# IV

# Sprawl and Its Control

## The Incidence and Control of Sprawl in the United States

## INTRODUCTION

One of the most interesting findings of the preceding chapter is the identification of *substantial concentrations of significant population, household, and employment growth in a relatively small number of states, EAs, and counties.* Almost all of the geographic subdivisions (the four Census regions, the 172 EAs, and the 3,091 counties) are projected to show growth in households and jobs over the 25-year period from 2000 to 2025. The exception to the positive growth trend are two EAs (Greenville, Mississippi, and Wheeling, West Virginia-Ohio) and about 530 counties; however, much of this decline is either not significant or is taking place in counties that are already developed. The slowest-growing 125 EAs, consisting of about 2,000 of the 3,091 counties, contribute less than 25 percent of the nation's growth. In addition, there are approximately 365 counties that are growing significantly but are urban or developed suburban counties that, by definition, are not sprawl counties. The remaining counties (approximately 735) are the undeveloped, rural, and suburban locations with significant growth that are ripe for the low-density development termed sprawl—unlimited outward extension characterized by leapfrog development and low-density residential and nonresidential uses.

Using growth and its locational nexus, the incidence of sprawl can be specified by variables that will track significant growth in locations where this growth might be inappropriate. This will provide quantitative answers to the following key questions. To what degree is sprawl—significant, low-density residential and nonresidential development occurring at the outer fringe—present nationwide? Further, if controlling the geographic extent of sprawl development is desirable, which alternative locations can absorb additional growth without experiencing excessive growth themselves? Finally, are such alternative locations available within an existing EA or is a controlled sprawl condition not possible in some EAs?

The purpose of this chapter is to provide answers to the above questions while looking at the phenomenon of this type of growth nationwide. In particular:

- How many of the approximately 3,100 counties are experiencing significant sprawl?
- Does sprawl have a temporal dimension? Is it projected to increase or decrease significantly or remain stable between the recent past period (1980 to 2000) and the future period (2000 to 2025)?
- To what extent can sprawl be contained with more concentrated development?

**Table 4.1**
**Average Annual Household and Employment Growth in Counties**

| Variable | Average Annual Growth Rate | | 1980–2000 Average Annual Numerical Growth | | | 2000–2025 Average Annual Numerical Growth | | |
|---|---|---|---|---|---|---|---|---|
| | 1980–2000 | 2000–2025 | Absolute Growth | 40% of Growth | 160% of Growth | Absolute Growth | 40% of Growth | 160% of Growth |
| Households | 1.36 | 1.04 | 357 | 143 | 411 | 328 | 131 | 525 |
| Employment | 2.03 | 1.32 | 752 | 301 | 1,203 | 639 | 256 | 1,022 |

*Source:* Woods & Poole (1998).

In this chapter, the projections of population, households, and employment will be used to define two different future growth scenarios for the United States: *uncontrolled growth (sprawl)* and *controlled growth (compact development or smart growth)*. Both future growth scenarios involve development over the period 2000 to 2025. The prior period of development is used to benchmark the type of sprawl taking place in the future period: sustained, growing, or decreasing.[1] These projections are then located by EA to map the presence of (1) a future with sprawl and (2) a future wherein sprawl has been controlled. In the first scenario, household and employment projections for an area define the incidence of historical development or sprawl for a 2000 to 2025 projection period under uncontrolled growth. In the second scenario, households and employment are redistributed to more developed counties within an EA. Redirecting growth to these counties, which are closer to established metropolitan centers, reduces the incidence of growth in outlying rural and undeveloped areas. Thus, future sprawl is reduced and controlled in these locations. The results are presented for states, EAs, and counties.

As indicated in chapter 2, the 172 BEA EAs are the regional entities used to analyze the incidence of sprawl. Each EA represents a commuting region, with urban, suburban, and rural counties, whose *total* population, household, and employment projections are *identical under the two future development scenarios*. Demographic projections do not vary by EA over the 25-year period. Sprawl is controlled within an EA by redirecting a portion of a county's growth to other counties. An individual *county's* population, household, and employment projections will vary by scenario because the scenarios allocate growth differently within an EA. Thus, if outer-county growth is limited for the purposes of controlling sprawl, inner-county growth within the EA is enhanced.

**Table 4.2**
**Relative Sprawl Designations**
(Based on Past and Future Sprawl Presence)

| 1980–2000 | 2000–2025 | Designation |
|---|---|---|
| Nonsprawl | Sprawl | Growing Sprawl |
| Sprawl | Sprawl | Sustained Sprawl |
| Sprawl | Nonsprawl | Decreasing Sprawl |
| Nonsprawl | Nonsprawl | Nonsprawl |

*Source:* Center for Urban Policy Research, Rutgers University.

## UNCONTROLLED-GROWTH SCENARIO

### Sprawl Designation Process at the County Level

Household and employment growth is determined for all counties for the periods 1980 to 2000 and 2000 to 2025 to provide both historical and future designations of sprawl or nonsprawl. Growth rates for each period are calculated and the upper quartile of county growth rates for each EA is established. Counties in the upper quartile of growth rate (the defining characteristic of significant sprawl in an EA) cannot fall below the average annual national growth rate or 40 percent of the average annual national absolute increase. (Table 4.1 shows the annual average national growth rate and annual average absolute increase for both periods.) The growth rate threshold values for each EA are presented in Appendix C.

[1] Sprawl is decreasing primarily because the market for development is slowing in most of the areas experiencing sprawl (i.e., it is skipping over to other places), not because curative measures are in force that have sprawl under control.

**Table 4.3**
**Sprawl by County Type under Uncontrolled Growth**

| Designation | Rural and Undeveloped | Suburban and Rural Center | Urban Center and Urban | Total |
|---|---|---|---|---|
| Decreasing Sprawl | 145 | 32 | 0 | 177 |
| Sustained Sprawl | 347 | 84 | 0 | 431 |
| Growing Sprawl | 106 | 28 | 0 | 134 |
| **Sprawl Subtotal** | **598** | **144** | **0** | **742** |
| Nonsprawl | 2,128 | 121 | 100 | 2,349 |
| **Grand Total** | **2,726** | **265** | **100** | **3,091** |

*Sources:* Projection data from Woods & Poole (1998). Data interpretation by the Center for Urban Policy Research, Rutgers University.

Another check on the significant sprawl designation is that a county is not given a sprawl designation if its overall growth is due solely to the growth of a dominant city. If a single city represents more than 50 percent of the county's growth, the county is not designated as a sprawl county. Since the city is growing strongly within its own bounds and accounts for over half of the county's growth, the county is not sprawling; rather, it is assumed that the city is the growing entity.

Further, if a county is not initially designated as sprawling by its relative growth rate, but it has an absolute growth level of 160 percent of the national county annual average, it is also classified as a sprawl county. This criteria applies more to suburban counties where the growth rates would never exceed the growth rate thresholds due to their size.

In Table 4.2, sprawl is characterized in a way that demonstrates the changing nature of its presence in an area. The terms defined below are empirically demonstrated in the sections that follow.

Courtesy of USFWS/C. Dobert

- *Nonsprawl*—counties (except urban and urban centers) that do *not* meet the above sprawl criteria during both the 1980 to 2000 period and the 2000 to 2025 period;
- *Decreasing sprawl*—counties that *do* meet the sprawl criteria for 1980 to 2000 but *do not* meet the criteria for 2000 to 2025. (These are primarily locations where the market has cooled, not where ameliorative measures are in place. Further, most fall just below one or another sprawl criterion.)
- *Sustained sprawl*—counties that *do* meet the above criteria for sprawl in both time periods.
- *Growing sprawl*—counties that *do not* meet the sprawl criteria for 1980 to 2000 but *do* meet it for the 2000 to 2025 period.

This temporal definition of sprawl recognizes that, in any given county, sprawl is either (1) nonexistent; (2) decreasingly occurring; (3) continuously occurring; or (4) newly occurring.

## Existing Incidence of Sprawl

Using the above definitions, the incidence of sprawl can be viewed nationally. Sprawl (significant low-density growth in developing suburban, rural center, rural, and undeveloped counties) will affect 742 out of the 3,091 counties in the nation, or about 24 percent of all counties, at some point during the 2000 to 2025 period (see Table 4.3). In terms of numbers of counties, sprawl is occurring to a greater degree (by a ratio of four to one) in rural and undeveloped counties than in either developing suburban or rural cen-

Courtesy of T. Nelessen

ter counties. Close to 600 (81 percent) of the 742 counties where significant sprawl is taking place are rural or undeveloped counties.

Of the temporal categories of sprawl, sustained sprawl (occurring in the 1980 to 2000 period and projected for the 2000 to 2025 period) involves by far the largest number of counties (431), followed by decreasing sprawl (sprawl occurring less in the period from 2000 to 2025; 177 counties), and growing sprawl (sprawl projected only for the later period; 134 counties). Sprawl does, however, represent a significant share of overall national growth. Of the 23.5 million projected growth in households over the period 2000 to 2025, growth of 13.1 million households, or 56 percent, will take place in counties characterized by significant *sprawl* growth; growth of 8.3 million households, or 35 percent, will occur in more developed urban and suburban *nonsprawl* counties; and growth of 2.0 million households, or 8.6 percent, will occur in very low growth rural and undeveloped, *nonsprawl* counties. Of the 13.1 million household growth in *sprawl* counties, growth of 9.8 million households, or 75 percent, will be in counties that exhibit *sustained sprawl* (multiperiod); growth of 2.1 million households, or 16 percent, will occur in counties that exhibit *decreasing sprawl* (slowing in the later period); and growth of 1.3 million households, or 1 percent, will occur in counties with *growing sprawl* (only in the later period). Thus, development in significant sprawl locations affects well over half of the future growth of households in the United States, three-quarters of which have sprawled for the past twenty years and will continue to sprawl to some degree for the next 25 years.

It should be understood that this does not mean that sprawl is absent from other locations; i.e., very low growth rural and undeveloped counties. In most of these locations, low-level sprawl *is* taking place. These are isolated piano-key residential developments along county roads and gas station/convenience store developments at major intersections. In fact, as mentioned previously, sprawl is occurring in most locations—even in locations with no new net growth and in locations within the two most famous cities with growth boundaries (Lexington, Kentucky, and Portland, Oregon). Except for concentrated urban development and specific higher-density infill projects, low-level sprawl is occurring almost everywhere that growth is taking place in the United States. However, this analysis focuses on significant sprawl, which will occur in the future in about one-quarter of the nation's counties. Compared with household growth, potentially less employment growth will take place in sprawl locations. In fact, more employment growth

**Table 4.4**
**Sprawl as a Share of All Growth and by County Sprawl Type**

| Shares of All Growth | Households | Employment |
|---|---|---|
| Sprawl Counties | 13,133,070 | 20,367,000 |
| Very Low Growth: Rural and Undeveloped Counties | 2,007,070 | 4,822,760 |
| Developed: Urban and Suburban Counties | 8,313,270 | 24,228,340 |
| **Total Growth** | **23,454,410** | **49,418,100** |
| **County Sprawl Type** | **Households** | **Employment** |
| Decreasing Sprawl Counties | 2,053,110 | 3,550,210 |
| Growing Sprawl Counties | 1,289,670 | 2,978,610 |
| Sustained Sprawl Counties | 9,790,290 | 13,838,180 |
| **All Sprawl Counties** | **13,133,070** | **20,367,000** |

*Sources:* Projection data from Woods & Poole (1998). Data interpretation by the Center for Urban Policy Research, Rutgers University.

**Table 4.5**
**States with the Most Significant Future Household Growth in Sprawl Locations**

| State | Rank | Percentage of National Sprawl Household Growth (%) | Percentage of State's Household Growth That Is Sprawl (%) |
|---|---|---|---|
| Florida | 1 | 12.8 | 69.9 |
| California | 2 | 9.3 | 40.3 |
| Arizona | 3 | 7.8 | 97.6 |
| Texas | 4 | 6.2 | 30.7 |
| N. Carolina | 5 | 4.7 | 70.4 |
| S. Carolina | 6 | 3.6 | 85.8 |
| Colorado | 7 | 3.5 | 69.8 |
| Washington | 8 | 3.4 | 52.8 |
| Georgia | 9 | 3.4 | 44.3 |
| Nevada | 10 | 3.0 | 88.8 |

*Source:* Center for Urban Policy Research, Rutgers University.

will take place in *nonsprawl* developed urban and suburban county locations (24.2 million jobs, or 49 percent of total job growth) than will take place in significantly growing rural, undeveloped, and developing suburban (i.e., *sprawl*) counties (20.4 million jobs, or 41 percent of total job growth). Further, each of these two loci of future job growth represents five to six times the amount of employment growth that will take place in the very low growth *nonsprawl* rural and undeveloped counties (4.8 million or barely 10 percent of total job growth (see Table 4.4). Thus, household growth, as opposed to employment growth, is far more likely to be associated with, and thus to characterize, potential sprawl locations.

# WHERE IS SPRAWL TAKING PLACE IN THE UNITED STATES?

## States

Figure 4.1 and Table 4.5 show projected sprawl in the United States for the uncontrolled-growth scenario. Again, it is obvious that sprawl trends follow growth trends. The *10* states that will contribute the largest percentages to future sprawl household growth are states that are synonymous with growth. These are, in order of descending rank, Florida, California, Arizona, Texas, North Carolina, South Carolina, Colorado, Washington, Georgia, and Nevada. Five of these 10 states are in the South; five are in the West. These ten states represent 58 percent of sprawl household

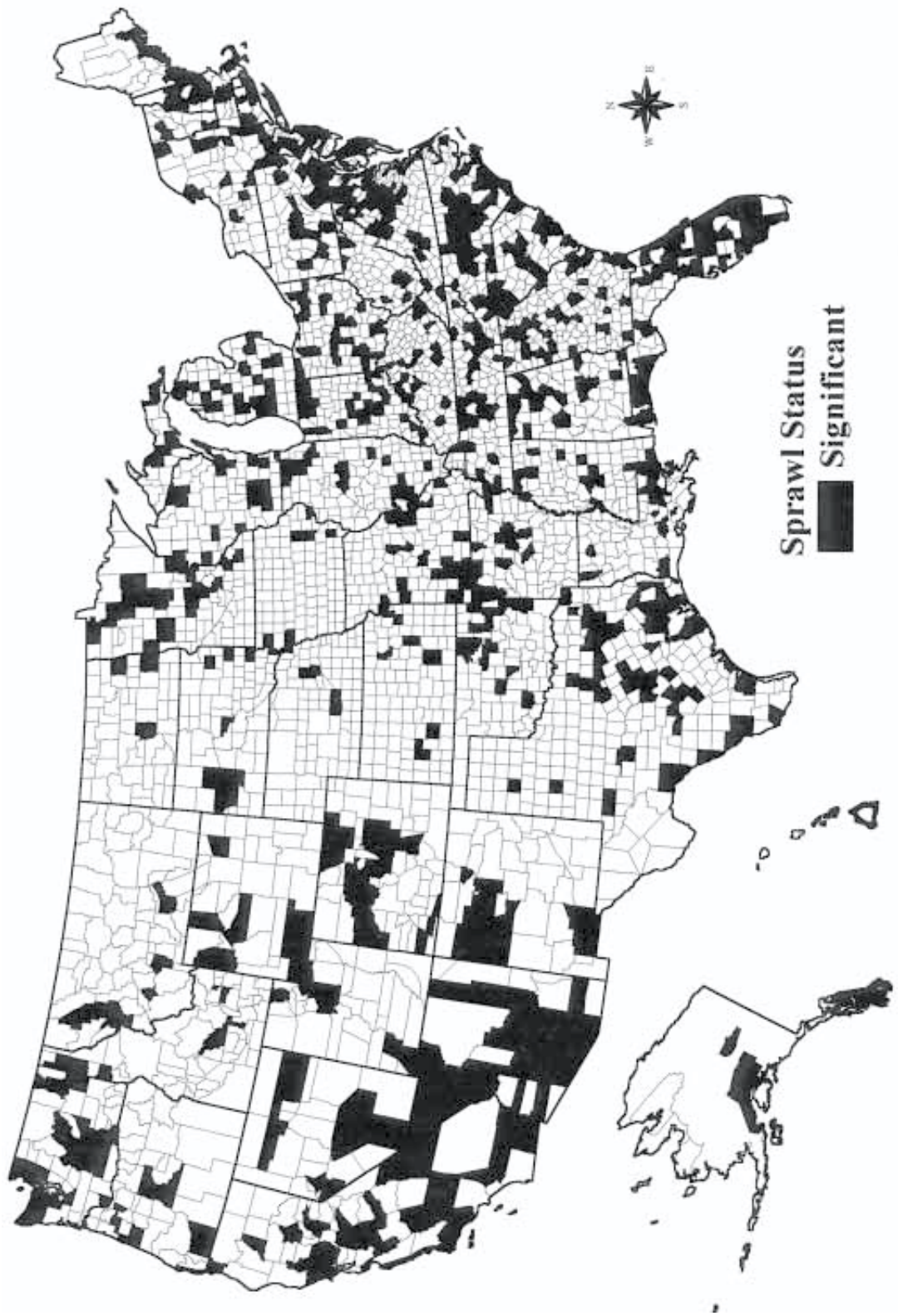



**Figure 4.1**
**Projected Sprawl in the United States: Uncontrolled-Growth Scenario**

**Figure 4.2**
**Projected Sprawl in the United States: Controlled-Growth Scenario**

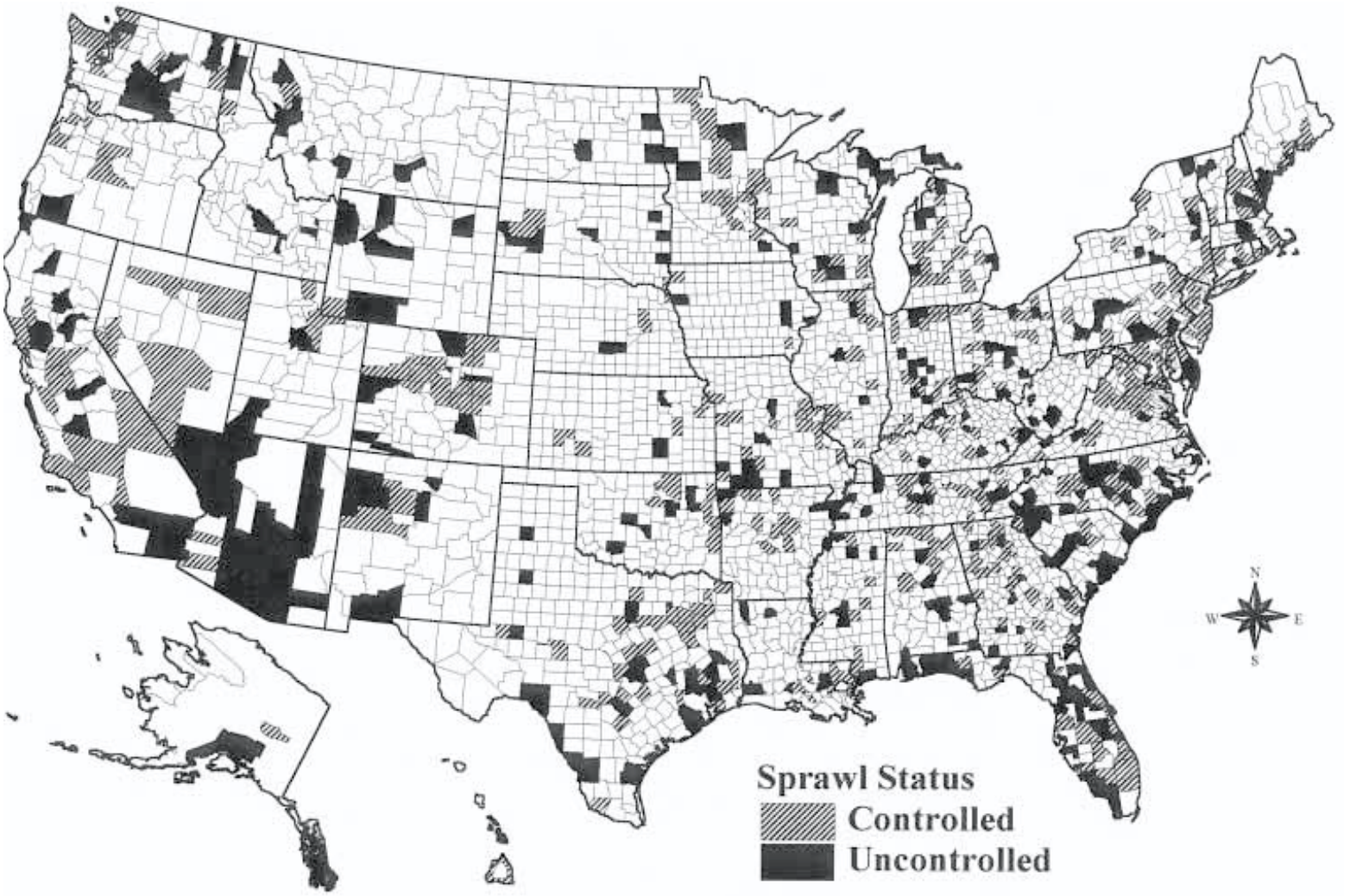


**Table 4.6**
**Sprawl Growth Compared with Overall Growth in States**
(Top 20 States)

| State | Sprawl Growth Rank | Total Growth Rank | 2000–2025 Household Increase in Sprawl Counties | 2000–2025 Household Increase in All Counties | Percentage of U.S. Household Growth Designated as Sprawl (%) | Percentage of All U.S. Household Growth (%) | Percentage of County Growth Designated as Sprawl (%) |
|---|---|---|---|---|---|---|---|
| Florida | 1 | 3 | 1,681,350 | 2,405,432 | 12.8 | 10.3 | 69.9 |
| California | 2 | 1 | 1,221,059 | 3,032,456 | 9.3 | 12.9 | 40.3 |
| Arizona | 3 | 4 | 1,024,588 | 1,049,559 | 7.8 | 4.5 | 97.6 |
| Texas | 4 | 2 | 809,213 | 2,638,577 | 6.2 | 11.2 | 30.7 |
| North Carolina | 5 | 6 | 622,361 | 883,790 | 4.7 | 3.8 | 70.4 |
| South Carolina | 6 | 11 | 467,982 | 545,564 | 3.6 | 2.3 | 85.8 |
| Colorado | 7 | 9 | 462,203 | 662,646 | 3.5 | 2.8 | 69.8 |
| Washington | 8 | 7 | 451,562 | 855,796 | 3.4 | 3.6 | 52.8 |
| Georgia | 9 | 5 | 447,186 | 1,009,838 | 3.4 | 4.3 | 44.3 |
| Nevada | 10 | 15 | 392,899 | 442,453 | 3.0 | 1.9 | 88.8 |
| Maryland | 11 | 16 | 349,474 | 437,233 | 2.7 | 1.9 | 79.9 |
| Tennessee | 12 | 10 | 341,558 | 639,882 | 2.6 | 2.7 | 53.4 |
| Ohio | 13 | 12 | 300,371 | 534,892 | 2.3 | 2.3 | 56.2 |
| Alabama | 14 | 17 | 296,901 | 431,386 | 2.3 | 1.8 | 68.8 |
| Indiana | 15 | 14 | 288,901 | 473,235 | 2.2 | 2.0 | 61.1 |
| Virginia | 16 | 8 | 287,747 | 696,076 | 2.2 | 3.0 | 41.3 |
| Michigan | 17 | 13 | 253,060 | 477,693 | 1.9 | 2.0 | 53.0 |
| Pennsylvania | 18 | 24 | 250,533 | 315,339 | 1.9 | 1.3 | 79.5 |
| Missouri | 19 | 25 | 242,836 | 282,786 | 1.9 | 1.2 | 85.9 |
| Wisconsin | 20 | 22 | 236,905 | 368,530 | 1.8 | 1.6 | 64.3 |

*Source:* Center for Urban Policy Research, Rutgers University.

growth and 60 percent of all household growth. The top *twenty* sprawl growth states represent 75 percent of national sprawl household growth and 85 percent of all household growth. In the previously listed top-10 sprawl states, state sprawl household growth in an individual state as a percentage of overall national sprawl household growth varies from nearly 13 percent for Florida to about 3.0 percent for Nevada. One-eighth of all future sprawl growth will take place in Florida. The share of overall growth in a state that is sprawl is highest in Arizona, at nearly 98 percent, and lowest in Texas, at nearly 31 percent. In Arizona, only 2 percent of all household growth from 2000 to 2025 will occur either in nonsprawl developed suburban and urban counties or in a very limited fashion in nonsprawl, very low development locations. In Texas, in contrast, 70 percent of all household growth during this period will occur in these types of already developed or very low development (nonsprawl) county locations. Table 4.6 lists the states with the most sprawl (by percentage contribution to national sprawl growth) as well as the share of their overall growth that is designated sprawl.

The most interesting comparison that can be drawn from Table 4.6 is that even though there is a high correlation between growth in states and sprawl in states, there are also some noticeable differences. Among the states where sprawl dominates overall growth, Florida is the first most significant sprawl state but the third most significant overall growth state. Similarly, South Carolina is the sixth most significant sprawl state but the 11th most significant overall growth state, and Nevada and Maryland are the 10th and 11th most significant sprawl states but the 15th and 16th most significant overall growth states.

Courtesy of C. Galley

## Table 4.7
## States Ranked by Sprawl Index

| State | Rank | Sprawl Index (House-holds) | Percentage of U.S. Household Growth Designated as Sprawl (%) | Percentage of All U.S. Household Growth (%) |
|---|---|---|---|---|
| Florida | 1 | 16.0 | 12.8 | 10.3 |
| Arizona | 2 | 13.6 | 7.8 | 4.5 |
| California | 3 | 6.7 | 9.3 | 12.9 |
| North Carolina | 4 | 6.0 | 4.7 | 3.8 |
| South Carolina | 5 | 5.5 | 3.6 | 2.3 |
| Nevada | 6 | 4.7 | 3.0 | 1.9 |
| Colorado | 7 | 4.4 | 3.5 | 2.8 |
| Maryland | 8 | 3.8 | 2.7 | 1.9 |
| Texas | 9 | 3.4 | 6.2 | 11.2 |
| Washington | 10 | 3.2 | 3.4 | 3.6 |
| Missouri | 11 | 2.8 | 1.9 | 1.2 |
| Alabama | 12 | 2.8 | 2.3 | 1.8 |
| Pennsylvania | 13 | 2.7 | 1.9 | 1.3 |
| Georgia | 14 | 2.7 | 3.4 | 4.3 |
| Tennessee | 15 | 2.5 | 2.6 | 2.7 |
| New Jersey | 16 | 2.4 | 1.6 | 1.0 |
| Indiana | 17 | 2.4 | 2.2 | 2.0 |
| Ohio | 18 | 2.3 | 2.3 | 2.3 |
| Wisconsin | 19 | 2.1 | 1.8 | 1.6 |
| Michigan | 20 | 1.8 | 1.9 | 2.0 |
| Virginia | 21 | 1.6 | 2.2 | 3.0 |
| Alaska | 22 | 1.5 | 0.9 | 0.5 |
| New Hampshire | 23 | 1.4 | 0.8 | 0.5 |
| Mississippi | 24 | 1.4 | 1.0 | 0.8 |
| New Mexico | 25 | 1.3 | 1.2 | 1.1 |
| Illinois | 26 | 1.2 | 1.4 | 1.6 |
| Oregon | 27 | 1.1 | 1.4 | 1.8 |
| Arkansas | 28 | 1.1 | 0.9 | 0.7 |
| Montana | 29 | 0.9 | 0.6 | 0.4 |
| Louisiana | 30 | 0.9 | 1.1 | 1.3 |
| Utah | 31 | 0.9 | 1.3 | 1.8 |
| New York | 32 | 0.8 | 0.9 | 1.1 |
| Minnesota | 33 | 0.7 | 1.1 | 1.7 |
| Maine | 34 | 0.6 | 0.5 | 0.5 |
| South Dakota | 35 | 0.6 | 0.4 | 0.2 |
| Massachusetts | 36 | 0.6 | 0.8 | 1.1 |
| Kentucky | 37 | 0.6 | 0.8 | 1.2 |
| Hawaii | 38 | 0.5 | 0.6 | 0.7 |
| Oklahoma | 39 | 0.5 | 0.6 | 0.9 |
| Idaho | 40 | 0.4 | 0.6 | 0.8 |
| Rhode Island | 41 | 0.4 | 0.3 | 0.2 |
| Delaware | 42 | 0.3 | 0.3 | 0.3 |
| Connecticut | 43 | 0.3 | 0.2 | 0.1 |
| Iowa | 44 | 0.3 | 0.4 | 0.5 |
| North Dakota | 45 | 0.3 | 0.2 | 0.1 |
| West Virginia | 46 | 0.2 | 0.3 | 0.3 |
| Wyoming | 47 | 0.2 | 0.2 | 0.2 |
| Vermont | 48 | 0.2 | 0.2 | 0.2 |
| Kansas | 49 | 0.1 | 0.2 | 0.5 |
| Nebraska | 50 | 0.0 | 0.1 | 0.4 |

*Source:* Center for Urban Policy Research, Rutgers University.

Among states with relatively high growth that are not necessarily dominated by sprawl, Texas is the fourth most significant sprawl state but the second most significant overall growth state. Georgia is the ninth most significant sprawl state but the fifth most significant overall growth state. Virginia is the 16th most significant sprawl state but the eighth most significant overall growth state. As a cautionary note, these relationships are based on the scale of overall growth and the number of relatively undeveloped locations in a state where this growth could take place.

It is possible to rank states as future sprawl-growth sites by creating an index that links their contribution to sprawl household growth with their contribution to overall household growth. This is an index of potential state vulnerability for significant amounts of development to occur in the sprawl locations. To be high on the list, a state must experience significant household growth destined for relatively undeveloped counties. The measure is created by dividing the percentage contribution to national sprawl household growth by the percentage contribution to overall household growth, then multiplying this fraction by the percentage contribution to national sprawl household growth. This is the same as multiplying the percentage contribution to national sprawl by the percentage of sprawl of overall household growth in the state. This index puts the state of Florida at the top of the list in terms of vulnerability to sprawl and the state of Nebraska at the bottom. All states, ranked by sprawl vulnerability, are found in Table 4.7, and the top ten appear as follows:

**Table 4.8**
**Sprawl in EAs by Region**

| Region and Division | EAs with Sprawl: Number of EAs | EAs with Sprawl: Total Counties in EAs | EAs with Sprawl: Sprawl Counties in EAs | EAs without Sprawl: Number of EAs | EAs without Sprawl: Total Counties in EAs | U.S. Total: Total EAs | U.S. Total: Total Counties in EAs |
|---|---|---|---|---|---|---|---|
| **Northeast** | **12** | **213** | **69** | **2** | **13** | **14** | **226** |
| New England | 4 | 57 | 20 | 0 | 0 | 4 | 57 |
| Middle Atlantic | 8 | 156 | 49 | 2 | 13 | 10 | 169 |
| **Midwest** | **45** | **1,009** | **194** | **6** | **72** | **51** | **1,081** |
| East North Central | 23 | 411 | 114 | 0 | 0 | 23 | 411 |
| West North Central | 22 | 598 | 80 | 6 | 72 | 28 | 670 |
| **South** | **70** | **1,321** | **347** | **4** | **39** | **74** | **1,360** |
| South Atlantic | 34 | 563 | 187 | 0 | 0 | 34 | 563 |
| East South Central | 13 | 312 | 68 | 1 | 10 | 14 | 322 |
| West South Central | 23 | 446 | 92 | 3 | 29 | 26 | 475 |
| **West** | **29** | **387** | **132** | **4** | **37** | **33** | **424** |
| Mountain | 18 | 265 | 71 | 2 | 26 | 20 | 291 |
| Pacific | 11 | 122 | 61 | 2 | 11 | 13 | 133 |
| **Total** | **156** | **2,930** | **742** | **16** | **161** | **172** | **3,091** |

*Source:* Center for Urban Policy Research, Rutgers University.

**Sprawl Index—Top 10 States**

| | | | |
|---|---|---|---|
| (1) | Florida | (6) | Nevada |
| (2) | Arizona | (7) | Colorado |
| (3) | California | (8) | Maryland |
| (4) | N. Carolina | (9) | Texas |
| (5) | S. Carolina | (10) | Washington |

A number of interesting relationships emerge from this index. For example, Pennsylvania is 13th on the list, ahead of Georgia (14th), New Jersey (16th), Virginia (21st), and Oregon (27th). Minnesota is 33rd on the list and Connecticut is 43rd. The list reflects a state's share of national growth as well as the proportion of that growth that represents sprawl.

## Regions

On a regional basis, sprawl locations parallel growth locations. As shown in Table 4.8, most of the future overall household growth will take place in the South (45.5 percent), followed by the West (33.5 percent), the Midwest (14.7 percent) and the Northeast (6.3 percent). The same is true for sprawl. Most sprawl will take place in the South (44.8 percent), followed by the West (33.7 percent), the Midwest (14.0 percent), and the Northeast (7.4 percent). Interestingly, the Northeast has a higher share of sprawl growth than it does overall growth. This is the only region where this is true. The similarities of the overall regional percentages clearly mask obvious differences in growth versus sprawl percentages at the state and Census-division levels.

The above findings confirm that, at the regional level, significant sprawl is associated with significant growth. Sprawl is a phenomenon that is associated with the fastest-growing regions of the United States. This clearly points out the reality that no region is able to statistically contain its outward development. For the most part, significant growth regions in the United States are significant sprawl regions.

## BEA EAs

Of the 172 BEA EAs in the United States, sprawl is evident in 156, or about 90 percent. This comprises approximately 742 counties or about five counties per EA. On a regional basis, sprawl is most prevalent in the South. It is found in 70 of 74, or 95 percent, of the South's EAs (see Table 4.8). All of the other regions have about 88 percent of their EAs experiencing sprawl. At the Census-division level, sprawl is most prevalent in EAs (about 100 percent each) in the South Atlantic, East North Central, and New England Divisions. The divisions with the least sprawl-

ing EAs are the West North Central and the Middle Atlantic.

The following EAs evidence the greatest amount of sprawl (ordered by percentage of overall sprawl household growth):

- Phoenix-Mesa, AZ-NM
- Los Angeles-Riverside, CA
- Miami-Fort Lauderdale, FL
- Washington-Baltimore, DC-MD
- Denver-Boulder-Greeley, CO
- Las Vegas, NV-AZ-UT
- Orlando, FL
- San Francisco-Oakland, CA
- Houston-Galveston-Brazoria, TX
- Atlanta, GA-AL-NC
- Seattle-Tacoma-Bremerton, WA
- Boston-Worcester-Lawrence-Lowell-Brockton, MA
- New York-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT
- Raleigh-Durham-Chapel Hill, NC
- Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD
- Nashville, TN-KY
- Tucson, AZ
- Portland-Salem, OR
- Chicago-Gary-Kenosha, IL-IN-WI
- Indianapolis, IN-IL

The above 20 of the 172 BEA EAs, consisting of 575 of the 3,091 counties, together comprise over one-half (57 percent) of the sprawl growth in the United States. Eight of these EAs are in the South and eight are in the West; two are in the Northeast and two are in the Midwest. These 20 areas also represent about 46 percent of the overall household growth of the United States. They range in their contribution to national sprawl growth from 5.5 percent at the top to 1.4 percent at the bottom (see Table 4.9). Since they

Courtesy of C. Galley

Courtesy of C. Galley

are the largest sprawling EAs, their contributions to sprawl growth are obviously larger than their contributions to overall household growth. There is significant variance in the amount of overall growth that is sprawl. The Tucson, Las Vegas, and Phoenix EAs have the highest sprawl shares, with close to 100 percent of their growth as sprawl. The San Francisco, Houston, Seattle, and Atlanta EAs have the lowest percentages, with only about 40 percent of their overall household growth as sprawl. While these latter lower percentages show that specific urban areas (nonsprawl locations) in the West and South can encompass a reasonable amount of overall EA growth, most of the EAs nationwide are dominated by growth taking place primarily in sprawl locations.

Again, while there is similarity between the rankings of significant sprawl-growth EAs and significant overall-growth EAs, their differences are also pronounced. The Phoenix-Mesa, AZ-NM EA is the first most significant sprawl-growth EA, yet the sixth most significant EA in overall growth. The Miami-Fort Lauderdale EA is the third most significant sprawl-growth EA, but the eighth most significant EA in overall growth. The Denver, Boulder, Greeley, CO; Las Vegas, NV-AZ-UT; and Orlando, FL EAs are the 5th, 6th, and 7th EAs in sprawl growth, yet the 10th, 14th, and 11th EAs, respectively, in overall growth. Tucson, AZ is the 17th EA in sprawl growth, yet the 32nd EA in overall growth. At the other extreme, the Dallas-Fort Worth EA is the 21st most significant EA in sprawl growth but only the second most significant EA in overall growth. The San Francisco-Oakland EA is the 8th most significant EA in sprawl growth, yet the third EA in overall growth. The Atlanta, GA-AL-NC EA is the 10th most significant in sprawl growth, yet the 4th most significant EA in overall growth. EAs also can be ranked according to a sprawl index that combines both sprawl and overall household growth. The same sprawl index used for the states is used for

**Table 4.9**
**Sprawl Growth Compared with Overall Growth in EAs**
(Top 30 EAs)

| EA Name* (Code #) | No. of Counties | Sprawl Growth Rank | Total Growth Rank | 2000–2025 Household Growth in Sprawl Counties | 2000–2025 Household Growth in All Counties | Percentage of U.S. Household Growth Designated as Sprawl (%) | Percentage of All U.S. Household Growth (%) | Percentage of County Growth Designated as Sprawl (%) |
|---|---|---|---|---|---|---|---|---|
| Phoenix-Mesa (158) | 8 | 1 | 6 | 715,750 | 725,011 | 5.5 | 3.1 | 98.7 |
| Los Angeles-River. (160) | 10 | 2 | 1 | 640,142 | 1,160,231 | 4.9 | 2.9 | 55.2 |
| Miami-Fort Laud.(31) | 10 | 3 | 8 | 547,741 | 678,757 | 4.2 | 1.8 | 80.7 |
| Washington-Balt. (13) | 52 | 4 | 5 | 459,204 | 794,409 | 3.5 | 4.9 | 57.8 |
| Denver-Boulder (141) | 49 | 5 | 10 | 437,473 | 636,246 | 3.3 | 2.7 | 68.8 |
| Las Vegas (153) | 11 | 6 | 14 | 422,883 | 424,361 | 3.2 | 2.6 | 99.7 |
| Orlando (30) | 13 | 7 | 11 | 415,559 | 614,319 | 3.2 | 3.4 | 67.7 |
| San Francisco (163) | 22 | 8 | 3 | 347,522 | 797,268 | 2.7 | 1.1 | 43.6 |
| Houston-Galveston (131) | 38 | 9 | 7 | 299,110 | 724,754 | 2.3 | 1.1 | 41.3 |
| Atlanta (40) | 67 | 10 | 4 | 298,464 | 795,581 | 2.3 | 0.9 | 37.5 |
| Seattle-Tacoma (170) | 15 | 11 | 9 | 271,813 | 644,295 | 2.1 | 1.3 | 42.2 |
| Boston-Worcester (3) | 29 | 12 | 13 | 251,724 | 437,445 | 1.9 | 1.3 | 57.5 |
| NY-Northern NJ (10) | 58 | 13 | 22 | 244,512 | 309,525 | 1.9 | 3.4 | 79.0 |
| Raleigh-Durham (19) | 18 | 14 | 27 | 239,539 | 257,037 | 1.8 | 1.9 | 93.2 |
| Philadelphia-Wil. (12) | 18 | 15 | 26 | 238,264 | 264,970 | 1.8 | 0.7 | 89.9 |
| Nashville (71) | 54 | 16 | 23 | 222,123 | 305,503 | 1.7 | 3.1 | 72.7 |
| Tucson (159) | 3 | 17 | 32 | 203,936 | 203,936 | 1.6 | 0.5 | 100.0 |
| Portland-Salem (167) | 24 | 18 | 16 | 203,759 | 401,739 | 1.6 | 2.7 | 50.7 |
| Chicago-Gary-Ken. (64) | 30 | 19 | 15 | 200,698 | 405,854 | 1.5 | 0.6 | 49.5 |
| Indianapolis (67) | 45 | 20 | 24 | 181,356 | 293,208 | 1.4 | 1.3 | 61.9 |
| Dallas-Fort Worth (127) | 77 | 21 | 2 | 178,517 | 925,006 | 1.4 | 3.4 | 19.3 |
| Jacksonville (29) | 27 | 22 | 25 | 168,103 | 281,343 | 1.3 | 0.5 | 59.8 |
| Tampa-St. Peters. (34) | 4 | 23 | 19 | 155,619 | 379,561 | 1.2 | 0.7 | 41.0 |
| Sacramento-Yolo (164) | 11 | 24 | 21 | 154,234 | 339,517 | 1.2 | 1.7 | 45.4 |
| Cincinnati-Hamilton (49) | 22 | 25 | 33 | 142,683 | 200,233 | 1.1 | 0.5 | 71.3 |
| Columbia (98) | 11 | 26 | 40 | 142,047 | 159,239 | 1.1 | 0.9 | 89.2 |
| Sarasota-Bradenton (33) | 4 | 27 | 35 | 133,742 | 171,550 | 1.0 | 1.2 | 78.0 |
| Minneapolis (107) | 70 | 28 | 17 | 131,694 | 399,604 | 1.0 | 1.7 | 33.0 |
| Greensboro-Win.(18) | 18 | 29 | 42 | 130,698 | 151,432 | 1.0 | 0.4 | 86.3 |
| Fort Myers-Cape C. (32) | 2 | 30 | 52 | 122,179 | 122,179 | 1.0 | 0.6 | 100.0 |

*Source:* Center for Urban Policy Research, Rutgers University.

* Abbreviated for space.

the EAs: sprawl household growth divided by total household growth, then multiplied by sprawl household growth. Again, the index is sensitive to the overall amount of growth an EA contributes to overall growth as well as the share of overall growth that is sprawl. Table 4.10 provides a listing of the EAs evidencing the greatest sprawl according to this index. The top ten, in descending order, are as follows:

**Sprawl Index—Top 10 EAs**

(1) Phoenix-Mesa, AZ-NM
(2) Miami-Fort Lauderdale, FL
(3) Las Vegas, NV-AZ-UT
(4) Los Angeles-Riverside-Orange, CA-AZ
(5) Denver-Boulder-Greeley, CO-KS-NE
(6) Orlando, FL
(7) Washington-Balimore, DC-MD-VA-WV-PA
(8) Raleigh-Durham-Chapel Hill, NC
(9) Philadelphia-Wilm.-Atl. C., PA-NJ-DE-MD
(10) Tucson, AZ

**Table 4.10**
**EAs Ranked by Sprawl Index**
(Top 30 EAs)

| EA Name | Rank | Sprawl Index | Percentage of U.S. Household Growth Designated as Sprawl (%) | Percentage of All U.S. Household Growth (%) |
|---|---|---|---|---|
| Phoenix-Mesa, AZ-NM | 1 | 9.6 | 5.5 | 3.1 |
| Miami-Fort Lauderdale, FL | 2 | 6.0 | 4.2 | 2.9 |
| Las Vegas, NV-AZ-UT | 3 | 5.7 | 3.2 | 1.8 |
| Los Angeles-Riverside-Orange, CA-AZ | 4 | 4.8 | 4.9 | 4.9 |
| Denver-Boulder-Greeley, CO-KS-NE | 5 | 4.1 | 3.3 | 2.7 |
| Orlando, FL | 6 | 3.8 | 3.2 | 2.6 |
| Washington-Baltimore, DC-MD-VA-WV-PA | 7 | 3.6 | 3.5 | 3.4 |
| Raleigh-Durham-Chapel Hill, NC | 8 | 3.0 | 1.8 | 1.1 |
| Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD | 9 | 2.9 | 1.8 | 1.1 |
| Tucson, AZ | 10 | 2.8 | 1.6 | 0.9 |
| New York-Northern New Jersey-Long Island, NY-NJ-CT-PA-MA-VT | 11 | 2.6 | 1.9 | 1.3 |
| Nashville, TN-KY | 12 | 2.2 | 1.7 | 1.3 |
| San Francisco-Oakland-San Jose, CA | 13 | 2.1 | 2.7 | 3.4 |
| Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH-RI-VT | 14 | 2.0 | 1.9 | 1.9 |
| Columbia, SC | 15 | 1.7 | 1.1 | 0.7 |
| Houston-Galveston-Brazoria, TX | 16 | 1.7 | 2.3 | 3.1 |
| Fort Myers-Cape Coral, FL | 17 | 1.7 | 0.9 | 0.5 |
| Seattle-Tacoma-Bremerton, WA | 18 | 1.6 | 2.1 | 2.7 |
| Greensboro-Winston-Salem-High Point, NC-VA | 19 | 1.5 | 1.0 | 0.6 |
| Indianapolis, IN-IL | 20 | 1.5 | 1.4 | 1.3 |
| Atlanta, GA-AL-NC | 21 | 1.5 | 2.3 | 3.4 |
| Anchorage, AK | 22 | 1.5 | 0.9 | 0.5 |
| Sarasota-Bradenton, FL | 23 | 1.4 | 1.0 | 0.7 |
| Portland-Salem, OR-WA | 24 | 1.4 | 1.6 | 1.7 |
| Greenville-Spartanburg-Anderson, SC-NC | 25 | 1.4 | 0.9 | 0.5 |
| Cincinnati-Hamilton, OH-KY-IN | 26 | 1.4 | 1.1 | 0.9 |
| Jacksonville, FL-GA | 27 | 1.4 | 1.3 | 1.2 |
| Chicago-Gary-Kenosha, IL-IN-WI | 28 | 1.4 | 1.5 | 1.7 |
| Charleston-North Charleston, SC | 29 | 1.2 | 0.7 | 0.4 |
| Wilmington, NC-SC | 30 | 1.2 | 0.8 | 0.6 |

*Source:* Center for Urban Policy Research, Rutgers University.

## County Level

Of the 742 counties evidencing sprawl growth, about one-half (247) are in the South, 26 percent (194) are in the Midwest, 18 percent (132) are in the West, and 9 percent (69) are in the Northeast (Tables 4.11 and 4.12). At the Census-division level most of the sprawl counties are located in the South Atlantic Division followed by counties in the East North Central Division (see Table 4.11).

What are the most significant sprawl counties in the United States? As shown in Table 4.13, 11 sprawl counties represent 20 percent of national sprawl growth; 30 sprawl counties represent nearly one-third of national sprawl growth. Table 4.13 lists the top 30 counties in order of their contribution to national sprawl. Of the 30 counties, 16 are in the West, 13 are in the South, one is in the Midwest, and none are in the Northeast. None of the sprawl counties have a density that qualifies that county as an urban center or an urban county. Similarly, few major cities in sprawl counties dominate; i.e., few cities account for more than one-half of host county growth.

The top 30 counties' contributions to sprawl household growth vary from 5 percent at the top to about 0.5 percent at the bottom. One hundred counties con-

**Table 4.11**
**Sprawl Counties by Census Region and Division**

| Division | Nonsprawl | Decreasing Sprawl | Sustained Sprawl | Growing Sprawl | Total |
|---|---|---|---|---|---|
| **Northeast** | | | | | |
| New England | 37 | 8 | 9 | 3 | 57 |
| Middle Atlantic | 120 | 19 | 25 | 5 | 169 |
| **Subtotal** | 157 | 27 | 34 | 8 | 226 |
| **South** | | | | | |
| South Atlantic | 376 | 52 | 111 | 24 | 563 |
| East South Central | 254 | 15 | 42 | 11 | 322 |
| West South Central | 383 | 17 | 56 | 19 | 475 |
| **Subtotal** | 1,013 | 84 | 209 | 54 | 1,360 |
| **Midwest** | | | | | |
| East North Central | 297 | 29 | 58 | 27 | 411 |
| West North Central | 590 | 18 | 44 | 18 | 670 |
| **Subtotal** | 887 | 47 | 102 | 45 | 1,081 |
| **West** | | | | | |
| Mountain | 220 | 10 | 41 | 20 | 291 |
| Pacific | 72 | 9 | 45 | 7 | 133 |
| **Subtotal** | 292 | 19 | 86 | 27 | 424 |
| **Total** | **2,349** | **177** | **431** | **134** | **3,091** |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 4.12**
**Sprawl Counties: Percentage of Regional and National Sprawl**

| Region | Sprawl Counties | Nonsprawl Counties | Total | Percentage of Total Regional Sprawl (%) | Percentage of Total National Sprawl (%) |
|---|---|---|---|---|---|
| **Northeast** | 69 | 157 | 226 | 30.5 | 9.3 |
| **Midwest** | 194 | 887 | 1,081 | 17.9 | 26.1 |
| **South** | 347 | 1,013 | 1,360 | 25.5 | 46.8 |
| **West** | 132 | 292 | 424 | 31.1 | 17.8 |
| **Total/Avg.** | **742** | **2,349** | **3,091** | **24.0** | **100.0** |

*Source:* Center for Urban Policy Research, Rutgers University.

tribute to 50 percent of national sprawl household growth; 300 counties contribute to three-quarters of national sprawl household growth. Ten percent of the nation's counties contribute to three-quarters of national sprawl household growth.

Again, while there is correspondence between sprawl household growth counties and total household growth counties, it is far from a one-to-one correspondence. Riverside, California, is the fourth most significant sprawl county, but the 10th most significant overall growth county. Clackamas, Oregon, is the 26th most significant sprawl-growth county, but the 65th most significant overall-growth county.

A sprawl index also can be applied to counties and a ranking of counties developed. Again, the index is a composite of a county's contribution that is sprawl household growth. The index is the share of sprawl growth divided by the share of total household growth times the share of sprawl household growth. The top 30 sprawl counties are listed in Table 4.13. The top 20 are as follows:

**Table 4.13**
**Counties Ranked by Sprawl Index**
(Top 30 Counties)

| Rank | County | 1990 Households (#) | 1980–1990 Household Growth (%) | Percentage of U.S. Sprawl 2000–2025 | Major City | 1990 Households (#) | 1980–1990 Household Growth (%) |
|---|---|---|---|---|---|---|---|
| 1 | Maricopa, AZ | 807,560 | 48.2 | 5.06 | Phoenix, AZ | 369,921 | 29.9 |
| 2 | Clark, NV | 287,025 | 65.1 | 2.69 | Las Vegas, NV | 99,735 | 60.5 |
| 3 | Palm Beach, FL | 365,558 | 56.0 | 1.77 | West Palm Beach, FL | 28,787 | 8.3 |
| 4 | Riverside, CA | 402,067 | 65.5 | 1.72 | Riverside, CA | 75,463 | 23.8 |
| 5 | Broward, FL | 528,442 | 26.6 | 1.69 | Ft. Lauderdale, FL | 66,440 | -1.7 |
| 6 | San Bernardino, CA | 464,737 | 50.6 | 1.64 | San Bernardino, CA | 54,482 | 27.2 |
| 7 | Pima, AZ | 261,792 | 37.8 | 1.40 | Tucson, AZ | 162,685 | 29.9 |
| 8 | Arapahoe, CO | 154,710 | 45.9 | 1.14 | Littleton, CO | 13,905 | 30.7 |
| 9 | Wake, NC | 165,743 | 55.6 | 1.10 | Raleigh, NC | 85,822 | 56.5 |
| 10 | Seminole, FL | 107,657 | 70.2 | 0.95 | Sanford, FL | 12,119 | 45.1 |
| 11 | Snohomish, WA | 171,713 | 42.3 | 0.88 | Everett, WA | 28,679 | 28.3 |
| 12 | Pasco, FL | 121,674 | 49.6 | 0.79 | Dade City, FL | 1,353 | -35.6 |
| 13 | Fort Bend, TX | 70,424 | 76.8 | 0.79 | Rosenberg, TX | 6,428 | 14.3 |
| 14 | Montgomery, TX | 63,563 | 53.2 | 0.76 | Conroe, TX | 10,016 | 50.4 |
| 15 | Manatee, FL | 91,060 | 46.9 | 0.70 | Bradenton, FL | 18,871 | 52.6 |
| 16 | El Paso, CO | 146,965 | 36.3 | 0.69 | Colorado Springs, CO | 110,862 | 36.5 |
| 17 | Utah, UT | 70,168 | 19.9 | 0.65 | Provo, UT | 23,805 | 18.5 |
| 18 | Solano, CA | 113,429 | 41.0 | 0.63 | Fairfield, CA | 25,425 | 38.1 |
| 19 | Lexington-Fayette, KY* | 61,633 | 29.4 | 0.62 | Lexington-Fayette, KY* | 61,633 | |
| 20 | Lee, FL | 140,124 | 69.8 | 0.61 | Ft. Meyers, FL | 18,144 | 25.9 |
| 21 | Williamson, TX | 48,792 | 95.7 | 0.60 | Taylor, TX | 29,381 | 12.9 |
| 22 | Clark, WA | 88,440 | 28.6 | 0.54 | Vancouver, WA | 20,138 | 7.1 |
| 23 | Ventura, CA | 217,298 | 25.8 | 0.52 | Oxnard, CA | 39,302 | 18.8 |
| 24 | Anchorage, AK* | 82,702 | 36.8 | 0.52 | Anchorage, AK | 82,702 | 36.8 |
| 25 | Montgomery, MD | 282,228 | 36.2 | 0.51 | Rockville, MD | 15,660 | 8.7 |
| 26 | Clackamas, OR | 104,180 | 22.5 | 0.50 | Portland (part of), OR | 187,268 | 17.9 |
| 27 | Placer, CA | 64,330 | 49.6 | 0.49 | Roseville, CA | 16,606 | 81.2 |
| 28 | Sonoma, CA | 149,540 | 29.8 | 0.49 | Santa Rosa, CA | 45,708 | 31.5 |
| 29 | Greenville, SC | 123,650 | 20.7 | 0.48 | Greenville, SC | 24,101 | 8.7 |
| 30 | Butler, OH | 104,830 | 18.7 | 0.46 | Hamilton, OH | 23,992 | 0.8 |

*Sources:* Projection data from Woods & Poole (1998). Data interpretation by the Center for Urban Policy Research, Rutgers University.
* City-county government.

**Sprawl Index—Top 20 Counties**

| | |
|---|---|
| (1) Maricopa, AZ | (11) Snohomish, WA |
| (2) Clark, NV | (12) Pasco, FL |
| (3) Palm Beach, FL | (13) Fort Bend, TX |
| (4) Riverside, CA | (14) Montgomery, TX |
| (5) Broward, FL | (15) Manatee, FL |
| (6) San Bernardino, CA | (16) El Paso, CO |
| (7) Pima, AZ | (17) Utah, UT |
| (8) Arapahoe, CO | (18) Solano, CA |
| (9) Wake, NC | (19) Lexington, SC |
| (10) Seminole, FL | (20) Lee, FL |

# CONTROLLING SPRAWL IN THE UNITED STATES

## The Controlled-Growth Scenario

In a region—i.e., an EA or a metropolitan area—jobs, residences, and retailing are drawn together by frequent interactions between them. These amount to work trips and shopping trips from the residence; the lengths of these trips in various directions determine the extent of physical land area in an EA. Usually,

Courtesy of C. Galley

this land area is made up of 10 to 20 counties of county types from urban to rural.

In order to alter the pattern of development, controls and incentives can be employed that would place bounds on where growth would take place. Controls have multiple dimensions: one involves the control of development between counties (intercounty); another involves the control of development within counties (intracounty).

There are two primary means of controlling development in a region. The first is to limit the amount of growth taking place in the outer counties by redirecting it to inner counties. This is accomplished by drawing an urban growth boundary or an urban service area around the inner counties and allowing only a portion of the growth to go to the outer counties. This controls *intercounty* sprawl development. A second method of controlling sprawl is by limiting the outward movement of growth in a single county. This controls *intracounty* sprawl. This is accomplished by using techniques similar to those used to control intercounty sprawl, but growth is kept within a single county. A boundary is drawn around the existing concentration of growth in a county. The rest of the county is "protected" from development by limiting the amount of growth allowed to occur there.

In the analyses described in subsequent stages of the study, *both intercounty and intracounty* methods of sprawl control will be assumed to be in effect, and their impacts will be measured. The discussion that follows in this chapter focuses primarily on *intercounty* control of development. Controlling sprawl means keeping a significant share of development in already developed counties or as close to already developed counties as possible. The controlled-growth scenario allows growth to take place in the outer counties of an EA, but a significant measure of growth is kept closer in; i.e., closer to more centrally located urban and nonsprawling suburban counties near the economic nodes of an EA. This happens in two ways. One component of growth is kept within developed suburban counties and rural center counties that grew in the past. Another component of growth is redirected to urban center and urban counties on infill and redevelopment sites in those counties. Thus, one component of growth is allowed to take place in already sprawled, close-in suburban or growth-center rural counties; another component of growth is redirected to core locations; and a reduced component of growth is allowed to continue to rural

and undeveloped locations. This is the controlled- or smart-growth scenario. The next several subsections describe the methods used to achieve such growth direction and the degree to which this procedure is successful in controlling sprawl.

## Definition of Controlled Growth

Sprawl is curtailed in the controlled-growth scenario by redirecting growth from fast-growth rural, undeveloped, and developing suburban counties to urban, urban center, rural center, and developed suburban counties. In the last case, suburban counties are allowed to take growth only if they are large, established counties that are projected to exhibit low-growth or declining growth patterns in the future.

Growth is removed from fast-growth, rural, undeveloped, and developing suburban counties to significantly reduce both their rates of growth and their absolute growth increments. For empirical purposes, this is defined as placing them below 75 percent of the *sprawl threshold*. Growth in excess of 75 percent of this threshold is redirected from sprawling undeveloped counties in the EA to nonsprawling, developed counties in the same EA.[2] This reduces sprawl growth in relatively undeveloped counties to at least 75 percent of the growth that would have occurred under the uncontrolled-growth scenario.

The redirection objective is to significantly reduce sprawl in all nonurban locations by 25 percent or more from their uncontrolled-growth thresholds. However, receiving counties (primarily urban center, urban, or developed suburban) also must remain below the sprawl thresholds. Receiving counties within an EA can accept household or employment growth only until they reach 75 percent of their upper-quartile growth rate limits. A suburban or rural center county, depending on its current level of growth, can be either shielded from growth because it is a growing county or the recipient of growth because it is a mostly developed county, ripe for redevelopment.

A further consideration relative to urban areas in some Census divisions (New England, Middle Atlantic, and East North Central) is also modeled. Urban and urban center counties that consume growth in these areas can receive additional households and jobs only until their growth rate has increased by one-quarter. This prevents excessive growth from being sent to these locations, which would be unlikely, under current and near-future market conditions, given the levels of urban distress that might be found there.

**Table 4.14**
**Incidence of Sprawl under Controlled Growth**

| Designation | # Counties |
|---|---|
| Decreasing Sprawl | 26 |
| Sustained Sprawl | 220 |
| Growing Sprawl | 76 |
| **Remaining Uncontrolled** | **322** |
| **Controlled Sprawl** | **420** |

*Source:* Center for Urban Policy Research, Rutgers University

## Control of Sprawl—Nationwide

Table 4.14 summarizes the gross results of the controlled-growth scenario. After redirection, 420 (55 percent) of the 742 counties exhibiting significant sprawl can be designated as *controlled-sprawl* counties. This

Courtesy of G. Lowenstein

[2] The control threshold is 75 percent of the selection threshold. This actually reduces growth in these counties to between 25 percent and 80 percent of household growth.

**Table 4.15**
**Sprawl by County Type under Controlled Growth**

| Designation | Rural and Undeveloped | Suburban and Rural Center | Urban Center and Urban | Total |
|---|---|---|---|---|
| Nonsprawl | 2,128 | 121 | 100 | 2,349 |
| Decreasing Sprawl | 19 | 7 | 0 | 26 |
| Sustained Sprawl | 166 | 54 | 0 | 220 |
| Growing Sprawl | 57 | 19 | 0 | 76 |
| Controlled Sprawl | 356 | 64 | 0 | 420 |
| **Total** | **2,726** | **265** | **100** | **3,091** |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 4.16**
**Counties Approaching Sprawl under Uncontrolled and Controlled Growth**
(Growth Rates between 75 Percent and 100 Percent of the Sprawl Thresholds)

| Scenario | Rural and Undeveloped | Suburban and Rural Center | Total |
|---|---|---|---|
| Uncontrolled Growth | 177 | 72 | 249 |
| Controlled Growth | 33 | 26 | 59 |
| Decrease | 144 | 46 | 190 |

*Source:* Center for Urban Policy Research, Rutgers University.

means that their growth rates have been reduced sufficiently to render them nonsprawl locations. Thus, at the intercounty scale, enough growth has been diverted inward to reduce significantly the growth pressure on approximately 420 outer locations.

Results of the redirected growth are further presented in Figure 4.2. The sprawling counties whose growth rates could not be tempered are scattered throughout the country in EAs where there are no viable receiving counties to take additional growth without transforming themselves to a sprawling condition. These locations are typically found in traditionally growing states of the Southeast or the West, or in newly growing states of the Southwest where no population or employment centers are able to accommodate the future sprawl that could be redirected.

Courtesy of G. Lowenstein

## Control of Sprawl—by County Type

Table 4.15 shows the breakdown of sprawling and nonsprawling counties by county development type under controlled growth. Eighty-five percent of the counties where sprawl can be controlled are rural and undeveloped counties. The remaining 15 percent are suburban and rural center counties. No sprawl control can occur in urban center and urban counties, as those counties, by definition, are developed sufficiently that their growth is not sprawling.

Households and jobs are also redirected in nonsprawling counties that approach, but do not yet reach, the sprawl limit (see Table 4.16). This is done to prevent a whole new array of "almost sprawl" counties from materializing after the sprawl counties are controlled to 75 percent of their former sprawl level.

There are 249 nonurban counties with future growth over 75 percent of the sprawl threshold but less than the actual sprawl threshold. In the controlled-growth scenario, the growth in 190 of these counties is brought below the 75 percent threshold under the redirection policy. In summary, limiting growth to no greater than 75 percent of the sprawl threshold provides benefits to a total of 190 additional decreasing-sprawl counties and almost-sprawling counties—144 in rural and undeveloped counties and 46 in suburban and rural center counties.

## Control of Sprawl—by Sprawl Type

Originally, 742 of the national total of 3,091 counties exhibited significant sprawl. Of these, sprawl can be controlled in 420. Approximately 320 counties remain where sprawl cannot be controlled. Table 4.17 shows the breakdown of uncontrolled- and controlled-sprawl counties by type of sprawl. The various means to control sprawl discussed above are successful in controlling 211 of the 431 sustained-sprawl locations, 58 of 134 growing-sprawl locations, and 151 of 177 decreasing-sprawl locations.[3]

Thus, holding back the movement of development outward and redirecting this growth inward is successful in limiting sustained sprawl in 49 percent of the instances, limiting growing sprawl in 43 percent of the instances, and further limiting growth in decreasing-sprawl locations in 85 percent of the instances.

Clearly, the greatest numerical inroads to controlling sprawl are those undertaken for locations where sprawl is likely to be sustained into the future. Close to half of the sprawl that is controllable takes place in counties with sustained sprawl. The next most significant numerical benefit comes from controlling sprawl in locations where sprawl is likely to be decreasing (see Table 4.18). These are areas where development is already cooling off and, in fact, represent a substantial share of the cases between 75 percent and 100 percent of the sprawl threshold. Measures of control are very effective in this category of sprawl. The category of sprawl wherein controls have the least numerical effect is the one categorized as increasing sprawl. These are sites in the South and West where sprawl is just beginning, but significantly so, and in locations where few already developed locations (urban center, urban, and suburban counties) exist to redirect this growth. Sprawl in these locations usually cannot be redirected.

**Table 4.17**
**Control of Sprawl Counties by Sprawl Type**

| Sprawl Category | Uncontrolled | Controlled | Remainin |
|---|---|---|---|
| Sustained | 431 | 211 | 220 |
| Growing | 134 | 58 | 76 |
| Decreasing | 177 | 151 | 26 |
| **Total** | **742** | **420** | **322** |

*Source:* Center for Urban Policy Research, Rutgers University

## Control of Sprawl—by Number

Table 4.19 summarizes the number of households and jobs by the region to which they were redirected under a controlled-growth scenario. The West and the South, by far, have the largest numbers of households likely to be redirected to more central locations as part of a controlled-growth scenario. In both cases, about one million households are redirected inward, representing 12 percent and 11 percent of overall household growth. About one-quarter of this level of redirection of households is found in the Midwest (298,000 households) and in the Northeast (210,000 households). In these latter regions, this represents, respectively, a redirection of 12 percent and 14 percent of household growth toward more central areas.

The West and South also have the largest numbers of jobs that are redirected close-in, 1.3 million and 915,000 jobs, respectively. This represents nearly 10 percent and 5 percent of all jobs in these regions. The Midwest and the Northeast each have approxi-

Courtesy of G. Lowenstein

[3] Decreasing-sprawl locations are sprawl counties where the market is cooling due in part to the leapfrogging of development to other counties.

**Table 4.18**
**Controlled Growth: Household, Population, and Employment**
**Redirection Summary by County Type**

| Variable | Undeveloped and Rural Counties | Rural Center and Suburban Counties | | Urban and Urban Center Counties | |
|---|---|---|---|---|---|
| | Redirect From | Redirect From | Redirect To | Redirect To | Total |
| **Households** | | | | | |
| Adjusted Projected Growth (#, in 000s) | 8,829 | 9,329 | | 5,296 | 23,454 |
| Redirected (#, in 000s) | 2,078 | 482 | 730 | 1,830 | 2,5610 |
| Percentage Redirected (%) | 23.5 | 5.2 | 7.8 | 34.6 | 10.9 |
| **Population** | | | | | |
| Adjusted Projected Growth (#, in 000s) | 24,586 | 22,524 | | 13,617 | 60,727 |
| Redirected (#, in 000s) | 5,585 | 1,289 | 1,867 | 5,008 | 6,875 |
| Percentage Redirected (%) | 22.7 | 5.7 | 8.3 | 36.8 | 11.3 |
| **Jobs** | | | | | |
| Adjusted Projected Growth (#, in 000s) | 15,491 | 17,315 | | 16,612 | 49,418 |
| Redirected (#, in 000s) | 2,366 | 771 | 623 | 2,514 | 3,137 |
| Percentage Redirected (%) | 15.3 | 4.5 | 3.6 | 15.1 | 6.3 |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 4.19**
**Controlled Growth: Household, Population, and Employment**
**Redirection Summary by Region**

| Variable | Northeast | South | Midwest | West | Total |
|---|---|---|---|---|---|
| **Households** | | | | | |
| Projected Growth (#, in 000s) | 1,476 | 10,664 | 3,450 | 7,865 | 23,454 |
| Redirected (#, in 000s) | 210 | 1,138 | 298 | 915 | 2,561 |
| Percentage Redirected (%) | 14.2 | 10.7 | 8.6 | 11.6 | 10.9 |
| **Population** | | | | | |
| Projected Growth (#, in 000s) | 3,629 | 27,300 | 8,668 | 21,130 | 60,727 |
| Redirected (#, in 000s) | 539 | 2,959 | 804 | 2,572 | 6,875 |
| Percentage Redirected (%) | 14.9 | 10.3 | 9.3 | 12.2 | 11.3 |
| **Jobs** | | | | | |
| Projected Growth (#, in 000s) | 6,049 | 19,022 | 10,457 | 13,890 | 49,418 |
| Redirected (#, in 000s) | 422 | 915 | 462 | 1,338 | 3,137 |
| Percentage Redirected (%) | 7.0 | 4.8 | 4.4 | 9.6 | 6.3 |

*Source:* Center for Urban Policy Research, Rutgers University.

mately 450,000 jobs redirected. That amounts to one-third to one-half of the number of jobs redirected in the West and South regions. The redirection represents 4 percent and 7 percent of all job growth in the Midwest and Northeast regions.

## Control of Sprawl—by Region

Table 4.20 shows that, on a regional basis, nearly half (192) of the counties where sprawl can be controlled are in the South, approximately one-quarter (121) are in the Midwest, and one-eighth each are in the West

**Table 4.20**
**Control of Sprawl Counties by Location**

| Census Region | Uncontrolled | Controlled | Remaining |
|---|---|---|---|
| Northeast | 69 | 47 | 22 |
| South | 347 | 192 | 155 |
| Midwest | 194 | 121 | 73 |
| West | 132 | 60 | 72 |
| **Total** | **742** | **420** | **322** |

*Source:* Center for Urban Policy Research, Rutgers University.

state. Numerically, the greatest number of counties where sprawl can be controlled are in the states where growth is in evidence and where large numbers of counties as units of local government exist. These are Georgia, Texas, and Virginia, wherein 32, 30, and 26 counties, respectively, have their sprawl controlled. These are all states that have in excess of 100 counties; Texas has over 250. The following states, each with an average number of counties, exhibit controlled sprawl in 15 to 20 counties: Indiana (18), Ohio (17), North Carolina (16), California (15), Florida (15), Tennessee (15), Missouri (15), and Michigan (15).

**Table 4.21**
**Controlled Growth: Sprawl by Region and Census Division**

| | Remaining Sprawl | | | Controlled | |
|---|---|---|---|---|---|
| Division | Decreasing | Sustained | Growing | Sprawl | Grand Total |
| **Northeast** | | | | | |
| New England | 1 | 6 | 2 | 11 | 20 |
| Middle Atlantic | 3 | 6 | 4 | 36 | 49 |
| **Subtotal** | 4 | 12 | 6 | 47 | 69 |
| **South** | | | | | |
| South Atlantic | 12 | 57 | 14 | 104 | 187 |
| East South Central | 1 | 26 | 6 | 35 | 68 |
| West South Central | 1 | 29 | 9 | 53 | 92 |
| **Subtotal** | 14 | 112 | 29 | 192 | 347 |
| **Midwest** | | | | | |
| East North Central | 3 | 25 | 14 | 72 | 114 |
| West North Central | 0 | 20 | 11 | 49 | 80 |
| **Subtotal** | 4 | 45 | 25 | 121 | 194 |
| **West** | | | | | |
| Mountain | 2 | 29 | 13 | 27 | 71 |
| Pacific | 3 | 22 | 3 | 33 | 61 |
| **Subtotal** | 5 | 51 | 16 | 60 | 132 |
| **Total** | **26** | **220** | **76** | **420** | **742** |

*Source:* Center for Urban Policy Research, Rutgers University.

(60) and Northeast (47). Measures used to control sprawl are successful in nearly 70 percent of the sprawl-growth counties in the Northeast, 60 percent of the sprawl-growth counties in the Midwest, 55 percent of the sprawl-growth counties in the South and 45 percent of the sprawl-growth counties in the West. This information is also presented by Census division in Table 4.21

## Control of Sprawl—by State

Table 4.22 displays both the remaining incidence of sprawl and the ability to control sprawl by individual

Finally, locations with a relatively high level of controlled sprawl for the number of counties that exhibit sprawl are Minnesota (14), Illinois (13), Colorado (12), Maryland (12), Kentucky (11), Pennsylvania (11), Wisconsin (10), Arkansas (10), and Washington (10).

How much household growth is actually being controlled in the states listed above and other states nationwide? Is the 75 percent threshold truly a meaningful control? Tables 4.23 and 4.24 show both the percentage and numerical amounts of households that are redirected from primarily rural and undeveloped

## Table 4.22
## County Sprawl Status by State—Controlled Growth

| State | Non-Sprawl | Remaining Uncontrolled Sprawl | | | Controlled Sprawl | Total |
|---|---|---|---|---|---|---|
| | | Decreasing | Growing | Sustained | | |
| Alabama | 49 | 0 | 0 | 9 | 9 | 67 |
| Alaska | 6 | 0 | 0 | 3 | 2 | 11 |
| Arizona | 4 | 2 | 2 | 5 | 1 | 14 |
| Arkansas | 61 | 0 | 1 | 3 | 10 | 75 |
| California | 28 | 2 | 2 | 11 | 15 | 58 |
| Colorado | 43 | 0 | 3 | 5 | 12 | 63 |
| Connecticut | 4 | 1 | 0 | 0 | 3 | 8 |
| Delaware | 1 | 0 | 0 | 1 | 1 | 3 |
| Florida | 31 | 2 | 2 | 17 | 15 | 67 |
| Georgia | 116 | 1 | 4 | 6 | 32 | 159 |
| Hawaii | 2 | 0 | 0 | 1 | 1 | 4 |
| Idaho | 38 | 0 | 1 | 4 | 1 | 44 |
| Illinois | 87 | 0 | 1 | 1 | 13 | 102 |
| Indiana | 62 | 0 | 3 | 9 | 18 | 92 |
| Iowa | 93 | 0 | 3 | 1 | 2 | 99 |
| Kansas | 98 | 0 | 0 | 2 | 5 | 105 |
| Kentucky | 100 | 0 | 3 | 6 | 11 | 120 |
| Louisiana | 52 | 0 | 2 | 4 | 6 | 64 |
| Maine | 10 | 0 | 1 | 2 | 3 | 16 |
| Maryland | 10 | 1 | 0 | 1 | 12 | 24 |
| Massachusetts | 11 | 0 | 0 | 1 | 2 | 14 |
| Michigan | 59 | 2 | 5 | 2 | 15 | 83 |
| Minnesota | 69 | 0 | 3 | 1 | 14 | 87 |
| Mississippi | 67 | 1 | 1 | 6 | 7 | 85 |
| Missouri | 91 | 0 | 2 | 7 | 15 | 115 |
| Montana | 49 | 0 | 1 | 5 | 1 | 56 |
| Nebraska | 88 | 0 | 1 | 1 | 3 | 93 |
| Nevada | 11 | 0 | 0 | 1 | 5 | 17 |
| New Hampshire | 4 | 1 | 0 | 1 | 4 | 10 |
| New Jersey | 12 | 0 | 0 | 0 | 9 | 21 |
| New Mexico | 24 | 0 | 2 | 4 | 2 | 32 |
| New York | 48 | 1 | 2 | 2 | 9 | 62 |
| North Carolina | 59 | 8 | 4 | 13 | 16 | 100 |
| North Dakota | 50 | 0 | 0 | 3 | 0 | 53 |
| Ohio | 61 | 0 | 4 | 6 | 17 | 88 |
| Oklahoma | 65 | 0 | 1 | 5 | 6 | 77 |
| Oregon | 27 | 0 | 0 | 3 | 6 | 36 |
| Pennsylvania | 48 | 1 | 3 | 4 | 11 | 67 |
| Rhode Island | 3 | 0 | 0 | 0 | 2 | 5 |
| South Carolina | 30 | 0 | 1 | 12 | 3 | 46 |
| South Dakota | 58 | 0 | 1 | 5 | 2 | 66 |
| Tennessee | 69 | 0 | 1 | 10 | 15 | 95 |
| Texas | 201 | 1 | 5 | 17 | 30 | 254 |
| Utah | 23 | 0 | 1 | 2 | 3 | 29 |
| Vermont | 11 | 0 | 0 | 2 | 1 | 14 |
| Virginia | 76 | 0 | 1 | 2 | 26 | 105 |
| Washington | 22 | 1 | 1 | 5 | 10 | 39 |
| West Virginia | 47 | 0 | 4 | 1 | 3 | 55 |
| Wisconsin | 53 | 1 | 1 | 6 | 10 | 71 |
| Wyoming | 17 | 0 | 3 | 2 | 1 | 23 |
| **Total** | **2,349** | **26** | **76** | **220** | **420** | **3,091** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 4.23
## Controlled Growth: States by Percentage Reduction in Household Growth

| State | Households Shifted | Shifted Households as Percentage of Sprawl Growth (%) | Sprawl Growth |
|---|---|---|---|
| Hawaii | 46,644 | 60.71 | 76,837 |
| West Virginia | 17,222 | 50.61 | 34,032 |
| California | 556,602 | 45.58 | 1,221,059 |
| Rhode Island | 15,046 | 40.66 | 37,002 |
| Maryland | 136,532 | 39.07 | 349,474 |
| Virginia | 106,586 | 37.04 | 287,747 |
| New Hampshire | 38,102 | 34.47 | 110,521 |
| Georgia | 151,619 | 33.91 | 447,186 |
| Oregon | 61,477 | 32.69 | 188,048 |
| Minnesota | 41,821 | 29.62 | 141,207 |
| Utah | 43,588 | 26.57 | 164,049 |
| Massachusetts | 26,975 | 25.89 | 104,201 |
| Delaware | 9,451 | 25.24 | 37,445 |
| Texas | 195,462 | 24.15 | 809,213 |
| Pennsylvania | 59,588 | 23.78 | 250,533 |
| Tennessee | 81,224 | 23.78 | 341,558 |
| Illinois | 41,517 | 22.47 | 184,764 |
| Louisiana | 31,523 | 22.26 | 141,616 |
| Oklahoma | 17,997 | 21.84 | 82,408 |
| Arkansas | 24,169 | 21.31 | 113,389 |
| Colorado | 94,268 | 20.40 | 462,203 |
| New Jersey | 38,976 | 19.01 | 204,989 |
| Kentucky | 20,110 | 18.83 | 106,811 |
| Alabama | 55,056 | 18.54 | 296,901 |
| New Mexico | 27,384 | 17.28 | 158,493 |
| Florida | 284,068 | 16.90 | 1,681,350 |
| Missouri | 39,973 | 16.46 | 242,836 |
| Indiana | 46,208 | 15.99 | 288,901 |
| Wisconsin | 33,220 | 14.02 | 236,905 |
| Ohio | 41,529 | 13.83 | 300,371 |
| New York | 16,313 | 13.42 | 121,576 |
| Michigan | 33,614 | 13.28 | 253,060 |
| Washington | 58,693 | 13.00 | 451,562 |
| Kansas | 2,478 | 11.12 | 22,287 |
| Nebraska | 765 | 7.53 | 10,151 |
| Mississippi | 9,384 | 6.89 | 136,270 |
| Wyoming | 1,573 | 5.22 | 30,150 |
| South Carolina | 18,524 | 3.96 | 467,982 |
| Nevada | 13,296 | 3.38 | 392,899 |
| Maine | 2,347 | 3.37 | 69,620 |
| North Carolina | 8,270 | 1.33 | 622,361 |
| Idaho | 958 | 1.32 | 72,400 |
| Arizona | 10,445 | 1.02 | 1,024,588 |
| Alaska | – | – | 111,059 |
| Connecticut | – | – | 23,214 |
| Iowa | – | – | 46,018 |
| Montana | – | – | 75,860 |
| North Dakota | – | – | 24,578 |
| South Dakota | – | – | 50,056 |
| Vermont | | | 25,331 |
| **Top 20 States** | **1,703,140** | **33.25** | **5,122,289** |
| **United States** | **2,560,592** | **19.50** | **13,133,071** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 4.24
## Controlled Growth: States by Numerical Reduction in Household Growth

| State | Households Shifted | Shifted Households as Percentage of Sprawl Growth (%) | Sprawl Growth |
|---|---|---|---|
| California | 556,602 | 45.58 | 1,221,059 |
| Florida | 284,068 | 16.90 | 1,681,350 |
| Texas | 195,457 | 24.15 | 809,213 |
| Georgia | 151,619 | 33.91 | 447,186 |
| Maryland | 136,532 | 39.07 | 349,474 |
| Virginia | 106,586 | 37.04 | 287,747 |
| Colorado | 94,268 | 20.40 | 462,203 |
| Tennessee | 81,224 | 23.78 | 341,558 |
| Oregon | 61,477 | 32.69 | 188,048 |
| Pennsylvania | 59,588 | 23.78 | 250,533 |
| Washington | 58,693 | 13.00 | 451,562 |
| Alabama | 55,056 | 18.54 | 296,901 |
| Hawaii | 46,644 | 60.71 | 76,837 |
| Indiana | 46,208 | 15.99 | 288,901 |
| Utah | 43,588 | 26.57 | 164,049 |
| Minnesota | 41,821 | 29.62 | 141,207 |
| Ohio | 41,529 | 13.83 | 300,371 |
| Illinois | 41,517 | 22.47 | 184,764 |
| Missouri | 39,973 | 16.46 | 242,836 |
| New Jersey | 38,976 | 19.01 | 204,989 |
| New Hampshire | 38,102 | 34.47 | 110,521 |
| Michigan | 33,614 | 13.28 | 253,060 |
| Wisconsin | 33,220 | 14.02 | 236,905 |
| Louisiana | 31,523 | 22.26 | 141,616 |
| New Mexico | 27,384 | 17.28 | 158,493 |
| Massachusetts | 26,975 | 25.89 | 104,201 |
| Arkansas | 24,169 | 21.31 | 113,389 |
| Kentucky | 20,110 | 18.83 | 106,811 |
| South Carolina | 18,524 | 3.96 | 467,982 |
| Oklahoma | 17,997 | 21.84 | 82,408 |
| West Virginia | 17,222 | 50.61 | 34,032 |
| New York | 16,313 | 13.42 | 121,576 |
| Rhode Island | 15,046 | 40.66 | 37,002 |
| Nevada | 13,296 | 3.38 | 392,899 |
| Arizona | 10,445 | 1.02 | 1,024,588 |
| Delaware | 9,451 | 25.24 | 37,445 |
| Mississippi | 9,384 | 6.89 | 136,270 |
| North Carolina | 8,270 | 1.33 | 622,361 |
| Kansas | 2,478 | 11.12 | 22,287 |
| Maine | 2,347 | 3.37 | 69,620 |
| Wyoming | 1,573 | 5.22 | 30,150 |
| Idaho | 958 | 1.32 | 72,400 |
| Nebraska | 765 | 7.53 | 10,151 |
| Alaska | – | – | 111,059 |
| Connecticut | – | – | 23,214 |
| Iowa | – | – | 46,018 |
| Montana | – | – | 75,860 |
| North Dakota | – | – | 24,578 |
| South Dakota | – | – | 50,056 |
| Vermont | – | – | 25,331 |
| **Top 20 States** | **2,181,426** | **26.00** | **8,390,788** |
| **United States** | **2,560,592** | **19.50** | **13,133,071** |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 4.25**
**Controlled Growth: EAs by Percentage Reduction in Household Growth**
(Top 30 EAs)

| EA | Households Shifted | Shifted Households as Percentage of Sprawl Growth (%) | Sprawl Growth |
|---|---|---|---|
| Honolulu, HI | 57,149 | 74.38 | 76,837 |
| Los Angeles-Riverside-Orange, CA-AZ | 370,624 | 57.90 | 640,142 |
| Duluth-Superior, MN-WI | 2,366 | 55.35 | 4,275 |
| Tampa-St. Petersburg-Clearwater, FL | 85,642 | 55.03 | 155,619 |
| San Francisco-Oakland-San Jose, CA | 184,677 | 53.14 | 347,522 |
| Amarillo, TX-NM | 8,209 | 50.91 | 16,124 |
| Shreveport-Bossier City, LA-AR | 7,209 | 50.69 | 14,224 |
| McAllen-Edinburg-Mission, TX | 5,654 | 50.01 | 11,307 |
| Atlanta, GA-AL-NC | 135,695 | 45.46 | 298,464 |
| New Orleans, LA-MS | 20,552 | 45.03 | 45,636 |
| Washington-Baltimore, DC-MD-VA-WV-PA | 200,785 | 43.72 | 459,204 |
| Birmingham, AL | 45,134 | 42.81 | 105,382 |
| Philadelphia-Wilmington-Atl. City, PA-NJ-DE-MD | 94,143 | 39.51 | 238,264 |
| Albuquerque, NM-AZ | 26,152 | 38.86 | 67,299 |
| Portland-Salem, OR-WA | 78,738 | 38.64 | 203,759 |
| Austin-San Marcos, TX | 42,863 | 38.49 | 111,361 |
| Sarasota-Bradenton, FL | 49,968 | 37.36 | 133,742 |
| Salt Lake City-Ogden, UT-ID | 43,588 | 37.17 | 117,278 |
| Richmond-Petersburg, VA | 29,541 | 36.48 | 80,986 |
| Beaumont-Port Arthur, TX | 3,889 | 35.84 | 10,851 |
| Savannah, GA-SC | 14,680 | 35.53 | 41,316 |
| Oklahoma City, OK | 9,205 | 35.41 | 25,998 |
| Minneapolis-St. Paul, MN-WI-IA | 46,417 | 35.25 | 131,694 |
| Reno, NV-CA | 13,296 | 34.27 | 38,794 |
| St. Louis, MO-IL | 32,590 | 33.18 | 98,214 |
| Champaign-Urbana, IL | 1,513 | 33.15 | 4,563 |
| Little Rock-North Little Rock, AR | 15,788 | 32.93 | 47,947 |
| Boston-Worcester-Lawr.-Low.-Broc., MA-NH-RI-VT | 80,122 | 31.83 | 251,724 |
| San Antonio, TX | 30,826 | 30.78 | 100,137 |
| Milwaukee-Racine, WI | 18,532 | 29.37 | 63,103 |
| **Top 30 EAs** | **1,745,042** | **44.27** | **3,941,766** |
| **United States** | **2,560,592** | **19.50** | **13,133,071** |

*Source:* Center for Urban Policy Research, Rutgers University.

to urban and urban center counties within a specific state. The percentage listing shows Hawaii, West Virginia, California, and Rhode Island as capable of redirecting, in descending order, from 60 percent to 40 percent of their future household growth in rural and undeveloped locations to more urban locations. The numerical listing is similarly illustrative. California, Florida, Texas, Georgia, Maryland, and Virginia can redirect in descending order from 560,000 to 100,000 households over the period 2000 to 2025 to more urban locations. To place California's redirection in perspective, the state will grow by three million households in the projected future. The top 10 states in each of these categories are listed below.

**Sprawl Control—Top 10 States**

| States with Greatest Percentage of Redirection | States with Greatest Numerical Redirection |
|---|---|
| • Hawaii | • California |
| • West Virginia | • Florida |
| • California* | • Texas |
| • Oregon | • Georgia |
| • Massachusetts | • Maryland |
| • Rhode Island | • Virginia |
| • Maryland* | • Colorado |
| • Virginia* | • Tennessee |
| • New Hampshire | • Oregon |
| • Georgia* | • Pennsylvania |

* Four of the top 10 states appear on both lists.

**Table 4.26**
**Controlled Growth: EAs by Numerical Reduction in Household Growth**
(Top 30 EAs)

| EA | Households Shifted | Shifted Households as Percentage of Sprawl Growth (%) | Sprawl Growth |
|---|---|---|---|
| Los Angeles-Riverside-Orange, CA-AZ | 370,624 | 57.90 | 640,142 |
| Washington-Baltimore, DC-MD-VA-WV-PA | 200,785 | 43.72 | 459,204 |
| San Francisco-Oakland-San Jose, CA | 184,677 | 53.14 | 347,522 |
| Atlanta, GA-AL-NC | 135,695 | 45.46 | 298,464 |
| Miami-Fort Lauderdale, FL | 101,541 | 18.54 | 547,741 |
| Denver-Boulder-Greeley, CO-KS-NE | 94,268 | 21.55 | 437,473 |
| Philadelphia-Wilmington, PA-NJ-DE-MD | 94,143 | 39.51 | 238,264 |
| Tampa-St. Petersburg-Clearwater, FL | 85,642 | 55.03 | 155,619 |
| Boston-Worcester-Lawr.-Broc., MA-NH-RI-VT | 80,122 | 31.83 | 251,724 |
| Portland-Salem, OR-WA | 78,738 | 38.64 | 203,759 |
| Houston-Galveston-Brazoria, TX | 63,619 | 21.27 | 299,110 |
| Nashville, TN-KY | 60,581 | 27.27 | 222,123 |
| Chicago-Gary-Kenosha, IL-IN-WI | 53,794 | 26.80 | 200,698 |
| Sarasota-Bradenton, FL | 49,968 | 37.36 | 133,742 |
| Jacksonville, FL-GA | 47,957 | 28.53 | 168,103 |
| Honolulu, HI | 46,644 | 60.71 | 76,837 |
| Minneapolis-St. Paul, MN-WI-IA | 46,417 | 35.25 | 131,694 |
| Birmingham, AL | 45,134 | 42.83 | 105,382 |
| Salt Lake City-Ogden, UT-ID | 43,588 | 37.17 | 117,278 |
| Austin-San Marcos, TX | 42,863 | 38.49 | 111,361 |
| Seattle-Tacoma-Bremerton, WA | 41,371 | 15.22 | 271,813 |
| Dallas-Fort Worth, TX | 38,885 | 21.78 | 178,517 |
| Cincinnati-Hamilton, OH-KY-IN | 37,800 | 26.49 | 142,683 |
| St. Louis, MO-IL | 32,590 | 33.18 | 98,214 |
| San Antonio, TX | 30,826 | 30.78 | 100,137 |
| Richmond-Petersburg, VA | 29,541 | 36.48 | 80,986 |
| Albuquerque, NM-AZ | 26,152 | 38.86 | 67,299 |
| Indianapolis, IN-IL | 22,068 | 12.17 | 181,356 |
| N Y-Northern N J-Long Island, NY-NJ-CT-PA-MA-VT | 21,444 | 8.77 | 244,512 |
| New Orleans, LA-MS | 20,552 | 45.03 | 45,636 |
| **Top 30 EAs** | **2,228,029** | **33.98** | **6,557,393** |
| **United States** | **2,560,592** | **19.50** | **13,133,071** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Control of Sprawl—by EA

A similar list of sprawl-controlled locations by EA can be developed in terms of the percentage and numerical redirection of sprawl households within them. This is shown in Tables 4.25 and 4.26. What is shown in the percentage table is that Honolulu, HI; Los Angeles-Riverside-Orange, CA-AZ; San Francisco-Oakland-San Jose, CA; Tampa-St. Petersburg-Clearwater, FL; Birmingham, AL; Portland-Salem, OR-WA; and Atlanta, GA-AL-NC, can redirect significant percentages of sprawl households elsewhere. Most of the others in the top 10 EAs, while they can direct a large proportion, have only small amounts of overall household growth. The numerical shift list is also instructive. Los Angeles-Riverside-Orange, CA; Washington-Baltimore, DC-MD-VA-WV-PA; San Francisco-Oakland-San Jose, CA; Atlanta, GA-AL-NC; and Miami-Fort Lauderdale, FL, can redirect, in descending order, from 370,000 to 100,000 households from rural and undeveloped to more urbanized areas over the projection period.

In certain EAs the ability to redirect sprawl appears to involve a considerable number of households. In each of these, the EA is very large. For example, the Los Angeles-Riverside-Orange, CA-AZ, EA extends for the entire southern portion of the state of California, except for San Diego County.

**Sprawl Control—Top 10 EAs**

| EAs with Greatest Percentage of Redirection | EAs with Greatest Numerical Redirection |
|---|---|
| • Honolulu (172) | • Los Angeles (160) |
| • Los Angeles* (160) | • Washington (13) |
| • Duluth (109) | • San Francisco (163) |
| • Tampa* (34) | • Atlanta (40) |
| • San Francisco* (163) | • Miami (31) |
| • Amarillo (138) | • Denver (141) |
| • Shreveport (88) | • Philadelphia (12) |
| • McAllen (133) | • Tampa (34) |
| • Atlanta* (40) | • Boston (3) |
| • New Orleans (83) | • Portland (2) |

*Note:* For full EA names referenced by EA numbers, see Appendix B

* Four of the top 10 EAs appear on both lists.

## Control of Sprawl—by County

How much sprawl household growth is actually being controlled in individual counties? Tables 4.27 and 4.28 present the amounts of household growth that have been controlled in the top 50 counties nationally that are experiencing sprawl in their respective EAs. Sprawl control through this method ranges from a high of 80 percent to a low of 50 percent in the *percentage* of overall households redirected and from a high of 57,000 to a low of 7,000 in the *number* of households redirected over the 25-year projection period. Of the top 20 counties in *percentage* of redirection, 12 are in the South, and eight are in the West. Of a similar number of counties in numerical redirection, 11 are in the West, seven are in the South, and two are in the Northeast. These are listed below. Of the top 20 counties that benefit most by redirection, either in percentage or numerical terms, seven appear on both lists.

**Sprawl Control—Top 20 Counties**

| Counties with Greatest Percentage Redirection | Counties with Greatest Numerical Redirection |
|---|---|
| • Solano, CA* | • Riverside, CA |
| • Douglas, CO* | • San Bernardino, CA |
| • Frederick, MD* | • Solano, CA |
| • Brazoria, TX | • Palm Beach, FL |
| • Deschutes, OR | • Pasco, FL |
| • Summit, UT | • Sonoma, CA |
| • Maui + Kalawao, HI* | • Howard, MD |
| • Riverside, CA* | • Ventura, CA |
| • Carroll, MD | • Clackamas, OR |
| • Martin, FL | • Rockingham, NH |
| • Comal, TX | • Hernando, FL |
| • Fayette, GA | • Williamson, TX |
| • St. Tammany, LA | • Douglas, CO |
| • Union, FL | • Utah, UT |
| • Polk, TX | • Maui + Kalawao, HI |
| • San Bernardino, CA* | • Kern, CA |
| • Henry, GA | • Stanislaus, CA |
| • Howard, MD* | • Frederick, MD |
| • Sandoval, NM | • Manatee, FL |
| • Coryell, TX | • Chester, PA |

* Seven of the top 20 counties appear on both lists.

# SUMMARY

Sprawl—significant residential and nonresidential growth in developing suburban or rural and undeveloped counties—can be significantly controlled. Nationwide, 55 percent of the sprawl taking place can be redirected in a meaningful way to more central locations. Counties in every state and in the vast majority of EAs can experience less sprawl development than would have been the case without intercounty development redirection. As many as 20 to 30 counties in an individual state can benefit from a process such as this.

Two of the three significant categories of sprawl can be controlled in a meaningful way under this process. These are locations of sustained and decreasing sprawl. In the first case, 200 counties that have sprawled for 20 years and are likely to sprawl for an additional 25 years are able to be controlled through this process. In the second case, 150 counties that will sprawl less in the future than they have in the past but that will nevertheless continue to sprawl, can

## Table 4.27
## Controlled Growth: Counties by Percentage Reduction in Household Growth

| County | Rank | County Type | Households 2000 | Uncontrolled Households 2025 | Controlled Households 2025 | Households Shifted | Shifted Households as Percentage of Uncontrolled Change (%) |
|---|---|---|---|---|---|---|---|
| Solano, CA | 1 | R | 136,826 | 219,294 | 156,448 | 62,846 | 76.21 |
| Douglas, CO | 2 | R | 45,142 | 86,202 | 55,755 | 30,447 | 74.15 |
| Frederick, MD | 3 | R | 69,615 | 107,637 | 79,459 | 28,178 | 74.11 |
| Brazoria, TX | 4 | R | 80,771 | 115,701 | 91,190 | 24,511 | 70.17 |
| Deschutes, OR | 5 | UND | 44,013 | 76,624 | 53,857 | 22,767 | 69.81 |
| Summit, UT | 6 | UND | 10,696 | 25,619 | 15,397 | 10,222 | 68.50 |
| Maui + Kalawao, HI | 7 | R | 46,217 | 90,010 | 60,173 | 29,837 | 68.13 |
| Riverside, CA | 8 | R | 519,237 | 745,676 | 592,831 | 152,845 | 67.50 |
| Carroll, MD | 9 | R | 54,709 | 83,792 | 64,553 | 19,239 | 66.15 |
| Martin, FL | 10 | R | 52,436 | 81,755 | 62,516 | 19,239 | 65.62 |
| Comal, TX | 11 | R | 30,145 | 58,731 | 39,989 | 18,742 | 65.56 |
| Fayette, GA | 12 | R | 32,356 | 60,121 | 42,200 | 17,921 | 64.55 |
| St. Tammany, LA | 13 | R | 67,919 | 95,624 | 77,763 | 17,861 | 64.47 |
| Union, FL | 14 | UND | 3,685 | 8,006 | 5,245 | 2,761 | 63.89 |
| Polk, TX | 15 | UND | 18,817 | 32,221 | 23,671 | 8,550 | 63.78 |
| San Bernardino, CA | 16 | UND | 559,227 | 774,557 | 638,489 | 136,068 | 63.19 |
| Henry, GA | 17 | R | 35,488 | 62,143 | 45,332 | 16,811 | 63.07 |
| Howard, MD | 18 | S | 92,016 | 150,782 | 113,768 | 37,014 | 62.99 |
| Sandoval, NM | 19 | R | 31,833 | 58,257 | 41,677 | 16,580 | 62.75 |
| Coryell, TX | 20 | UND | 22,168 | 33,197 | 26,326 | 6,871 | 62.30 |
| Hernando, FL | 21 | R | 58,749 | 110,309 | 78,195 | 32,114 | 62.28 |
| Scott, MN | 22 | R | 28,142 | 49,669 | 36,295 | 13,374 | 62.13 |
| Loudoun, VA | 23 | R | 48,445 | 74,273 | 58,289 | 15,984 | 61.89 |
| Spotsylvania + Fredericks | 24 | R | 37,651 | 60,947 | 46,551 | 14,396 | 61.79 |
| Rockingham, NH | 25 | S | 105,620 | 159,256 | 126,216 | 33,040 | 61.60 |
| Sonoma, CA | 26 | R | 172,580 | 236,359 | 197,329 | 39,030 | 61.20 |
| Berkeley, WV | 27 | S | 28,956 | 46,275 | 35,801 | 10,474 | 60.48 |
| St. Lucie, FL | 28 | R | 72,431 | 107,017 | 86,355 | 20,662 | 59.74 |
| Rockdale, GA | 29 | R | 26,341 | 50,789 | 36,185 | 14,604 | 59.74 |
| Chester, PA | 30 | R | 154,274 | 196,096 | 171,166 | 24,930 | 59.61 |
| Summit, CO | 31 | UND | 9,080 | 19,600 | 13,350 | 6,250 | 59.42 |
| Eagle, CO | 32 | UND | 14,341 | 30,743 | 21,084 | 9,659 | 58.89 |
| Fauquier, VA | 33 | UND | 19,765 | 31,111 | 24,437 | 6,674 | 58.82 |
| Stafford, VA | 34 | R | 29,185 | 45,829 | 36,084 | 9,745 | 58.55 |
| Montgomery, TN | 35 | R | 46,994 | 70,540 | 56,838 | 13,702 | 58.19 |
| Clermont, OH | 36 | R | 64,148 | 87,761 | 74,090 | 13,671 | 57.89 |
| Stanislaus, CA | 37 | R | 148,241 | 198,296 | 169,500 | 28,796 | 57.53 |
| Blount, TN | 38 | R | 43,252 | 68,034 | 53,815 | 14,219 | 57.37 |
| Paulding, GA | 39 | R | 26,089 | 49,057 | 35,933 | 13,124 | 57.14 |
| St. Marys, MD | 40 | R | 31,073 | 48,124 | 38,418 | 9,706 | 56.92 |
| Calvert, MD | 41 | R | 24,388 | 37,692 | 30,153 | 7,539 | 56.67 |
| Shelby, KY | 42 | R | 11,097 | 14,707 | 12,668 | 2,039 | 56.48 |
| Pike, PA | 43 | UND | 15,380 | 22,271 | 18,379 | 3,892 | 56.48 |
| Burlington, NJ | 44 | R | 148,514 | 181,119 | 162,896 | 18,223 | 55.89 |
| Cheatham, TN | 45 | R | 13,268 | 22,528 | 17,363 | 5,165 | 55.78 |
| Charles, MD | 46 | R | 40,988 | 62,849 | 50,677 | 12,172 | 55.68 |
| Merced, CA | 47 | UND | 63,873 | 85,997 | 73,717 | 12,280 | 55.51 |
| Forsyth, GA | 48 | S | 29,634 | 57,079 | 41,888 | 15,191 | 55.35 |
| Itasca, MN | 49 | UND | 17,332 | 21,607 | 19,241 | 2,366 | 55.35 |
| Washington, RI | 50 | R | 46,424 | 66,653 | 55,477 | 11,176 | 55.25 |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 4.28
## Controlled Growth: Counties by Numerical Reduction in Household Growth

| County | Rank | County Type | Households 2000 | Uncontrolled Households 2025 | Controlled Households 2025 | Households Shifted | Shifted Households as Percentage of Uncontrolled Change (%) |
|---|---|---|---|---|---|---|---|
| Riverside, CA | 1 | R | 519,237 | 745,676 | 592,831 | 152,845 | 67.50 |
| San Bernardino, CA | 2 | UND | 559,227 | 774,557 | 638,489 | 136,068 | 63.19 |
| Solano, CA | 3 | R | 136,826 | 219,294 | 156,448 | 62,846 | 76.21 |
| Palm Beach, FL | 4 | S | 456,082 | 688,601 | 631,437 | 57,164 | 24.58 |
| Pasco, FL | 5 | R | 152,657 | 256,716 | 203,188 | 53,528 | 51.44 |
| Sonoma, CA | 6 | R | 172,580 | 236,359 | 197,329 | 39,030 | 61.20 |
| Howard, MD | 7 | S | 92,016 | 150,782 | 113,768 | 37,014 | 62.99 |
| Ventura, CA | 8 | R | 245,940 | 317,430 | 280,798 | 36,632 | 51.24 |
| Clackamas, OR | 9 | R | 132,337 | 197,428 | 161,761 | 35,667 | 54.80 |
| Rockingham, NH | 10 | S | 105,620 | 159,256 | 126,216 | 33,040 | 61.60 |
| Hernando, FL | 11 | R | 58,749 | 110,309 | 78,195 | 32,114 | 62.28 |
| Williamson, TX | 12 | R | 82,733 | 160,986 | 129,204 | 31,782 | 40.61 |
| Douglas, CO | 13 | R | 45,142 | 86,202 | 55,755 | 30,447 | 74.15 |
| Utah, UT | 14 | S | 101,790 | 187,187 | 157,236 | 29,951 | 35.07 |
| Maui + Kalawao, HI | 15 | R | 46,217 | 90,010 | 60,173 | 29,837 | 68.13 |
| Kern, CA | 16 | UND | 215,059 | 274,438 | 245,540 | 28,898 | 48.67 |
| Stanislaus, CA | 17 | R | 148,241 | 198,296 | 169,500 | 28,796 | 57.53 |
| Frederick, MD | 18 | R | 69,615 | 107,637 | 79,459 | 28,178 | 74.11 |
| Manatee, FL | 19 | R | 114,332 | 205,965 | 178,828 | 27,137 | 29.62 |
| Chester, PA | 20 | R | 154,274 | 196,096 | 171,166 | 24,930 | 59.61 |
| Brazoria, TX | 21 | R | 80,771 | 115,701 | 91,190 | 24,511 | 70.17 |
| Chesterfield, VA | 22 | S | 94,630 | 146,178 | 121,871 | 24,307 | 47.15 |
| Larimer, CO | 23 | R | 94,404 | 148,636 | 124,576 | 24,060 | 44.36 |
| Cherokee, GA | 24 | S | 49,677 | 93,388 | 70,219 | 23,169 | 53.00 |
| Charlotte, FL | 25 | R | 63,167 | 105,276 | 82,446 | 22,830 | 54.22 |
| Deschutes, OR | 26 | UND | 44,013 | 76,624 | 53,857 | 22,767 | 69.81 |
| Shelby, AL | 27 | R | 55,688 | 104,274 | 81,507 | 22,767 | 46.86 |
| St. Lucie, FL | 28 | R | 72,431 | 107,017 | 86,355 | 20,662 | 59.74 |
| Will, IL | 29 | S | 149,840 | 206,189 | 185,934 | 20,255 | 35.95 |
| Clay, FL | 30 | R | 50,533 | 89,677 | 69,682 | 19,995 | 51.08 |
| Carroll, MD | 31 | R | 54,709 | 83,792 | 64,553 | 19,239 | 66.15 |
| Martin, FL | 32 | R | 52,436 | 81,755 | 62,516 | 19,239 | 65.62 |
| Comal, TX | 33 | R | 30,145 | 58,731 | 39,989 | 18,742 | 65.56 |
| St. Charles, MO | 34 | S | 94,955 | 131,836 | 113,471 | 18,365 | 49.79 |
| Burlington, NJ | 35 | R | 148,514 | 181,119 | 162,896 | 18,223 | 55.89 |
| Fayette, GA | 36 | R | 32,356 | 60,121 | 42,200 | 17,921 | 64.55 |
| St. Tammany, LA | 37 | R | 67,919 | 95,624 | 77,763 | 17,861 | 64.47 |
| Montgomery, TX | 38 | S | 102,511 | 201,891 | 184,427 | 17,464 | 17.57 |
| San Joaquin, CA | 39 | R | 182,934 | 226,575 | 209,168 | 17,407 | 39.89 |
| Clark, WA | 40 | S | 126,454 | 199,946 | 182,686 | 17,260 | 23.49 |
| Henry, GA | 41 | R | 35,488 | 62,143 | 45,332 | 16,811 | 63.07 |
| Hawaii, HI | 42 | UND | 53,773 | 86,817 | 70,010 | 16,807 | 50.86 |
| Sandoval, NM | 43 | R | 31,833 | 58,257 | 41,677 | 16,580 | 62.75 |
| Worcester, MA | 44 | R | 278,720 | 322,261 | 305,895 | 16,366 | 37.59 |
| Loudoun, VA | 45 | R | 48,445 | 74,273 | 58,289 | 15,984 | 61.89 |
| Forsyth, GA | 46 | S | 29,634 | 57,079 | 41,888 | 15,191 | 55.35 |
| Rockdale, GA | 47 | R | 26,341 | 50,789 | 36,185 | 14,604 | 59.74 |
| Spotsylvania + Fredericks | 48 | R | 37,651 | 60,947 | 46,551 | 14,396 | 61.79 |
| Blount, TN | 49 | R | 43,252 | 68,034 | 53,815 | 14,219 | 57.37 |
| Sumner, TN | 50 | R | 48,068 | 77,407 | 63,190 | 14,217 | 48.46 |

*Source:* Center for Urban Policy Research, Rutgers University


Courtesy of C. Galley

experience an even greater deceleration of growth. The redirection process is successful only to a limited extent, however, in those locations where sprawl is only beginning to emerge. In growing sprawl locations in the country's Southeast, Southwest, and West areas, development is proceeding too quickly, and the numbers of central locations are too few, to adequately redirect growth to diminish sprawl. Only 50 of 134 counties experiencing this type of growth in these locations can be controlled by directing their growth elsewhere.

The solution in the context of the problem is apparent when making regional comparisons of controlling growth. Half of the counties whose growth can be controlled are in the South (192 counties), but the South evidences initially uncontrolled sprawl to a greater magnitude than all other regions combined (347 counties—see Table 4.21). In the Midwest, sprawl can be controlled at a 60 percent greater level because this sprawl involves far fewer places overall and it is of the type that is more easily controlled; i.e., decreasing sprawl. Of even more importance than the number of locations that can have their development altered is the number of households affected by such alteration. This is approximately one million households each in the South and West, and about one-quarter of this level each in the Northeast and the Midwest.

In the analyses completed thus far, what does "controlling sprawl" mean? Controlling sprawl is redirecting a portion of growth to locations where it would probably not have occurred under existing regulations and policies. The threshold chosen for controlling sprawl—25 percent less growth than would naturally have occurred—is admittedly an arbitrary cutoff point. Yet it is a significant point of reference that enables sufficient growth to be redirected inward and could double the household and employment growth in these areas. Coupled with urban service boundaries and various incentives to direct and attract growth inward, the implementation of compact development or smart growth can begin to take place. The implementation of smart growth is a huge commitment. It cannot occur without the conscious and coordinated effort of government at all levels.


Courtesy of G. Lowenstein

Courtesy of C. Galley

Following chapter 5, the two emerging scenarios will be subjected to a series of computer models to gauge their relative impacts. These relative impacts will reflect the scenarios discussed above. A glimpse at these results reveals that 4 million acres can be saved nationwide if the intercounty redirection discussed earlier, and additional intracounty controls are implemented.

Similar analyses will be undertaken for road and water infrastructure, travel time, real property development costs, public-service costs, the spatial mismatch of lower-income residents and jobs, and the quality of life experienced by households and workers in locations specific to the two scenarios. Each of the above fields will be scrutinized for the magnitude of their impacts.

The most important result at this stage, however, is the emerging dialogue on the location and incidence of various types of sprawl and the ability to control it. Arguably, sprawl is present in specific areas of the United States, yet by no means is it present in *all* areas. As expected, its greatest incidence occurs where growth is the most pronounced, and its ability to be controlled is dependent upon the availability of slow-growth or declining urban centers where growth can be directed. Further, the ability to control sprawl depends on its type. New sprawl in emerging growth areas is much more difficult to control than is continuing or decreasing sprawl in established growth areas.

The opportunity to engage in these types of discussion about sprawl is the result of the work completed in this study. Sprawl has a face that is becoming increasingly recognizable. It can be tracked over time and across locations. It can be mitigated to the degree that receiving zones are available within similar commuting zones. Sprawl can be viewed nationally, in Census regions and divisions, in states, in EAs, and in counties. Its impacts can also begin to be gauged. This is the task of the next chapters.

In the analyses following chapter 5, under the controlled-growth scenario, both intercounty and intracounty controls are in force. Household and employment flows are limited between counties, and household and employment flows are kept within urbanized areas of single counties. Using this model, effects will be measured on land conversion, utility provision, the costs to occupy real property, and the costs to provide basic public services.

Courtesy of R. Ewing

# V

# Analysis of Sprawl's Incidence:
## Fifteen Selected EAs

## INTRODUCTION

This chapter takes the controlled- and uncontrolled-growth scenarios shown for the nation as a whole by state and views demographic projections related to these two scenarios in 15 individual EAs. The purpose of this exercise is to determine whether the containment of sprawl in certain locations is reasonable relative to the locations where the original growth was to take place. Another reason for undertaking this exercise is to view the individual classifications of sprawl and nonsprawl counties in selected EAs nationwide. Do the classifications make sense given what is known about past, current, and future development in these locations? A final reason for undertaking this exercise is to demonstrate the extreme cases of sprawl—the New York-Northern New Jersey EA where sprawl is limited and it can be contained in large urban areas, versus the Las Vegas EA where sprawl is rapid and few central areas exist to contain it. The chapter begins with a discussion of the outcome of the two alternative development scenarios in each of the 15 EAs. These 15 EAs will also be broken out separately when the impacts of sprawl are discussed. The chapter concludes with general observations on the degree to which sprawl and its control are captured by the household and employment allocation model used in this study. The next chapter views the land converted to urban land uses as a result of development and its differences relative to each development alternative.

## THE SELECTION OF EXAMPLE EAs

Sprawl as defined is taking place in 740 of 3,091 counties and 160 of 172 EAs nationwide. As indicated in the preceding chapter, sprawl is taking place to a much greater extent in the South and West regions of the United States, especially in counties in Florida, Texas, and California, than it is in other locations.

Example EAs have been selected in terms of their general recognizability and their contributions to national sprawl. Thus, the 15 case examples of sprawl and its control are selected because they are both recognizable and have been studied by numerous scholars and because they represent significant components of national sprawl. These locations consist of (1) EAs that will show the largest absolute growth increments during the next 25 years (Los Angeles-Riverside, CA-AZ EA) and those whose growth will be much more modest (Austin-San Marcos, TX); (2) EAs that encompass close to 90 counties (New York-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA) and those that contain few counties (Tucson, AZ EA); (3) EAs that exhibit significant amounts of sprawl but are able to accommodate most of it (Atlanta, GA-

AL-NC EA), and relatively little sprawl and difficulty accommodating it (Lexington, KY-TN-VA-WV EA); (4) EAs with large core areas that can serve as receiving locations (Chicago-Gary-Kenosha, IL-IN-WI EA) and those that have small cores wherein little growth can be absorbed (Tucson, AZ EA); and (5) EAs that have existing planned responses to growth control (Portland-Salem, OR-WA and Lexington, KY-TN-VA-WV EAs) versus those that have unbridled growth with little control (Los Angeles-Riverside, CA-AZ and Las Vegas, NV-AZ-UT EAs).

The 15 EAs are

- Atlanta, GA-AL-NC
- Austin-San Marcos, TX
- Birmingham, AL
- Chicago-Gary-Kenosha, IL-IN-WI
- Denver-Boulder-Greeley, CO-KS-NE
- Las Vegas, NV-AZ-UT
- Lexington, KY-TN-VA-WV
- Los Angeles-Riverside-Orange, CA-AZ
- Miami-Fort Lauderdale, FL
- Minneapolis-St. Paul, MN-WI-IA
- NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT
- Portland-Salem, OR-WA
- Raleigh-Durham-Chapel Hill, NC
- Tucson, AZ
- Washington-Baltimore, DC-MD-VA-WV-PA

Each of the following individual presentations of these example EAs includes a descriptive section; a summary table of growth in households and employment under the uncontrolled- and controlled-growth scenarios; a detailed table of the growth in households and employment for every county of the EA under both scenarios; and one figure each mapping the projected sprawl under the uncontrolled- and controlled-growth scenarios.

## ATLANTA, GA-AL-NC EA (EA 40)

The Atlanta, GA-AL-NC EA has become the commercial, transportation, and cultural capital of the southeastern United States. The EA enjoys a diverse geography, experiences a moderate climate most of the year, has a well-developed transportation system, and, not surprisingly given these attributes, a very strong regional economy.

The Atlanta, GA-AL-NC EA's educational facilities are major contributors to its growth. Among the region's numerous colleges and universities is the nation's largest consortium of African American institutions of higher learning. In addition to this solid educational base, the Atlanta EA is home to some of the nation's—and the world's—largest companies, including Coca-Cola, CNN, Delta Airlines, Ritz-Carlton Hotels, UPS, Home Depot, and Holiday Inn Worldwide. Also in the region are the sixth District Federal Reserve Bank, the fourth District Federal Home Loan Bank, and many regional, national, and international banks.

Ninety percent of the U.S. population is within two hours' flying time of the Atlanta EA, making the EA one of the most-visited convention locales in America. This robust convention business supports tens of thousands of workers. Atlanta's Hartsfield International Airport offers more daily scheduled flights than any other airport in the world and houses the largest international concourse in the United States. Future expansion is planned. The well-located, yet underutilized, Metro Atlanta Rapid Transit Authority (MARTA) provides rail and bus service throughout much of the central EA. The Atlanta, GA-AL-NC EA serves as the Southeast's railway freight center, and is a stop on Amtrak's service between the Northeast and New Orleans. Three interstates and a perimeter highway connect the Atlanta EA with the rest of the nation.

The Atlanta, GA-AL-NC EA ranks nationally in the top 10 EAs in total growth. That growth also places it in the top 10 EAs in sprawl development. This South Region EA comprises 67 counties. Of those 67 counties, 20 are sprawling and represent sending locations; six are nonsprawling suburban or urban counties and represent receiving locations. The remaining 41 counties are slow- or no-growth rural and undeveloped

Courtesy of R. Ewing

## Table 5.1
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Atlanta, GA-AL-NC EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 298,464 | 14,923 | 299,994 | 15,000 | 163,047 | 8,152 | 200,335 | 10,017 |
| Nonsprawl Core Counties | 408,530 | 68,088 | 832,527 | 138,755 | 544,225 | 90,704 | 932,186 | 155,364 |
| Nonsprawl Rural and Undev. Counties | 88,587 | 2,161 | 101,924 | 2,486 | 88,309 | 2,154 | 101,924 | 2,486 |
| **EA** | **795,581** | **11,874** | **1,234,445** | **18,425** | **795,581** | **11,874** | **1,234,445** | **18,425** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.2
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Atlanta, GA-AL-NC EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Barrow, GA | R | S-C | 14,504 | 5,461 | 5,461 | 1.00 | 14,196 | 3,807 | 3,807 | 1.00 |
| Carroll, GA | R | S-C | 29,780 | 6,099 | 6,099 | 1.00 | 41,443 | 9,965 | 9,965 | 1.00 |
| Coweta, GA | R | S-C | 29,559 | 14,814 | 9,844 | 1.50 | 31,175 | 12,585 | 11,524 | 1.09 |
| Fayette, GA | R | S-C | 32,356 | 27,765 | 9,844 | 2.82 | 36,705 | 26,994 | 13,568 | 1.99 |
| Henry, GA | R | S-C | 35,488 | 26,655 | 9,844 | 2.71 | 34,633 | 26,158 | 12,802 | 2.04 |
| Jackson, GA | R | S-C | 13,844 | 6,080 | 5,725 | 1.06 | 19,267 | 6,663 | 6,663 | 1.00 |
| Oconee, GA | R | S-C | 9,124 | 7,345 | 3,773 | 1.95 | 8,379 | 4,564 | 4,564 | 1.00 |
| Paulding, GA | R | S-C | 26,089 | 22,968 | 9,844 | 2.33 | 14,568 | 8,778 | 5,385 | 1.63 |
| Rockdale, GA | R | S-C | 26,341 | 24,448 | 9,844 | 2.48 | 43,081 | 33,716 | 15,925 | 2.12 |
| Walton, GA | R | S-C | 18,898 | 8,575 | 7,815 | 1.10 | 17,990 | 7,029 | 6,650 | 1.06 |
| Whitfield, GA | R | S-C | 31,600 | 7,294 | 7,294 | 1.00 | 71,244 | 17,099 | 17,099 | 1.00 |
| Cherokee, GA | S | S-C | 49,677 | 43,711 | 20,542 | 2.13 | 42,082 | 31,884 | 15,555 | 2.05 |
| Douglas, GA | S | S-C | 33,167 | 23,774 | 13,715 | 1.73 | 39,192 | 31,169 | 14,487 | 2.15 |
| Forsyth, GA | S | S-C | 29,634 | 27,445 | 12,254 | 2.24 | 34,046 | 29,624 | 12,585 | 2.35 |
| Dawson, GA | UND | S-C | 5,293 | 3,720 | 2,189 | 1.70 | 4,205 | 2,048 | 2,048 | 1.00 |
| Lumpkin, GA | UND | S-C | 6,754 | 4,174 | 2,793 | 1.49 | 7,512 | 3,115 | 3,115 | 1.00 |
| Union, GA | UND | S-C | 6,399 | 2,596 | 2,596 | 1.00 | 6,578 | 2,103 | 2,103 | 1.00 |
| White, GA | UND | S-C | 7,126 | 5,542 | 2,947 | 1.88 | 9,145 | 5,081 | 5,081 | 1.00 |
| Bartow, GA | R | S-NC | 26,075 | 11,623 | 10,782 | 1.08 | 33,284 | 12,505 | 12,303 | 1.02 |
| Hall, GA | R | S-NC | 44,923 | 18,375 | 9,844 | 1.87 | 76,202 | 25,107 | 25,107 | 1.00 |
| **Receiving Counties** | | | | | | | | | | |
| Clarke, GA | S | NS | 36,349 | 6,847 | 11,572 | .59 | 75,495 | 19,395 | 22,499 | .86 |
| Clayton, GA | U | NS | 80,788 | 39,148 | 42,263 | .93 | 138,403 | 79,157 | 79,157 | 1.00 |
| Cobb, GA | U | NS | 234,787 | 155,985 | 155,985 | 1.00 | 365,724 | 214,169 | 214,169 | 1.00 |
| De Kalb, GA | U | NS | 236,154 | 36,583 | 90,634 | .40 | 421,162 | 138,454 | 163,662 | .85 |
| Fulton, GA | U | NS | 298,493 | 36,740 | 110,544 | .33 | 833,856 | 215,348 | 286,695 | .75 |
| Gwinnett, GA | U | NS | 195,755 | 133,227 | 133,227 | 1.00 | 294,742 | 166,004 | 166,004 | 1.00 |

*Continued on next page*

**Table 5.2—*Continued***

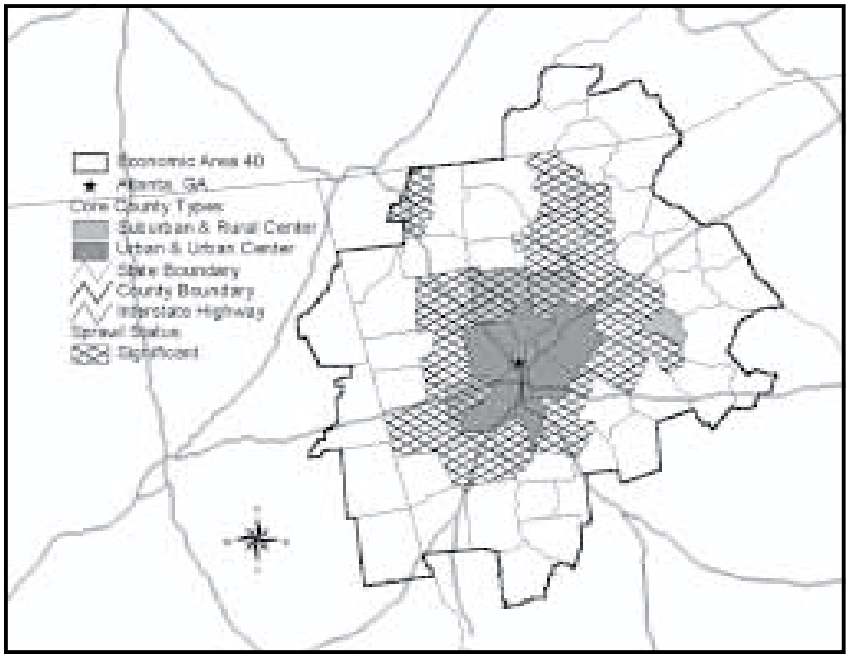
| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Floyd, GA | R | NS | 33,042 | 3,344 | 3,344 | 1.00 | 51,761 | 6,244 | 6,244 | 1.00 |
| Gordon, GA | R | NS | 15,681 | 6,483 | 6,483 | 1.00 | 26,975 | 9,419 | 9,419 | 1.00 |
| Habersham, GA | R | NS | 11,996 | 3,523 | 3,523 | 1.00 | 17,958 | 2,822 | 2,822 | 1.00 |
| Haralson, GA | R | NS | 9,514 | 2,105 | 2,105 | 1.00 | 8,734 | 2,749 | 2,749 | 1.00 |
| Hart, GA | R | NS | 8,321 | 1,299 | 1,299 | 1.00 | 8,946 | 816 | 816 | 1.00 |
| Madison, GA | R | NS | 9,691 | 4,036 | 4,007 | 1.01 | 6,296 | 2,277 | 2,277 | 1.00 |
| Murray, GA | R | NS | 12,062 | 5,237 | 4,988 | 1.05 | 15,472 | 4,842 | 4,842 | 1.00 |
| Newton, GA | R | NS | 19,833 | 7,987 | 7,987 | 1.00 | 22,220 | 7,233 | 7,233 | 1.00 |
| Polk, GA | R | NS | 13,641 | 1,462 | 1,462 | 1.00 | 12,661 | 1,990 | 1,990 | 1.00 |
| Spalding, GA | R | NS | 21,679 | 4,196 | 4,196 | 1.00 | 29,487 | 6,454 | 6,454 | 1.00 |
| Stephens, GA | R | NS | 10,277 | 2,438 | 2,438 | 1.00 | 15,588 | 4,595 | 4,595 | 1.00 |
| Troup, GA | R | NS | 22,484 | 2,940 | 2,940 | 1.00 | 37,024 | 6,201 | 6,201 | 1.00 |
| Upson, GA | R | NS | 10,592 | 1,240 | 1,240 | 1.00 | 13,812 | 1,895 | 1,895 | 1.00 |
| Banks, GA | UND | NS | 4,674 | 1,416 | 1,416 | 1.00 | 4,170 | 663 | 663 | 1.00 |
| Butts, GA | UND | NS | 5,602 | 2,251 | 2,251 | 1.00 | 6,978 | 2,181 | 2,181 | 1.00 |
| Chambers, AL | UND | NS | 14,088 | -105 | -105 | 1.00 | 16,411 | 2,202 | 2,202 | 1.00 |
| Chattooga, GA | UND | NS | 9,241 | 1,793 | 1,793 | 1.00 | 11,131 | 2,485 | 2,485 | 1.00 |
| Cherokee, AL | UND | NS | 8,446 | 1,052 | 1,052 | 1.00 | 7,483 | 865 | 865 | 1.00 |
| Cherokee, NC | UND | NS | 9,268 | 3,189 | 3,189 | 1.00 | 11,778 | 4,341 | 4,341 | 1.00 |
| Clay, NC | UND | NS | 3,459 | 832 | 832 | 1.00 | 2,949 | 956 | 956 | 1.00 |
| Cleburne, AL | UND | NS | 5,293 | 731 | 731 | 1.00 | 4,740 | 687 | 687 | 1.00 |
| Elbert, GA | UND | NS | 7,504 | 507 | 507 | 1.00 | 9,814 | 897 | 897 | 1.00 |
| Fannin, GA | UND | NS | 7,681 | 3,150 | 3,150 | 1.00 | 6,926 | 2,286 | 2,286 | 1.00 |
| Franklin, GA | UND | NS | 7,346 | 1,428 | 1,428 | 1.00 | 10,415 | 2,102 | 2,102 | 1.00 |
| Gilmer, GA | UND | NS | 6,985 | 2,815 | 2,815 | 1.00 | 9,120 | 2,569 | 2,569 | 1.00 |
| Graham, NC | UND | NS | 3,042 | 545 | 545 | 1.00 | 3,401 | 833 | 833 | 1.00 |
| Greene, GA | UND | NS | 4,769 | 1,085 | 1,085 | 1.00 | 6,102 | 659 | 659 | 1.00 |
| Heard, GA | UND | NS | 3,786 | 1,136 | 1,136 | 1.00 | 2,624 | 222 | 222 | 1.00 |
| Jasper, GA | UND | NS | 3,595 | 559 | 559 | 1.00 | 3,436 | 537 | 537 | 1.00 |
| Lamar, GA | UND | NS | 5,321 | 1,047 | 1,047 | 1.00 | 5,809 | 656 | 656 | 1.00 |
| Macon, NC | UND | NS | 12,227 | 4,554 | 4,554 | 1.00 | 14,273 | 5,052 | 5,052 | 1.00 |
| Meriwether, GA | UND | NS | 8,296 | 1,872 | 1,872 | 1.00 | 11,805 | 3,946 | 3,946 | 1.00 |
| Morgan, GA | UND | NS | 5,184 | 1,553 | 1,553 | 1.00 | 7,312 | 892 | 892 | 1.00 |
| Oglethorpe, GA | UND | NS | 4,287 | 1,292 | 1,292 | 1.00 | 2,567 | 403 | 403 | 1.00 |
| Pickens, GA | UND | NS | 7,182 | 3,030 | 3,030 | 1.00 | 7,456 | 3,522 | 3,522 | 1.00 |
| Pike, GA | UND | NS | 4,311 | 1,298 | 1,298 | 1.00 | 2,931 | 410 | 410 | 1.00 |
| Rabun, GA | UND | NS | 5,642 | 2,229 | 2,229 | 1.00 | 8,175 | 2,424 | 2,424 | 1.00 |
| Randolph, AL | UND | NS | 7,890 | 579 | 579 | 1.00 | 8,608 | 667 | 667 | 1.00 |
| Talbot, GA | UND | NS | 2,532 | 63 | 63 | 1.00 | 1,295 | 227 | 227 | 1.00 |
| Taliaferro, GA | UND | NS | 712 | -93 | -93 | 1.00 | 380 | 1 | 1 | 1.00 |
| Towns, GA | UND | NS | 3,832 | 2,489 | 2,489 | 1.00 | 3,672 | 1,702 | 1,702 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

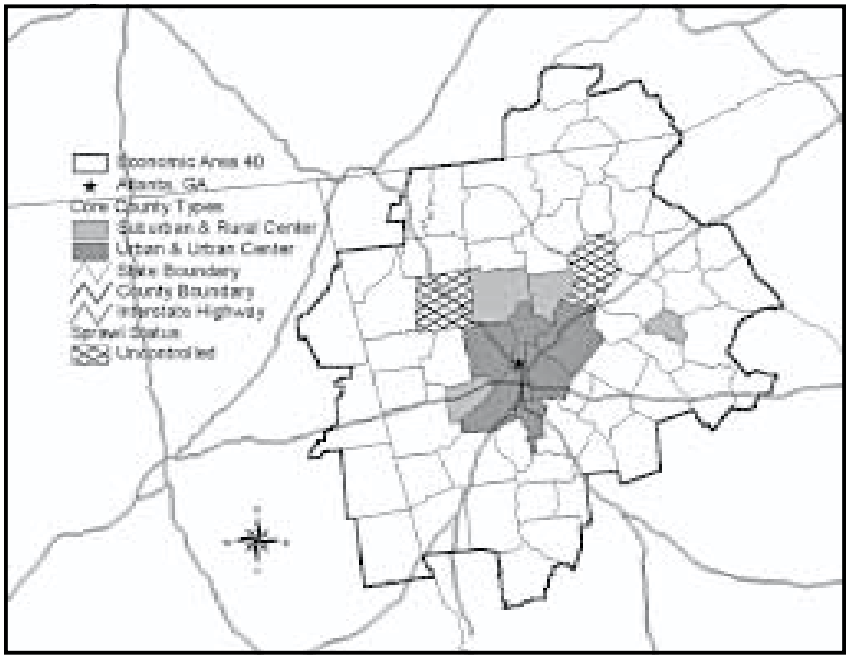
counties where sprawl is not a significant factor. The sending counties of the EA are Barrow, GA; Carroll, GA; Cherokee, GA; Coweta, GA; Dawson, GA; Douglas, GA; Fayette, GA; Forsyth, GA; Henry, GA; Jackson, GA; Lumpkin, GA; Oconee, GA; Paulding, GA; Rockdale, GA; Union, GA; Walton, GA; White, GA; Whitfield, GA; Bartow, GA; and Hall, GA. The re-

**Figure 5.1**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Atlanta, GA-AL-NC EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Fgure 5.2**
**Projected Sprawl: Controlled-Growth Scenario**
**Atlanta, GA-AL-NC EA**




*Source:* Center for Urban Policy Research, Rutgers University.

ceiving counties are Clarke, GA; Clayton, GA; Cobb, GA; De Kalb, GA; Fulton, GA; and Gwinnett, GA.

Atlanta, the heart of the EA and capital of the state of Georgia, is located entirely in Fulton County. Developed and developing counties within the Atlanta suburbanizing area are to the east, Gwinnett, Walton, Rockdale, and Newton; to the south, Henry, Clayton, and Fayette; to the west, Douglas, Paulding, and Cobb; to the north, Cherokee and Forsyth. The core of developed areas around Atlanta includes Fulton, De Kalb, Clayton, Cobb, and Gwinnett counties. Clarke is a distant developed county to the east, containing the city of Athens, Georgia. These are the receiving locations of the EA.

Of the sending counties, most are second-ring counties except for the more distant locations of Whitfield, Lumpkin, and White to the north; Jackson, Barrow, and Oconee to the east; and Coweta to the South.

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 14,923 households; nonsprawl suburban and urban counties increase by 68,088 households over the period 2000 to 2025 (Table 5.1). Under the controlled-growth scenario, sprawl counties increase by an average of 8,152 households; nonsprawl urban and suburban counties increase by 90,704 households. Sprawling rural and undeveloped counties have their absolute growth decreased by an average of 42.7 percent; nonsprawl urban and suburban counties have their growth increased by 33.2 percent. Tables 5.1 and 5.2 present the growth numbers for both households and employment under each scenario. In Table 5.2, the ratio of uncontrolled growth to controlled growth is presented as the control ratio, which is the multiplier of uncontrolled households or employment required to achieve the status of a controlled-sprawl location.

The most significant controlled-sprawl counties in this EA are Fayette, GA, and Henry, GA, immediately south of Fulton and De Kalb counties, respectively. Their growth in households is reduced by 65 percent. Four of the controlled-sprawl counties are diminishing their growth rate on their own and do not require further growth redirection. These are the counties of Barrow, GA; Carroll, GA; Whitfield, GA; and Union, GA. Counties that are reducing sprawl by their own natural diminishment are relatively few in number but exist in all of the EAs presented here, except for the Birmingham, AL EA.

Courtesy of R. Ewing

In the Atlanta, GA-AL-NC EA, approximately two-thirds of the counties (45) remain unchanged under the two alternative growth scenarios. These are the 41 slow- or no-growth counties, two growing urban counties, and two uncontrolled-sprawl counties. The latter are north of Atlanta, to the west and east, respectively. Notably increasing in their growth under the controlled scenario are De Kalb County, GA, and Fulton County, GA, with their growth in households increasing by 150 percent and 200 percent, respectively. This growth amounts to a total of only 27.1 percent and 24.7 percent of their 2000 base, respectively, or 1.1 percent and 1.0 percent annually. Of the six urban/suburban counties in the EA, two are growing at a reasonable rate (Cobb and Gwinnett counties) and do not get extra growth under the controlled-growth scenario. The remaining four receive extra growth. Figures 5.1 and 5.2 map sprawl locations in the EA under the uncontrolled- and the controlled-growth scenarios.

In summary, of the 20 sprawling counties under the uncontrolled-growth scenario, 18 are subsequently controlled and only two sprawling counties (Bartow, GA, and Hall, GA) remain uncontrolled. Overall, the Atlanta EA is characterized by both considerable sprawl in its counties and by considerable potential for the control of sprawl. The massive spread of sprawl in all locations, but especially north and east, is contained in the immediate core counties under the controlled-growth scenario.

## AUSTIN-SAN MARCOS, TX EA (EA 130)

The Austin-San Marcos, TX EA is home to numerous software entrepreneurs who form the backbone of an innovative and progressive economy. Located

## Table 5.3
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Austin-San Marcos, TX EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 111,361 | 27,840 | 95,303 | 23,826 | 68,498 | 17,125 | 52,265 | 13,066 |
| Nonsprawl Core Counties | 116,471 | 116,471 | 253,425 | 253,425 | 159,334 | 159,334 | 296,463 | 296,463 |
| Nonsprawl Rural and Undev. Counties | 10,544 | 2,109 | 13,693 | 2,739 | 10,544 | 2,109 | 13,693 | 2,739 |
| **EA** | **238,376** | **36,242** | **362,421** | **36,242** | **238,376** | **36,242** | **362,421** | **36,242** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.4
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Austin-San Marcos, TX EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Hays, TX | R | S-C | 31,983 | 20,792 | 9,844 | 2.11 | 42,361 | 21,504 | 16,576 | 1.30 |
| Bastrop, TX | UND | S-C | 18,034 | 7,079 | 7,079 | 1.00 | 16,749 | 6,287 | 6,287 | 1.00 |
| Burnet, TX | UND | S-C | 12,862 | 6,817 | 5,104 | 1.34 | 15,078 | 5,783 | 5,783 | 1.00 |
| Williamson, TX | R | S-NC | 82,733 | 78,253 | 46,471 | 1.68 | 81,388 | 61,729 | 23,618 | 2.61 |
| **Receiving Counties** | | | | | | | | | | |
| Travis, TX | U | NS | 301,125 | 116,471 | 159,334 | 0.73 | 611,269 | 253,425 | 296,463 | 0.85 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Blanco, TX | UND | NS | 3,343 | 1,239 | 1,239 | 1.00 | 4,039 | 1,225 | 1,225 | 1.00 |
| Caldwell, TX | UND | NS | 10,870 | 3,032 | 3,032 | 1.00 | 11,329 | 4,506 | 4,506 | 1.00 |
| Lee, TX | UND | NS | 5,687 | 1,546 | 1,546 | 1.00 | 9,572 | 2,698 | 2,698 | 1.00 |
| Llano, TX | UND | NS | 6,413 | 2,518 | 2,518 | 1.00 | 6,580 | 2,619 | 2,619 | 1.00 |
| Milam, TX | UND | NS | 9,661 | 2,209 | 2,209 | 1.00 | 11,535 | 2,645 | 2,645 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

in a part of Austin called Silicon Hills, the EA's high-technology sector has become one of the fastest growing (after Seattle) and most prominent in the nation. In addition to being a high-technology enclave, the Austin-San Marcos, TX EA is home to the state capital of Texas, where a considerable number of federal and state employees are found. Austin also houses the largest campus of the University of Texas, which undertakes research with and for neighboring advanced technology industries. Productive relationships among the computer, educational, and state sectors have spurred the development of the Austin-San Marcos, TX EA's financial industry. Supporting service businesses have prospered as well, with convention, tourist, retail, and restaurant sectors continuing to share in the EA's steady growth. Part of the Austin-

San Marcos, TX EA's growth stems from its location. The Austin-San Marcos, TX EA is less than 200 miles from three in-state cities that are three of the 10 largest cities in the country—Houston, Dallas, and San Antonio. The Austin-San Marcos, TX EA is only a few hours' drive from the Mexican border, a gateway to growing Latin American markets.

The Austin-San Marcos, TX EA in the South Region of the United States is comprises of 10 counties. Of these counties, four are sprawling and represent the sending locations; one is an urban county and represents the receiving location. The remaining five counties are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. The four sprawling counties are Bastrop, TX; Burnet, TX; Hays, TX; and Williamson, TX. The urban county is Travis, TX.

The core of the EA is the city of Austin, which is located in Travis County. Sprawl is occurring one county deep on all sides of the city. The counties to which sprawl is spreading are Williamson (to the north), Bastrop (to the east), Hays (to the south), and Burnet (to the west).

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 27,840 households; the urban county increases by 116,471 households over the period 2000 to 2025. Under the controlled-growth scenario, sprawling counties increase by an average of 17,125 households; the urban county increases by 159,334 households. Sprawling rural and undeveloped counties have their growth decreased by an average of 38.5 percent; the urban county has its growth increased by 36.8 percent. Tables 5.3 and 5.4 present the growth numbers for both households and employment under each scenario. In the Austin-San Marcos, TX EA, six counties remain unchanged under the two alternative growth scenarios. These are the five counties where growth is too small to be of consequence and the one county that remains uncontrolled. The most significant counties in terms of their decrease are Hays and Williamson counties, each decreasing its growth by close to half. The most significant county in terms of its growth increase is Travis, TX, with a growth of 35 percent. Figures 5.3 and 5.4 map the sprawl locations.

Of the four sprawling counties in the Austin-San Marcos, TX EA, three are controlled and only one (Williamson, TX) remains uncontrolled. Overall, the EA is characterized by both average levels of sprawl and by considerable levels of control.

## BIRMINGHAM, AL EA (EA 78)

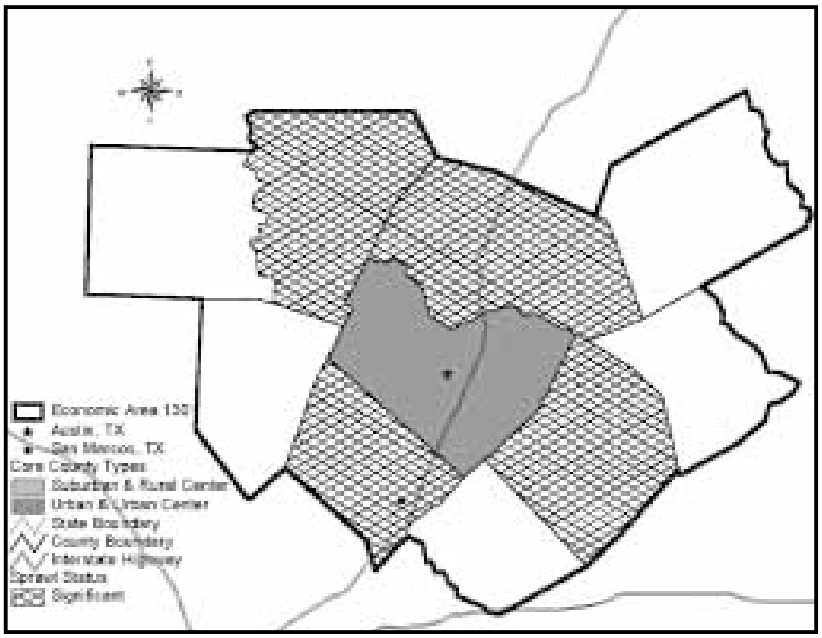
Birmingham, AL, is a southern city that is simultaneously traditional, vibrant, diverse, and complex. It has been said that Birmingham is the last major southern city in America. The Birmingham, AL EA is noted for its rich mineral deposits (coal, hematite, and others) and its steel, aircraft, and chemical industries. Purposeful economic redirection is under way to diversify the economy by strengthening its finance and service industries. The area is divided into six sectors by the convergence within the city of Birmingham, AL, of three principal interstates (I-20, I-65, and I-59). The Birmingham MSA is the 65th largest of 330 MSAs nationwide and contains approximately one-quarter of the state's population, business establishments, retail sales, and effective buying income. In an MIT study, the Birmingham-Tuscaloosa corridor was ranked as the third-best metropolitan area in the country for starting and growing a business, having the lowest business taxes of 19 southeastern cities and the seventh-lowest residential taxes of these same cities. Recently, Mercedes-Benz opened its first American production facility in nearby Vance, turning out the versatile M-Class All-Activity Vehicle. New attractions, including a major theme park and one of the country's best science museums, have opened in Birmingham.

The Birmingham, AL EA in the South Region of the United States comprises 15 counties. Of these counties, five are sprawling and represent the sending locations; two are nonsprawling suburban or urban counties and represent the receiving locations. The remaining eight are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawling counties are Blount, AL; Shelby, AL; St. Clair, AL; Tuscaloosa, AL; and Cullman, AL. Core urban locations are the counties of Calhoun, AL, and Jefferson, AL.

The central city of the core is Birmingham, located entirely in Jefferson County. At some distance to the east is Calhoun County, containing one of Alabama's largest cities—Anniston. Each of the sprawling counties shares a border with Jefferson County. Southeast of the city is Shelby County, the 15th-fastest-growing county in the United States with more than 100,000 in population.

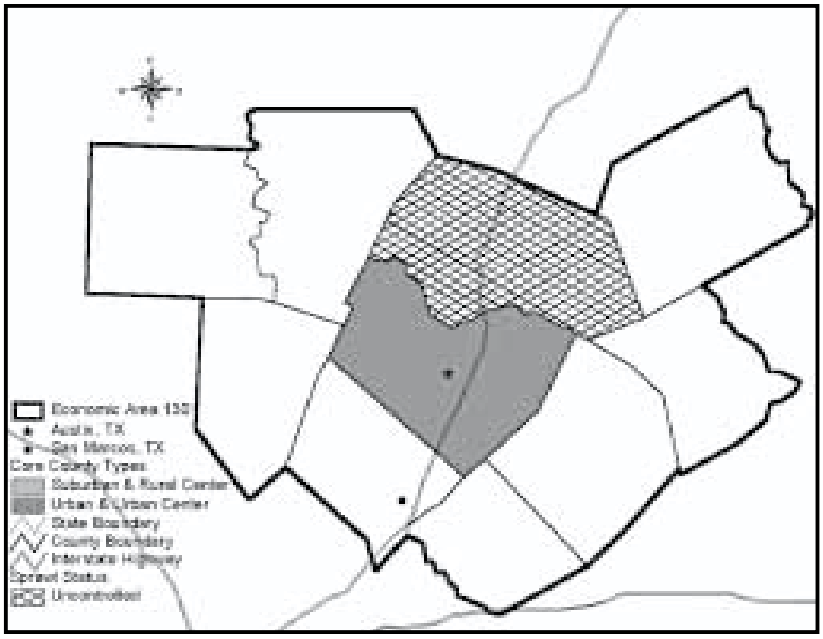
Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 21,076 households; suburban and urban areas increase by

**Figure 5.3**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Austin-San Marcos, TX EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.4**
**Projected Sprawl: Controlled-Growth Scenario**
**Austin-San Marcos, TX EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Table 5.5**
**Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Birmingham, AL EA**

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 105,382 | 21,076 | 103,084 | 20,617 | 63,156 | 12,631 | 59,988 | 11,998 |
| Nonsprawl Core Counties | 33,604 | 16,802 | 147,725 | 73,863 | 75,993 | 37,997 | 191,620 | 95,810 |
| Nonsprawl Rural and Undev. Counties | 26,451 | 3,306 | 31,596 | 3,950 | 26,288 | 3,286 | 30,797 | 3,850 |
| **EA** | **165,437** | **11,029** | **282,405** | **18,827** | **165,437** | **11,029** | **282,405** | **18,827** |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 5.6**
**County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Birmingham, AL EA**

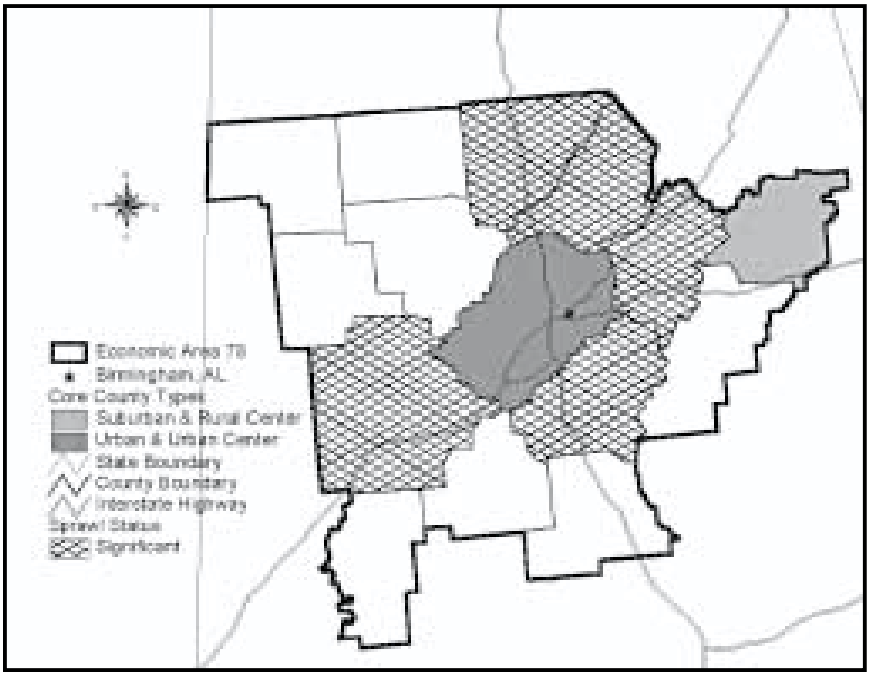
| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Uncontrolled | Controlled | Control Ratio | Year 2000 | Uncontrolled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| St. Clair, AL | R | S-C | 23,826 | 15,492 | 7,943 | 1.95 | 20,315 | 10,712 | 5,975 | 1.79 |
| Tuscaloosa, AL | R | S-C | 63,209 | 19,719 | 10,536 | 1.87 | 93,052 | 27,048 | 19,163 | 1.41 |
| Blount, AL | UND | S-C | 17,886 | 8,611 | 5,963 | 1.44 | 15,591 | 5,971 | 5,971 | 1.00 |
| Cullman, AL | R | S-NC | 30,446 | 12,974 | 12,974 | 1.00 | 38,154 | 13,647 | 11,222 | 1.22 |
| Shelby, AL | R | S-NC | 55,688 | 48,586 | 25,741 | 1.89 | 60,040 | 45,706 | 17,658 | 2.59 |
| **Receiving Counties** | | | | | | | | | | |
| Calhoun, AL | S | NS | 45,761 | 8,211 | 12,510 | 0.66 | 64,967 | 15,493 | 18,232 | 0.85 |
| Jefferson, AL | U | NS | 266,567 | 25,393 | 63,483 | 0.40 | 475,684 | 132,232 | 173,387 | 0.76 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Talladega, AL | R | NS | 28,767 | 5,018 | 5,018 | 1.00 | 32,510 | 6,953 | 6,953 | 1.00 |
| Walker, AL | R | NS | 28,310 | 8,128 | 8,128 | 1.00 | 28,384 | 9,147 | 8,348 | 1.10 |
| Bibb, AL | UND | NS | 6,673 | 1,489 | 1,489 | 1.00 | 6,327 | 1,834 | 1,834 | 1.00 |
| Chilton, AL | UND | NS | 14,160 | 4,097 | 4,097 | 1.00 | 12,815 | 3,579 | 3,579 | 1.00 |
| Fayette, AL | UND | NS | 7,147 | 736 | 736 | 1.00 | 8,593 | 1,744 | 1,744 | 1.00 |
| Hale, AL | UND | NS | 5,990 | 1,115 | 1,115 | 1.00 | 5,693 | 1,098 | 1,098 | 1.00 |
| Marion, AL | UND | NS | 12,553 | 2,401 | 2,401 | 1.00 | 17,005 | 3,900 | 3,900 | 1.00 |
| Winston, AL | UND | NS | 9,911 | 3,467 | 3,304 | 1.05 | 16,235 | 3,341 | 3,341 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

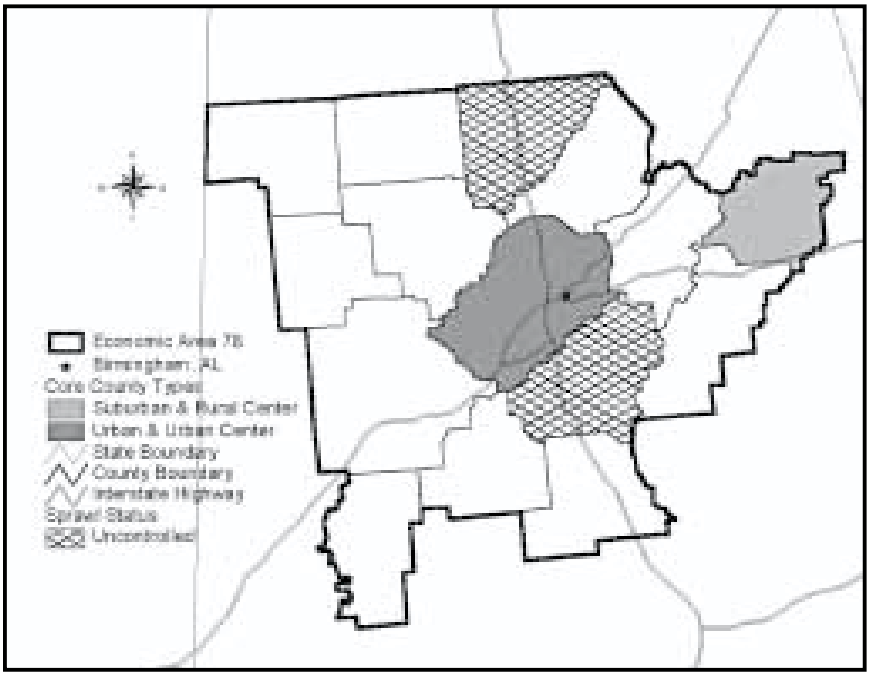
16,802 households. Under the controlled-growth scenario, sprawl counties increase by an average of 8,887 households. Sprawling rural and undeveloped counties have their growth decreased by an average of 57.5 percent. The Birmingham, AL EA is among the top 10 EAs nationwide in sprawl control. The two urban or suburban counties have their combined growth increased threefold. Tables 5.5 and 5.6 present growth

**Figure 5.5**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Birmingham, AL EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.6**
**Projected Sprawl: Controlled-Growth Scenario**
**Birmingham, AL EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Table 5.7**
**Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Chicago-Gary-Kenosha, IL-IN-WI EA**

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 200,698 | 20,070 | 355,552 | 35,555 | 149,082 | 14,908 | 249,967 | 24,997 |
| Nonsprawl Core Counties | 187,804 | 36,113 | 1,139,312 | 222,125 | 239,420 | 46,437 | 1,218,144 | 243,629 |
| Nonsprawl Rural and Undev. Counties | 17,352 | 1,157 | 49,207 | 3,280 | 17,352 | 1,157 | 75,960 | 3,236 |
| **EA** | **405,854** | **13,528** | **1,544,071** | **51,469** | **405,854** | **13,528** | **1,544,071** | **51,469** |

*Source:* Center for Urban Policy Research, Rutgers University.

numbers for both households and employment under each scenario. The most significantly growth-controlled counties are Blount, AL, and Tuscaloosa, AL; their growth in households is reduced by 30 percent and 47 percent, respectively. In the Birmingham, AL EA, approximately nine counties remain unchanged under the two scenarios. These are the eight low-growth counties and the one county that cannot be controlled (Cullman County, AL, immediately north of Birmingham, AL). The most significant increase in a core county occurs in Jefferson, AL, with a household growth increase of 150 percent. This growth amounts to only 14.3 percent of the base or 0.6 percent annually. Figures 5.5 and 5.6 map sprawl in EA counties under the uncontrolled- and the controlled-growth scenarios.

In summary, of the five sprawling counties in the Birmingham, AL EA, four are controlled and one remains uncontrolled. The EA is characterized by both average sprawl and by considerable control.

## CHICAGO-GARY-KENOSHA, IL-IN-WI EA (EA 64)

The Chicago-Gary-Kenosha, IL-IN-WI EA has developed a highly diversified economy based in part on a sophisticated transportation network. It is the nation's most important rail and trucking center and home to one of the country's busiest airports. The city of Chicago, IL, and its suburbs are well served by commuter railroad, bus, subway, and elevated train lines. Its port is a major focus of domestic and international shipping.

The Chicago-Gary-Kenosha, IL-IN-WI EA continues to be a major manufacturing center, with about one-fifth of its workforce employed in fabrication industries. The Chicago-Gary-Kenosha, IL-IN-WI EA contains the headquarters of numerous large corporations, as well as the world's largest commodities trading organizations. Chicago, IL, continues to maintain its position as an important convention and trade-show center, with attractions that include nationally reknowned lakefronts, parks, museums, and theaters. Nearby is the Loop, an important shopping and entertainment district that is currently undergoing expansion.

The Chicago-Gary-Kenosha, IL-IN-WI EA is among the top 20 EAs nationwide in total growth. This growth places it in the top 20 EAs in sprawl development as well. The Chicago-Gary-Kenosha EA comprises 30 counties. Of those counties, 10 are sprawling and represent sending locations; five are nonsprawling suburban or urban counties and represent receiving locations. The remaining 15 are slow- or no-growth rural and undeveloped counties where sprawl is not a significant issue. Sprawling counties

Courtesy of C. Galley

## Table 5.8
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Chicago-Gary-Kenosha, IL-IN-WI EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Boone, IL | R | S-C | 13,638 | 1,549 | 1,549 | 1.00 | 15,893 | 2,969 | 2,969 | 1.00 |
| Kendall, IL | R | S-C | 16,909 | 4,013 | 4,013 | 1.00 | 17,924 | 5,850 | 5,850 | 1.00 |
| Porter, IN | R | S-C | 54,165 | 19,055 | 9,844 | 1.94 | 74,327 | 29,187 | 19,163 | 1.52 |
| Kane, IL | S | S-C | 131,088 | 34,274 | 31,577 | 1.09 | 211,702 | 63,683 | 56,430 | 1.13 |
| Kenosha, WI | S | S-C | 55,685 | 17,992 | 13,414 | 1.34 | 66,503 | 26,894 | 17,726 | 1.52 |
| McHenry, IL | S | S-C | 84,071 | 31,352 | 20,251 | 1.55 | 117,486 | 51,988 | 31,316 | 1.66 |
| Will, IL | S | S-C | 149,840 | 56,349 | 36,094 | 1.56 | 169,769 | 88,175 | 45,252 | 1.95 |
| Winnebago, IL | S | S-C | 104,824 | 17,198 | 19,377 | 0.89 | 180,163 | 47,077 | 47,265 | 1.00 |
| Jasper, IN | UND | S-C | 10,463 | 3,121 | 3,121 | 1.00 | 14,410 | 4,833 | 4,833 | 1.00 |
| McLean, IL | UND | S-C | 54,112 | 15,795 | 9,844 | 1.60 | 99,969 | 34,896 | 19,163 | 1.82 |
| **Receiving Counties** | | | | | | | | | | |
| Lake, IN | S | NS | 179,401 | 20,006 | 26,285 | 0.76 | 241,174 | 71,616 | 64,285 | 1.11 |
| Rock, WI | S | NS | 58,403 | 7,829 | 9,517 | 0.82 | 88,203 | 14,886 | 16,605 | .90 |
| DuPage, IL | U | NS | 321,379 | 80,424 | 81,966 | 0.98 | 686,506 | 193,413 | 203,492 | .95 |
| Lake, IL | U | NS | 213,132 | 86,917 | 86,917 | 1.00 | 397,666 | 208,492 | 208,492 | 1.00 |
| Cook, IL | UC | NS | 1,892,850 | -14,609 | 27,498 | -0.53 | 3,205,662 | 622,217 | 725,270 | .86 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Kankakee, IL | R | NS | 37,425 | 2,472 | 2,472 | 1.00 | 56,454 | 16,310 | 15,048 | 1.08 |
| La Porte, IN | R | NS | 41,091 | 4,765 | 4,765 | 1.00 | 59,701 | 12,378 | 12,378 | 1.00 |
| Bureau, IL | UND | NS | 13,927 | -131 | -131 | 1.00 | 18,080 | 859 | 859 | 1.00 |
| Carroll, IL | UND | NS | 6,711 | -251 | -251 | 1.00 | 8,166 | 461 | 461 | 1.00 |
| De Kalb, IL | UND | NS | 29,879 | 5,285 | 5,285 | 1.00 | 45,223 | 11,217 | 11,217 | 1.00 |
| De Witt, IL | UND | NS | 6,711 | 386 | 386 | 1.00 | 10,079 | 1,423 | 1,423 | 1.00 |
| Grundy, IL | UND | NS | 13,526 | 1,416 | 1,416 | 1.00 | 17,467 | 2,872 | 2,872 | 1.00 |
| Iroquois, IL | UND | NS | 12,391 | 981 | 981 | 1.00 | 15,440 | 1,742 | 1,742 | 1.00 |
| La Salle, IL | UND | NS | 43,180 | 3,518 | 3,518 | 1.00 | 59,058 | 15,454 | 15,454 | 1.00 |
| Lee, IL | UND | NS | 13,158 | 405 | 405 | 1.00 | 17,884 | 1,958 | 1,958 | 1.00 |
| Livingston, IL | UND | NS | 14,318 | 26 | 26 | 1.00 | 20,952 | 2,350 | 2,350 | 1.00 |
| Newton, IN | UND | NS | 5,453 | 731 | 731 | 1.00 | 5,833 | 822 | 822 | 1.00 |
| Ogle, IL | UND | NS | 19,478 | 4,145 | 4,145 | 1.00 | 24,933 | 7,319 | 6,646 | 1.10 |
| Putnam, IL | UND | NS | 2,240 | 145 | 145 | 1.00 | 3,063 | 310 | 310 | 1.00 |
| Stephenson, IL | UND | NS | 19,636 | 696 | 696 | 1.00 | 29,284 | 2,420 | 2,420 | 1.00 |

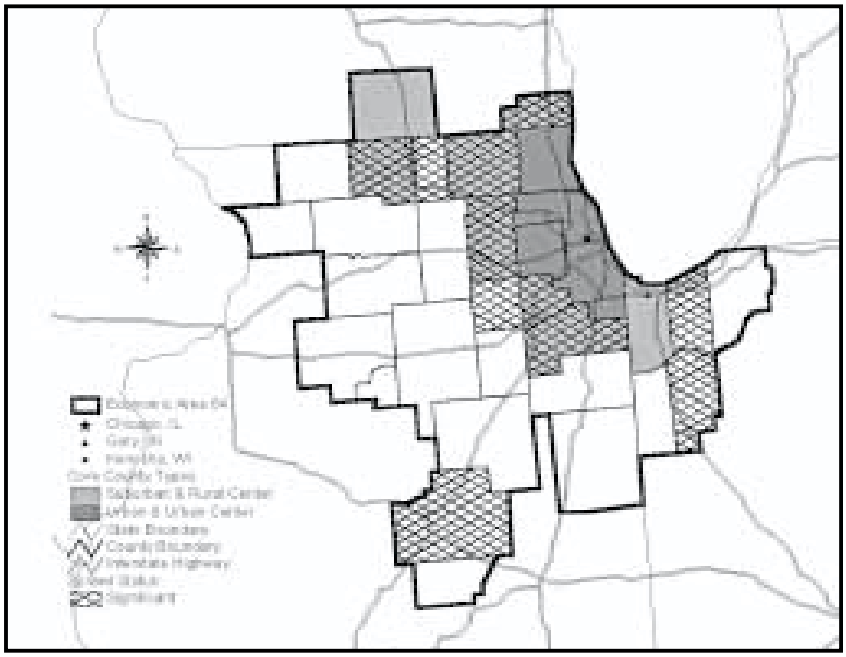
*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

are the counties of Boone, IL; Jasper, IN; Kane, IL; Kendall, IL; Kenosha, WI; McHenry, IL; McLean, IL; Porter, IN; Will, IL; and Winnebago, IL. Core counties are the counties of Lake, IN; Rock, WI; DuPage, IL; Lake, IL; and Cook, IL.

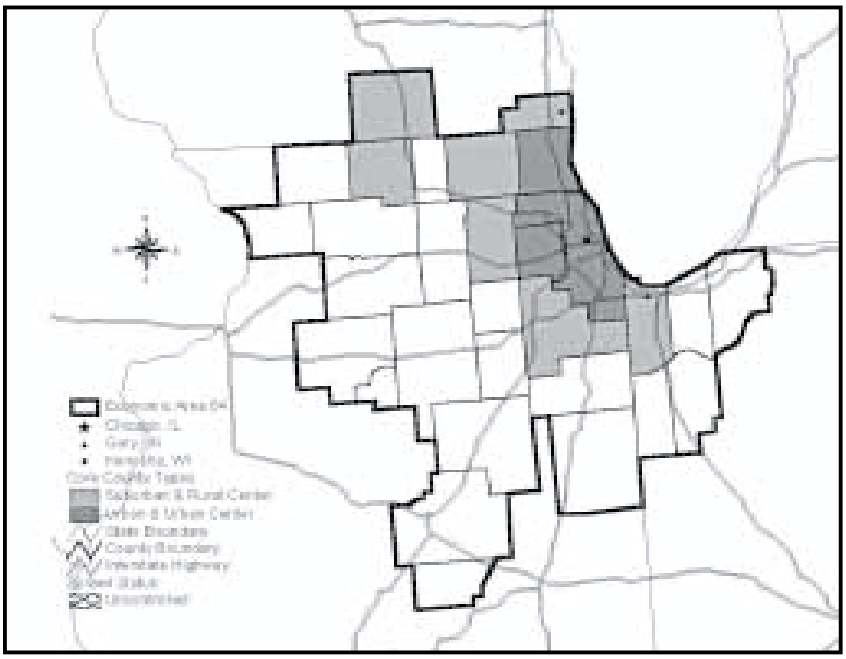
Chicago, IL, is located in Cook County, and the Chicago metropolitan area extends into Lake, McHenry, Will, Kendall, and Kane counties in Illinois as well as Lake County (Gary) in Indiana. The EA also encompasses Rock County (Beloit) in Wisconsin, significantly northwest of Chicago, IL.

**Figure 5.7**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Chicago-Gary-Kenosha, IL-IN-WI EA**



*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.8**
**Projected Sprawl: Controlled-Growth Scenario**
**Chicago-Gary-Kenosha, IL-IN-WI EA**



*Source:* Center for Urban Policy Research, Rutgers University.

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 20,070 households; suburban and urban areas increase by an average of 36,113 households. Under the controlled-growth scenario, sprawl counties increase by an average of 14,908 households; suburban and urban areas increase by an average of 46,437. Sprawling rural and undeveloped counties have their growth decreased by an average of 25.7 percent; urban and nonsprawl suburban counties have their growth increased by 27.5 percent. In the Chicago-Gary-Kenosha, IL-IN-WI EA, 15 of the counties remain unchanged under the two growth scenarios. These are all very slow growth rural and undeveloped counties. Tables 5.7 and 5.8 present the growth numbers for both households and employment under each scenario. The most significantly controlled-sprawl counties are McHenry, IL; McLean, IL; and Porter, IN. Their growth in households is reduced by 35 percent, 40 percent, and 50 percent, respectively. The most notable change in a core county under the controlled-growth scenario is Cook County, IL (Chicago, IL), where an outflow of households is reversed under this scenario. The reversal generated the negative control ratios found in Table 5.8. Figures 5.7 and 5.8 map sprawl locations under the uncontrolled- and controlled-growth scenarios. The vast bulk of sprawl occurring to the west of Cook County is controlled by containing growth in Cook, DuPage, and Lake counties, IL, and Lake County, IN.

In summary, in the Chicago-Gary-Kenosha, IL-IN-WI EA, all 10 sprawling counties can be controlled. Overall, the EA is characterized by average sprawl and by considerable control.

Courtesy of T. Delcorso

Courtesy of C. Galley

## DENVER-BOULDER-GREELEY, CO-KS-NE EA (EA 141)

Denver, Colorado, is located in the northeast central part of the state on the South Platte River. It has more than doubled in population since 1960. Denver has a population of 510,000 making it larger than the entire population of Wyoming. Denver's population has increased by 23 percent since 1990. It is the 20th largest metropolitan area in America, and has the 10th largest downtown area. Denver has the greatest percentage of high school and college graduates of any major metropolitan area in the United States; 92.1 percent of the population in the metropolitan area have a high school diploma and 35 percent have at least a bachelor's degree, according to the 1990 U.S. Census. Thirty-three miles from the city is the Denver International Airport, one of the newest air facilities in the nation. Denver is the state capital of Colorado and is known as a transportation and commercial center. Its economy is driven by fuel, the aerospace industry, meat processing, and tourism. Recession and a drop in the energy industry caused Denver's growth to slow in the late 1980s, but in 1997, the city experienced its highest hotel occupancy in eight years and the highest average room rate ever, an indication that the economy had once again recovered. Denver is at the crossroads of three interstates. I-25 runs south from Cheyenne through the general area of Greeley, Denver, Colorado Springs, and Pueblo to New Mexico. I-70 runs east or west from Denver to Kansas and Utah, respectively. I-76 terminates in Denver from Nebraska in the northeast.

Denver is in Denver County, and its metropolitan area extends into Adams and Arapahoe counties (in the north and east) and Jefferson County in the west. Denver is bordered in the south by Douglas County, and beyond that lies El Paso County, which contains the city of Colorado Springs. South of El Paso County

## Table 5.9
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Denver-Boulder-Greeley, CO-KS-NE

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 437,473 | 27,342 | 707,195 | 44,200 | 345,293 | 21,581 | 559,043 | 34,940 |
| Nonsprawl Core Counties | 173,508 | 43,377 | 387,802 | 96,951 | 265,688 | 66,422 | 535,980 | 133,995 |
| Nonsprawl Rural and Undev. Counties | 25,265 | 871 | 41,626 | 1,435 | 25,265 | 871 | 41,601 | 1,435 |
| **EA** | **636,246** | **12,985** | **1,136,623** | **23,1966** | **636,246** | **12,985** | **1,136,623** | **23,196** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.10
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Denver-Boulder-Greeley, CO-KS-NE

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Douglas, CO | R | S-C | 45,142 | 41,060 | 10,613 | 4.17 | 49,039 | 48,806 | 19,163 | 2.55 |
| El Paso, CO | S | S-C | 194,230 | 91,112 | 91,329 | 1.00 | 311,820 | 141,534 | 123,217 | 1.15 |
| Eagle, CO | UND | S-C | 14,341 | 16,402 | 6,743 | 2.43 | 35,642 | 39,240 | 14,084 | 2.79 |
| Elbert, CO | UND | S-C | 6,279 | 3,408 | 2,952 | 1.15 | 4,671 | 2,157 | 2,157 | 1.00 |
| Garfield, CO | UND | S-C | 16,130 | 14,031 | 7,584 | 1.85 | 27,053 | 25,455 | 10,690 | 2.38 |
| Grand, CO | UND | S-C | 4,369 | 3,207 | 3,207 | 1.00 | 9,054 | 6,764 | 3,578 | 1.89 |
| Park, CO | UND | S-C | 4,838 | 1,769 | 1,769 | 1.00 | 3,541 | 1,384 | 1,384 | 1.00 |
| Pitkin, CO | UND | S-C | 6,939 | 3,559 | 3,263 | 1.09 | 22,080 | 11,552 | 8,725 | 1.32 |
| Routt, CO | UND | S-C | 7,636 | 5,886 | 3,591 | 1.64 | 17,560 | 12,609 | 6,939 | 1.82 |
| Summit, CO | UND | S-C | 9,080 | 10,520 | 4,270 | 2.46 | 25,281 | 21,885 | 9,990 | 2.19 |
| Teller, CO | UND | S-C | 8,331 | 7,098 | 3,917 | 1.81 | 9,632 | 6,266 | 6,266 | 1.00 |
| Weld, CO | UND | S-C | 59,231 | 19,296 | 13,926 | 1.96 | 83,911 | 26,853 | 19,163 | 1.40 |
| Larimer, CO | R | S-NC | 94,404 | 54,232 | 30,174 | 1.80 | 147,069 | 73,799 | 51,543 | 1.43 |
| Arapahoe, CO | S | S-NC | 206,849 | 149,530 | 149,530 | 1.00 | 355,718 | 254,747 | 254,747 | 1.00 |
| Gilpin, CO | UND | S-NC | 1,901 | 1,783 | 1,783 | 1.00 | 7,019 | 9,735 | 2,989 | 3.26 |
| Mesa, CO | UND | S-NC | 45,270 | 14,580 | 10,643 | 1.48 | 62,127 | 24,409 | 24,409 | 1.00 |
| **Receiving Counties** | | | | | | | | | | |
| Adams, CO | S | NS | 124,351 | 60,342 | 58,471 | 1.03 | 168,446 | 80,263 | 66,562 | 1.21 |
| Boulder, CO | S | NS | 109,222 | 34,493 | 51,357 | .67 | 218,230 | 64,252 | 86,234 | .75 |
| Jefferson, CO | S | NS | 200,602 | 61,138 | 94,325 | .65 | 275,274 | 97,950 | 108,776 | .90 |
| Denver, CO | UC | NS | 233,140 | 17,535 | 61,535 | .28 | 520,824 | 145,337 | 274,408 | .53 |

*Continued on next page*

**Table 5.10—*Continued***

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Chaffee, CO | UND | NS | 6,066 | 1,312 | 1,312 | 1.00 | 7,735 | 2,156 | 2,156 | 1.00 |
| Cheyenne, KS | UND | NS | 1,378 | -116 | -116 | 1.00 | 1,781 | -100 | -100 | 1.00 |
| Clear Creek, CO | UND | NS | 3,958 | 2,456 | 2,456 | 1.00 | 4,577 | 2,171 | 2,171 | 1.00 |
| Custer, CO | UND | NS | 1,279 | 252 | 252 | 1.00 | 1,187 | 197 | 197 | 1.00 |
| Delta, CO | UND | NS | 11,114 | 4,409 | 4,409 | 1.00 | 11,120 | 4,380 | 4,380 | 1.00 |
| Dundy, NE | UND | NS | 998 | -105 | -105 | 1.00 | 1,475 | 87 | 87 | 1.00 |
| Fremont, CO | UND | NS | 15,204 | 3,088 | 3,088 | 1.00 | 16,149 | 5,715 | 5,715 | 1.00 |
| Gove, KS | UND | NS | 1,208 | -159 | -159 | 1.00 | 2,269 | 87 | 87 | 1.00 |
| Gunnison, CO | UND | NS | 4,998 | 1,462 | 1,462 | 1.00 | 10,027 | 3,612 | 3,612 | 1.00 |
| Hinsdale, CO | UND | NS | 322 | 67 | 67 | 1.00 | 475 | 96 | 96 | 1.00 |
| Jackson, CO | UND | NS | 625 | 51 | 51 | 1.00 | 931 | 111 | 111 | 1.00 |
| Kit Carson, CO | UND | NS | 2,876 | -69 | -69 | 1.00 | 4,182 | -252 | -252 | 1.00 |
| Lake, CO | UND | NS | 2,622 | 716 | 716 | 1.00 | 2,932 | 1,169 | 1,169 | 1.00 |
| Lincoln, CO | UND | NS | 1,984 | -92 | -92 | 1.00 | 2,929 | 232 | 232 | 1.00 |
| Logan, CO | UND | NS | 7,415 | 550 | 550 | 1.00 | 11,496 | 1,461 | 1,461 | 1.00 |
| Logan, KS | UND | NS | 1,243 | 4 | 4 | 1.00 | 2,108 | 112 | 112 | 1.00 |
| Moffat, CO | UND | NS | 4,697 | 1,061 | 1,061 | 1.00 | 7,275 | 2,226 | 2,226 | 1.00 |
| Montrose, CO | UND | NS | 12,507 | 5,369 | 5,369 | 1.00 | 18,030 | 7,150 | 7,125 | 1.00 |
| Morgan, CO | UND | NS | 9,663 | 1,504 | 1,504 | 1.00 | 15,127 | 2,597 | 2,597 | 1.00 |
| Ouray, CO | UND | NS | 1,413 | 593 | 593 | 1.00 | 2,083 | 715 | 715 | 1.00 |
| Phillips, CO | UND | NS | 1,821 | 57 | 57 | 1.00 | 2,341 | 125 | 125 | 1.00 |
| Rio Blanco, CO | UND | NS | 2,419 | 298 | 298 | 1.00 | 3,922 | 651 | 651 | 1.00 |
| San Miguel, CO | UND | NS | 2,587 | 2,831 | 2,831 | 1.00 | 7,197 | 6,218 | 6,218 | 1.00 |
| Sheridan, KS | UND | NS | 1,054 | -72 | -72 | 1.00 | 1,831 | -43 | -43 | 1.00 |
| Sherman, KS | UND | NS | 2,637 | -245 | -245 | 1.00 | 4,363 | 281 | 281 | 1.00 |
| Thomas, KS | UND | NS | 3,172 | 93 | 93 | 1.00 | 6,201 | 832 | 832 | 1.00 |
| Wallace, KS | UND | NS | 669 | -76 | -76 | 1.00 | 1,165 | 26 | 26 | 1.00 |
| Washington, CO | UND | NS | 1,900 | -107 | -107 | 1.00 | 2,643 | -130 | -130 | 1.00 |
| Yuma, CO | UND | NS | 3,716 | 133 | 133 | 1.00 | 5,094 | -256 | -256 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.

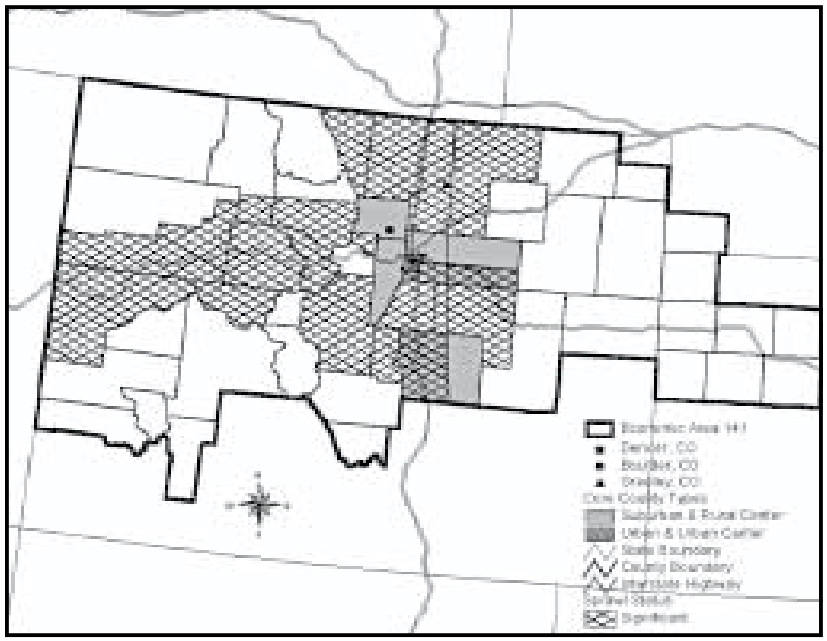
*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

is Pueblo County, containing the city of Pueblo. The city of Boulder is 25 miles northwest of Denver in Boulder County, and the city of Greeley is 60 miles north-northeast of Denver in Weld County. Sprawl is moving outward from Denver in all directions, particularly north and south on I-25 and east and west on I-70 to Grand Junction in the west.

The Denver-Boulder-Greeley, CO-KS-NE EA ranks nationally in the top 10 EAs in total growth. This growth also places it in the top 10 EAs in sprawl development. This West Region EA comprises 49 counties. Of these counties, 16 are sprawling and represent sending locations; four are nonsprawling suburban or urban counties and represent receiving locations. The remaining 29 counties are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawling sending locations are the counties of Douglas, CO; El Paso, CO; Eagle, CO; Elbert, CO; Garfield, CO; Grand, CO; Park, CO; Pitkin, CO; Routt, CO; Summit, CO; Teller, CO; Weld, CO; Larimer, CO; Arapahoe, CO; Gilpin, CO; and Mesa, CO. Urban and suburban receiving locations are the counties of Adams, CO; Boulder, CO; Jefferson, CO; and Denver, CO.

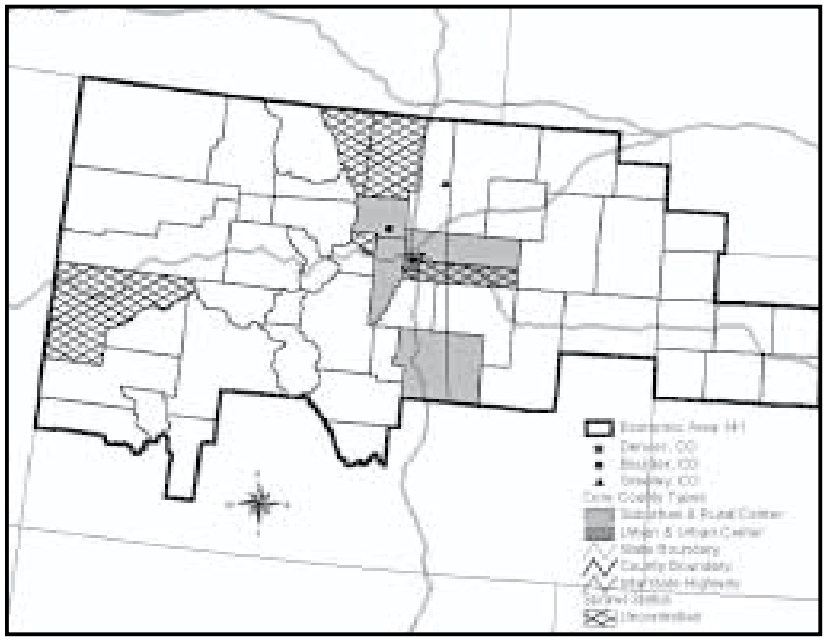
Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 27,342 households; nonsprawling suburban and urban counties increase by an average of 43,377 households.

**Figure 5.9**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Denver-Boulder-Greeley, CO-KS-NE**



*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.10**
**Projected Sprawl: Controlled-Growth Scenario**
**Denver-Boulder-Greeley, CO-KS-NE**



*Source:* Center for Urban Policy Research, Rutgers University.

Under the controlled-growth scenario, sprawling counties increase by an average of 21,581 households; nonsprawling suburban and urban counties increase by an average of 66,422 households. Sprawling rural and undeveloped counties have their absolute growth decreased by an average of 27.0 percent; nonsprawl urban and suburban counties have their growth increased by 53.1 percent. Tables 5.9 and 5.10 present the projected growth in households and employment under each scenario.

The most significantly sprawl-controlled counties are Douglas, CO, and Larimer, CO, with their growth in households reduced by 76.0 percent and 44.4 percent, respectively. In the Denver-Boulder-Greeley EA, almost two-thirds of the counties (34) remain unchanged under the two alternative growth scenarios. These are the 29 slow- or no-growth counties and two of the four sprawling counties that are not controlled. Notably increasing in its growth under the controlled-growth scenario is Denver, CO, with a household growth increase of about 250 percent. This latter growth amounts to a total of only 18.9 percent of the 2000 base or 0.8 percent annually. Of the six urban/suburban counties in the EA, three are growing at an accelerated rate and need to have growth diverted to other counties under the controlled-growth scenario. The remaining three receive extra growth. Figures 5.9 and 5.10 map sprawl locations in the EA under the uncontrolled- and the controlled-growth scenarios.

In summary, of the 16 sprawling counties under the uncontrolled-growth scenario, 12 are controlled and only four remain uncontrolled. Overall, the Denver-Boulder-Greeley EA is characterized by both considerable sprawl in counties and only reasonable ability to control sprawl.

## LAS VEGAS, NV-AZ-UT EA (EA 153)

The thousands of migrants who move to the Las Vegas, NV-AZ-UT EA monthly are feeding a self-perpetuating construction and service industry boom that promises to create a significant metropolitan region in the country over the next 20 years. For the time being, however, the gaming, tourism, and convention sectors continue their dominance, and the expanding light manufacturing and distribution industries are adding to the EA's growing pains.


Courtesy of R. Ewing

Growth of this magnitude is not without its costs. Recent rapid growth in the Las Vegas, NV-AZ-UT EA has severely strained the area's resources, particularly water, as well as its infrastructure, social service system, police and fire protection, and environment. Schools are being constructed in rapid fashion, barely keeping up with rising enrollments, and traffic congestion is growing everywhere in the metropolitan area.

The Las Vegas, NV-AZ-UT EA ranks in the top 20 EAs nationwide in total growth. This growth also places it in the top 10 EAs in sprawl development. This West Region EA comprises 11 counties, of which five are sprawling and the remaining six are slow- or no-growth rural and undeveloped counties where sprawl is not a significant issue. There are no nonsprawling suburban or urban counties within this EA that could serve as receiving locations. The sprawling counties are Nye, NV; Clark, NV; Iron, UT; Mohave, AZ; and Washington, UT.

The city of Las Vegas, NV, is located in the middle of Clark County, NV, on the Arizona and Utah borders. Kingman, AZ, in Mohave County is the closest Arizona city. St. George, UT, in Washington County and Cedar City, UT, in Iron County are the closest Utah cities. The only other Nevada county influenced by growth emanating from Las Vegas, NV, is Nye County, northwest of Clark County. Except for Nye County, NV, these counties are part of the Interstate 5 corridor through the EA. Clark County itself is so large, so spread out, and of such low density that it is a sprawling suburban location. Clark County contains the city of Henderson, which was the fastest-growing city in the United States during the period 1990 to 2000 (as measured by building permits).

**Table 5.11**
**Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Las Vegas, NV-AZ-UT EA**

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 422,883 | 84,577 | 649,768 | 129,854 | 422,883 | 84,577 | 649,768 | 129,854 |
| Nonsprawl Core Counties | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Nonsprawl Rural and Undev. Counties | 1,478 | 246 | 5,238 | 873 | 1,478 | 246 | 5,238 | 873 |
| **EA** | **424,361** | **38,578** | **655,006** | **59,546** | **424,361** | **38,578** | **655,006** | **59,546** |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 5.12**
**County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Las Vegas, NV-AZ-UT EA**

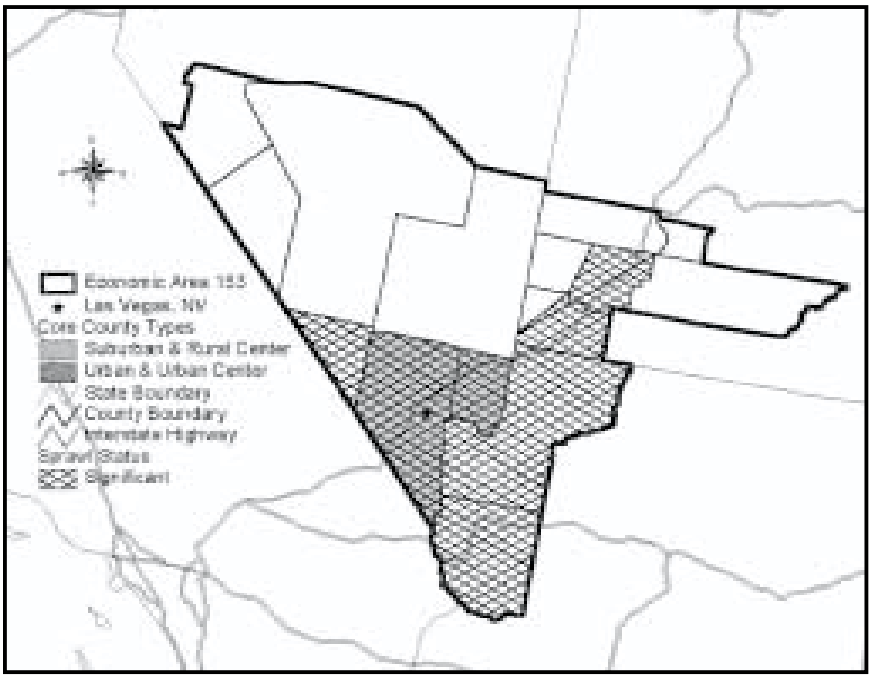
| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sprawling Counties** | | | | | | | | | | |
| Nye, NV | UND | S-C | 9,950 | 2,486 | 2,486 | 1.00 | 12,157 | 6,155 | 6,155 | 1.00 |
| Washington, UT | R | S-NC | 30,059 | 39,276 | 39,276 | 1.00 | 44,036 | 43,580 | 43,580 | 1.00 |
| Clark, NV | S | S-NC | 463,705 | 352,899 | 352,899 | 1.00 | 740,481 | 559,719 | 559,719 | 1.00 |
| Iron, UT | UND | S-NC | 9,618 | 7,495 | 7,495 | 1.00 | 17,215 | 12,997 | 12,997 | 1.00 |
| Mohave, AZ | UND | S-NC | 53,750 | 20,727 | 20,727 | 1.00 | 49,835 | 27,317 | 27,317 | 1.00 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Beaver, UT | UND | NS | 2,012 | 487 | 487 | 1.00 | 2,611 | 906 | 906 | 1.00 |
| Esmeralda, NV | UND | NS | 533 | 91 | 91 | 1.00 | 468 | 171 | 171 | 1.00 |
| Garfield, UT | UND | NS | 1,483 | 484 | 484 | 1.00 | 2,840 | 1,454 | 1,454 | 1.00 |
| Lincoln, NV | UND | NS | 1,478 | 500 | 500 | 1.00 | 2,298 | 1,170 | 1,170 | 1.00 |
| Mineral, NV | UND | NS | 2,286 | -92 | -92 | 1.00 | 3,316 | 1,522 | 1,522 | 1.00 |
| Piute, UT | UND | NS | 511 | 8 | 8 | 1.00 | 373 | 15 | 15 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

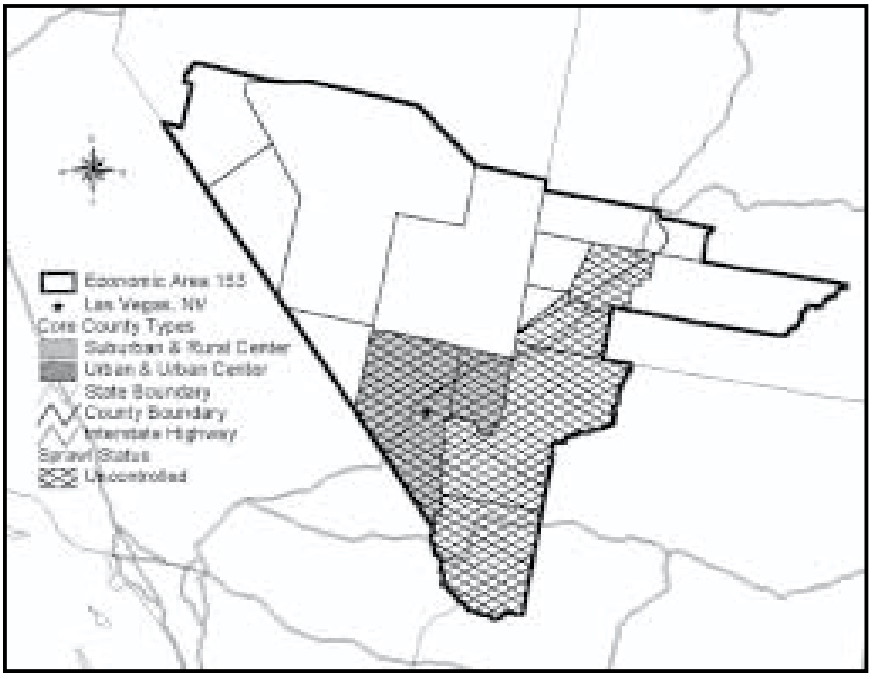
Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 84,577 households. There can be no controlled-growth scenario redirection, since there are no receiving counties. The county of Clark, NV, has the most significant increases in growth, followed by the county of Washington, UT. Their increases in households are 352,899 and 39,276, respectively, under both scenarios for the projected period. Nye County, NV is diminishing its growth rate on its own and does not require further growth redirection. Tables 5.11 and 5.12 present the growth numbers for both households and employment under each scenario. Figures 5.11 and 5.12 show EA sprawl locations under both un-

**Figure 5.11**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Las Vegas, NV-AZ-UT EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.12**
**Projected Sprawl: Controlled-Growth Scenario**
**Las Vegas, NV-AZ-UT EA**




*Source:* Center for Urban Policy Research, Rutgers University.

Courtesy of R. Ewing

controlled- and controlled-growth scenarios. Since this EA has very large counties in terms of physical size, the counties are divided into sections, with only the applicable portion of the counties indicating a sprawl designation. Subdivided counties are prevalent in this EA as well as in the EAs of Tucson, AZ; Los Angeles-Riverside, CA-AZ; and Denver-Boulder-Greeley, CO-KS-NE.

In summary, of the five sprawling counties, four remain sprawling in the Las Vegas, NV-AZ-UT EA. This EA is characterized by considerable sprawl and by almost no intercounty sprawl control.

## LEXINGTON, KY-TN-VA-WV EA (EA 47)

The Lexington, KY-TN-VA-WV EA serves as the health-care, retail, and cultural center of central Kentucky. The service sector dominates the regional economy, although retail, government, and manufacturing sectors contribute significantly to the metropolitan area's growth. Health-care services also contribute to the regional economy, with fully a third of the top 15 employers part of this sector. The Lexington, KY-TN-VA-WV EA's central location has made it a natural hub for both services and health care in the central and eastern Kentucky region.

By national standards, the Lexington, KY-TN-VA-WV EA is an attractive place to relocate in or in which to establish a business. With utility costs well below the national average, a reasonably educated workforce, a strategic location at the interchange of I-75 and I-64, it should come as no surprise that the Lexington, KY-TN-VA-WV EA is growing at a faster rate than either the state or the nation. In addition to this being the horse capital of the country (a status that in itself has boosted the regional tourist and hospitality industry), recent corporate newcomers include Valvoline, Toyota, GTE, Trane, and Proctor and Gamble. The Lexington, KY-TN-VA-WV EA, in the South Region of the United States, comprises 67 counties. Of these counties, 11 are sprawling rural and undeveloped counties and represent sending locations; two are nonsprawling suburban or urban counties and represent receiving locations. The remaining 54 are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawling locations consist of the following counties: Claiborne, TN; Floyd, KY; Madison, KY; Pulaski, KY; Woodford, KY; Jessamine, KY; Laurel, KY; Perry, KY; Pike, KY; Scott, KY; and Tazewell, VA. Urban and suburban locations consist of Franklin and Fayette, KY, counties.

Lexington-Fayette, KY, is a consolidated city-county government. The city of Lexington, KY, is surrounded by the first (1954) urban growth boundary in the United States, which encompasses a significant share of Fayette County. Franklin County contains Frankfort, KY, the state's capital, and is separated from Fayette County (Lexington, KY) to the southeast by Woodford and Scott counties. Sprawl is occurring to the northwest and south of Lexington-Fayette County and also along State Route 80 in the south-central part of the state.

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 4,145 households; suburban and urban areas increase by 15,210 households. Under the controlled-growth scenario, sprawling counties increase by an average of 4,110 households; suburban and urban areas increase by 15,899 households. Sprawling rural and undeveloped counties have their growth decreased by an average of 3.0 percent; suburban and urban counties have their growth increased by 4.5 percent. Tables 5.13 and 5.14 list the growth in households and employment under both development scenarios. The most significant growth-controlled county is Floyd, KY, with a reduction in household growth of 20 percent. The most significant increase in county growth under the controlled-growth scenario is Franklin, KY, wherein household growth increases by 65 percent. Figures 5.13 and 5.14 show sprawl locations in the uncontrolled- and controlled-growth scenarios.

Of the 11 sprawling counties, five are controlled and six remain uncontrolled. In the Lexington, KY-TN-VA-WV EA, 60 counties remain unchanged under the two growth scenarios. These are the 54 with modest

## Table 5.13
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Lexington, KY-TN-VA-WV EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 46,591 | 4,145 | 78,984 | 7,180 | 45,211 | 4,110 | 77,205 | 7,019 |
| Nonsprawl Core Counties | 30,419 | 15,210 | 82,815 | 41,408 | 31,799 | 15,899 | 84,594 | 42,297 |
| Nonsprawl Rural and Undev. Counties | 40,443 | 749 | 72,958 | 1,351 | 40,443 | 749 | 72,958 | 1,351 |
| **EA** | **117,453** | **1,753** | **234,757** | **3,504** | **117,453** | **1,753** | **234,757** | **3,504** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.14
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Lexington, KY-TN-VA-WV EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Floyd, KY | R | S-C | 16,708 | 3,867 | 3,000 | 1.29 | 15,535 | 5,647 | 5,647 | 1.00 |
| Madison, KY | R | S-C | 23,602 | 2,281 | 2,281 | 1.00 | 34,719 | 6,179 | 6,179 | 1.00 |
| Pulaski, KY | R | S-C | 22,157 | 4,229 | 3,979 | 1.06 | 32,594 | 7,804 | 7,804 | 1.00 |
| Woodford, KY | R | S-C | 8,423 | 1,676 | 1,676 | 1.00 | 15,588 | 3,843 | 3,843 | 1.00 |
| Claiborne, TN | UND | S-C | 11,275 | 2,897 | 2,897 | 1.00 | 15,510 | 4,128 | 4,128 | 1.00 |
| Jessamine, KY | R | S-NC | 13,450 | 5,397 | 5,397 | 1.00 | 17,669 | 8,061 | 8,061 | 1.00 |
| Laurel, KY | R | S-NC | 19,033 | 6,318 | 6,318 | 1.00 | 28,380 | 10,072 | 10,072 | 1.00 |
| Perry, KY | R | S-NC | 11,699 | 3,338 | 3,338 | 1.00 | 14,653 | 5,954 | 5,954 | 1.00 |
| Pike, KY | R | S-NC | 28,442 | 8,366 | 8,366 | 1.00 | 32,854 | 12,974 | 12,974 | 1.00 |
| Scott, KY | R | S-NC | 11,040 | 3,644 | 3,644 | 1.00 | 24,834 | 7,633 | 7,282 | 1.05 |
| Tazewell, VA | R | S-NC | 18,915 | 4,578 | 4,315 | 1.06 | 21,714 | 6,689 | 5,261 | 1.27 |
| **Receiving Counties** | | | | | | | | | | |
| Franklin, KY | S | NS | 19,079 | 2,046 | 3,426 | 0.60 | 38,550 | 7,560 | 9,339 | .81 |
| Fayette, KY | U | NS | 102,216 | 28,373 | 28,373 | 1.00 | 208,106 | 75,255 | 75,255 | 1.00 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Anderson, KY | R | NS | 6,978 | 1,498 | 1,498 | 1.00 | 6,777 | 1,408 | 1,408 | 1.00 |
| Bell, KY | R | NS | 11,497 | 1,132 | 1,132 | 1.00 | 12,546 | 2,711 | 2,711 | 1.00 |
| Bourbon, KY | R | NS | 7,449 | 237 | 237 | 1.00 | 9,565 | 272 | 272 | 1.00 |
| Boyle, KY | R | NS | 10,447 | 1,025 | 1,025 | 1.00 | 19,547 | 4,089 | 4,089 | 1.00 |
| Clark, KY | R | NS | 12,190 | 1,000 | 1,000 | 1.00 | 16,058 | 1,549 | 1,549 | 1.00 |
| Harlan, KY | R | NS | 13,293 | 723 | 723 | 1.00 | 10,662 | 2,521 | 2,521 | 1.00 |
| Johnson, KY | R | NS | 9,089 | 531 | 531 | 1.00 | 9,434 | 577 | 577 | 1.00 |
| Knox, KY | R | NS | 12,032 | 2,233 | 2,233 | 1.00 | 11,097 | 2,557 | 2,557 | 1.00 |
| Letcher, KY | R | NS | 10,024 | 946 | 946 | 1.00 | 7,656 | 1,809 | 1,809 | 1.00 |
| McDowell, WV | R | NS | 11,584 | -2,036 | -2,036 | 1.00 | 7,521 | 1,744 | 1,744 | 1.00 |

*Continued on next page*

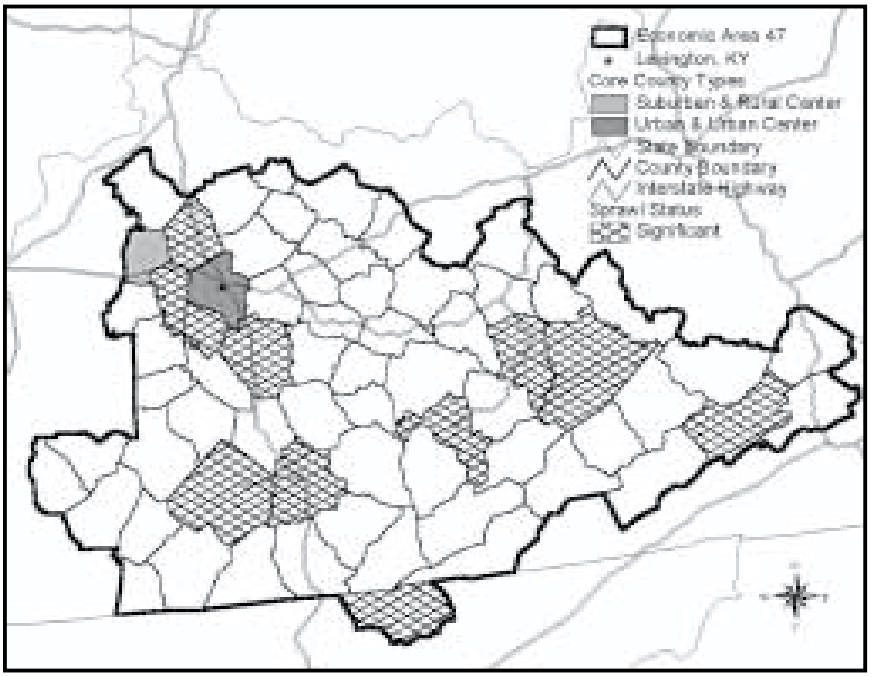
**Table 5.14—*Continued***

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Mercer, KY | R | NS | 8,251 | 1,022 | 1,022 | 1.00 | 10,771 | 1,637 | 1,637 | 1.00 |
| Mercer, WV | R | NS | 26,116 | 1,131 | 1,131 | 1.00 | 30,569 | 3,538 | 3,538 | 1.00 |
| Mingo, WV | R | NS | 12,008 | 690 | 690 | 1.00 | 12,905 | 1,599 | 1,599 | 1.00 |
| Montgomery, KY | R | NS | 8,012 | 1,011 | 1,011 | 1.00 | 10,841 | 2,566 | 2,566 | 1.00 |
| Rowan, KY | R | NS | 7,750 | 1,449 | 1,449 | 1.00 | 11,411 | 3,357 | 3,357 | 1.00 |
| Taylor, KY | R | NS | 9,157 | 809 | 809 | 1.00 | 15,819 | 2,155 | 2,155 | 1.00 |
| Whitley, KY | R | NS | 13,713 | 2,222 | 2,222 | 1.00 | 16,843 | 2,885 | 2,885 | 1.00 |
| Wise+Norton, VA | R | NS | 16,944 | 1,778 | 1,778 | 1.00 | 22,071 | 3,939 | 3,939 | 1.00 |
| Adair, KY | UND | NS | 6,478 | 628 | 628 | 1.00 | 8,117 | 1,062 | 1,062 | 1.00 |
| Bath, KY | UND | NS | 3,984 | 408 | 408 | 1.00 | 4,052 | 533 | 533 | 1.00 |
| Bland, VA | UND | NS | 2,420 | -12 | -12 | 1.00 | 2,871 | 70 | 70 | 1.00 |
| Breathitt, KY | UND | NS | 5,710 | 153 | 153 | 1.00 | 4,946 | 101 | 101 | 1.00 |
| Buchanan, VA | UND | NS | 10,709 | 347 | 347 | 1.00 | 11,723 | 2,466 | 2,466 | 1.00 |
| Casey, KY | UND | NS | 5,799 | 615 | 615 | 1.00 | 6,970 | 891 | 891 | 1.00 |
| Clay, KY | UND | NS | 8,316 | 2,548 | 2,548 | 1.00 | 7,639 | 2,527 | 2,527 | 1.00 |
| Clinton, KY | UND | NS | 3,762 | 231 | 231 | 1.00 | 4,127 | 325 | 325 | 1.00 |
| Dickenson, VA | UND | NS | 6,645 | 529 | 529 | 1.00 | 4,589 | 1,326 | 1,326 | 1.00 |
| Estill, KY | UND | NS | 5,891 | 598 | 598 | 1.00 | 4,469 | 482 | 482 | 1.00 |
| Fleming, KY | UND | NS | 5,128 | 278 | 278 | 1.00 | 6,392 | 163 | 163 | 1.00 |
| Garrard, KY | UND | NS | 5,264 | 442 | 442 | 1.00 | 4,919 | 341 | 341 | 1.00 |
| Green, KY | UND | NS | 4,305 | 153 | 153 | 1.00 | 4,656 | 391 | 391 | 1.00 |
| Harrison, KY | UND | NS | 6,633 | 253 | 253 | 1.00 | 8,007 | 120 | 120 | 1.00 |
| Jackson, KY | UND | NS | 4,886 | 491 | 491 | 1.00 | 3,921 | 441 | 441 | 1.00 |
| Knott, KY | UND | NS | 6,428 | 526 | 526 | 1.00 | 4,539 | 592 | 592 | 1.00 |
| Lawrence, KY | UND | NS | 5,736 | 420 | 420 | 1.00 | 4,314 | 222 | 222 | 1.00 |
| Lee, KY | UND | NS | 2,914 | 196 | 196 | 1.00 | 2,651 | 398 | 398 | 1.00 |
| Lee, VA | UND | NS | 9,478 | 455 | 455 | 1.00 | 8,790 | 268 | 268 | 1.00 |
| Leslie, KY | UND | NS | 4,862 | 446 | 446 | 1.00 | 4,424 | 596 | 596 | 1.00 |
| Lincoln, KY | UND | NS | 8,355 | 730 | 730 | 1.00 | 6,969 | 592 | 592 | 1.00 |
| Magoffin, KY | UND | NS | 4,839 | 279 | 279 | 1.00 | 3,771 | 184 | 184 | 1.00 |
| Martin, KY | UND | NS | 4,542 | 577 | 577 | 1.00 | 4,022 | 846 | 846 | 1.00 |
| McCreary, KY | UND | NS | 6,237 | 1,696 | 1,696 | 1.00 | 4,677 | 1,134 | 1,134 | 1.00 |
| Menifee, KY | UND | NS | 2,044 | 89 | 89 | 1.00 | 1,861 | 38 | 38 | 1.00 |
| Morgan, KY | UND | NS | 4,587 | 322 | 322 | 1.00 | 4,836 | 779 | 779 | 1.00 |
| Nicholas, KY | UND | NS | 2,796 | 142 | 142 | 1.00 | 3,081 | 127 | 127 | 1.00 |
| Owen, KY | UND | NS | 3,853 | 198 | 198 | 1.00 | 3,802 | 72 | 72 | 1.00 |
| Owsley, KY | UND | NS | 2,088 | 128 | 128 | 1.00 | 1,278 | -60 | -60 | 1.00 |
| Powell, KY | UND | NS | 4,616 | 1,193 | 1,193 | 1.00 | 5,277 | 1,219 | 1,219 | 1.00 |
| Robertson, KY | UND | NS | 881 | 12 | 12 | 1.00 | 801 | -79 | -79 | 1.00 |
| Rockcastle, KY | UND | NS | 6,182 | 1,771 | 1,771 | 1.00 | 5,956 | 1,878 | 1,878 | 1.00 |
| Russell, KY | UND | NS | 6,853 | 829 | 829 | 1.00 | 9,833 | 1,549 | 1,549 | 1.00 |
| Russell, VA | UND | NS | 11,591 | 3,116 | 3,116 | 1.00 | 12,778 | 3,802 | 3,802 | 1.00 |
| Wayne, KY | UND | NS | 7,372 | 1,434 | 1,434 | 1.00 | 8,503 | 1,832 | 1,832 | 1.00 |
| Wolfe, KY | UND | NS | 2,992 | 821 | 821 | 1.00 | 2,682 | 689 | 689 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.

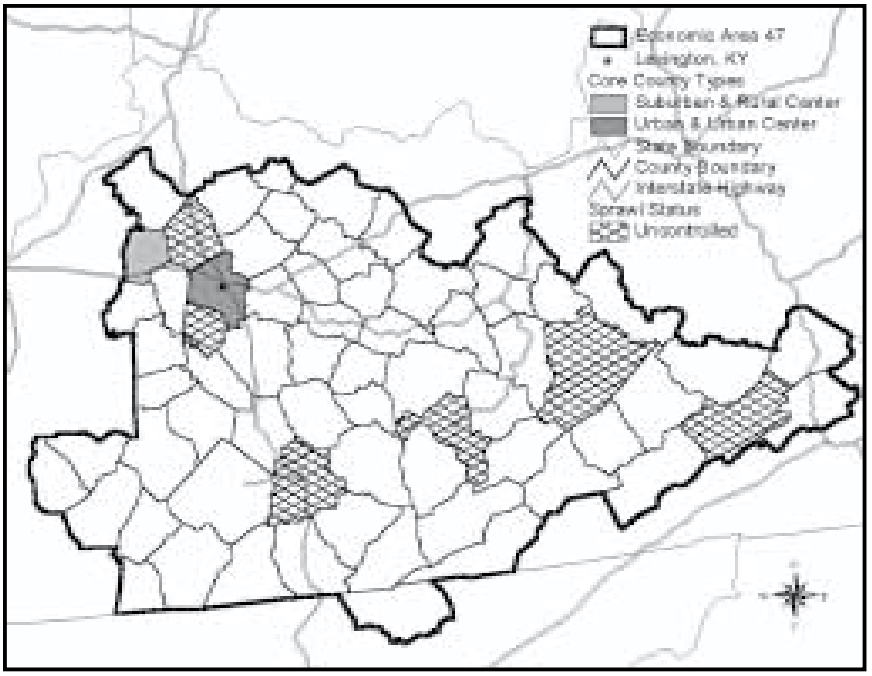
*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

**Figure 5.13**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Lexington, KY-TN-VA-WV EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.14**
**Projected Sprawl: Controlled-Growth Scenario**
**Lexington, KY-TN-VA-WV EA**




*Source:* Center for Urban Policy Research, Rutgers University.

growth and the six sprawl counties that cannot be controlled. Overall, the Lexington, KY-TN-VA-WV EA is characterized by a reasonable level of sprawl and by reasonable control. There are no centers in the south-central portion of the state to contain the sprawl that is growing along State Route 80.

## LOS ANGELES-RIVERSIDE-ORANGE, CA-AZ EA (EA 160)

The Los Angeles-Riverside-Orange, CA-AZ EA has undergone considerable economic restructuring over the last couple of decades. Spurred by growth in Asian trade, the Los Angeles-Riverside-Orange, CA-AZ EA has become an international financial and business center second only to New York. It has become the financial hub of the western United States, and together with Tokyo, the de facto financial capital of the Pacific Rim. Other service industries have continued to develop as well, with the entertainment, insurance, and real estate sectors enjoying a mid-1990s resurgence.

What is particularly unusual in the case of the Los Angeles-Riverside-Orange, CA-AZ EA is that rapid growth in manufacturing is also taking place. Manufacturing growth is occurring in two industries: aerospace/defense-related electronics and consumer goods, particularly garments and apparel. Traditional manufacturing plants have left the area, however. Car assembly (GM) and rubber manufacturing (Firestone, General Tire), for example, have virtually disappeared.

So while craft workers and machine operators continue to decline in number along with traditional manufacturing, the growth in government spending in aerospace and electronics has increased to the point that Los Angeles-Riverside-Orange, CA-AZ EA can

Courtesy of C. Galley

Courtesy of S. Simon

now boast of the largest aggregate number of engineers and scientists in the United States. At the other end of the salary scale, new immigrants continue to fill the rank and file of the restructured but growing electronics manufacturing sector.

The Los Angeles-Riverside-Orange, CA-AZ EA ranks in the top 10 EAs nationwide in total growth. This growth also places it in the top 10 EAs in sprawl development. This West Region EA comprises 10 counties. Of these counties, eight are sprawling and represent sending locations; two are urban counties and represent receiving locations. Sprawling locations are the counties of San Luis Obispo, CA; Yuma and La Paz, AZ; Imperial, CA; Kern, CA; Riverside, CA; San Bernardino, CA; Santa Barbara, CA; and Ventura, CA. Urban and suburban counties are Los Angeles, CA, and Orange, CA.

Los Angeles County encompasses entirely the city of Los Angeles, CA. The Los Angeles urbanized area spills over to Orange County to the southeast. Both San Bernardino County and Riverside County are influenced by the Los Angeles urbanized area at their most western edges. Both of these counties stretch more than one hundred miles east to the Nevada and Arizona borders, respectively, and on the whole, are very rural counties. Los Angeles is spreading northwest and southeast, influencing development in Ventura, Santa Barbara, San Bernardino, San Luis Obispo, and Kern counties. Also included in this EA are the most southeastern county in California—Imperial County—and two rural Arizona locations—La Paz and Yuma counties. Relating this growth to the highway system, it is occurring in the I-5, I-8, and I-10 corridors as well as along the coastal highway.

Under the uncontrolled-growth scenario, sprawl counties increase by an average of 80,018 households; ur-

## Table 5.15
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Los Angeles-Riverside-Orange, CA-AZ EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 640,142 | 80,018 | 1,125,322 | 140,665 | 269,518 | 33,690 | 522,851 | 65,356 |
| Nonsprawl Core Counties | 520,089 | 260,045 | 1,884,830 | 942,415 | 890,713 | 445,357 | 1,766,287 | 883,144 |
| Nonsprawl Rural and Undev. Counties | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **EA** | **1,160,231** | **116,023** | **3,010,152** | **301,015** | **1,160,231** | **116,023** | **3,010,152** | **301,015** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.16
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Los Angeles-Riverside-Orange, CA-AZ EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Santa Barbara, CA | R | S-C | 139,363 | 18,364 | 18,364 | 2.05 | 239,045 | 62,311 | 49,431 | 1.26 |
| Ventura, CA | R | S-C | 245,940 | 71,490 | 34,858 | 7.26 | 400,448 | 203,529 | 82,806 | 2.46 |
| Kern, CA | UND | S-C | 215,059 | 59,379 | 30,481 | 1.95 | 311,361 | 87,346 | 64,384 | 1.36 |
| S. Bernardino, CA | UND | S-C | 559,227 | 215,330 | 79,262 | 2.72 | 668,342 | 328,236 | 138,202 | 2.38 |
| S. L. Obispo, CA | UND | S-C | 89,061 | 22,098 | 12,623 | 1.75 | 125,173 | 48,933 | 25,884 | 1.89 |
| Yuma+L. Paz, AZ | UND | S-C | 51,980 | 16,551 | 9,844 | 1.68 | 72,939 | 31,063 | 19,163 | 1.62 |
| Riverside, CA | R | S-NC | 519,237 | 226,439 | 73,594 | 3.00 | 563,212 | 342,801 | 121,878 | 2.81 |
| Imperial, CA | UND | S-NC | 42,028 | 10,491 | 10,491 | 1.00 | 62,394 | 21,103 | 21,103 | 1.00 |
| **Receiving Counties** | | | | | | | | | | |
| Los Angeles, CA | U | NS | 3,138,637 | 240,128 | 581,460 | .41 | 5,172,513 | 1,151,637 | 1,686,174 | .68 |
| Orange, CA | U | NS | 955,539 | 279,961 | 309,253 | .91 | 1,721,587 | 733,193 | 801,127 | .92 |

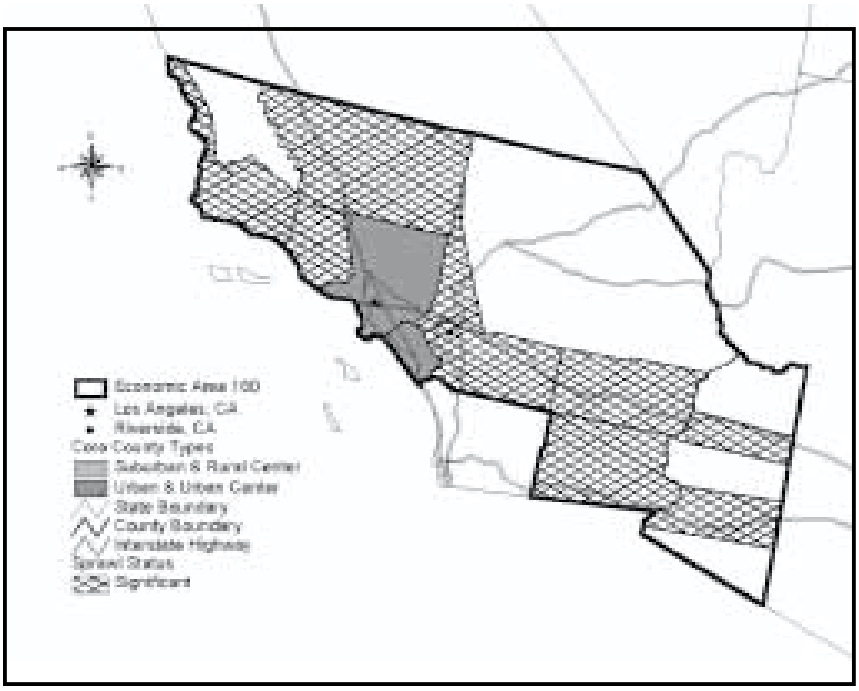
*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three types of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

ban/suburban counties increase by an average of 260,045 households. Under the controlled-growth scenario, sprawling counties increase by an average of 33,690 households and urban/suburban counties increase by an average of 445,357 households. Sprawling rural and undeveloped counties have their growth decreased by an average of 57.9 percent; urban and suburban counties have their growth increased by 71.0 percent. Tables 5.15 and 5.16 present the growth in households and employment under each development scenario.

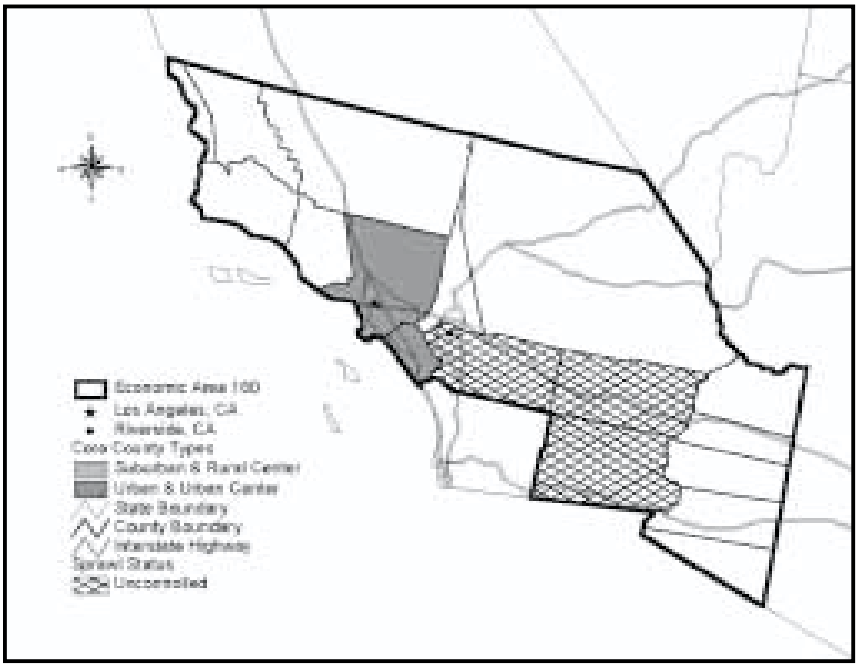
The most significantly growth-controlled counties are Riverside, CA, and San Bernardino, CA, with household growth reduced by 67.5 percent and 63.2 percent, respectively. The most significantly increased county is Los Angeles, CA, with an increase in household growth of approximately 140 percent; this

**Figure 5.15**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Los Angeles-Riverside-Orange, CA-AZ EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.16**
**Projected Sprawl: Controlled-Growth Scenario**
**Los Angeles-Riverside-Orange, CA-AZ EA**




*Source:* Center for Urban Policy Research, Rutgers University.

growth amounts to only 10.9 percent of the 2000 base or 0.4 percent annually. Figures 5.15 and 5.16 show sprawl locations for the uncontrolled- and controlled-growth scenarios in the EA. Even with the significant household growth increase directed to Los Angeles County, only the two sprawling counties in Arizona can be controlled. It should be noted that this EA has very large geographic counties. If the sprawl growth was determined to be occurring in only a portion of a large county, as it is in San Bernardino, La Paz, and Yuma counties, the counties are divided into sections with the appropriate portion (as opposed to the whole county) indicating a sprawl location.

In summary, of the eight sprawling counties in the Los Angeles-Riverside-Orange, CA-AZ EA, six are controlled and two remain uncontrolled. The EA is characterized by considerable levels of sprawl and by considerable levels of control.

## MIAMI-FORT LAUDERDALE, FL EA (EA 31)

The Miami-Fort Lauderdale, FL EA is a historic tourist and retirement destination. Tourists alone provide economic support to many parts of the EA—to the tune of several billion dollars per year. Along with tourism, retirement in-migration has a key economic impacts on the Miami-Fort Lauderdale, FL EA. The retirement influx is slowing and changing in its ethnic composition. The fastest-growing employment sectors in the region—services and retail—are especially reliant upon temporary (tourist) and permanent (retiree) migrants to sustain their growth.

In the mid- to late 1990s, times were good in the Miami-Fort Lauderdale, FL EA. This success was further amplified by the excellent transportation system of the region. The FEC and CSX railroads traverse the entire region, as do the Florida Turnpike and I-95. While I-95 is becoming impassable, other routes have some excess capacity. This is especially true of the railroads. There are international seaports and airports in the region and a number of academic institutions. These encourage the development of local economic agglomerations. The clusters, often composed of high-tech companies, draw upon the expertise of university settings. An example in southern Palm Beach County includes the grouping of IBM, Siemen, Motorola, Northern Telecom Electronics, Phillips Components, Pratt & Whitney, Northrup Grumman, and Piper Aircraft.

Courtesy of C. Galley

While most of the Miami-Fort Lauderdale, FL EA generally has prospered in recent years, older suburban areas have declined. While some urban areas are on the rise, older suburban areas have paid the price of continued sprawl. The increased reliance on cars and trucks in lieu of mass transit systems, along with the building of hundreds of thousands of suburban tract houses in western areas and thousands of miles of highways, has pulled households and businesses out of older developed eastern suburbs.

The Miami-Fort Lauderdale, FL EA ranks in the top 10 EAs nationwide in total growth. This growth also places it in the top 10 EAs in sprawl development. This South Region EA comprises 10 counties. Of these counties, seven are sprawling and represent sending locations; one is a nonsprawling urban county and represents a receiving location. The remaining two counties are relatively slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawling counties are Broward, FL; Hendry, FL; Martin, FL; Palm Beach, FL; St. Lucie, FL; Indian River, FL; and Monroe, FL. Broward County, FL is different from most other counties included here since it is a sprawling suburban county whose sprawl is triggered primarily by employment growth. This results in the county receiving households yet exporting employment in an attempt to be controlled. The urban county is the county of Miami-Dade, FL.

The Miami-Fort Lauderdale metropolitan area extends due north from southern Miami-Dade County through Broward, Palm Beach, Martin, St. Lucie, and Indian River counties and south through Monroe County. It thus encompasses the regional planning areas of the Treasure Coast and South Florida Re-

**Table 5.17**
**Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Miami-Fort Lauderdale, FL EA**

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 547,741 | 78,248 | 820,112 | 117,159 | 459,224 | 65,603 | 708,377 | 101,197 |
| Nonsprawl Core Counties | 127,137 | 127,137 | 392,340 | 392,340 | 215,654 | 215,654 | 504,075 | 504,075 |
| Nonsprawl Rural and Undev. Counties | 3,879 | 1,940 | 7,330 | 3,665 | 3,879 | 1,940 | 7,330 | 3,665 |
| **EA** | **678,757** | **67,876** | **1,219,782** | **121,978** | **678,757** | **67,876** | **1,219,782** | **121,978** |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 5.18**
**County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Miami-Fort Lauderdale, FL EA**

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Uncontrolled | Controlled | Control Ratio | Year 2000 | Uncontrolled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Martin, FL | R | S-C | 52,436 | 29,319 | 10,080 | 2.91 | 61,327 | 30,710 | 19,163 | 1.60 |
| St. Lucie, FL | R | S-C | 72,431 | 34,586 | 13,924 | 2.48 | 69,324 | 19,061 | 19,061 | 1.00 |
| Broward, FL | S | S-C | 639,166 | 221,368 | 234,392 | 0.94 | 844,725 | 417,679 | 366,953 | 1.14 |
| Palm Beach, FL | S | S-C | 456,082 | 232,519 | 175,355 | 1.33 | 585,037 | 290,221 | 254,143 | 1.14 |
| Hendry, FL | UND | S-C | 10,247 | 3,426 | 3,426 | 1.00 | 17,773 | 7,023 | 7,023 | 1.00 |
| Indian River, FL | R | S-NC | 42,788 | 14,320 | 9,844 | 1.45 | 52,650 | 24,049 | 22,871 | 1.05 |
| Monroe, FL | UND | S-NC | 37,241 | 12,203 | 12,203 | 1.00 | 53,225 | 31,369 | 19,163 | 1.64 |
| **Receiving Counties** | | | | | | | | | | |
| Miami-Dade, FL | S | NS | 761,628 | 127,137 | 215,654 | 0.59 | 1,205,394 | 392,340 | 504,075 | 0.78 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Glades, FL | UND | NS | 3,112 | 814 | 814 | 1.00 | 2,419 | 1,141 | 1,141 | 1.00 |
| Okeechobee, FL | UND | NS | 11,131 | 3,065 | 3,065 | 1.00 | 13,210 | 6,189 | 6,189 | 1.00 |

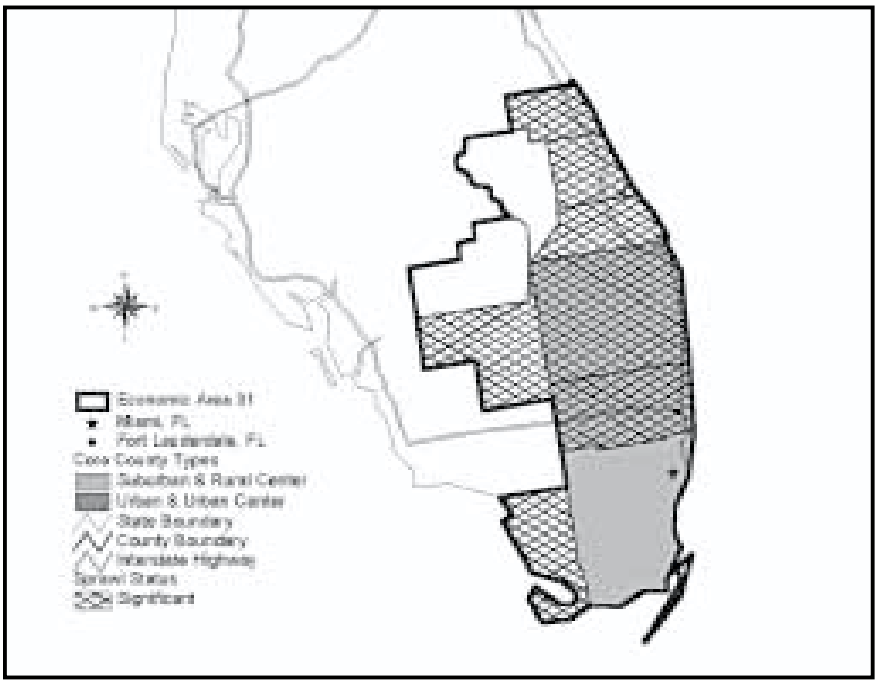
*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

gional Planning Commissions. These contain the sprawling counties of the Miami-Fort Lauderdale, FL EA. Two very rural counties that are part of this EA but not considered sprawling due to their relatively slow growth are Glades and Okeechobee counties.

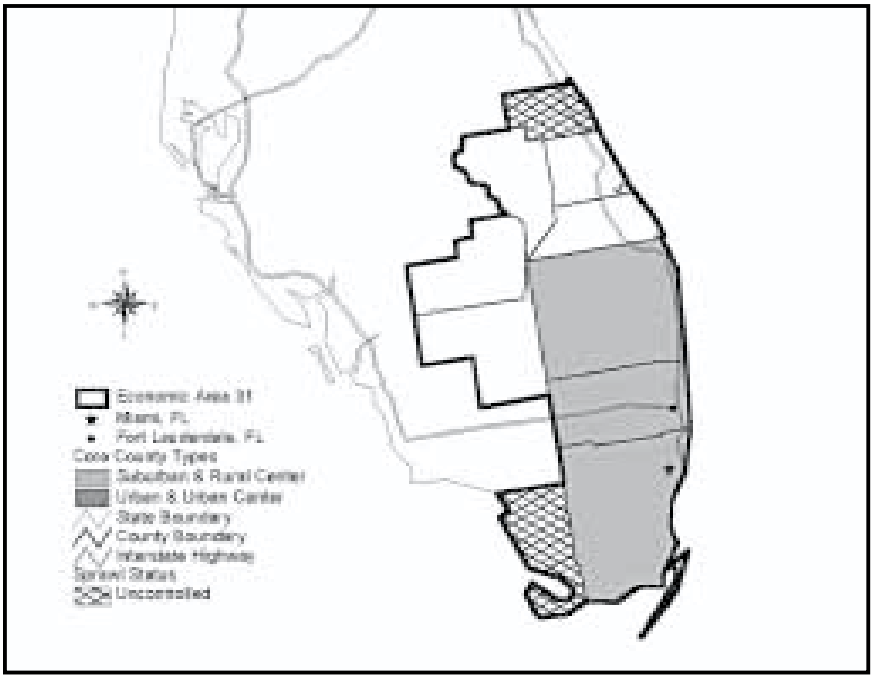
Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 78,248 households; the urban county increases by 127,137 households. Under the controlled-growth scenario, sprawl counties increase by an average of 65,065 households; the urban county increases by 215,654. Sprawling rural and undeveloped counties have their growth decreased by an average of 52 percent; nonsprawling urban Miami-Dade County has its growth increased by 69.6 percent. Tables 5.17 and 5.18 present the growth for both households and employment under each scenario. The most significantly

**Figure 5.17**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Miami-Fort Lauderdale, FL EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.18**
**Projected Sprawl: Controlled-Growth Scenario**
**Miami-Fort Lauderdale, FL EA**




*Source:* Center for Urban Policy Research, Rutgers University.

growth-controlled county is Palm Beach, FL, with a reduction in household growth of 24.6 percent. Overall, sprawl counties' absolute growth is reduced by about 100,000 households, or by 20 percent. The county with the most increased growth under the controlled-growth scenario is Miami-Dade, FL, with a household growth of 75 percent, or 75,000 households. In the Miami-Fort Lauderdale, FL EA, five counties remain unchanged under the two growth scenarios. Figures 5.17 and 5.18 show the sprawl counties under uncontrolled- and controlled-growth scenarios in the EA.

Of the original seven sprawling counties in the Miami-Fort Lauderdale EA, five are controlled. Two sprawling counties (Indian River, FL, and Monroe, FL) remain uncontrolled. The EA is characterized by both considerable sprawl and considerable potential control of sprawl. Projected growth for Monroe County under the uncontrolled-growth scenario is much greater than the county can accommodate under current hurricane and barrier island development restrictions. If growth is directed elsewhere under the uncontrolled-growth scenario, this could affect the ability to exert sprawl control in Broward County in the future.

## MINNEAPOLIS-ST. PAUL, MN-WI-IA EA (EA 107)

Minneapolis, the largest city in Minnesota, is the center of finance, industry, trade, and transportation for the Upper Midwest. Minneapolis is just west of St. Paul, its "Twin City," separated from it by the Mississippi River. Minneapolis is also a center for graphic arts, electronics, and instruments as well as a transportation center and distribution point for the Upper Midwest. Banking, insurance, and other services are important. Major industries include machinery and metal fabricating, plastics, computers, and publishing.

Courtesy of R. Ewing

Courtesy of R. Ewing

Minneapolis-St. Paul, MN-WI-IA EA is considered to be one of the highest quality-of-life locations in the United States. It is a region characterized by relatively low housing costs, the availability of quality education, and comparatively high wages. The region is also noted for its tax-base sharing and significant state aid to poorer urban and suburban school districts. The Minneapolis-St. Paul, MN-WI-IA EA is further known for its attention to physical environment and transportation planning. The region is one of the fastest-growing metropolitan areas of the Midwest.

The Minneapolis-St. Paul, MN-WI-IA EA ranks in the top 30 EAs nationwide in total growth. This growth also places it in the top 30 EAs in sprawl development. The Midwest Region EA comprises 70 counties. Of those counties, 16 are sprawling and represent sending locations; five are nonsprawling suburban or urban counties and represent receiving locations. The remaining 49 counties are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawl counties are Beltrami, MN; Benton, MN; Burnett, WI; Carver, MN; Cass, MN; Chisago, MN; Crow Wing, MN; Eau Claire, WI; Goodhue, MN; Isanti, MN; Pine, MN; Scott, MN; Sherburne, MN; St. Croix, WI; Stearns, MN; and Wright, MN. Urban and suburban counties are Anoka, MN; Dakota, MN; Washington, MN; Hennepin, MN; and Ramsey, MN.

The city of Minneapolis is located in Hennepin County; so too is the nation's biggest mall, "The Mall of America." The city of St. Paul is in Ramsey County to the east. Anoka County is north of Minneapolis-St. Paul, and Dakota County is due south. Washington County is the county immediately east of St. Paul.

## Table 5.19
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Minneapolis-St. Paul, MN-WI-IA EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 131,694 | 8,231 | 204,969 | 12,811 | 86,766 | 5,423 | 142,369 | 8,898 |
| Nonsprawl Core Counties | 227,902 | 45,580 | 617,953 | 123,591 | 274,319 | 54,864 | 684,283 | 136,857 |
| Nonsprawl Rural and Undev. Counties | 40,008 | 816 | 132,679 | 2,708 | 38,519 | 786 | 128,949 | 2,632 |
| **EA** | **399,604** | **5,709** | **955,601** | **13,651** | **399,604** | **5,709** | **955,601** | **13,651** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.20
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Minneapolis-St. Paul, MN-WI-IA EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Benton, MN | R | S-C | 13,043 | 5,077 | 3,779 | 1.34 | 18,259 | 6,661 | 5,429 | 1.23 |
| Carver, MN | R | S-C | 23,003 | 9,191 | 6,664 | 1.38 | 39,223 | 12,605 | 11,663 | 1.08 |
| Chisago, MN | R | S-C | 14,449 | 6,701 | 4,186 | 1.60 | 16,853 | 7,063 | 5,011 | 1.41 |
| Eau Claire, WI | R | S-C | 35,547 | 13,567 | 9,844 | 1.38 | 63,571 | 29,326 | 18,903 | 1.55 |
| Scott, MN | R | S-C | 28,142 | 21,527 | 8,153 | 2.64 | 43,312 | 33,580 | 12,879 | 2.61 |
| Sherburne, MN | R | S-C | 19,636 | 8,510 | 5,689 | 1.50 | 22,798 | 8,328 | 6,779 | 1.23 |
| St. Croix, WI | R | S-C | 20,844 | 5,206 | 5,206 | 1.00 | 33,064 | 9,128 | 9,128 | 1.00 |
| Stearns, MN | R | S-C | 45,823 | 15,567 | 9,844 | 1.58 | 97,212 | 32,503 | 19,163 | 1.70 |
| Wright, MN | R | S-C | 29,367 | 12,166 | 8,508 | 1.43 | 37,955 | 14,631 | 11,286 | 1.30 |
| Beltrami, MN | UND | S-C | 14,452 | 5,673 | 4,187 | 1.35 | 22,354 | 8,660 | 6,647 | 1.30 |
| Burnett, WI | UND | S-C | 6,460 | 3,621 | 1,872 | 1.93 | 8,230 | 4,733 | 4,733 | 1.00 |
| Cass, MN | UND | S-C | 10,874 | 6,535 | 3,150 | 2.07 | 14,516 | 9,108 | 4,316 | 2.11 |
| Crow Wing, MN | UND | S-C | 20,827 | 5,008 | 5,008 | 1.00 | 30,589 | 7,895 | 7,895 | 1.00 |
| Goodhue, MN | UND | S-C | 17,026 | 5,954 | 4,933 | 1.21 | 30,240 | 11,205 | 8,992 | 1.25 |
| Isanti, MN | UND | S-C | 10,711 | 3,899 | 3,103 | 1.26 | 14,268 | 4,854 | 4,854 | 1.00 |
| Pine, MN | UND | S-C | 9,114 | 3,492 | 2,640 | 1.32 | 12,016 | 4,689 | 4,689 | 1.00 |
| **Receiving Counties** | | | | | | | | | | |
| Anoka, MN | U | NS | 104,425 | 49,730 | 49,730 | 1.00 | 138,367 | 61,676 | 61,676 | 1.00 |
| Dakota, MN | U | NS | 128,899 | 71,220 | 71,220 | 1.00 | 190,133 | 98,630 | 98,630 | 1.00 |
| Washington, MN | U | NS | 70,903 | 47,261 | 47,261 | 1.00 | 79,253 | 54,136 | 54,136 | 1.00 |
| Hennepin, MN | UC | NS | 445,193 | 52,890 | 82,381 | 0.64 | 1,012,840 | 263,632 | 323,901 | .81 |
| Ramsey, MN | UC | NS | 194,540 | 6,801 | 23,727 | 0.29 | 387,789 | 139,879 | 145,939 | .96 |

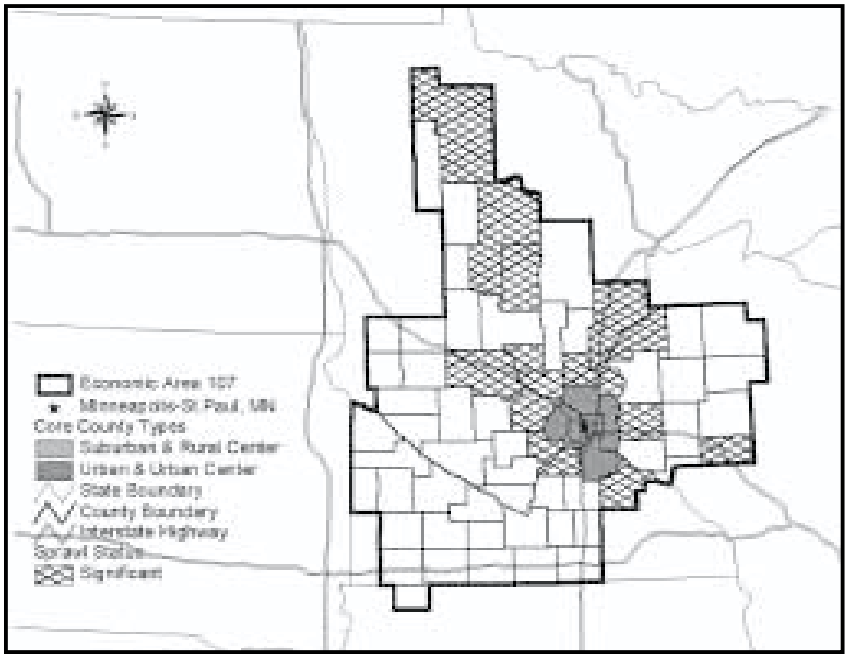
*Continued on next page*

**Table 5.20—*Continued***

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Barron, WI | R | NS | 17,462 | 4,160 | 4,160 | 1.00 | 28,280 | 7,921 | 7,921 | 1.00 |
| Blue Earth, MN | R | NS | 20,088 | 1,732 | 1,732 | 1.00 | 42,757 | 14,661 | 12,714 | 1.15 |
| Chippewa, WI | R | NS | 20,633 | 2,263 | 2,263 | 1.00 | 29,387 | 5,246 | 5,246 | 1.00 |
| Pierce, WI | R | NS | 12,261 | 1,076 | 1,076 | 1.00 | 15,248 | 2,762 | 2,762 | 1.00 |
| Rice, MN | R | NS | 18,192 | 1,330 | 1,330 | 1.00 | 30,300 | 6,057 | 6,057 | 1.00 |
| Steele, MN | R | NS | 12,153 | 1,777 | 1,777 | 1.00 | 23,507 | 5,720 | 5,720 | 1.00 |
| Aitkin, MN | UND | NS | 5,880 | 768 | 768 | 1.00 | 6,167 | 1,176 | 1,176 | 1.00 |
| Brown, MN | UND | NS | 10,650 | 355 | 355 | 1.00 | 18,959 | 1,912 | 1,912 | 1.00 |
| Chippewa, MN | UND | NS | 5,244 | -409 | -409 | 1.00 | 8,546 | 1,941 | 1,941 | 1.00 |
| Clearwater, MN | UND | NS | 3,099 | 17 | 17 | 1.00 | 4,015 | 166 | 166 | 1.00 |
| Cottonwood, MN | UND | NS | 4,948 | -438 | -438 | 1.00 | 8,003 | 1,264 | 1,264 | 1.00 |
| Douglas, MN | UND | NS | 12,368 | 2,985 | 2,985 | 1.00 | 20,433 | 6,074 | 6,074 | 1.00 |
| Dunn, WI | UND | NS | 14,482 | 5,685 | 4,196 | 1.35 | 22,260 | 8,175 | 6,619 | 1.24 |
| Faribault, MN | UND | NS | 6,559 | -855 | -855 | 1.00 | 9,242 | 324 | 324 | 1.00 |
| Freeborn, MN | UND | NS | 12,648 | -1,086 | -1,086 | 1.00 | 17,229 | 2,831 | 2,831 | 1.00 |
| Grant, MN | UND | NS | 2,415 | -289 | -289 | 1.00 | 3,724 | 370 | 370 | 1.00 |
| Hubbard, MN | UND | NS | 6,872 | 2,557 | 2,557 | 1.00 | 8,031 | 3,104 | 3,104 | 1.00 |
| Jackson, MN | UND | NS | 4,590 | -433 | -433 | 1.00 | 6,966 | 606 | 606 | 1.00 |
| Kanabec, MN | UND | NS | 5,280 | 343 | 343 | 1.00 | 6,567 | 644 | 644 | 1.00 |
| Kandiyohi, MN | UND | NS | 16,213 | 4,105 | 4,105 | 1.00 | 28,438 | 8,683 | 8,456 | 1.03 |
| Lac Qui Parle, MN | UND | NS | 3,280 | -96 | -96 | 1.00 | 4,499 | 42 | 42 | 1.00 |
| Le Sueur, MN | UND | NS | 9,325 | 981 | 981 | 1.00 | 12,331 | 2,240 | 2,240 | 1.00 |
| Lincoln, MN | UND | NS | 2,618 | -303 | -303 | 1.00 | 3,439 | 237 | 237 | 1.00 |
| Lyon, MN | UND | NS | 9,589 | 1,233 | 1,233 | 1.00 | 19,639 | 3,528 | 3,528 | 1.00 |
| Martin, MN | UND | NS | 9,032 | -441 | -441 | 1.00 | 13,854 | 1,791 | 1,791 | 1.00 |
| McLeod, MN | UND | NS | 13,123 | 3,237 | 3,237 | 1.00 | 25,570 | 7,550 | 7,550 | 1.00 |
| Meeker, MN | UND | NS | 8,062 | 291 | 291 | 1.00 | 9,888 | 706 | 706 | 1.00 |
| Mille Lacs, MN | UND | NS | 8,099 | 2,739 | 2,739 | 1.00 | 12,210 | 4,567 | 4,567 | 1.00 |
| Morrison, MN | UND | NS | 11,031 | 800 | 800 | 1.00 | 16,017 | 2,222 | 2,222 | 1.00 |
| Murray, MN | UND | NS | 3,738 | -544 | -544 | 1.00 | 4,906 | 46 | 46 | 1.00 |
| Nicollet, MN | UND | NS | 10,746 | 2,395 | 2,395 | 1.00 | 18,162 | 4,463 | 4,463 | 1.00 |
| Nobles, MN | UND | NS | 7,708 | -650 | -650 | 1.00 | 15,089 | 3,133 | 3,133 | 1.00 |
| Osceola, IA | UND | NS | 2,755 | -220 | -220 | 1.00 | 3,817 | 190 | 190 | 1.00 |
| Pepin, WI | UND | NS | 2,685 | -44 | -44 | 1.00 | 3,696 | 101 | 101 | 1.00 |
| Polk, WI | UND | NS | 14,743 | 1,979 | 1,979 | 1.00 | 19,838 | 3,783 | 3,783 | 1.00 |
| Pope, MN | UND | NS | 4,326 | 50 | 50 | 1.00 | 5,741 | 516 | 516 | 1.00 |
| Redwood, MN | UND | NS | 6,446 | -657 | -657 | 1.00 | 10,848 | 2,331 | 2,331 | 1.00 |
| Renville, MN | UND | NS | 6,565 | -770 | -770 | 1.00 | 9,549 | 863 | 863 | 1.00 |
| Rusk, WI | UND | NS | 6,058 | 720 | 720 | 1.00 | 8,623 | 1,590 | 1,590 | 1.00 |
| Sawyer, WI | UND | NS | 6,886 | 3,005 | 3,005 | 1.00 | 9,167 | 4,115 | 4,115 | 1.00 |
| Sibley, MN | UND | NS | 5,548 | 63 | 63 | 1.00 | 6,677 | 266 | 266 | 1.00 |
| Stevens, MN | UND | NS | 3,713 | -217 | -217 | 1.00 | 6,379 | 603 | 603 | 1.00 |
| Swift, MN | UND | NS | 4,093 | -633 | -633 | 1.00 | 6,262 | 911 | 911 | 1.00 |
| Todd, MN | UND | NS | 9,110 | 466 | 466 | 1.00 | 11,492 | 864 | 864 | 1.00 |
| Wadena, MN | UND | NS | 5,128 | 356 | 356 | 1.00 | 7,933 | 1,037 | 1,037 | 1.00 |
| Waseca, MN | UND | NS | 6,956 | 751 | 751 | 1.00 | 11,319 | 2,645 | 2,645 | 1.00 |
| Washburn, WI | UND | NS | 6,214 | 687 | 687 | 1.00 | 7,458 | 1,245 | 1,245 | 1.00 |
| Watonwan, MN | UND | NS | 4,527 | -281 | -281 | 1.00 | 6,879 | 383 | 383 | 1.00 |
| Yel. Medici., MN | UND | NS | 4,555 | -532 | -532 | 1.00 | 6,854 | 1,074 | 1,074 | 1.00 |

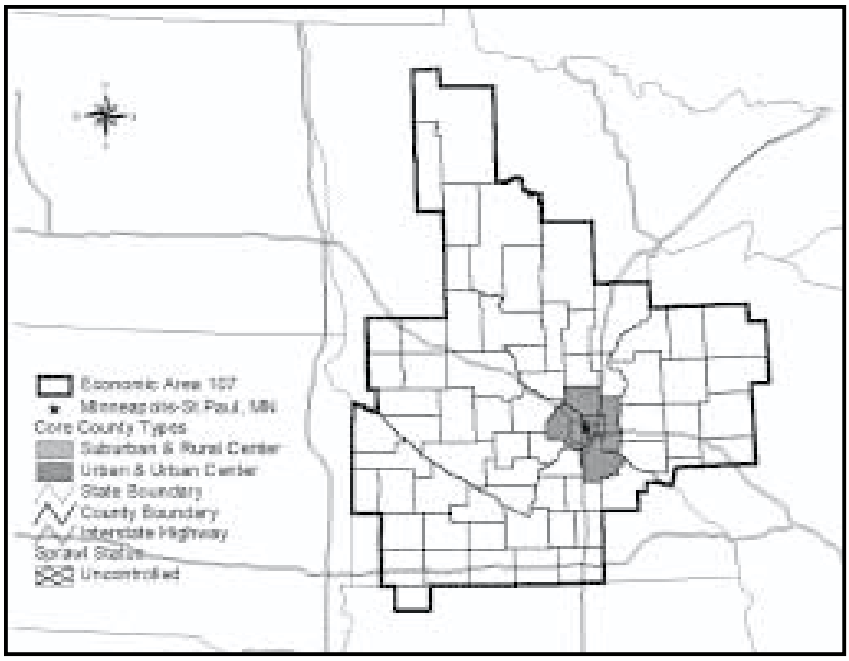
*Source:* Center for Urban Policy Research, Rutgers University.
*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

**Figure 5.19**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Minneapolis-St. Paul, MN-WI-IA EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.20**
**Projected Sprawl: Controlled-Growth Scenario**
**Minneapolis-St. Paul, MN-WI-IA EA**




*Source:* Center for Urban Policy Research, Rutgers University.

Close-in, developing counties near Minneapolis are Scott, Carver, Wright, and Sherburne counties. Sprawl is occurring along I-94 southeast and northwest of Minneapolis and along I-35 south and north of Minneapolis. Sprawl is also taking place along State Route 371 west of Grand Rapids and north of Brainerd.

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 8,231 households; urban and suburban counties increase by 45,580 households. Under the controlled-growth scenario, all sprawling counties are controlled. These sprawling counties increase in household growth by an average of 5,423 households; urban and suburban counties increase by an average of 54,864. Sprawling rural and undeveloped counties experience growth decreases of an average of 34 percent; urban and suburban counties experience growth increases of 20 percent. Tables 5.19 and 5.20 list the growth in households and employment under each scenario. The most significant growth-controlled counties are Burnett, WI, and Scott, MN, with their household growth reduced by 48.3 percent and 62.1 percent, respectively. In this EA, approximately 49 counties remain unchanged under the two growth scenarios. These are the slow or no-growth counties. The most significantly increased counties in growth are Hennepin, MN (Minneapolis) and Ramsey, MN (St. Paul), with their growth in households increased by 55.8 percent and 248.9 percent, respectively. The latter's increased growth amounts to a total of only 8.7 percent of the 2000 base, or 0.3 percent annually. Figures 5.19 and 5.20 show sprawl locations under the uncontrolled- and controlled-growth scenarios for the EA.

In summary, all 16 sprawling counties are controlled by redirecting growth back into Hennepin, Ramsey, and other suburban counties. Overall, the EA is characterized by both considerable sprawl and very significant control of sprawl.

## NY-NORTHERN NJ-LONG ISLAND, NY-NJ-CT-PA-MA-VT EA (EA 10)

The NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA encompasses New York City, NY, and its immediate suburbs. This is one of the highest per-capita-income and educational-attainment areas of the country and the financial and cultural capital of the

Courtesy of C. Galley

United States. Lower Manhattan is the financial center, and mid-Manhattan contains more theaters and cultural attractions than any other city in the world. Both financial and personal services dominate the economy of this nearly 60-county metropolitan area. The New York metropolitan area contains three of the 10 largest-volume airports in the United States. The Port of New York-Newark is the largest-volume freight port on the East Coast. The number of physicians, Ph.D. faculty members, and lawyers in the NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA exceeds that found in the ten largest countries in the world (as measured by GNP).

Occupying half the number of component counties (31) of the NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA, the Tri-State Metropolitan Region consists of nearly 20 million people living in approximately 1,600 cities, towns, and villages. It encompasses an area nearly 13,000 square miles at the center of the Boston-Washington northeast metropolitan corridor. New York City, the core of the NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA, has 578 miles of waterfront; 6,375 miles of streets; 18,000 eating establishments; 62,500 hotels rooms; 3 airports; 12 subway routes; over 650 miles of track for 5,800 subway cars; 12,000 taxis; and 4,000 buses.

The NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA ranks nationally in the top 30 EAs in total growth and also in the top 30 EAs in sprawl growth. This Northeast Region EA comprises 58 counties. Of those counties, 20 are sprawling and represent sending locations; 21 are nonsprawling suburban or urban counties and represent receiving locations. The remaining 17 are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawling areas consist of the counties of Bennington, VT; Dutchess, NY; Hunterdon, NJ; Litchfield, CT; Luzerne, PA; Monmouth, NJ; Mon-

## Table 5.21
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 244,512 | 12,226 | 671,949 | 33,597 | 225,373 | 11,269 | 562,149 | 28,107 |
| Nonsprawl Core Counties | 44,528 | 2,120 | 1,372,782 | 65,371 | 63,667 | 3,032 | 1,490,700 | 70,986 |
| Nonsprawl Rural and Undev. Counties | 20485 | 1,205 | 121,379 | 7,140 | 20,485 | 1,205 | 113,261 | 6,662 |
| **EA** | **309,525** | **5,337** | **2,166,110** | **37,347** | **309,525** | **5,337** | **2,166,110** | **37,347** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.22
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Dutchess, NY | R | S-C | 93,072 | 6,292 | 6,292 | 1.00 | 134,202 | 38,801 | 19,163 | 2.02 |
| Hunterdon, NJ | R | S-C | 43,434 | 9,066 | 8,470 | 1.07 | 63,415 | 18,028 | 15,707 | 1.15 |
| Litchfield, CT | R | S-C | 70,513 | 7,779 | 7,779 | 1.00 | 91,825 | 11,079 | 11,079 | 1.00 |
| Luzerne, PA | R | S-C | 127,700 | -2,116 | -2,116 | 1.00 | 170,174 | 28,735 | 21,075 | 1.36 |
| Monroe, PA | R | S-C | 45,293 | 12,982 | 8,832 | 1.47 | 57,068 | 8,904 | 8,904 | 1.00 |
| New London, CT | R | S-C | 95,158 | 8,308 | 8,308 | 1.00 | 159,006 | 41,972 | 19,692 | 2.13 |
| Orange, NY | R | S-C | 110,974 | 15,796 | 10,820 | 1.46 | 155,836 | 41,004 | 19,299 | 2.12 |
| Putnam, NY | R | S-C | 31,776 | 6,669 | 6,196 | 1.08 | 32,041 | 10,658 | 7,936 | 1.34 |
| Sussex, NJ | R | S-C | 49,725 | 9,469 | 9,469 | 1.00 | 54,035 | 16,210 | 13,384 | 1.21 |
| Tolland, CT | R | S-C | 46,541 | 2,626 | 2,626 | 1.00 | 53,591 | 7,188 | 7,188 | 1.00 |
| Monmouth, NJ | S | S-C | 218,652 | 34,703 | 34,943 | 0.99 | 297,224 | 60,301 | 61,235 | .98 |
| Morris, NJ | S | S-C | 162,345 | 14,776 | 15,287 | 0.97 | 326,478 | 86,878 | 80,865 | 1.07 |
| Ocean, NJ | S | S-C | 192,008 | 43,551 | 37,442 | 1.16 | 185,620 | 44,634 | 44,728 | 1.00 |
| Somerset, NJ | S | S-C | 102,988 | 20,189 | 20,083 | 1.01 | 199,444 | 76,520 | 49,400 | 1.55 |
| Suffolk, NY | S | S-C | 447,668 | 35,952 | 37,506 | 0.96 | 694,937 | 144,919 | 146,826 | .99 |
| Bennington, VT | UND | S-C | 14,622 | 1,299 | 1,299 | 1.00 | 24,764 | 6,583 | 6,134 | 1.07 |
| Pike, PA | UND | S-C | 15,380 | 6,891 | 2,999 | 2.30 | 11,748 | 3,726 | 3,726 | 1.00 |
| Union, PA | UND | S-C | 12,675 | 1,296 | 1,296 | 1.00 | 20,254 | 869 | 869 | 1.00 |
| Wayne, PA | UND | S-C | 17,135 | 4,483 | 3,341 | 1.34 | 18,956 | 3,784 | 3,784 | 1.00 |
| Middlesex, CT | R | S-NC | 57,944 | 4,501 | 4,501 | 1.00 | 85,487 | 21,156 | 21,156 | 1.00 |

*Continued on next page*

**Table 5.22—*Continued***

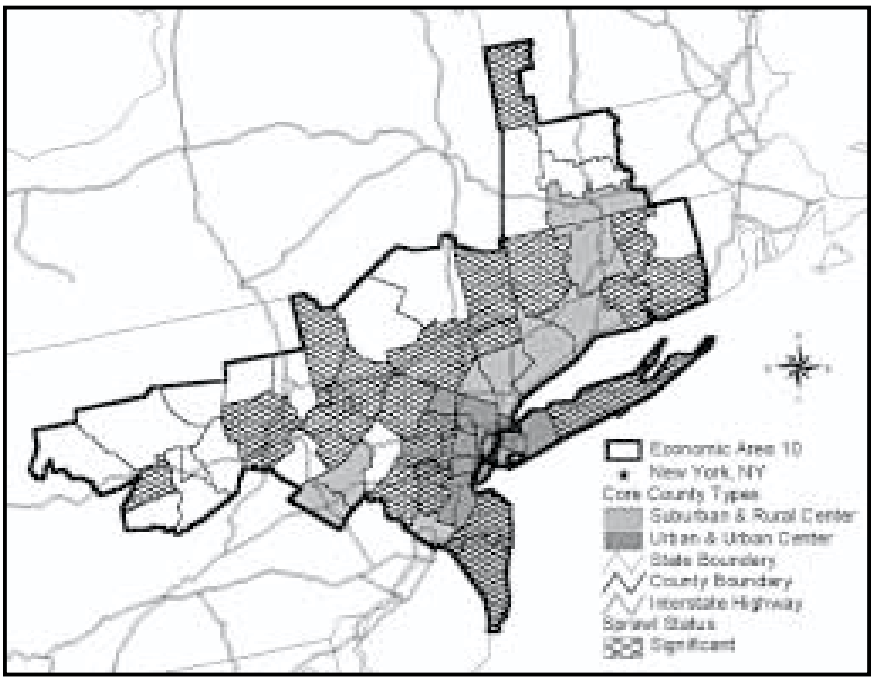
| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Receiving Counties** | | | | | | | | | | |
| Fairfield, CT | S | NS | 312,466 | 12,127 | 13,604 | 0.89 | 540,039 | 84,908 | 88,333 | .96 |
| Hampden, MA | S | NS | 168,962 | -1,372 | -333 | 4.12 | 234,711 | 26,597 | 28,808 | .92 |
| Hartford, CT | S | NS | 318,504 | -11,945 | -9,703 | 1.23 | 595,023 | 93,540 | 97,314 | .96 |
| Lehigh, PA | S | NS | 118,133 | 5,902 | 6,421 | 0.92 | 192,461 | 28,116 | 29,487 | .95 |
| Mercer, NJ | S | NS | 120,800 | 7,493 | 7,979 | 0.94 | 239,504 | 60,604 | 59,322 | 1.02 |
| New Haven, CT | S | NS | 303,990 | 1,514 | 3,263 | 0.46 | 447,432 | 38,313 | 43,396 | .88 |
| Northampton, PA | S | NS | 97,238 | 5,266 | 5,681 | 0.93 | 110,594 | 20,805 | 21,267 | .98 |
| Rockland, NY | S | NS | 91,340 | 7,431 | 7,745 | 0.96 | 134,410 | 27,695 | 28,087 | .99 |
| Westchester, NY | S | NS | 332,367 | 9,377 | 11,055 | 0.85 | 498,913 | 71,634 | 75,275 | .95 |
| Bergen, NY | U | NS | 321,204 | 12,231 | 12,770 | 0.96 | 555,196 | 83,148 | 90,173 | .92 |
| Essex, NY | U | NS | 267,782 | -28,844 | -28,099 | 1.03 | 435,368 | 48,128 | 54,834 | .88 |
| Middlesex, NJ | U | NS | 255,908 | 25,045 | 25,359 | 0.99 | 449,392 | 121,473 | 123,361 | .98 |
| Nassau, NY | U | NS | 441,890 | -3,490 | -2,594 | 1.35 | 738,117 | 93,486 | 104,021 | .90 |
| Passaic, NJ | U | NS | 160,589 | 240 | 554 | 0.43 | 222,325 | 32,400 | 35,276 | .92 |
| Richmond, NY | U | NS | 141,543 | 18,142 | 18,283 | 0.99 | 115,272 | 48,613 | 48,613 | 1.00 |
| Union, NJ | U | NS | 182,099 | -2,776 | -2,397 | 1.16 | 277,334 | 879 | 7,238 | .12 |
| Bronx, NY | UC | NS | 430,655 | 32,919 | 33,517 | 0.98 | 264,981 | 31,880 | 35,780 | .89 |
| Hudson, NJ | UC | NS | 207,646 | -10,998 | -10,506 | 1.05 | 283,977 | 56,063 | 58,707 | .95 |
| Kings, NY | UC | NS | 821,017 | -46,650 | -44,681 | 1.04 | 575,243 | 124,290 | 128,895 | .96 |
| New York, NY | UC | NS | 747,872 | -206 | 1,267 | -0.16 | 2,503,961 | 232,015 | 273,721 | .85 |
| Queens, NY | UC | NS | 741,006 | 13,122 | 14,481 | 0.91 | 603,714 | 48,195 | 58,793 | .82 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Berkshire, MA | R | NS | 54,005 | -760 | -760 | 1.00 | 77,736 | 15,645 | 15,645 | 1.00 |
| Carbon, PA | R | NS | 23,251 | 1,260 | 1,260 | 1.00 | 21,560 | 2,665 | 2,665 | 1.00 |
| Columbia, PA | R | NS | 24,199 | 461 | 461 | 1.00 | 34,310 | 5,317 | 5,317 | 1.00 |
| Hampshire, MA | R | NS | 53,535 | 2,829 | 2,829 | 1.00 | 79,034 | 11,224 | 11,224 | 1.00 |
| Lackawanna, PA | R | NS | 83,119 | -3,326 | -3,326 | 1.00 | 121,145 | 19,417 | 19,417 | 1.00 |
| Montour, PA | R | NS | 6,885 | 566 | 566 | 1.00 | 14,107 | 3,359 | 3,359 | 1.00 |
| Northumber., PA | R | NS | 38,414 | -380 | -380 | 1.00 | 39,999 | 1,275 | 1,275 | 1.00 |
| Ulster, NY | R | NS | 62,773 | 4,663 | 4,663 | 1.00 | 78,935 | 27,281 | 19,163 | 1.42 |
| Warren, NJ | R | NS | 37,338 | 5,894 | 5,894 | 1.00 | 46,292 | 7,785 | 7,785 | 1.00 |
| Windham, CT | R | NS | 38,888 | 2,260 | 2,260 | 1.00 | 48,897 | 9,755 | 9,755 | 1.00 |
| Clinton, PA | UND | NS | 14,110 | 46 | 46 | 1.00 | 15,474 | 2,038 | 2,038 | 1.00 |
| Franklin, MA | UND | NS | 29,101 | 2,306 | 2,306 | 1.00 | 35,744 | 1,423 | 1,423 | 1.00 |
| Lycoming, PA | UND | NS | 45,945 | 1,048 | 1,048 | 1.00 | 65,920 | 7,863 | 7,863 | 1.00 |
| Snyder, PA | UND | NS | 13,615 | 1,106 | 1,106 | 1.00 | 20,753 | 1,077 | 1,077 | 1.00 |
| Sullivan, NY | UND | NS | 25,521 | 1,496 | 1,496 | 1.00 | 32,947 | 3,218 | 3,218 | 1.00 |
| Sullivan, PA | UND | NS | 2,342 | 33 | 33 | 1.00 | 2,868 | 623 | 623 | 1.00 |
| Wyoming, PA | UND | NS | 10,785 | 983 | 983 | 1.00 | 12,511 | 1,414 | 1,414 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

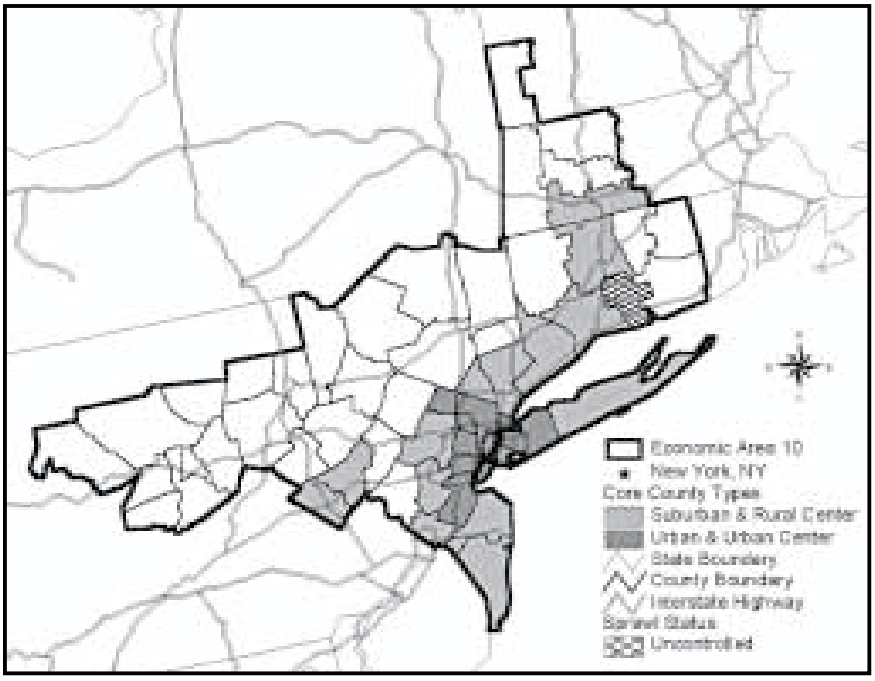
roe, PA; Morris, NJ; New London, CT; Ocean, NJ; Orange, NY; Pike, PA; Putnam, NY; Somerset, NJ; Suffolk, NY; Sussex, NJ; Tolland, CT; Union, PA; Wayne, PA; and Middlesex, CT. Suburban and urban locations consist of Fairfield, CT; Hampden, MA; Hartford, CT; Lehigh, PA; Mercer, NJ; New Haven, CT; Northampton, PA; Rockland, NY; Westchester, NY; Bergen, NJ; Essex, NJ; Middlesex, NJ; Nassau,

**Figure 5.21**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.22**
**Projected Sprawl: Controlled-Growth Scenario**
**NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA**




*Source:* Center for Urban Policy Research, Rutgers University.


Courtesy of C. Galley

NY; Passaic, NJ; Richmond, NY; Union, NJ; Bronx, NY; Hudson, NJ; Kings, NY; New York, NY; and Queens, NY. New York City's five boroughs consist of New York, Kings, Queens, Bronx, and Richmond counties. Other suburban and urban locations on the New York City side of the Hudson River are Nassau, Westchester, Fairfield, New Haven, and Hartford counties. On the New Jersey side of the Hudson River are Mercer, Middlesex, Union, Essex, Hudson, Bergen, and Passaic counties in New Jersey and Rockland County in New York. Similar suburban and urban locations immediately west of Trenton, NJ, are Northhampton and Lehigh counties in Pennsylvania. Sprawl is taking place along the Garden State Parkway, the New Jersey Turnpike, and Routes I-80 and I-78 in New Jersey; along Routes I-95 and I-84 in Connecticut; the Long Island Expressway, I-28 and I-384, and the lower New York State Thruway in New York; and along the eastern terminus of I-84, I-80, I-78, and I-76 in Pennsylvania.

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 12,226 households; suburban and urban areas increase by 2,120 households. Under the controlled-growth scenario, sprawl counties increase by an average of 11,269 households; suburban and urban areas increase by 3,032 households. Sprawling rural and undeveloped counties decrease by an average of 16.0 percent; urban and suburban counties increase by 43.0 percent. The former percentage is reflective of the large number of receiving counties in this EA as well as the low average growth of sending counties. Tables 5.21 and 5.22 present the growth in households and employment under each scenario.

The most significantly growth-controlled counties are Monroe, NY; Orange, NY; Ocean, NJ; Pike, PA; and Wayne, PA. In the NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA, 39 counties remain unchanged under the two growth scenarios. The most significantly increased growth counties are Hartford, CT; New Haven, CT; and Westchester, NY. In the case of Hartford County, it is not an absolute increase but rather a slowing of the decrease in household growth. Figures 5.21 and 5.22 show sprawl locations for the uncontrolled- and the controlled-growth scenarios in the EA.

Of the 20 sprawling counties, 19 are controlled. Only one sprawling county, Middlesex, CT, remains uncontrolled. Overall, the EA is characterized by both significant sprawl and significant sprawl control.

## PORTLAND-SALEM, OR-WA EA (EA 167)

The Portland-Salem, OR-WA EA focuses on Portland, OR, a city of 500,000 inhabitants and the largest and principal city in the state of Oregon. Portland, OR, is 10 miles southeast of the confluence of the Willamette and Columbia rivers. The economy of the area is reliant upon exports of lumber, aluminum, and wheat and the production of chemicals and electronic components. Also located within the city's bounds are shipyards and meatpacking plants. Portland, OR, served as a supply staging area for the northwest gold rushes of the late nineteenth century. Portland has experienced significant growth in its service and financial sectors since 1980.

The Portland-Salem, OR-WA EA ranks nationally in the top 20 EAs in total growth; this growth also places it in the top 20 EAs in sprawl development. This Western Region EA comprises 24 counties. Of those counties, seven are sprawling rural and undeveloped counties and represent sending locations; three are nonsprawling suburban or urban counties and repre-


Courtesy of R. Ewing

## Table 5.23
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Portland-Salem, OR-WA EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 203,759 | 29,108 | 238,749 | 34,107 | 125,021 | 17,860 | 151,487 | 21,641 |
| Nonsprawl Core Counties | 166,079 | 55,026 | 323,466 | 107,822 | 243,817 | 81,272 | 411,126 | 137,042 |
| Nonsprawl Rural and Undev. Counties | 32,901 | 2,350 | 66,063 | 4,719 | 32,901 | 2,350 | 65,665 | 4,690 |
| **EA** | **401,739** | **16,739** | **628,278** | **26,178** | **401,739** | **16,739** | **628,278** | **26,178** |

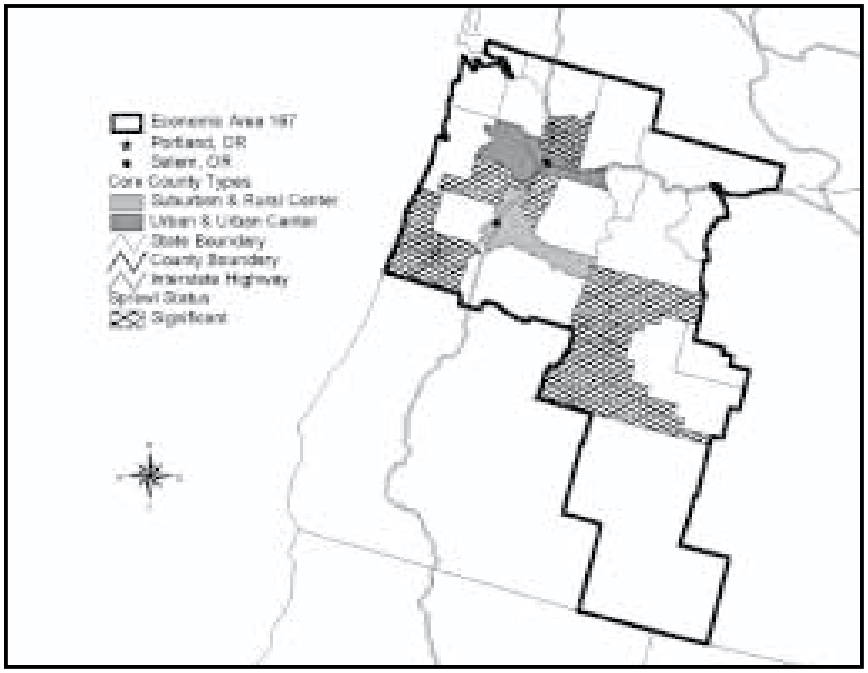
*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.24
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Portland-Salem, OR-WA EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Benton, OR | R | S-C | 30,322 | 9,367 | 9,367 | 1.00 | 50,051 | 16,377 | 16,377 | 1.00 |
| Clackamas, OR | R | S-C | 132,337 | 65,091 | 29,424 | 2.21 | 174,260 | 77,337 | 33,882 | 2.28 |
| Yamhill, OR | R | S-C | 28,499 | 7,906 | 7,906 | 1.00 | 39,361 | 10,542 | 10,542 | 1.00 |
| Clark, WA | S | S-C | 126,454 | 73,492 | 56,232 | 1.31 | 147,308 | 73,266 | 57,284 | 1.28 |
| Deschutes, OR | UND | S-C | 44,013 | 32,611 | 9,844 | 3.31 | 65,971 | 43,434 | 19,163 | 2.27 |
| Jefferson, OR | UND | S-C | 6,334 | 3,716 | 2,817 | 1.32 | 8,946 | 4,304 | 4,304 | 1.00 |
| Lincoln, OR | UND | S-C | 21,211 | 11,576 | 9,432 | 1.23 | 25,548 | 13,489 | 9,935 | 1.36 |
| **Receiving Counties** | | | | | | | | | | |
| Marion, OR | S | NS | 101,382 | 26,214 | 36,048 | 0.73 | 160,243 | 37,030 | 50,198 | 0.74 |
| Washington, OR | U | NS | 166,448 | 113,303 | 113,303 | 1.00 | 255,613 | 152,399 | 152,399 | 1.00 |
| Multnomah, OR | UC | NS | 266,098 | 25,562 | 94,466 | 0.27 | 534,368 | 134,037 | 208,529 | 0.64 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Cowlitz, WA | R | NS | 36,754 | 9,957 | 9,957 | 1.00 | 49,012 | 17,343 | 17,343 | 1.00 |
| Polk, OR | R | NS | 22,889 | 7,082 | 7,082 | 1.00 | 21,491 | 8,755 | 8,357 | 1.05 |
| Clatsop, OR | UND | NS | 14,434 | 1,128 | 1,128 | 1.00 | 21,091 | 5,442 | 5,442 | 1.00 |
| Columbia, OR | UND | NS | 16,297 | 1,796 | 1,796 | 1.00 | 14,192 | 3,404 | 3,404 | 1.00 |
| Crook, OR | UND | NS | 6,603 | 889 | 889 | 1.00 | 8,690 | 2,167 | 2,167 | 1.00 |
| Hood River, OR | UND | NS | 7,645 | 1,263 | 1,263 | 1.00 | 12,988 | 3,919 | 3,919 | 1.00 |
| Klickitat, WA | UND | NS | 7,105 | 592 | 592 | 1.00 | 8,450 | 1,704 | 1,704 | 1.00 |
| Lake, OR | UND | NS | 2,839 | -61 | -61 | 1.00 | 4,070 | 320 | 320 | 1.00 |
| Linn, OR | UND | NS | 40,212 | 6,021 | 6,021 | 1.00 | 56,041 | 15,808 | 15,808 | 1.00 |
| Sherman, OR | UND | NS | 733 | -110 | -110 | 1.00 | 1,127 | 51 | 51 | 1.00 |
| Skamania, WA | UND | NS | 3,880 | 2,229 | 2,229 | 1.00 | 2,838 | 1,542 | 1,542 | 1.00 |
| Tillamook, OR | UND | NS | 10,225 | 1,314 | 1,314 | 1.00 | 11,469 | 3,089 | 3,089 | 1.00 |
| Wahkiakum, WA | UND | NS | 1,564 | 249 | 249 | 1.00 | 1,503 | 454 | 454 | 1.00 |
| Wasco, OR | UND | NS | 9,342 | 552 | 552 | 1.00 | 11,621 | 2,065 | 2,065 | 1.00 |

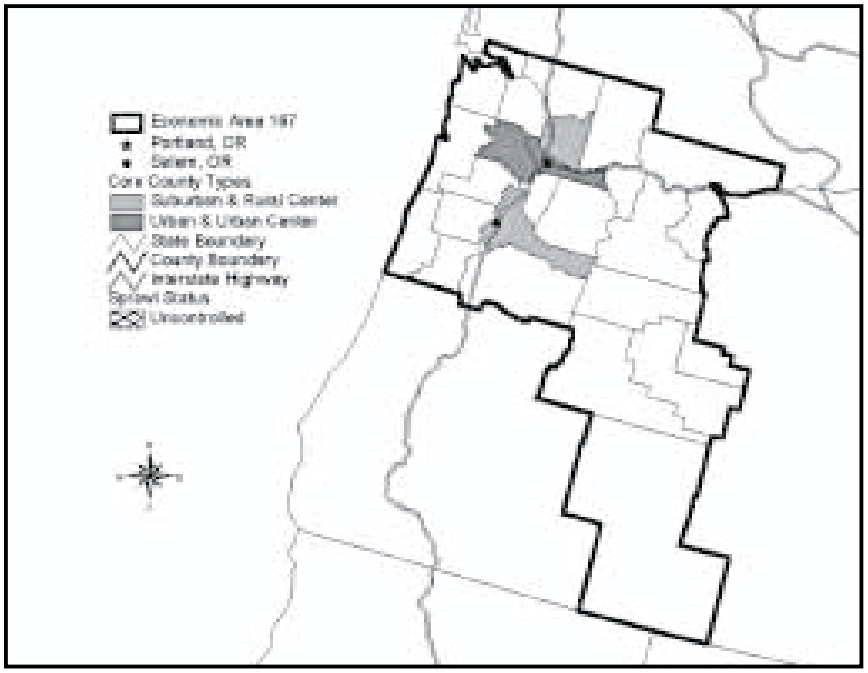
*Source:* Center for Urban Policy Research, Rutgers University.
*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

**Figure 5.23**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Portland-Salem, OR-WA EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.24**
**Projected Sprawl: Controlled-Growth Scenario**
**Portland-Salem, OR-WA EA**




*Source:* Center for Urban Policy Research, Rutgers University.

Courtesy of R. Ewing

sent receiving locations. The remaining 14 counties are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawling counties are Benton, OR; Clark, WA; Deschutes, OR; Jefferson, OR; Lincoln, OR; Yamhill, OR; and Clackamas, OR. Urban and suburban counties are Marion, OR; Washington, OR; and Multnomah, OR.

The city of Portland, OR, is in Multnomah County, and the Portland Urban Growth Boundary encompasses the urban portions of Multnomah, Washington, and Clackamas counties. The city of Salem is in Marion County, which is a bridge suburban county between Salem and Bend, OR. Sprawl is taking place from south of Clackamas to north of Eugene along I-5 in Clackamas, Yamhill, Benton, and Lincoln counties, and from Salem to Bend along U.S. Route 20 and State Route 22 in Jefferson and Deschutes counties. It is also taking place north of Portland in Clark County, WA.

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 29,108 households; suburban and urban counties increase by 55,026 households. Under the controlled-growth scenario, sprawl counties increase by an average of 17,860 households; suburban and urban counties increase by 81,272 households. Sprawling rural and undeveloped counties have their growth decreased by an average of 47.2 percent; urban and suburban counties have their growth increased by 47.7 percent. Tables 5.23 and 5.24 present the growth in households and employment for each growth scenario. The most significantly growth-controlled counties are: Clark, WA; Deschutes, OR; Lincoln, OR; and Clackamas, OR. The counties experiencing the most significant increased growth are Marion, OR (Salem, 47 percent), and Multnomah, OR (Portland, 270 percent). The latter's increased growth amounts to a total of only 25.9 percent of the 2000 base or 1.0 percent annually. Figures 5.23 and 5.24 show sprawl in the uncontrolled- and controlled-growth scenarios for the EAs. It should be noted that in the eastern portion of this EA there are physically large counties. If it is determined that sprawl growth is occurring in only a portion of a large county, the county is divided into sections, with the appropriate portion indicating its sprawl status.

All seven sprawling counties are controlled. Overall, the EA is characterized by a reasonable level of sprawl and also by considerable control of sprawl.

## RALEIGH-DURHAM-CHAPEL HILL, NC EA (EA 19)

Raleigh, NC, is a city of 225,000, 50 miles south of the Virginia border. Raleigh is part of the research triangle (Raleigh, Durham, and Greensboro) and is the capital of the state of North Carolina. The Raleigh-Durham-Chapel Hill, NC EA has experienced a very rapid economic restructuring in recent decades as the old economy—based on textiles, tobacco, and furniture manufacturing—made way for one increasingly rooted in high technology, finance, and services. An enormous research park, bounded by the state's three major universities, has grown to accommodate the need. The strategy has been to encourage companies to expand their research into areas that these universities excel in, especially chemistry, electronics, and pharmaceuticals. These efforts have led to substantial increases in employment in finance, insurance, real estate, and electronics manufacturing. Similarly, employment in education, law, engineering, social services, and motion pictures has grown impressively, attracted in part by less expensive labor and state tax credits in these areas. Raleigh lies 30 miles distant from two major interstates (I-95 to Fayetteville and I-85 to Charlotte), each traversing the state in a northeast-southwest direction. Raleigh-Durham is also the terminus of Interstate 40 from Washington.

Raleigh is located in Wake County, which is east of Durham County (containing the city of Durham) and Orange County (containing the city of Chapel Hill). The city of Greensboro in Guilford County, immediately to the west, is not part of the Raleigh-Durham-Chapel Hill, NC EA. Sprawl is taking place all around Wake County. This is true to the northeast and northwest and in every direction to the south. To the south

## Table 5.25
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Raleigh-Durham-Chapel Hill, NC EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 217,193 | 27,149 | 320,931 | 40,116 | 211,110 | 26,389 | 316,273 | 39,534 |
| Nonsprawl Core Counties | 22,346 | 22,346 | 55,025 | 55,025 | 28,429 | 28,429 | 59,683 | 59,683 |
| Nonsprawl Rural and Undev. Counties | 17,498 | 2,187 | 36,059 | 4,507 | 17,498 | 2,187 | 36,059 | 4,507 |
| **EA** | **257,037** | **14,280** | **412,015** | **22,890** | **257,037** | **14,280** | **412,015** | **22,890** |

*Source:* Center for Urban Policy Research, Rutgers University.

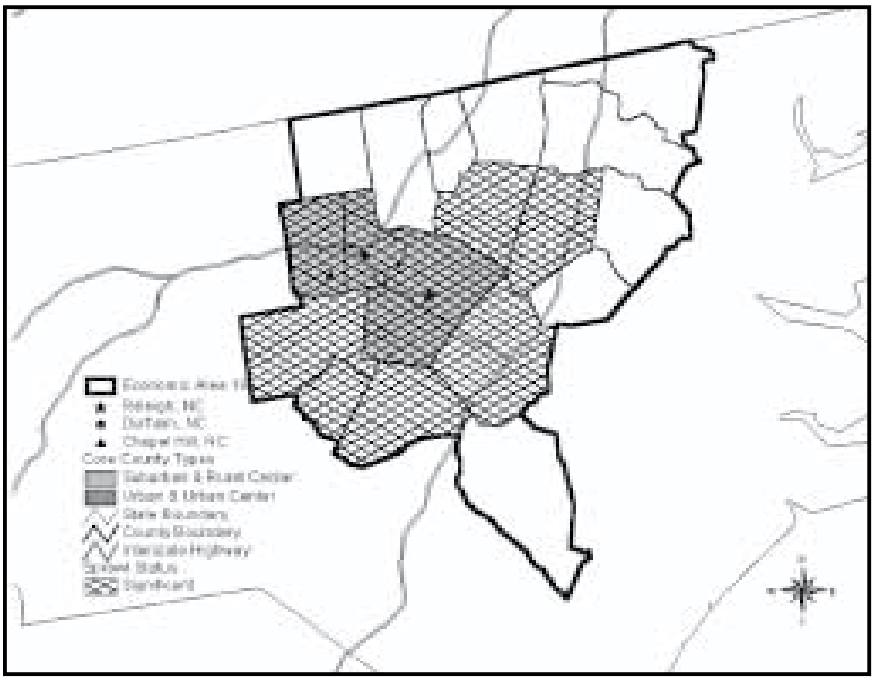
## Table 5.26
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Raleigh-Durham-Chapel Hill, NC EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Franklin, NC | R | S-C | 17,267 | 7,360 | 5,912 | 1.24 | 13,976 | 5,452 | 5,452 | 1.00 |
| Harnett, NC | R | S-C | 31,155 | 8,639 | 8,639 | 1.00 | 31,895 | 9,412 | 9,412 | 1.00 |
| Lee, NC | R | S-C | 19,480 | 8,201 | 6,670 | 1.23 | 36,468 | 10,538 | 10,538 | 1.00 |
| Nash, NC | R | S-C | 34,511 | 6,134 | 6,134 | 1.00 | 55,415 | 14,962 | 14,962 | 1.00 |
| Chatham, NC | UND | S-C | 18,184 | 4,620 | 4,620 | 1.00 | 23,379 | 6,814 | 6,814 | 1.00 |
| Johnston, NC | R | S-NC | 41,373 | 18,515 | 18,515 | 1.00 | 45,767 | 19,472 | 16,966 | 1.15 |
| Orange, NC | S | S-NC | 45,715 | 19,534 | 16,430 | 1.19 | 73,455 | 25,772 | 23,621 | 1.09 |
| Wake, NC | S | S-NC | 233,218 | 144,190 | 144,190 | 1.00 | 439,414 | 228,509 | 228,509 | 1.00 |
| **Receiving Counties** | | | | | | | | | | |
| Durham, NC | S | NS | 83,026 | 22,346 | 28,429 | 0.79 | 185,601 | 55,025 | 59,683 | .92 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Edgecombe, NC | R | NS | 20,636 | 1,462 | 1,462 | 1.00 | 29,488 | 3,633 | 3,633 | 1.00 |
| Person, NC | R | NS | 12,929 | 2,272 | 2,272 | 1.00 | 17,005 | 2,839 | 2,839 | 1.00 |
| Vance, NC | R | NS | 15,584 | 2,144 | 2,144 | 1.00 | 22,358 | 3,859 | 3,859 | 1.00 |
| Wilson, NC | R | NS | 27,015 | 5,794 | 5,794 | 1.00 | 46,319 | 12,455 | 12,455 | 1.00 |
| Granville, NC | UND | NS | 15,213 | 3,669 | 3,669 | 1.00 | 22,757 | 5,420 | 5,420 | 1.00 |
| Halifax, NC | UND | NS | 21,190 | 341 | 341 | 1.00 | 25,111 | 4,935 | 4,935 | 1.00 |
| Northampton, NC | UND | NS | 7,968 | 600 | 600 | 1.00 | 7,027 | 619 | 619 | 1.00 |
| Sampson, NC | UND | NS | 19,115 | 778 | 778 | 1.00 | 24,025 | 1,893 | 1,893 | 1.00 |
| Warren, NC | UND | NS | 6,756 | 438 | 438 | 1.00 | 5,592 | 406 | 406 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.

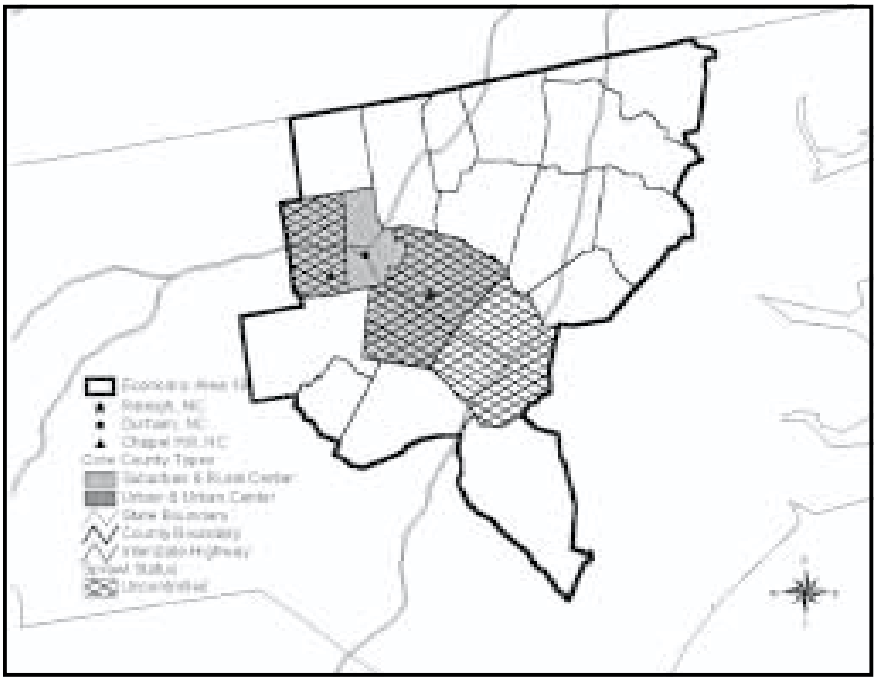
*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

**Figure 5.25**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Raleigh-Durham-Chapel Hill, NC EA**



*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.26**
**Projected Sprawl: Controlled-Growth Scenario**
**Raleigh-Durham-Chapel Hill, NC EA**



*Source:* Center for Urban Policy Research, Rutgers University.

lie Chatham, Lee, Harnett (Fayetteville), and Johnston counties. To the northeast and northwest are the rural counties of Nash (Rocky Mount) and the suburban/urban counties of Durham and Orange.

The Raleigh-Durham-Chapel Hill, NC EA ranks nationally in the top 30 EAs in total growth. This growth also places it in the top 20 EAs in sprawl development. This South Region EA comprises 18 counties. Of these 18 counties, eight are sprawling and represent sending locations; one is a nonsprawling suburban county (Durham, NC) and is the only receiving location. The remaining nine counties are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawling counties of the EA are Franklin, NC; Harnett, NC; Lee, NC; Nash, NC; Chatham, NC; Johnston, NC; Orange, NC; and Wake, NC. The last two counties, somewhat less suburban than Durham and growing faster, are suburban sprawl counties.

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 27,149 households; nonsprawl suburban and urban counties increase by 22,346 households. Under the controlled-growth scenario, sprawl counties increase by an average of 26,389 households: nonsprawling suburban and urban counties increase by an average of 28,429. Sprawling rural and undeveloped counties have their absolute growth decreased by an average of 5.5 percent; nonsprawl urban and suburban counties have their growth increased by 27.2 percent. Tables 5.25 and 5.26 present the growth in households and employment for each scenario.

The most significantly sprawl-controlled counties are Franklin and Lee, NC, with their growth in households reduced by 19.7 percent and 18.7 percent, respectively. In the Raleigh-Durham-Chapel Hill EA, almost three-quarters of the counties (12) remain unchanged under the two alternative growth scenarios. These are the nine slow- or no-growth counties and the three sprawling counties, which cannot be altered. Notably increasing in its growth under the controlled scenario is Durham, NC, with a household growth increase of 27.2 percent. Of the three suburban counties in the EA, two (Wake and Orange counties) are growing at an accelerated rate and need to have growth diverted to other counties under the controlled-growth scenario. The remaining county, Durham County, receives extra growth. Figures 5.25 and 5.26 map sprawl locations in the EA under the uncontrolled- and controlled-growth scenarios.

In summary, of the eight sprawling counties, five are controlled and three remain uncontrolled. Overall, the Raleigh-Durham-Chapel Hill, NC EA is characterized by both significant sprawl and by some measure of control.

## TUCSON, AZ EA (EA 159)

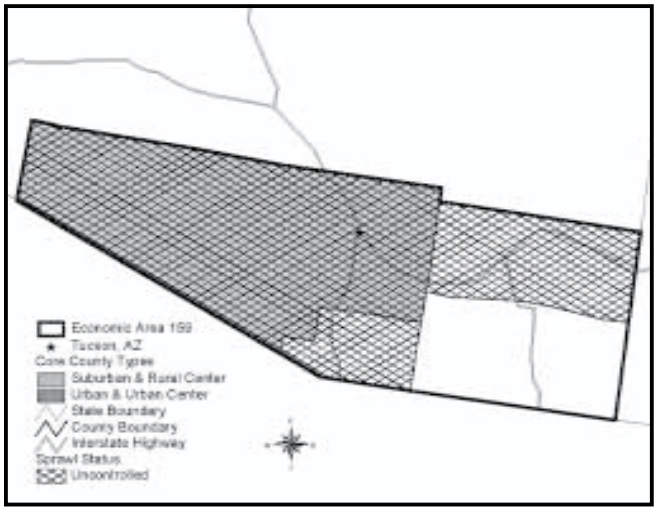
Tucson, AZ, is a city of 600,000 inhabitants located on the Santa Cruz River, in the center of the Tucson, AZ EA. The Tucson region produces aircraft parts, electronic components, missile-directed weaponry, and optical goods. The region is also a tourist and retirement destination. Tucson, AZ, is the largest U.S. city totally dependent on groundwater. This conflicts significantly with rapidly growing residential neighborhoods that often contain lawns and golf courses requiring daily watering. The Tucson region is one of the fastest-growing regions in the United States.

The Tucson, AZ EA in the West Region of the United States comprises three counties. All three are sprawling counties, but they are not sending locations, since there are no nonsprawling suburban or urban counties that can function as receiving locations within this EA. The sprawling counties are Cochise, AZ; Pima, AZ; and Santa Cruz, AZ.

Tucson, AZ, is located in the northeastern corner of Pima County and is linked to Phoenix and Maricopa County by I-10. Tucson, AZ, is linked by I-19 to Nogales in Santa Cruz County and by I-10 through Cochise County to Las Cruces, NM. Sprawl is taking place along both I-19 and I-10.

Courtesy of R. Ewing

**Figure 5.27**
**Projected Sprawl: Uncontrolled- and Controlled-Growth Scenario**
**Tucson, AZ EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Table 5.27**
**Regional Summary of Growth in Households and Employment**
**Under Uncontrolled- and Controlled-Growth Scenarios: Tucson, AZ EA**

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 203,936 | 67,979 | 229,659 | 76,553 | 203,936 | 67,979 | 229,659 | 76,553 |
| Nonsprawl Core Counties | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Nonsprawl Rural and Undev. Counties | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **EA** | **203,936** | **67,979** | **229,659** | **76,553** | **203,936** | **67,979** | **229,659** | **76,553** |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 5.28**
**County Summary of Growth in Households and Employment**
**Under Uncontrolled- and Controlled-Growth Scenarios: Tucson, AZ EA**

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Uncontrolled | Controlled | Control Ratio | Year 2000 | Uncontrolled | Controlled | Control Ratio |
| **Sprawling Counties** | | | | | | | | | | |
| Pima, AZ | RC | S-NC | 339,176 | 184,260 | 184,260 | | 430,569 | 204,822 | 204,822 | 1.00 |
| Cochise, AZ | UND | S-NC | 42,564 | 14,065 | 14,065 | 1.00 | 48,204 | 20,167 | 20,167 | 1.00 |
| Santa Cruz, AZ | UND | S-NC | 12,076 | 5,611 | 5,611 | 1.00 | 15,677 | 4,670 | 4,670 | 1.00 |

*Source:* Center for Urban Policy Research, Rutgers University.
*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 67,979 households. Under the controlled-growth scenario, since there are no receiving counties, sprawl counties increase at the same rate. Tables 5.27 and 5.28 present the growth for both households and employment under each scenario. The county of Pima, AZ, where Tucson is located, has the most significant increase in household growth (184,260). Figure 5.27 shows the uncontrolled-growth scenario for this EA.

All three counties in this EA are sprawling and continue to remain as such. The EA is characterized by considerable sprawl and by no ability to exert inter-county sprawl control.

## WASHINGTON-BALTIMORE, DC-MD-VA-WV-PA EA (EA 13)

Washington, DC, is a city of 600,000 located between Maryland and Virginia on the east bank of the Potomac River at its confluence with the Anacostia River. Washington has been the nation's capital since 1790; with the annexation of Georgetown (in the mid-1800s), Washington and the District of Columbia became coterminous.

The seat of the most influential government in the free world, the Washington-Baltimore, DC-MD-VA-WV-PA EA seems poised to lead in the developing technological revolution. Knowledge-based and service-oriented, the Washington-Baltimore, DC-MD-VA-WV-PA EA economy continues to grow rapidly, encompassing biological research, computer applications, and data banks. Well-known organizations such as National Geographic, the Library of Congress, the Smithsonian Institution, Discovery Communications, and the Nature Conservancy are all part of this industry. The federal government plays its part in this

Courtesy of C. Galley

Courtesy of C. Galley

economic restructuring. As the world's biggest producer of information, it is spurring the growth of businesses that mine, package, and resell its data. Federal agencies are also the world's largest financiers of basic research, channeling large amounts of funding to Washington-Baltimore, DC-MD-VA-WV-PA EA universities and laboratories.

Washington, DC, is a national, cultural, and tourism center served by three major airports and the Northeast Corridor Line of the Amtrak railroad. The city contains all major offices of the U.S. federal government, which dominates regional employment. Washington, DC, is located 35 miles south of Baltimore, MD, along Interstate 95. Around Baltimore and Washington, respectively, are Interstates 695 (the Baltimore Beltway) and 495 (the Capital Beltway). Interstates 83, 70, 270, and 66 run west to east from Interstate 81 and terminate in the Baltimore-Washington region. Interstate 81 parallels Interstate 95 through Virginia, 50 to 110 miles to the west. Sprawl is emerging in the Washington-Baltimore, DC-MD-VA-WV-PA EA in inner counties in multiple rings around both major cities.

The Washington-Baltimore, DC-MD-VA-WV-PA EA ranks nationally in the top 10 EAs in total growth. This growth also places it in the top 10 EAs in sprawl development. This South Region EA comprises 52 counties. Of those 52 counties, 23 are sprawling and represent sending locations; eight are nonsprawling suburban or urban counties and represent receiving locations. The remaining 21 counties are slow- or no-growth rural and undeveloped counties where sprawl is not a significant factor. Sprawl counties in the EA are Anne Arundel, MD; Berkeley, WV; Calvert, MD; Caroline, VA; Carroll, MD; Charles, MD; Culpeper, VA; Fauquier, VA; Frederick, VA; Frederick, MD; Garrett, MD; Harford, MD; Howard, MD; Jefferson, WV; King George, VA; Loudoun, VA; Montgomery, MD; Orange, VA; Queen Anne, MD; Spotsylvania,

## Table 5.29
## Regional Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Washington-Baltimore, DC-MD-VA-WV-PA EA

| | Uncontrolled-Growth Scenario | | | | Controlled-Growth Scenario | | | |
|---|---|---|---|---|---|---|---|---|
| | Household Growth | | Employment Growth | | Household Growth | | Employment Growth | |
| | Total | Avg. | Total | Avg. | Total | Avg. | Total | Avg. |
| Sprawl Counties | 459,204 | 19,965 | 746,394 | 32,452 | 264,794 | 11,513 | 572,216 | 24,879 |
| Nonsprawl Core Counties | 292,476 | 36,559 | 1,044,022 | 130,503 | 486,886 | 60,861 | 1,224,668 | 153,084 |
| Nonsprawl Rural and Undev. Counties | 42,729 | 2,035 | 96,652 | 4,602 | 42,729 | 2,035 | 90,184 | 4,294 |
| **EA** | **794,409** | **15,277** | **1,887,068** | **36,290** | **794,409** | **15,277** | **1,887,068** | **36,290** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 5.30
## County Summary of Growth in Households and Employment Under Uncontrolled- and Controlled-Growth Scenarios: Washington-Baltimore, DC-MD-VA-WV-PA EA

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Sending Counties** | | | | | | | | | | |
| Calvert, MD | R | S-C | 24,388 | 13,304 | 5,765 | 2.31 | 24,128 | 13,387 | 8,922 | 1.50 |
| Carroll, MD | R | S-C | 54,709 | 29,083 | 9,844 | 2.95 | 63,369 | 37,860 | 19,163 | 1.98 |
| Charles, MD | R | S-C | 40,988 | 21,861 | 9,689 | 2.26 | 49,990 | 28,859 | 18,485 | 1.56 |
| Frederick, VA | R | S-C | 30,692 | 9,340 | 7,255 | 1.29 | 53,523 | 15,038 | 15,038 | 1.00 |
| Frederick, MD | R | S-C | 69,615 | 38,022 | 9,844 | 3.86 | 96,569 | 58,220 | 19,163 | 3.04 |
| Jefferson, WV | R | S-C | 16,010 | 8,183 | 3,785 | 2.16 | 16,845 | 9,575 | 6,229 | 1.54 |
| King George, VA | R | S-C | 6,309 | 2,776 | 2,776 | 1.00 | 10,904 | 4,604 | 4,604 | 1.00 |
| Loudoun, VA | R | S-C | 48,445 | 25,828 | 9,844 | 2.62 | 76,569 | 35,259 | 19,163 | 1.84 |
| Spotsylvania, VA | R | S-C | 37,651 | 23,296 | 8,900 | 2.62 | 53,101 | 32,841 | 19,163 | 1.71 |
| St. Mary's, MD | R | S-C | 31,073 | 17,051 | 7,345 | 2.32 | 40,735 | 24,940 | 15,063 | 1.66 |
| Stafford, VA | R | S-C | 29,185 | 16,644 | 6,899 | 2.41 | 26,688 | 15,552 | 9,869 | 1.58 |
| Warren, VA | R | S-C | 12,516 | 6,174 | 2,959 | 2.09 | 11,055 | 6,387 | 6,387 | 1.00 |
| Ann Arundel, MD | S | S-C | 172,043 | 41,212 | 40,670 | 1.01 | 274,056 | 101,264 | 101,291 | 1.00 |
| Berkeley, WV | S | S-C | 28,956 | 17,319 | 6,845 | 2.53 | 33,711 | 21,375 | 12,465 | 1.71 |
| Harford, MD | S | S-C | 79,224 | 32,824 | 18,728 | 1.75 | 85,409 | 30,638 | 30,982 | .99 |
| Howard, MD | S | S-C | 92,016 | 58,766 | 21,752 | 2.70 | 138,822 | 99,961 | 51,333 | 1.95 |
| Montgomery, MD | S | S-C | 320,635 | 66,887 | 73,261 | .91 | 549,322 | 168,652 | 181,225 | .93 |
| Caroline, VA | UND | S-C | 8,082 | 3,443 | 1,911 | 1.80 | 6,278 | 2,943 | 2,943 | 1.00 |
| Culpeper, VA | UND | S-C | 11,591 | 3,447 | 2,740 | 1.26 | 16,667 | 5,954 | 5,954 | 1.00 |
| Fauquier, VA | UND | S-C | 19,765 | 11,346 | 4,672 | 2.43 | 26,794 | 15,698 | 9,908 | 1.58 |
| Garrett, MD | UND | S-C | 11,549 | 4,932 | 2,730 | 1.81 | 17,574 | 8,069 | 6,498 | 1.24 |
| Orange, VA | UND | S-C | 9,710 | 3,049 | 3,049 | 1.00 | 10,244 | 2,904 | 2,904 | 1.00 |
| Queen Anne, MD | UND | S-C | 14,930 | 4,417 | 3,529 | 1.25 | 14,780 | 6,414 | 5,465 | 1.17 |

*Continued on next page*

**Table 5.30—*Continued***

| County | | | Households (HH) 2000–2025 | | | | Employment (Jobs) 2000–2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HH Growth Under | | | | Job Growth Under | | |
| Name | Type | Sprawl Status | Year 2000 | Un-controlled | Controlled | Control Ratio | Year 2000 | Un-controlled | Controlled | Control Ratio |
| **Receiving Counties** | | | | | | | | | | |
| Baltimore, MD | S | NS | 291,247 | 49,341 | 63,298 | 0.78 | 426,310 | 137,837 | 145,059 | .95 |
| Prince Geor., MD | S | NS | 288,089 | 57,086 | 64,968 | 0.88 | 387,193 | 108,057 | 120,865 | .89 |
| Baltimore, MD | U | NS | 253,309 | -35,052 | 47,149 | -0.74 | 461,452 | 60,935 | 121,688 | .50 |
| Fairfax, VA | U | NS | 370,018 | 173,211 | 173,211 | 1.00 | 646,258 | 319,630 | 319,630 | 1.00 |
| Prince Wil., MD | U | NS | 105,008 | 56,539 | 56,539 | 1.00 | 129,303 | 74,021 | 74,021 | 1.00 |
| Alexandria, VA | UC | NS | 58,521 | 4,665 | 14,524 | 0.32 | 119,763 | 83,313 | 83,313 | 1.00 |
| Arlington, VA | UC | NS | 83,982 | 4,713 | 20,280 | 0.23 | 231,321 | 169,516 | 169,516 | 1.00 |
| D. of Columbia | UC | NS | 230,802 | -18,027 | 46,918 | -.38 | 739,343 | 90,713 | 190,576 | .48 |
| **Slow- or No-Growth Counties** | | | | | | | | | | |
| Allegany, MD | R | NS | 29,294 | -1,809 | -1,809 | 1.00 | 37,657 | 13,463 | 13,463 | 1.00 |
| Franklin, PA | R | NS | 49,654 | 6,455 | 6,455 | 1.00 | 65,982 | 15,557 | 15,557 | 1.00 |
| Mineral, WV | R | NS | 10,880 | 1,733 | 1,733 | 1.00 | 8,431 | 2,604 | 2,604 | 1.00 |
| Morgan, WV | R | NS | 5,636 | 1,536 | 1,536 | 1.00 | 4,528 | 1,598 | 1,598 | 1.00 |
| Talbot, MD | R | NS | 14,160 | 3,054 | 3,054 | 1.00 | 23,551 | 5,007 | 5,007 | 1.00 |
| Washington, MD | R | NS | 49,328 | 10,530 | 10,530 | 1.00 | 72,302 | 25,630 | 19,163 | 1.34 |
| Caroline, MD | UND | NS | 11,381 | 2,539 | 2,539 | 1.00 | 11,512 | 3,048 | 3,048 | 1.00 |
| Clarke, VA | UND | NS | 4,588 | 718 | 718 | 1.00 | 5,917 | 1,402 | 1,402 | 1.00 |
| Dorchester, MD | UND | NS | 12,371 | 501 | 501 | 1.00 | 15,311 | 1,571 | 1,571 | 1.00 |
| Fulton, PA | UND | NS | 5,534 | 597 | 597 | 1.00 | 6,579 | 1,037 | 1,037 | 1.00 |
| Grant, WV | UND | NS | 4,504 | 1,233 | 1,233 | 1.00 | 6,641 | 2,289 | 2,289 | 1.00 |
| Hampshire, WV | UND | NS | 7,574 | 2,394 | 2,394 | 1.00 | 6,827 | 2,818 | 2,818 | 1.00 |
| Hardy, WV | UND | NS | 4,850 | 1,089 | 1,089 | 1.00 | 7,444 | 1,228 | 1,228 | 1.00 |
| Kent, MD | UND | NS | 7,385 | 756 | 756 | 1.00 | 10,759 | 2,352 | 2,352 | 1.00 |
| Madison, VA | UND | NS | 4,592 | 1,229 | 1,229 | 1.00 | 4,863 | 1,581 | 1,581 | 1.00 |
| Page, VA | UND | NS | 8,928 | 1,412 | 1,412 | 1.00 | 9,890 | 2,156 | 2,156 | 1.00 |
| Randolph, WV | UND | NS | 11,524 | 2,886 | 2,886 | 1.00 | 15,238 | 5,192 | 5,192 | 1.00 |
| Rappahan., VA | UND | NS | 2,965 | 1,253 | 1,253 | 1.00 | 3,007 | 1,398 | 1,398 | 1.00 |
| Shenandoah, VA | UND | NS | 14,032 | 3,279 | 3,279 | 1.00 | 19,398 | 3,569 | 3,569 | 1.00 |
| Tucker, WV | UND | NS | 3,149 | 144 | 144 | 1.00 | 4,256 | 2,333 | 2,333 | 1.00 |
| Westmore., VA | UND | NS | 6,810 | 1,200 | 1,200 | 1.00 | 4,960 | 819 | 819 | 1.00 |

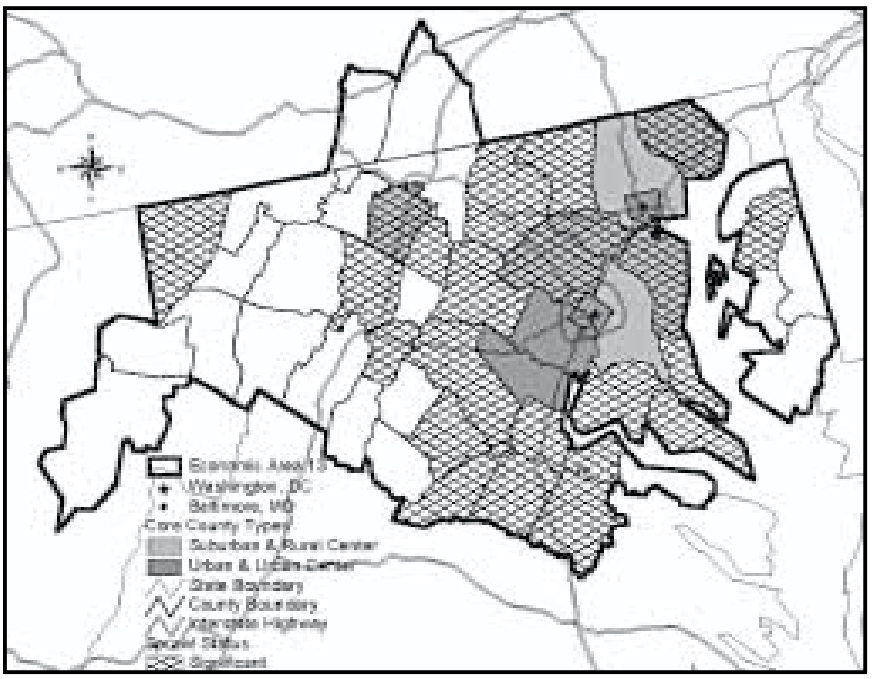
*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The six county-type categories are: Undeveloped (UND), Rural (R), Rural Center (RC), Suburban (S), Urban (U), Urban Center (UC). The three categories of sprawl status are: Nonsprawl (NS), Sprawl-Controlled (S-C), and Sprawl-Noncontrolled (S-NC).

VA; St. Mary's, MD; Stafford, VA; and Warren, VA. Urban and suburban counties in the EA are the District of Columbia; Arlington, VA; Alexandria, VA; Fairfax, VA; Prince William, VA; Baltimore City, MD; and Prince Georges, MD.

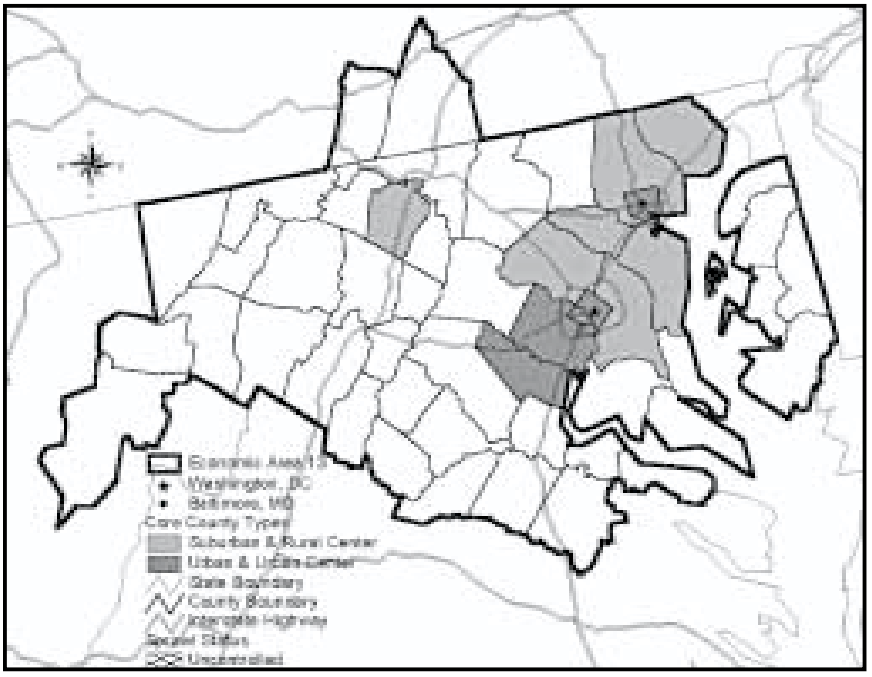
Under the sprawl or uncontrolled-growth scenario, sprawl counties increase by an average of 19,965 households; nonsprawl suburban and urban counties increase by 36,560 households. Under the controlled-growth scenario, sprawl counties increase by an average of 11,513 households; nonsprawl suburban and urban counties increase by an average of 60,861. Sprawling rural and undeveloped counties have their absolute growth decreased by an average of 57.2 percent; nonsprawl urban and suburban counties have their growth increased by 66.5 percent. Tables 5.29 and 5.30 present the growth in households and employment under each scenario. The most significantly sprawl-controlled county is Frederick, MD, with its growth in households reduced by 74.1 percent. In the Washington-Baltimore, DC-MD-VA-WV-PA EA, more than 40 percent of the counties (21) remain unchanged under the two alternative growth scenarios. These are the 21 slow- or no-growth counties south and west of Washington, DC. Noticeably increasing

**Figure 5.28**
**Projected Sprawl: Uncontrolled-Growth Scenario**
**Washington-Baltimore, DC-MD-VA-WV-PA EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Figure 5.29**
**Projected Sprawl: Controlled-Growth Scenario**
**Washington-Baltimore, DC-MD-VA-WV-PA EA**




*Source:* Center for Urban Policy Research, Rutgers University.

**Table 5.31**
**Summary of Household Growth and Sprawl Status**
**Under Uncontrolled- and Controlled-Growth Scenarios in 15 Selected EAs**

| EAs | Total Household Growth in All Counties | Un-controlled Household Growth Sprawl Counties | Controlled Household Growth Sprawl Counties | Difference Sent to Core Counties | Number of Sprawl Counties Un-controlled | Number of Sprawl Counties Controlled | Number of Sprawl Counties Remaining Un-controlled | Largest (%) Sending Counties (Name, %) | Largest (%) Receiving Counties (Name, %) |
|---|---|---|---|---|---|---|---|---|---|
| Atlanta, GA-AL-NC | 795,581 | 298,464 | 163,047 | 135,417 | 20 | 18 | 2 | Fayette (-65%) | Fulton, GA (+200%)* |
| Austin-San Marcos, TX | 238,376 | 111,361 | 68,498 | 42,863 | 4 | 3 | 1 | Hays, TX (-50%) | Travis, TX (+35%) |
| Birmingham, AL | 165,437 | 105,382 | 63,156 | 42,226 | 5 | 3 | 2 | Tuscaloosa, AL (-47%) | Jefferson, AL (+150%)* |
| Chicago-Gary-Kenosha, IL-IN-WI | 405,854 | 200,698 | 149,082 | 51,616 | 10 | 10 | 0 | Porter, IN (-50%) | Cook, IL (- to +) |
| Denver-Boulder-Greeley, CO-KS-NE | 636,246 | 437,473 | 319,172 | 118,301 | 16 | 12 | 4 | Larimer, CO (-44%) | Denver, CO (+251%)* |
| Las Vegas, NV-AZ-UT | 424,361 | 422,883 | 422,883 | 0 | 5 | 1 | 4 | — | — |
| Lexington, KY-TN-VA-WV | 117,453 | 46,591 | 45,211 | 1,380 | 11 | 5 | 6 | Floyd, KY (-22%) | Franklin, KY (+67%) |
| L. A.-River.-Orange, CA-AZ | 1,160,231 | 640,142 | 269,518 | 370,624 | 8 | 6 | 2 | Riverside, CA (-67%) | L. Angeles, CA (+142%)* |
| Miami-Fort Lauderdale, FL | 678,757 | 547,741 | 459,224 | 88,517 | 7 | 5 | 2 | Palm Beach, FL (-25%) | Miami-Dade, FL (+70%) |
| Minneapolis-St. Paul, MN-WI-IA | 399,604 | 131,694 | 86,766 | 44,928 | 16 | 16 | 0 | Scott, MN (-62%) | Ramsey, MN (+249%)* |
| NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT | 309,525 | 244,512 | 225,373 | 19,139 | 20 | 19 | 1 | Pike, PA (-56%) | Westchester, NY (+19%) |
| Portland-Salem, OR-WA | 401,739 | 203,759 | 125,021 | 78,738 | 7 | 7 | 0 | Deschutes, OR (-70%) | Multnomah, OR (+270%)* |
| Raleigh-Durham-Chapel Hill, NC | 257,037 | 217,193 | 211,110 | 6,083 | 8 | 5 | 3 | Franklin, NC (-20%) | Durham, NC (+27%) |
| Tucson, AZ | 203,936 | 203,936 | 203,936 | 0 | 3 | 0 | 3 | — | — |
| Washing.-Balt., DC-MD-VA-WV-PA | 794,409 | 459,204 | 264,794 | 194,410 | 23 | 23 | 0 | Frederick, MD (-74%) | Baltimore, MD (- to +) |
| **TOTAL** | 6,988,546 | 4,271,033 | 2,867,949 | 1,403,084 | 163 | 133 | 30 | | |

*Source:* Center for Urban Policy Research, Rutgers University.
*Note:* * the overall growth of these receiving counties is about one percent per year over the 25-year projection period and no more than a 30 percent increase of the 2000 existing household base.

in growth under the controlled-growth scenario are Baltimore, MD, and Washington, DC, where losses of 35,000 and 18,000, respectively, are reversed by an increase in households of approximately 45,000 in both locations. Of the 13 urban/suburban counties in the EA, five are growing at an accelerated rate and have growth diverted to other counties under the controlled-growth scenario. Two are growing at a reasonable rate and do not get extra growth under the controlled-growth scenario. The remaining six are slow-growth locations and receive extra growth. Figures 5.28 and 5.29 map sprawl locations in the EA under the uncontrolled- and controlled-growth scenarios.

In summary, all 23 counties sprawling under the uncontrolled-growth scenario are subsequently controlled. Overall, the Washington-Baltimore EA is characterized by both considerable sprawl in counties and by very considerable potential control of sprawl. The massive spread of sprawl in all locations, but especially surrounding Washington, DC, is contained in the immediate core counties under the controlled-growth scenario.

## CONCLUSION

The purpose of the foregoing analysis was to set forth a system whereby uncontrolled and controlled sprawl in multiple metropolitan areas can be studied. To what degree do the underlying designations of urban, suburban, rural, and undeveloped make sense? Are the locations designated sprawl those that appear to be sprawling locally? Is the control solution a workable one, given growth trends, available land, and the market realities of the area?

Most of the underlying designations of urban, suburban, rural, and undeveloped in an area appear reasonable. In the New York metropolitan area, designating the New York City boroughs of Manhattan,

Courtesy of T. Delcorso

Queens, Bronx, and Brooklyn, and Hudson County, NJ, as urban centers; the counties of Middlesex, Union, Essex, Bergen, Passaic, NJ, and Richmond and Nassau, NY, as urban; Fairfield, CT, Hampden, MA, Hartford, CT, Lehigh, PA, Mercer, NJ, New Haven, CT, Northhampton, PA, Rockland, NY, and Westchester, NY, as suburban; and Berkshire, MA, Warren, NJ, and Windham, CT, as rural makes sense for this region.

In the Portland area, saying that Multnomah County, containing the city of Portland, is the urban containment area, and that parts of Clackamas and other immediate counties are sprawling, clearly captures the sprawl designation of the Portland area.

Finally, concluding that sprawl cannot be controlled at all in the Tucson, AZ, and Las Vegas, NV-AZ-UT EAs, and perhaps only minimally in the Denver-Boulder-Greeley, CO-KS-NE and Miami-Fort Lauderdale, FL EAs, accurately portrays the likelihood of controlling sprawl in these locations.

Although another system could be utilized, the present methodology seems to both accurately designate the level of urbanization in areas and identify less-developed locations with sprawl and those where sprawl can and cannot be controlled.

This chapter was designed to view the incidence of sprawl in key EAs and to determine how sprawl was redirected under the controlled-growth scenario. The formula employed here provides a rather perceptive view of differing levels of urbanization across the nation according to unique definitions of urban, suburban, rural, and undeveloped areas. Such designation of areas provides the foundation for determining which areas (counties) in a region are likely to experience significant future sprawl. Once isolated, these areas would be controlled in the future by directing growth away from sprawling counties to other, more developed, slower-growing or declining counties.

Nationwide, if this formula is accurate, about 740 counties are defined as sprawling; of these, about 420 can be controlled. The 15 examples herein provide a basis to determine whether or not the scheme of land use and, ultimately, sprawl designation and control is adequate. This information is summarized in Table 5.31. As one can see, a significant amount of sprawl control can be exerted nationwide. This could be accomplished within the context of reasonable household- and employment-growth decreases in uncontrolled-sprawl counties and similar reasonable additions in controlled urban and suburban counties.

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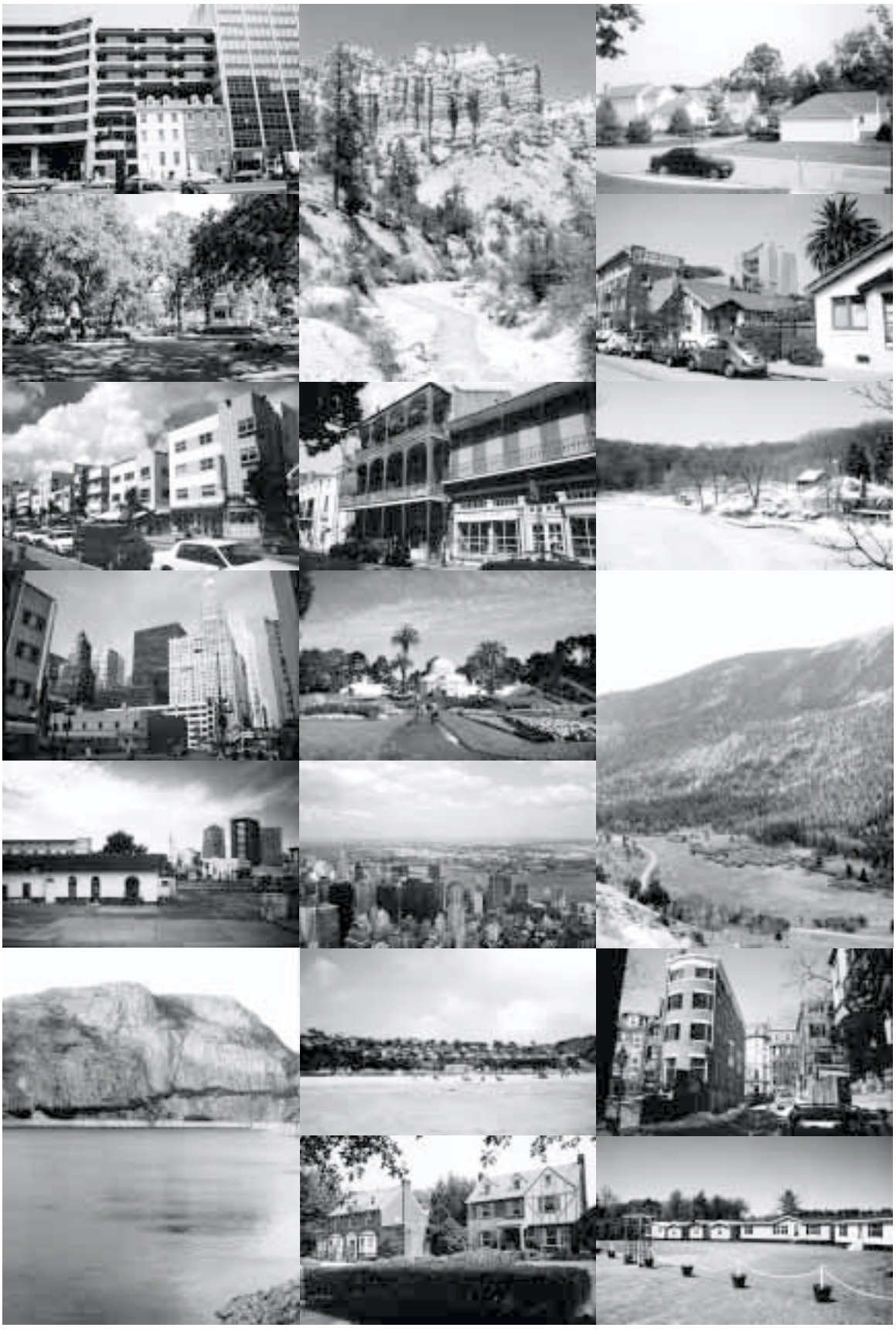
# PART II

# THE IMPACT OF SPRAWL ON RESOURCES



# Introduction to Part II

This portion of the study examines the impacts of sprawl on resources and determines what amounts of resources might be saved by choosing a future wherein the amount of sprawl would be curtailed. In chapter 6, development under the two national growth scenarios is allocated to counties with information on recent land conversion rates by type of dwelling and nonresidential space. This allows for tabulations of land conversion savings associated with reducing sprawl growth. In chapter 7, the two growth scenarios and their different types of development (the result of residential and nonresidential development trends of the prior decade) determine the number of water and sewer laterals that would be required under each growth plan. The controlled-growth or nonsprawl scenario features more single-family attached and multifamily development because development is closer in. More of these types of units can be served with a single lateral. Resource savings due to growth with more housing-type offerings (i.e., the nonsprawl scenario) can be tabulated in this way.

Chapter 8 examines the amount of road infrastructure required under the two alternative growth scenarios. A model linking population density and road density and information on levels of each in counties nationwide is used to determine how many more lane-miles are required to serve future development. Development taking place in close-in locations with greater road mile density might be served by making small changes in the existing network, as opposed to the wholly new road construction needed when development takes place in peripheral areas. These are savings attributable to a future with reduced sprawl.

In chapter 9, the cost-revenue impacts of sprawl versus compact development are viewed. The costs of providing new residents with public safety, public works, general government, recreation/culture, and educational services are compared under the two development scenarios. All per capita costs for these services in municipalities and school districts as well as costs at the county level itself are pitted against the revenues associated with development at these levels (tax, nontax, and intergovernmental transfers). Different costs and revenues are assigned to subcounty urbanized and nonurbanized areas. Depending upon where in a county development is projected (closer in or outside of urbanized areas) and whether development is projected to the closer-in (more under compact development) or the farther-out (more under sprawl development) counties, a different cost-revenue impact is projected.

Chapter 10 examines the property development costs associated with a sprawl versus a compact development future. To what degree are the real estate purchase costs greater or less as the result of locating closer to the more developed areas within a county or to the more urbanized counties within a region? The residential and nonresidential property development costs of closer-in versus farther-out development are analyzed, and the results are mixed. A greater variety of housing types makes housing cost options more plentiful closer in, as housing of different types is less expensive. Closer-in location means that the price advantages of peripheral location cannot be accessed. Single-family detached housing is less expensive farther out.

Courtesy of R. Ewing

# VI

# Land Conversion in the United States:

## Requirements under Sprawl and Alternative Development

## INTRODUCTION

The purpose of this chapter is to describe land conversion that would be associated with the two different development futures outlined in chapters 3 and 4 and illustrated for 15 EAs in chapter 5. This chapter is the first of several chapters that deal with the costs and benefits of sprawl (uncontrolled growth) versus compact or smart growth (controlled growth) with respect to their impact on the natural and man-made resources of the United States.

The chapter first describes two basic concepts of growth management as well as the procedures used to effect them. It clearly distinguishes between the two actions: sprawl growth (as defined earlier) and all growth. Next, the two actions are linked to the types of growth they affect. These are intercounty (between counties) and intracounty (within a county) redirection of households and employment. The section also reviews procedures used to establish the equivalent of growth boundaries and urban service areas in each EA to accomplish the above redirection.

The chapter then discusses growth projections and the relationships between growth and land demand. It deals individually with the methods used to progress from household and employment projections to housing units and nonresidential structures and ultimately to the land requirements for each.

The chapter concludes with a discussion of land converted under the two future growth scenarios. This includes growth in sprawl locations and overall, as well as how the growth scenario differences impact the nation, regions, states, EAs, and counties.

## CONCEPTUAL OVERVIEW

In chapter 4, the discussion involved sprawl versus growth. Sprawl was defined as growth in locations that would be difficult to access with public services, or would cause excessive amounts of infrastructure to be put in place and/or consume significant amounts of land and natural resources. In short, sprawl was defined as growth in the wrong place—significant residential and nonresidential growth in rural, undeveloped, and developing-suburban locations. For the purposes of this study, these locations are counties uniquely defined for each region of the country. This definition recognizes the implicit characteristics of sprawl growth. Sprawl is primarily single-use (residential single-family or strip commercial), low density, and skipped-over (leapfrog) development taking place at the periphery of the metropolitan area.

In actuality, however, development with these characteristics is taking place on the outer fringes of urban counties and in rural and undeveloped counties at an overall level below what could be qualified as sprawl. How should those types of growth be dealt with in the context of procedures put in place to control sprawl? Fast, low-density, leapfrog, single-use development at the edges of urban and developed suburban counties is clearly analogous to sprawl. So too is slow or small-scale low-density, leapfrog, single-use development in rural and undeveloped counties. How does the study avoid dealing with only a fraction of the sprawl problem? On the other hand, how does the study avoid simply providing measures to respond to all growth as opposed to measures to respond to sprawl growth? These issues will be dealt with in the following way.

Two systems for directing growth will be put in place. The first will be intercounty control of growth in an EA through the employment of a technique analogous to an urban growth boundary. This technique will position most growth in the urban and developed suburban counties of an EA. This will control sprawl development as defined in chapter 4. For the other type of "sprawl-like" development, either development at the fringe of an urban county or in a rural county of a magnitude that would not qualify as sprawl, another technique is necessary. This is intracounty positioning of growth using an equivalent to an urban service area. It involves allocating growth to more-developed versus less-developed places in an individual county. This intracounty control of growth requires identification of places within counties to direct growth (developed areas—urbanized areas or equivalent) and places where growth should be avoided (the rest of the county).[1] Developed areas must allow for space to grow so, ideally, they should be larger than urbanized areas. A definition other than the census definition of an urbanized area will be suggested later in this chapter. Furthermore, residential and nonresidential densities must be available for these subcounty areas.

These intercounty and intracounty controls permit the channeling of growth while basically maintaining the distinction between sprawl and growth. There is some overlap in attempting this type of accounting. Intercounty control of sprawl is the control of sprawl as defined (see chapter 4). Yet all of the sprawl growth

[1] This can occur only if developed locations already exist in counties. This will be explained subsequently.

Courtesy of G. Lowenstein

is not controllable. Approximately 320 of 740 counties with sprawl growth cannot be controlled through intercounty redistribution of households and jobs. Growth is explosive in these counties, and the other counties in the EA that serve as receiving counties are often suburban counties that sprawl themselves if too many households and jobs are directed to them. Yet these uncontrolled sprawl counties can still benefit from intracounty control. To be consistent with sprawl growth as defined in chapter 4, this intracounty control in uncontrolled-sprawl locations must be individually tagged to ensure proper crediting of the amount of growth that is controlled.

To simplify this chapter on land conversion, the distinction of intercounty positioning to bring the level of growth in sprawl counties to nonsprawl levels will be used to gauge the ability to control sprawl. Intracounty positioning will be used to gauge the control of "sprawl-like" growth taking place in nonsprawl-growth counties and in uncontrolled-sprawl-growth counties. Where intracounty controls save land in the latter case, this will be recorded as land savings related to sprawl development. Where it is not related to sprawl, it will be viewed as land savings related to overall growth.

It should be realized, however, that sprawl really includes all growth that is happening in identified sprawl counties as well as in urban and suburban counties and in rural and undeveloped counties (where it is happening at very low levels). While these low-level sprawl counties do not technically fit the definition of sprawl, their growth is clearly "sprawl-like" and should be controlled.

On another issue, the study's definition of sprawl fails to take into account the very small amount of nonsprawl development that is high density, mixed use (by design or proximity), and occurring in rural

and undeveloped areas in centers or well-serviced, large-scale developments. Therefore, this development is counted as sprawl, whereas perhaps it should not be. However, this type of development represents a very small fraction of all development taking place nationwide.

## Intercounty Redirection of Households and Employment (Control of Sprawl Growth)

Under the uncontrolled-growth scenario, there is no redirection of households and jobs. Under the controlled-growth scenario there is redirection of households and jobs to limit sprawl based upon the rules established in chapter 4: (1) growth is taken from smaller counties and allocated to larger counties to allow the largest number of counties to be controlled; (2) no sprawl county is increased to decrease growth in another sprawl county; and (3) no nonsprawling rural and undeveloped county is increased to decrease growth in a sprawl county.

Of the 3,091 counties nationwide, about 2,350 are nonsprawling and remain unchanged under both scenarios. Very little growth is taking place in 2,125 of those counties and 225 other counties are mostly developed. Approximately 420 counties undergo significant decreases in households and jobs through intercounty relocation, and their sprawl is controlled. Approximately 320 counties remain with sprawl uncontrolled. About 40 percent of those counties experience a reduction in growth under intercounty relocation but are not controlled. Approximately 210 of the 225 counties that are already developed receive households and jobs from the 420 counties that are controlled. These counties also participate in the intercounty relocation.

## Intracounty Redirection of Households and Employment (Control of All Growth)

Intracounty control under the uncontrolled-growth scenario does not take place. Development in developed areas and undeveloped areas proceeds as it has historically. Under the controlled-growth scenario, intracounty growth control does take place. About 10 percent more residential and nonresidential growth is directed to the more-developed portion of the county. This development experiences a 20 percent increase in residential density and a 10 percent increase in nonresidential FAR. In the undeveloped portions of the county under controlled growth, development takes place as it does under uncontrolled growth except that 20 percent of the residential development is clustered at a density of twice the uncontrolled, undeveloped area density.

### A Procedure for Intracounty Control

The existing development pattern of a county is determined according to the densities of groups of states, the county's density, and its projected growth rate. This assemblage of information indicates whether a county will be urban, suburban, or rural, and whether or not it is sprawling. A further division of the county is required in order to more accurately direct future growth within it.

Portions of the U.S. Census Metropolitan Statistical Areas (MSAs) cannot be used to define the developed and undeveloped areas in each county because the MSAs are composed of entire counties. This precludes any insight into divisions of an individual county. On the other hand, the U.S. Census Urbanized Areas (UAs) define developed areas within counties, but in such a narrow way that they fail to adequately portray developing areas in a metropolitan area. UAs do not realistically reflect newly developed areas that have not reached the density thresholds of urbanized areas. Rand McNally, in its *Commercial Atlas and Marketing Guide*, defines a Ranally Metro Area (RMA), which provides an excellent compromise between the extremes of the two census-defined areas (a whole MSA county versus urbanized areas within a county). An RMA is defined as a subcounty area with at least 70 people per square mile and 20 percent of its workforce commuting to the core areas of the RMA. RMAs comprise about 92 percent of the population of MSAs. Rand McNally updates

Courtesy of G Lowenstein

**Table 6.1**
**Percentage Growth Occurring within Developed Areas of Counties by Type of County and Census Division: 2000 to 2025**
(Used for Uncontrolled-Growth Scenario)

| Census Division | Un-developed | Rural | Rural Center | Suburban | Urban | Urban Center |
|---|---|---|---|---|---|---|
| New England | 0.0 | 20.0 | 29.3 | 79.3 | None | 100.0 |
| Mid-Atlantic | 3.0 | 41.5 | 79.9 | 88.1 | 93.6 | 100.0 |
| East North Central | 1.1 | 33.1 | 42.2 | 86.7 | 99.5 | 98.8 |
| West North Central | 2.1 | 16.7 | 41.6 | 74.3 | 82.1 | 98.6 |
| South Atlantic | 1.3 | 24.3 | 50.4 | 77.5 | 99.0 | 100.0 |
| East South Central | 0.5 | 14.9 | 0.0 | 67.5 | 95.9 | 100.0 |
| West South Central | 2.0 | 26.5 | 59.8 | 69.1 | 95.1 | 98.0 |
| Mountain | 1.5 | 15.0 | 37.5 | 64.9 | 77.5 | 99.9 |
| Pacific | 8.6 | 57.4 | 57.9 | 81.7 | 97.9 | 99.3 |
| United States | 1.9 | 26.2 | 46.8 | 77.0 | 93.7 | 99.4 |

*Source: U.S. Census of Population and Housing, 1980 and 1990.*
*Note:* For the above county types, the complement percentage occurs in undeveloped areas.

these demographics yearly. RMAs are defined for all counties with a population of at least 50,000. The research team uses this data to establish developed versus undeveloped areas in each county.

Once developed and undeveloped areas have been defined for the United States, the percentage of new growth that occurs in each of these areas must be determined. This percentage calculation is a key component of intracounty growth control. To establish this parameter, historic U.S. Census data are employed. Population figures in UAs in 1980 and 1990 are used to establish the historic growth pattern in close-in or developed areas and the percentage of growth going to these areas. The historic growth pattern determines the percentage of growth going to these areas in the future. These percentages are increased by the relationship between the physical size of RMAs to the physical size of UAs.

The Census Bureau defines urbanized areas (UAs) as one or more core urban areas and an adjacent, densely settled territory (urban fringe) that together have a minimum population of 50,000. The urban fringe generally consists of contiguous territory having a density of at least 1,000 persons per square mile. The urban fringe also includes outlying territories of lesser population density if they eliminate enclaves or indentations in the boundary of a UA.

The UA population growth within each county and the county's overall population growth from 1980 to 1990 are calculated. The ratio of growth in the UA to overall growth in the county, increased to account for the difference in size between the RMA and the UA, is then used to project similar distributions of future growth in developed and undeveloped areas of counties. These distributions are shown in Tables 6.1 and 6.2 by census division.


Courtesy of C. Galley

## THE ASSESSMENT MODEL

### The Rutgers Land Conversion Model

Land conversion as a result of development is projected using the Rutgers University land conversion model. This model translates households and employment projections to the demand for residential and nonresidential land. The model accounts for both vacancy of structures and inefficient use as well as other

**Table 6.2**
**Percentage Growth Occurring within Developed Areas of Counties by Type of County and Census Division: 2000 to 2025**
(Used for Controlled-Growth Scenario)

| Census Division | Un-developed | Rural | Rural Center | Suburban | Urban | Urban Center |
|---|---|---|---|---|---|---|
| New England | 0.0 | 22.0 | 32.2 | 87.2 | None | 100.0 |
| Mid-Atlantic | 3.3 | 45.6 | 87.9 | 94.1 | 96.8 | 100.0 |
| East North Central | 1.4 | 36.4 | 46.4 | 93.4 | 99.8 | 99.4 |
| West North Central | 2.3 | 18.3 | 45.7 | 81.7 | 90.3 | 99.3 |
| South Atlantic | 1.4 | 26.7 | 55.4 | 85.3 | 99.5 | 100.0 |
| East South Central | 0.6 | 16.3 | 0.0 | 74.3 | 98.0 | 100.0 |
| West South Central | 2.2 | 29.1 | 65.8 | 76.0 | 97.6 | 99.0 |
| Mountain | 1.6 | 16.5 | 41.2 | 71.4 | 85.3 | 100.0 |
| Pacific | 9.4 | 63.1 | 63.7 | 89.9 | 99.0 | 99.7 |
| United States | 2.1 | 28.8 | 51.4 | 84.7 | 96.9 | 99.7 |

*Source: U.S. Census of Population and Housing, 1980 and 1990.* Data interpretation by the Center for Urban Policy Research, Rutgers University.

*Note:* For the above county types, the complement percentage occurs in undeveloped areas.

land development requirements that consume extra land (Burchell et al. 1998).

Subroutines of the land conversion model deal with the amounts of agricultural and environmentally fragile land taken as a result of development. The subroutines ensure these various categories of land will not be double counted.

The model uses different densities, development locations, and housing types for uncontrolled (sprawl) growth versus controlled (compact or smart) growth; calculates the total, agricultural, and environmentally fragile land converted under each development alternative; and expresses these, as well as their differences, in acres. The land conversion model requires a basic unit of geography that can be divided into more- and less-developed areas. The basic geographic unit in this study is the county. The study employs the county types defined earlier as urban, suburban, and rural according to state density groupings. The study also employs census and other governmental data sources to establish development concentrations, densities, and housing mixes within counties.

Courtesy of C. Galley

## Population, Household, and Employment Projections

Population and employment projections for the 3,091 counties for the 20-year period 2000–2020 were obtained from Woods & Poole *1998 Regional Projections and Database*. The projections were extended by Rutgers University, to 2025. When intercounty redirection of households is involved, population and household projections are put through several iterations to ensure that the resulting population from differing housing-type projections was the same under uncontrolled versus controlled development, and that both agreed with original population projections at the EA and higher levels. An effort is made to hold population and household projections constant at the EA level even though household growth at the county level varies under the two alternatives. This involves altering household size somewhat to achieve parity. This procedure prevents overall populations in the two alternatives from differing solely because of differences in housing types.

Household projections for the counties and EAs are linked with detailed information on past growth in

Courtesy of A. Nelessen

housing types to develop projections of future residential units by type.

Employment projections at the county and EA levels are also drawn from Woods & Poole projections and are available by one-digit SIC. Data on employment growth by type are used at both the county and EA levels to produce both space and land requirements to support nonresidential growth.

## Residential and Nonresidential Space and Land Demands—Sequential Calculations

### Residential Structures

Household projections within each county for the period 2000 to 2025 are divided by area-specific overall occupancy rates to obtain gross housing-unit projections by type. These estimates of units to be produced are allocated to both developed and undeveloped areas according to procedures discussed in the prior section. As indicated previously, under uncontrolled growth, projections for counties follow the Woods & Poole historically based projections. Growth is allocated within a county to developed versus undeveloped areas according to the ratio of growth taking place in urbanized/RMA areas versus the entire county for the period 1980 to 1990.

Under controlled development, intercounty movement of households and employment is undertaken initially. Then intracounty moves are made between developed and undeveloped areas. In comparison to uncontrolled development, controlled-development densities in developed areas are increased by 20 percent. Clustering and density increase is encouraged for 20 percent of residential development in the undeveloped areas under controlled development. Through this process, land is preserved in the undeveloped areas by accommodating more development in the developed areas through "design" increases in density (approximately 20 percent), an increase not usually visible to the naked eye. Additionally, land is preserved under the controlled-growth scenario through the share in outer areas that is clustered at twice the prevailing density.

### Nonresidential Structures

Employment growth is translated to the demand for nonresidential structures by converting employment growth by SIC into employment growth by type of

structure, as indicated previously. Conversion to structure type generates the aggregate number of employees to be housed in certain types of structures. Development practice determines the size of the structure and space per employee by type of use—office, retail, and distribution/warehouse. Due to the high vacancy rates associated with nonresidential structures, in calculating the actual space of structures required to accommodate the particular growth of employees, the building size as determined by type or use is divided by the occupancy characteristics typical of these structures.

### Conversion to Land Requirements—Residential

To convert residential structures to the demand for raw land, densities and platting coefficients are used. Historical development densities by type of unit will be discussed in the following section.

In addition to the land required for residential units, a certain amount of land is needed for roads, street hardware, utilities, and open space. The total amount of land needed is determined by applying a platting coefficient, which also will be discussed subsequently.

### Conversion to Land Requirements—Nonresidential

Nonresidential structures are converted to land demand for nonresidential development using a floor-area ratio (FAR) and platting coefficients. Floor-area ratios for the study counties are obtained from industry sources and from national commercial Realtors.

Once the building size is known, it can be divided by the approximate floor-area ratio to determine the aggregate lot size per structure. Again, a platting coefficient is used (Burchell et al. 2000).

Courtesy of T. Delcorso

## Definitions, Data Sources, and Manipulations: Residential

In order to convert residential growth into structures, and then to the demand for raw land, housing types, densities, and platting coefficients are used. Housing type governs whether the household will move into a single-family detached, single-family attached (town house), multifamily building, or a manufactured home. Density is the number of units that can be developed on an acre of land. Finally, the platting coefficient is the ratio of the land required for internal roads and for inefficiencies of dividing the land into lots to the total land area. For example, a 125-acre parcel to be developed for single-family residential use would use 25 acres to accommodate internal roads and the inefficiencies of lot subdivision. The remaining 100 acres developed at a density of four units to the acre allow 400 single-family homes on the tract. This would provide each homeowner with a building lot of approximately 11,000 square feet. Its platting coefficient would be 0.20. Housing types, residential densities and platting coefficients are each discussed below.

### Housing Mix

Household increase is the net growth of future households that will require additional housing. New construction will be undertaken to accommodate this housing demand. To define the ratio of housing types in the future, historical data is used. Employing the 1980 and 1990 *Census of Population and Housing*, the increase in each housing type during that period is determined for individual counties. This percentage increase from 1980 to 1990 is used to project the future mix of housing that will be put in place in each county from 2000 to 2025.

The percentage of new construction in each county from 1980 to 1990 is divided into four housing types: single-family detached (SFD); single-family attached (SFA); multifamily (MF); and mobile homes (MH). These are shown in the accompanying Table 6.3. Aggregate summaries are included to provide a sense of the housing mix as a function of both county development type and regional location.

## Table 6.3
## National Housing Mix by County Development Type—Percentage of Construction (1980–1990)

| Census Division | County Development Type | Housing Mix | | | |
|---|---|---|---|---|---|
| | | Single-Family Detached (SFD) | Single-Family Attached (SFA) | Multifamily (MF) | Manufactured Homes (HM) |
| New England | Undeveloped | 64.1 | 4.8 | 9.6 | 21.5 |
| | Rural | 62.1 | 9.1 | 16.9 | 11.9 |
| | Rural Center | 49.3 | 0.0 | 18.0 | 32.7 |
| | Suburban | 43.6 | 17.1 | 28.3 | 11.0 |
| | Urban | N/A | N/A | N/A | N/A |
| | Urban Center | 0.0 | 24.9 | 51.4 | 23.7 |
| Mid-Atlantic | Undeveloped | 50.8 | 4.1 | 4.0 | 41.1 |
| | Rural | 50.3 | 17.0 | 11.5 | 21.2 |
| | Rural Center | 48.7 | 13.7 | 9.0 | 28.6 |
| | Suburban | 59.3 | 22.1 | 7.3 | 11.3 |
| | Urban | 33.1 | 37.8 | 13.1 | 16.0 |
| | Urban Center | 14.6 | 15.8 | 34.6 | 35.1 |
| East North Central | Undeveloped | 55.4 | 1.9 | 4.1 | 38.6 |
| | Rural | 46.1 | 6.0 | 15.0 | 32.9 |
| | Rural Center | 49.5 | 9.8 | 14.0 | 26.7 |
| | Suburban | 45.8 | 12.1 | 25.4 | 16.7 |
| | Urban | N/A | 12.8 | 15.5 | 23.5 |
| | Urban Center | 21.9 | 38.4 | 11.6 | 28.1 |
| West North Central | Undeveloped | 50.1 | 3.8 | 5.6 | 40.5 |
| | Rural | 52.6 | 7.6 | 16.7 | 23.1 |
| | Rural Center | 54.5 | 13.1 | 5.3 | 27.1 |
| | Suburban | 46.6 | 8.6 | 28.2 | 16.6 |
| | Urban | 53.8 | 17.5 | 21.6 | 7.1 |
| | Urban Center | 41.9 | 17.5 | 33.5 | 7.1 |
| South Atlantic | Undeveloped | 36.1 | 3.4 | 12.9 | 47.6 |
| | Rural | 42.4 | 6.3 | 17.8 | 33.6 |
| | Rural Center | 36.8 | 5.3 | 24.2 | 33.7 |
| | Suburban | 38.9 | 15.9 | 32.7 | 12.5 |
| | Urban | 42.6 | 15.3 | 35.2 | 6.9 |
| | Urban Center | 6.4 | 20.7 | 61.7 | 11.2 |
| East South Central | Undeveloped | 18.5 | 6.9 | 11.5 | 39.1 |
| | Rural | 38.9 | 3.4 | 18.4 | 39.3 |
| | Rural Center | 42.5 | 6.9 | 11.5 | 39.1 |
| | Suburban | 44.5 | 3.4 | 27.7 | 24.4 |
| | Urban | 38.1 | 10.3 | 40.0 | 11.6 |
| | Urban Center | 26.2 | 0.0 | 54.8 | 19.0 |
| West South Central | Undeveloped | 31.7 | 2.9 | 4.9 | 60.5 |
| | Rural | 44.8 | 3.4 | 13.3 | 38.5 |
| | Rural Center | 51.0 | 5.5 | 24.8 | 18.7 |
| | Suburban | 46.0 | 3.6 | 24.6 | 25.8 |
| | Urban | 46.6 | 7.3 | 37.2 | 9.9 |
| | Urban Center | 40.8 | 4.7 | 46.6 | 7.9 |
| Mountain | Undeveloped | 46.9 | 6.4 | 7.9 | 38.8 |
| | Rural | 67.0 | 8.0 | 7.5 | 17.5 |
| | Rural Center | 35.2 | 10.5 | 28.4 | 25.9 |
| | Suburban | 41.0 | 11.1 | 34.8 | 13.1 |
| | Urban | 50.5 | 10.5 | 23.7 | 15.3 |
| | Urban Center | 43.1 | 13.4 | 33.7 | 10.8 |
| Pacific | Undeveloped | 56.5 | 6.3 | 13.5 | 23.7 |
| | Rural | 55.3 | 11.4 | 14.9 | 18.5 |
| | Rural Center | 45.9 | 3.3 | 26.3 | 24.5 |
| | Suburban | 40.7 | 12.8 | 32.6 | 13.9 |
| | Urban | 28.5 | 23.3 | 36.5 | 11.7 |
| | Urban Center | 15.8 | 0.0 | 51.3 | 32.9 |
| United States | Undeveloped | 45.9 | 4.1 | 8.6 | 41.4 |
| | Rural | 47.6 | 8.0 | 15.8 | 28.6 |
| | Rural Center | 42.0 | 8.0 | 22.2 | 27.8 |
| | Suburban | 43.1 | 13.7 | 28.9 | 14.3 |
| | Urban | 39.2 | 17.6 | 33.1 | 10.1 |
| | Urban Center | 36.1 | 10.1 | 42.1 | 11.7 |

*Source: U.S. Census of Population and Housing, 1980 and 1990. Note:* Data used for uncontrolled- and controlled-development scenarios 2000 to 2025.

**Table 6.4**
**Residential Vacancy Rates by County Development Type and Census Division**

| County Division | Undeveloped and Rural (%) | Suburban and Rural Center (%) | Urban and Urban Center (%) | All County Types (%) |
|---|---|---|---|---|
| New England | 24.9 | 9.6 | 9.0 | 20.1 |
| Mid-Atlantic | 16.5 | 6.8 | 5.9 | 14.1 |
| East North Central | 14.6 | 6.3 | 6.0 | 13.6 |
| West North Central | 14.5 | 7.0 | 6.7 | 14.0 |
| South Atlantic | 13.6 | 8.6 | 8.7 | 12.9 |
| East South Central | 10.4 | 7.4 | 7.5 | 10.2 |
| West South Central | 18.1 | 11.4 | 11.5 | 17.5 |
| Mountain | 24.0 | 10.8 | 6.6 | 22.2 |
| Pacific | 16.1 | 7.0 | 5.2 | 14.3 |
| United States | 15.6 | 8.3 | 7.5 | 14.7 |

*Source: U.S. Census of Population and Housing, 1990.*

## Vacancy Rates

Vacancy rates affect the incidence of housing units within a housing market. To account for a sufficient number of units to accommodate both functional and preference-based vacancy, projected units are multiplied by 1.0 plus the prevailing vacancy rate expressed as a fraction. In counties that have a large seasonal vacancy rate (more than 10 percent), the dwelling-unit increase is limited to the nonseasonal rate plus one-half of the seasonal rate. Table 6.4 presents the average vacancy rate by county development types for each of the nine census divisions.

## Residential Densities

Residential densities are derived from new construction source data obtained in the Census Bureau's *Survey of Construction, Survey of New Mobile Home Placements,* and *Survey of Market Absorption.* The Department of Housing and Urban Development (HUD) sponsored all or part of each of these surveys. The data covers construction starts and completions in 1995 through 1997. From start to finish, the data covers about a 3.5-year period, from late 1994 (September) to early 1998 (March). While the surveys are national, samples are geographically keyed to census divisions (U.S. Department of Commerce 1999).

Courtesy of C. Galley

More than 53,000 construction sites are sampled in the above survey. They represent over 3 million new dwelling units constructed throughout the United States. The relative magnitude of the samples between and within census divisions correlates with the growth of each division and its component parts. Each sample has an associated weight, which is the estimated number of units the sample represents. Only the single-family attached and detached housing has density reported for it. These densities are shown in Table 6.5.

Information from industry sources (Urban Land Institute, National Association of Homebuilders) and from Rutgers University studies nationwide, is used to relate the single-family attached and single-family detached densities reported above to multifamily and manufactured home densities at the census division level. Relative average densities defining urban, suburban, rural, and undeveloped counties in a group of states are used to adjust census division densities to develop a unique future density by housing type for each county. These are shown in Table 6.6.

Densities for the controlled-growth scenario use the uncontrolled-growth densities modified as follows.

**Table 6.5**
**Single-Family Housing Densities**

| Census Region and Division | Single-Family Detached | | | | Single-Family Attached | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of Units | Total Acreage (Acres) | Average Lot Size (Acres) | Average Density (Units per Acre) | Number of Units | Total Acreage (Acres) | Average Lot Size (Acres) | Average Density (Units per Acre) |
| **Northeast Region** | **264,708** | **239,241** | **0.90** | **3.24** | **41,591** | **5,261** | **0.13** | **13.09** |
| New England | 96,488 | 92,630 | 0.96 | 2.03 | 7,134 | 1,264 | 0.18 | 6.96 |
| Mid-Atlantic | 168,220 | 146,611 | 0.87 | 3.93 | 34,457 | 3,997 | 0.12 | 14.36 |
| **Midwest Region** | **617,384** | **501,496** | **0.81** | **3.11** | **46,757** | **7,071** | **0.15** | **10.83** |
| East North Central | 349,059 | 349,059 | 0.84 | 3.01 | 20,723 | 3,524 | 0.17 | 11.16 |
| West North Central | 152,437 | 152,437 | 0.76 | 3.33 | 26,034 | 3,547 | 0.14 | 10.56 |
| **South Region** | **1,337,669** | **784,746** | **0.59** | **3.97** | **97,213** | **9,626** | **0.10** | **15.74** |
| South Atlantic | 827,030 | 476,927 | 0.58 | 3.70 | 78,365 | 6,968 | 0.09 | 16.79 |
| East South Central | 155,031 | 155,031 | 0.83 | 3.45 | 7,541 | 1,408 | 0.19 | 10.56 |
| West South Central | 152,789 | 152,789 | 0.47 | 4.95 | 11,307 | 1,250 | 0.11 | 11.86 |
| **West Region** | **785,914** | **342,609** | **0.44** | **5.73** | **30,437** | **3,125** | **0.10** | **13.79** |
| Mountain | 367,666 | 175,633 | 0.48 | 5.36 | 16,015 | 1,536 | 0.10 | 14.11 |
| Pacific | 418,248 | 166,976 | 0.40 | 6.05 | 14,422 | 1,589 | 0.11 | 13.44 |
| **United States** | **3,005,675** | **1,868,092** | **0.62** | **4.19** | **215,998** | **25,083** | **0.12** | **12.16** |

*Source: U.S. Survey of Construction, 1997.*

Density in urban center, urban, suburban, and rural center counties is increased by 20 percent regardless of where it occurs within a county. In undeveloped and rural counties, development densities remain unchanged under the controlled-growth scenario. Clustering is undertaken for 20 percent of all residential development under the controlled-growth scenario in the undeveloped portions of those counties. Densities for the controlled-growth scenario appear in Table 6.7.

### Platting Coefficients

To obtain the gross land required for residential housing, additional land must be added for roads, street hardware, utilities, and open space. Other land additive factors are the inefficiencies of subdividing larger parcels into building lots, the extra space of cul-de-sacs, and other rights-of-way requirements. This additional land is expressed as a platting coefficient that varies from a low of 10 percent for multifamily units to a high of 20 percent for single-family units. Platting coefficients used in this study by housing type are shown in Table 6.8.

Courtesy of G Lowenstein

## Definitions, Data Sources, and Manipulations: Nonresidential

Nonresidential uses are grouped into four general categories, each of which has an associated FAR. In order to convert nonresidential structures to the demand for raw land, FARs and platting coefficients are used. A FAR is the relationship between the amount of floor space in a building and the aggregate area of a developed land parcel. A 10,000-square-foot building on a one-acre lot (43,560 ft.$^2$) has a floor-area ratio of approximately 0.23. Floor-area ratios for the study are derived from prevailing industrial standards and from various national commercial Realtors. They vary somewhat by existing county development pattern (urban, suburban, rural) and less so by type of nonresidential use (retail, office, distribution/warehouse).

**Table 6.6**
**Residential Densities—Uncontrolled-Growth Scenario**
(Dwelling Units per Acre)

| Census Division | County Development Type | Developed Areas | | | | Undeveloped Areas | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SFD | SFA | MF | MH | SFD | SFA | MF | MH |
| New England | Undeveloped/Rural | 1.46 | 6.26 | 15.31 | 1.46 | 0.73 | N/A | N/A | 0.99 |
| | Rural Center | 2.19 | 7.40 | 19.14 | 2.19 | 1.97 | N/A | N/A | 1.97 |
| | Suburban | 3.29 | 7.70 | 19.14 | 3.29 | 2.56 | 5.99 | N/A | N/A |
| | Urban/Urban Center | 7.67 | 11.83 | 23.66 | 7.67 | 6.58 | 7.66 | N/A | N/A |
| Mid-Atlantic | Undeveloped/Rural | 2.37 | 9.82 | 31.59 | 3.20 | 1.19 | N/A | N/A | 1.60 |
| | Rural Center | 3.56 | 12.28 | 39.49 | 4.81 | 1.78 | N/A | N/A | 2.40 |
| | Suburban | 5.34 | 15.01 | 39.49 | 7.12 | 4.15 | 9.39 | N/A | N/A |
| | Urban/Urban Center | 12.46 | 18.55 | 48.82 | 12.46 | 10.68 | 12.00 | N/A | N/A |
| East North Central | Undeveloped/Rural | 3.06 | 5.66 | 9.60 | 4.88 | 0.95 | N/A | N/A | 3.68 |
| | Rural Center | 3.82 | 7.08 | 12.00 | 6.10 | 1.42 | N/A | N/A | 5.52 |
| | Suburban | 4.26 | 12.00 | 16.85 | 7.43 | 1.89 | 8.06 | N/A | N/A |
| | Urban/Urban Center | 6.63 | 12.67 | 18.64 | 9.03 | 3.44 | 8.92 | N/A | N/A |
| West North Central | Undeveloped/Rural | 2.93 | 5.11 | 9.08 | 5.39 | 0.91 | N/A | N/A | 2.20 |
| | Rural Center | 3.66 | 6.39 | 11.35 | 6.74 | 1.36 | N/A | N/A | 2.75 |
| | Suburban | 4.09 | 10.82 | 15.95 | 8.23 | 1.82 | 7.36 | N/A | N/A |
| | Urban/Urban Center | 6.36 | 11.43 | 17.64 | 9.99 | 3.30 | 8.14 | N/A | N/A |
| South Atlantic | Undeveloped/Rural | 3.15 | 9.43 | 13.26 | 3.22 | 0.58 | N/A | N/A | 0.58 |
| | Rural Center | 4.73 | 14.14 | 19.90 | 4.83 | 0.87 | N/A | N/A | 0.87 |
| | Suburban | 6.25 | 17.41 | 36.77 | 6.36 | 3.20 | 7.98 | N/A | N/A |
| | Urban/Urban Center | 6.25 | 20.67 | 60.11 | 6.36 | 3.20 | 9.43 | N/A | N/A |
| East South Central | Undeveloped/Rural | 4.15 | 6.04 | 8.34 | 4.15 | 0.77 | N/A | N/A | 0.77 |
| | Rural Center | 6.22 | 9.06 | 12.51 | 6.22 | 1.15 | N/A | N/A | 1.15 |
| | Suburban | 8.23 | 11.15 | 23.13 | 8.23 | 4.21 | 5.11 | N/A | N/A |
| | Urban/Urban Center | 8.23 | 13.24 | 37.80 | 8.23 | 4.21 | 6.04 | N/A | N/A |
| West South Central | Undeveloped/Rural | 3.64 | 6.17 | 9.37 | 4.31 | 0.67 | N/A | N/A | 0.74 |
| | Rural Center | 5.45 | 9.25 | 14.05 | 6.46 | 1.01 | N/A | N/A | 1.11 |
| | Suburban | 7.22 | 11.39 | 25.97 | 8.51 | 3.69 | 5.22 | N/A | N/A |
| | Urban/Urban Center | 7.22 | 13.52 | 42.46 | 8.51 | 3.69 | 6.17 | N/A | N/A |
| Mountain | Undeveloped/Rural | 4.22 | 7.92 | 11.15 | 4.66 | 0.78 | N/A | N/A | 0.80 |
| | Rural Center | 6.32 | 11.89 | 16.72 | 6.99 | 1.17 | N/A | N/A | 1.21 |
| | Suburban | 8.37 | 14.63 | 30.90 | 9.22 | 4.28 | 6.71 | N/A | N/A |
| | Urban/Urban Center | 8.37 | 17.37 | 50.51 | 9.22 | 4.28 | 7.92 | N/A | N/A |
| Pacific | Undeveloped/Rural | 4.99 | 7.27 | 10.62 | 5.26 | 0.92 | N/A | N/A | 0.91 |
| | Rural Center | 7.49 | 10.90 | 15.93 | 7.90 | 1.38 | N/A | N/A | 1.36 |
| | Suburban | 9.91 | 13.42 | 29.43 | 10.41 | 5.07 | 6.15 | N/A | N/A |
| | Urban/Urban Center | 9.91 | 15.93 | 48.12 | 10.41 | 5.07 | 7.27 | N/A | N/A |

*Sources: U.S. Survey of Construction, 1997.* Development data for each county by the Center for Urban Policy Research, Rutgers University.

*Notes:* Data used for projection period 2000–2025. N/A: not applicable. The four housing types are single-family detached (SFD), single-family attached (SFA), multifamily (MF), and manufactured homes (HM).

A platting coefficient is used to account for road and utility land conversion and inefficiencies in land design to allow this potential nonresidential land parcel to become an improved office, retail, or industrial use.

## Nonresidential Densities

Nonresidential uses of the types discussed above require different physical plants and different land development areas. The FAR is the key measure of nonresidential density and is defined for each nonresidential

**Table 6.7**
**Residential Densities—Controlled-Growth Scenario**
(Dwelling Units per Acre)

| Census Division | County Development Type | Developed Areas | | | | Undeveloped Areas | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SFD | SFA | MF | MH | SFD | SFA | MF | MH |
| New England | Undeveloped/Rural | 1.46 | 6.26 | 15.31 | 1.46 | 0.73 | N/A | N/A | 0.99 |
| | Rural Center | 2.63 | 8.88 | 22.97 | 2.63 | 2.37 | N/A | N/A | 2.37 |
| | Suburban | 3.95 | 9.24 | 22.97 | 3.95 | 3.07 | 7.18 | N/A | N/A |
| | Urban/Urban Center | 9.21 | 14.20 | 28.40 | 9.21 | 7.89 | 9.19 | N/A | N/A |
| Mid-Atlantic | Undeveloped/Rural | 2.37 | 9.82 | 31.59 | 3.20 | 1.19 | N/A | N/A | 1.60 |
| | Rural Center | 4.27 | 14.73 | 47.39 | 5.77 | 2.14 | N/A | N/A | 2.88 |
| | Suburban | 6.41 | 18.01 | 47.39 | 8.55 | 4.98 | 11.26 | N/A | N/A |
| | Urban/Urban Center | 14.95 | 22.26 | 58.59 | 14.95 | 12.82 | 14.41 | N/A | N/A |
| East North Central | Undeveloped/Rural | 3.06 | 5.66 | 9.60 | 4.88 | 0.95 | N/A | N/A | 3.68 |
| | Rural Center | 4.58 | 8.49 | 14.40 | 7.31 | 1.70 | N/A | N/A | 6.63 |
| | Suburban | 5.11 | 14.40 | 20.22 | 8.92 | 2.27 | 9.68 | N/A | N/A |
| | Urban/Urban Center | 7.95 | 15.20 | 22.36 | 10.84 | 4.13 | 10.70 | N/A | N/A |
| West North Central | Undeveloped/Rural | 2.93 | 5.11 | 9.08 | 5.39 | 0.91 | N/A | N/A | 2.20 |
| | Rural Center | 4.40 | 7.66 | 13.62 | 8.09 | 1.64 | N/A | N/A | 3.30 |
| | Suburban | 4.91 | 12.99 | 19.13 | 9.87 | 2.18 | 8.83 | N/A | N/A |
| | Urban/Urban Center | 7.63 | 13.72 | 21.16 | 11.99 | 3.96 | 9.77 | N/A | N/A |
| South Atlantic | Undeveloped/Rural | 3.15 | 9.43 | 13.26 | 3.22 | 0.58 | N/A | N/A | 0.58 |
| | Rural Center | 5.67 | 16.97 | 23.88 | 5.79 | 1.05 | N/A | N/A | 1.05 |
| | Suburban | 7.50 | 20.89 | 44.12 | 7.64 | 3.84 | 9.57 | N/A | N/A |
| | Urban/Urban Center | 7.50 | 24.81 | 72.13 | 7.64 | 3.84 | 11.32 | N/A | N/A |
| East South Central | Undeveloped/Rural | 4.15 | 6.04 | 8.34 | 4.15 | 0.77 | N/A | N/A | 0.77 |
| | Rural Center | 7.47 | 10.87 | 15.02 | 7.47 | 1.38 | N/A | N/A | 1.38 |
| | Suburban | 9.88 | 13.38 | 27.75 | 9.88 | 5.05 | 6.13 | N/A | N/A |
| | Urban/Urban Center | 9.88 | 15.89 | 45.37 | 9.88 | 5.05 | 7.25 | N/A | N/A |
| West South Central | Undeveloped/Rural | 3.64 | 6.17 | 9.37 | 4.31 | 0.67 | N/A | N/A | 0.74 |
| | Rural Center | 6.54 | 11.10 | 16.86 | 7.75 | 1.21 | N/A | N/A | 1.34 |
| | Suburban | 8.66 | 13.66 | 31.17 | 10.22 | 4.43 | 6.26 | N/A | N/A |
| | Urban/Urban Center | 8.66 | 16.22 | 50.95 | 10.22 | 4.43 | 7.40 | N/A | N/A |
| Mountain | Undeveloped/Rural | 4.22 | 7.92 | 11.15 | 4.66 | 0.78 | N/A | N/A | 0.80 |
| | Rural Center | 7.59 | 14.26 | 20.06 | 8.39 | 1.40 | N/A | N/A | 1.45 |
| | Suburban | 10.04 | 17.56 | 37.08 | 11.06 | 5.14 | 8.05 | N/A | N/A |
| | Urban/Urban Center | 10.04 | 20.85 | 60.62 | 11.06 | 5.14 | 9.51 | N/A | N/A |
| Pacific | Undeveloped/Rural | 4.99 | 7.27 | 10.62 | 5.26 | 0.92 | N/A | N/A | 0.91 |
| | Rural Center | 8.99 | 13.08 | 19.11 | 9.47 | 1.66 | N/A | N/A | 1.63 |
| | Suburban | 11.89 | 16.10 | 35.32 | 12.49 | 6.09 | 7.38 | N/A | N/A |
| | Urban/Urban Center | 11.89 | 19.12 | 57.74 | 12.49 | 6.09 | 8.72 | N/A | N/A |

*Source: U.S. Survey of Construction, 1997,* adjusted by the Center for Urban Policy Research, Rutgers University.

*Notes:* Data used for projection period 2000–2025. N/A: not applicable. The four housing types are single-family detached (SFD), single-family attached (SFA), multifamily (MF), and manufactured homes (HM).

type and county development type. FARs for developed areas within the county types are different from those for undeveloped areas. The study did not differentiate between regions of the country due to the similarity of current nonresidential developments nationwide. Table 6.9 presents the nonresidential FARs used in the uncontrolled-growth scenario.

The FARs for the controlled-growth scenario are the uncontrolled-growth densities modified to reflect the objectives of the controlled-growth scenario. Under the controlled-growth scenario, densities for all county development types are increased by 10 percent in and around the developed areas, while the densities in the undeveloped areas are the same as in the uncontrolled-

**Table 6.8**
**Residential Platting Coefficients**

| Housing Type | Platting Coefficient |
|---|---|
| Single-Family Detached | 0.20 |
| Single-Family Attached | 0.15 |
| Multifamily | 0.10 |
| Manufactured | 0.15 |

*Source:* Urban Design Associates, 1994, and the Center for Urban Policy Research, Rutgers University.

**Table 6.9**
**Nonresidential Densities (FARs)—Uncontrolled-Growth Scenario**

| County Development Type | Developed Areas | | | | Undeveloped Areas | | | |
|---|---|---|---|---|---|---|---|---|
| | Office | Retail | Industry | Warehouse | Office | Retail | Industry | Warehouse |
| Undeveloped/Rural | 0.10 | 0.15 | 0.08 | 0.05 | 0.09 | 0.13 | 0.07 | 0.04 |
| Suburban/Rural Center | 0.20 | 0.30 | 0.15 | 0.10 | 0.10 | 0.15 | 0.08 | 0.05 |
| Urban/Urban Center | 0.40 | 0.60 | 0.30 | 0.20 | 0.20 | 0.30 | 0.15 | 0.10 |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 6.10**
**Nonresidential Densities (FARs)—Controlled-Growth Scenario**

| County Development Type | Developed Areas | | | | Undeveloped Areas | | | |
|---|---|---|---|---|---|---|---|---|
| | Office | Retail | Industry | Warehouse | Office | Retail | Industry | Warehouse |
| Undeveloped/Rural | 0.11 | 0.17 | 0.08 | 0.06 | 0.09 | 0.13 | 0.07 | 0.04 |
| Suburban/Rural Center | 0.22 | 0.33 | 0.17 | 0.11 | 0.10 | 0.15 | 0.08 | 0.05 |
| Urban/Urban Center | 0.44 | 0.66 | 0.33 | 0.22 | 0.20 | 0.30 | 0.15 | 0.10 |

*Source:* Center for Urban Policy Research, Rutgers University.

growth scenario. Nonresidential densities for the controlled-growth scenario are presented in Table 6.10.

## Nonresidential Structures

Employment growth is transferred to the demand for nonresidential structures by relating employment growth by type (the Standard Industrial Classification [SIC] categories, plus government) to structures used in the conduct of those businesses or occupations. Ten of the employment sectors are collapsed into four categories of structures. The number of sectors reduce to 10 by combining local and federal government employment into one category and not including either military or farm structures. Table 6.11 presents this conversion. Conversion to structure type generates the aggregate number of office, retail, and warehouse structures. Employees determine the size of future structures according to the relationships shown in Table 6.12. Nonresidential structures are assumed to be developed as specification-constructed buildings of the size indicated in that exhibit.

## Vacancy Rates

Vacancy rates are part of the economic construct of nonresidential property markets. To maintain this balance into the future and to recognize the land conversion needs within a community, the required amount of nonresidential space is defined as structure-housed new employment times one plus the vacancy rate expressed as a fraction. Nonresidential vacancy rates are shown in Table 6.13.

**Table 6.11**
**Nonresidential Space by Structure Type from Employment Growth by SIC (1980–1990)**

| Employment Type | Structure Type | | | |
|---|---|---|---|---|
| Agricultural Services | Warehouse | (40%) | Retail | (60%) |
| Mining | Industrial | (20%) | No Structure | (80%) |
| Construction | Warehouse | (60%) | Office | (40%) |
| Manufacturing | Industrial | (100%) | | |
| Transportation, Communications, and Utilities (TCU) | Industrial | (70%) | Office | (30%) |
| Wholesale | Warehouse | (95%) | Office | (5%) |
| Retail | Retail | (90%) | Office | (10%) |
| Finance, Insurance, Real Estate (FIRE) | Office | (100%) | | |
| Services | Retail | (70%) | Office | (30%) |
| Government | Office | (95%) | Warehouse | (5%) |

*Source:* Urban Land Institute, *Development Impact Assessment Handbook*, 1995.

**Table 6.12**
**Nonresidential-Building Size Requirements Related to Space per Employee**

| Structure Type | Space per Employee (Square Feet) | Average Nonresidential Building Size (Square Feet) |
|---|---|---|
| Office | 333 | 25,000 |
| Retail | 400 | 10,000 |
| Industrial | 667 | 10,000 |
| Warehouse | 1,000 | 50,000 |

*Source:* Urban Land Institute, *Development Impact Assessment Handbook*, 1995.

**Table 6.13**
**Nonresidential Vacancy Rates by Structure Type**

| Structure Type | Vacancy Rate |
|---|---|
| Office | 0.20 |
| Retail | 0.10 |
| Industrial | 0.30 |
| Warehouse | 0.30 |

***Source:*** U.S. National Commercial Realtors, 1999.

**Table 6.14**
**Nonresidential Platting Coefficients by Structure Type**

| Structure Type | Platting Coefficient |
|---|---|
| Office | 0.20 |
| Retail | 0.05 |
| Industrial | 0.15 |
| Warehouse | 0.10 |

*Source:* UDA Associates, 1994.

### Platting Coefficients

An amount of land for roads, street hardware, utilities, and so on, must be added to the land required for nonresidential space. The percentage used to obtain an estimate of these additional land requirements is the platting coefficient. The nonresidential platting coefficient varies from a low of 5 percent for retail structures to a high of 20 percent for office buildings. Platting coefficients by nonresidential use as used in this study are shown in Table 6.14.

## LAND SUPPLY AND LAND OF VARIOUS TYPES

### Total Available Land

Available land is land that is either undeveloped or lends itself to redevelopment. The majority of the former category is agricultural and forest lands. The remaining "other" land is either mountainous, bar-

Courtesy of C. Galley

ren, or in the case of Alaska, tundra. Included in both categories above are lands considered environmentally sensitive or fragile.

Available rural land in the United States, of the three categories discussed above, amounts to approximately 1.8 billion acres. New Jersey, not counting land that is to be preserved for open space in the future, has remaining about six times the amount of land that would be converted during the course of a 25-year development period. Alaska has 3,300 times the amount that would be converted during the period. On average, in the United States, there exists 100 times the amount of land that would be converted for development. Coastal states on average have 15 to 50 times the amount of land required for development over a 25-year period. For the purposes of a 25-year projection period, available land to house this development is in relatively plentiful supply.

## Agricultural Land

Agricultural land is acreage that best supports farming. This type of land is characterized by favorable soil quality, growing season, and moisture supply, and under careful management can be farmed continuously at high levels of productivity without degrading either the environment or the resource base. Prime farmland includes land that is currently used as cropland, pastureland, rangeland, woodland, and other uses, e.g., roads, buildings. Woodland portions of qualified farms are defined as acting as a windbreak, watershed, or buffer to farming operations The agricultural land for each county is reported in the *1997 U.S. Census of Agriculture*, which is a product of the U.S. Department of Agriculture. In prior years, this census was a product of the Census Bureau (U.S. Department of Commerce). The most important change from previous census data is that farms with all their acres in the Conservation Reserve Program or the Wetlands Reserve Program are now included in the census tabulation, thus providing greater completeness in the acreage reported. The census delineates farmland in the various uses mentioned above. Table 6.15 summarizes the total agricultural land in each state and census division as reported in the *1997 U.S. Census of Agriculture* and the percentage of the state land that is in agricultural use.

## Environmentally Fragile Land

Environmentally fragile lands are lands that are particularly vulnerable to the activities of nature and man. They do not lend themselves well to development. The primary categories of environmentally fragile lands that are water-based are *floodplains, wetlands,*

**Table 6.15**
**Agricultural Land by Census Division and State**
(in Thousands of Acres and Percentage of Land Area)

| Census Division and State | Agricultural Land (in Acres) | Agricultural Land (%) | Census Division and State | Agricultural Land (in Acres) | Agricultural Land (%) |
|---|---|---|---|---|---|
| **New England** | **3,822.0** | **9.1** | **South Atlantic** | **49,259.4** | **28.3** |
| Connecticut | 359.3 | 11.3 | Delaware | 579.5 | 42.7 |
| Maine | 1,211.6 | 5.9 | District of Columbia | 0.0 | 0.0 |
| Massachusetts | 518.6 | 10.0 | Florida | 10,454.2 | 28.8 |
| New Hampshire | 415.0 | 7.0 | Georgia | 10,671.2 | 28.4 |
| Rhode Island | 55.3 | 7.9 | Maryland | 2,154.9 | 33.9 |
| Vermont | 1,262.2 | 20.5 | North Carolina | 9,122.3 | 28.7 |
| **Mid Atlantic** | **15,255.0** | **23.5** | South Carolina | 4,593.5 | 23.2 |
| New Jersey | 832.6 | 17.2 | Virginia | 8,228.2 | 32.6 |
| New York | 7,254.5 | 23.3 | West Virginia | 3,455.5 | 22.3 |
| Pennsylvania | 7,167.9 | 24.7 | **East South Central** | **43,285.8** | **37.2** |
| **East North Central** | **81,191.9** | **51.1** | Alabama | 8,704.4 | 26.3 |
| Illinois | 27,204.8 | 75.5 | Kentucky | 13,334.2 | 51.6 |
| Indiana | 15,111.0 | 65.3 | Mississippi | 10,124.8 | 33.2 |
| Michigan | 9,872.8 | 26.5 | Tennessee | 11,122.4 | 41.2 |
| Ohio | 14,103.1 | 53.4 | **West South Central** | **186,768.4** | **67.2** |
| Wisconsin | 14,900.2 | 41.5 | Arkansas | 14,365.0 | 42.2 |
| **West North Central** | **241,116.4** | **72.8** | Louisiana | 7,876.5 | 26.3 |
| Iowa | 31,166.7 | 86.5 | Oklahoma | 33,218.7 | 74.3 |
| Kansas | 46,089.3 | 87.5 | Texas | 131,308.3 | 77.5 |
| Minnesota | 25,994.6 | 48.2 | **Mountain** | **228,248.6** | **41.5** |
| Missouri | 28,826.2 | 64.6 | Arizona | 26,866.7 | 36.8 |
| Nebraska | 45,525.4 | 92.0 | Colorado | 32,634.2 | 49.0 |
| North Dakota | 19,159.3 | 42.3 | Idaho | 11,830.2 | 22.1 |
| South Dakota | 44,354.9 | 89.9 | Montana | 58,607.8 | 62.3 |
| **Pacific** | **46,966.5** | **8.1** | Nevada | 6,409.3 | 9.1 |
| Alaska | 881.0 | 0.2 | New Mexico | 45,787.1 | 61.1 |
| California | 27,698.8 | 27.4 | Utah | 12,024.7 | 22.1 |
| Hawaii | 1,439.1 | 34.8 | Wyoming | 34,088.7 | 54.5 |
| Oregon | 1,767.9 | 2.9 | | | |
| Washington | 15,179.7 | 35.1 | **United States** | **931,795.3** | **40.6** |

*Source: U.S. Census of Agriculture, 1997.*

and *critical sensitive watersheds*; those that are geologically based are *steep slopes, sinkholes,* and *erosion-prone lands*. Except for floodplains and wetlands, which are federally regulated, fragile lands are not universally protected and deserve special consideration. Besides the fragile lands within agricultural lands, the vast majority of these have some sort of tree cover, which results in their being identified as woodlands. Since there is a great deal of overlap between fragile lands and woodlands, forestland is chosen as an indicator of environmentally fragile lands. All unprotected fragile lands are considered subsumed within forestlands and are not counted separately.

The macro-perspective picture of environmentally fragile land is obtained using the U.S. Department of Agriculture's *1997 National Resource Inventory* (NRI). The NRI covers non-federal land in the United States (some 75 percent of the country's land base) and is undertaken every five years. This information captures data from 800,000 statistically selected locations throughout the United States, on land cover

**Table 6.16**
**Forestland by Census Division and State**
(in Thousands of Acres and Percentage of Land Area)

| Census Division and State | Forestland (in Acres) | Forestland (%) | Census Division and State | Forestland (in Acres) | Forestland (%) |
|---|---|---|---|---|---|
| **New England** | 30,392.8 | 72.6 | **South Atlantic** | 86,286.9 | 49.6 |
| Connecticut | 1,728.6 | 54.4 | Delaware | 347.0 | 25.6 |
| Maine | 17,633.1 | 85.1 | District of Columbia | 0.0 | 0.0 |
| Massachusetts | 2,657.3 | 51.2 | Florida | 12,255.2 | 33.7 |
| New Hampshire | 3,874.6 | 65.3 | Georgia | 21,216.3 | 56.4 |
| Rhode Island | 381.2 | 54.7 | Maryland | 2,330.7 | 36.6 |
| Vermont | 4,118.0 | 66.9 | North Carolina | 15,677.7 | 49.3 |
| **Mid Atlantic** | 34,463.6 | 53.1 | South Carolina | 10,957.7 | 55.4 |
| New Jersey | 1,624.7 | 33.6 | Virginia | 13,030.2 | 51.6 |
| New York | 17,532.8 | 56.3 | West Virginia | 10,472.1 | 67.5 |
| Pennsylvania | 15,306.1 | 52.8 | **East South Central** | 59,268.2 | 50.9 |
| **East North Central** | 44,124.5 | 27.8 | Alabama | 21,072.7 | 63.7 |
| Illinois | 3,631.4 | 10.1 | Kentucky | 10,440.4 | 40.4 |
| Indiana | 3,637.8 | 15.7 | Mississippi | 16,018.7 | 52.5 |
| Michigan | 16,237.7 | 43.6 | Tennessee | 11,736.4 | 43.5 |
| Ohio | 6,983.5 | 26.4 | **West South Central** | 45,759.8 | 16.5 |
| Wisconsin | 13,634.1 | 38.0 | Arkansas | 14,764.8 | 43.4 |
| **West North Central** | 32,094.8 | 9.7 | Louisiana | 13,114.3 | 43.8 |
| Iowa | 2,083.5 | 5.8 | Oklahoma | 7,253.9 | 16.2 |
| Kansas | 1,289.9 | 2.5 | Texas | 10,626.8 | 6.3 |
| Minnesota | 14,829.7 | 27.5 | **Mountain** | 25,247.4 | 4.6 |
| Missouri | 12,118.3 | 27.2 | Arizona | 4,261.9 | 5.8 |
| Nebraska | 799.1 | 1.6 | Colorado | 3,728.8 | 5.6 |
| North Dakota | 442.6 | 1.0 | Idaho | 3,941.9 | 7.4 |
| South Dakota | 531.7 | 1.1 | Montana | 5,279.0 | 5.6 |
| **Pacific** | 180,483.8 | 30.7 | Nevada | 296.9 | 0.4 |
| Alaska | 139,000.0 | 36.9 | New Mexico | 4,914.5 | 6.6 |
| California | 15,008.7 | 14.8 | Utah | 1,829.6 | 3.4 |
| Hawaii | 1,514.3 | 36.7 | Wyoming | 994.8 | 1.6 |
| Oregon | 12,294.5 | 19.8 | | | |
| Washington | 12,666.3 | 29.3 | **United States** | **538,121.8** | **23.2** |

*Source: National Resources Inventory, 1997.*

and land use. Table 6.16 is a listing of the forestland determined by the 1997 NRI for each state and census division and its percentage of overall land. It presents the total acres within the state or division and the percentage that forestland is of the entire state or division. The NRI information is statistically reliable for nationwide, statewide, and multicounty use. Other sources must be employed to tease out county-level data.

The micro-perspective or county-level data is obtained from the U.S. Geological Survey (USGS). The USGS, in conjunction with other institutions, has generated a 1-km resolution global land cover database. The basic source of the land cover data is the National Aeronautics and Space Administration's (NASA) high-altitude aerial photography. The database was developed on a continent-by-continent basis, using 1-km Advanced Very High Resolution Radiometer (AVHRR) during the period April 1992 through March 1993.

For this study, forestland data was the main item taken from the North American Continent database for the


Courtesy of C. Galley

reasons described above. Farmland data was also gathered where required to estimate missing data in the *U.S. Census of Agriculture*.

### Land Conversion by Type

Land is developed in the most economic manner available to the developing agent. Whether due to small lots, brownfields, or existing zoning requirements, developers are drawn to undeveloped parcels usually beyond the edge of existing development. In these locations, the land needs only to be cleared of natural growth. In the same vein, the developer will also avoid difficult terrain, preferring level or near-level ground. Except in mountainous and barren portions of the country, the land most vulnerable to this type of development is either agricultural land or woodlands, which are the least regulated and the most plentiful of the categories of available, privately held land.

Agricultural land and forestland are the prime sources of land converted to residential and nonresidential uses by development. It is reasonable to assume that if agricultural land or forestland is a specified percentage of a county's available land, then on average, that percentage of an acre of agricultural land or forestland will be converted into the residential and nonresidential uses for each whole acre of land converted. In counties wherein no developed areas are defined, the percentage of agricultural land and forestland is based upon the county's entire land area. Where developed areas exist within a county, the available area for land conversion is considered reduced. In these counties, the percentage of agricultural land and forestland is determined using the county's remaining undeveloped and rural land area. In the cases where counties have significant developed areas and the undeveloped areas are less than the existing total of agricultural and forestland, then the agricultural and forest land area is used as the basis of the available land area. All land is taken for conversion according to the percentage incidence of the three major types of land in a state: agriculture, forest, and other.

## RESULTS OF THE ASSESSMENT: RESIDENTIAL AND NONRESIDENTIAL GROWTH

Tables 6.17 and 6.18 show types and amounts of residential and nonresidential development likely to take place in the United States and its major regions under the two proposed development scenarios. Table 6.17 shows differences in magnitudes of development across types of counties due to *intercounty* movement. Table 6.18 shows differences in developed versus undeveloped areas within counties as a result of *intracounty* movement.

### Residential Units and Nonresidential Space Constructed

Uncontrolled development in the 3,091 counties nationwide produces about 53 million development units (26.49 million residential; 26.48 million nonresidential)[2] over the 25-year period, 2000 to 2025.

The South, over the projection period, will gain 12.3 million residential units and 10.6 million nonresidential units, a total of nearly 23 million development units. The West will gain 8.6 million residential units and 7.4 million nonresidential units, a total of 16.0 million development units. The Midwest will receive 3.8 million residential units and 5.5 million

[2] One nonresidential development unit equals 1,000 square feet.

## Table 6.17
## Residential, Nonresidential, and Total Units in Urban/Suburban/Rural Center Counties versus Rural/Undeveloped Counties—Uncontrolled- and Controlled-Growth Intercounty Scenario: 2000 to 2025
(One Unit of Nonresidential Space Equals 1,000 Square Feet)

| Region | Type of Development | Uncontrolled-Growth Scenario | | | Controlled-Growth Scenario | | | Difference in Urban/ Suburban / Rural Center |
|---|---|---|---|---|---|---|---|---|
| | | Urban/ Suburban/ Rural Center | Rural/Un-developed | Total | Urban/ Suburban/ Rural Center | Rural/Un-developed | Total | |
| Northeast | Residential | 1,006,117 | 794,995 | 1,801,112 | 1,074,430 | 647,062 | 1,721,492 | 68,313 |
| | Nonresidential | 2,041,456 | 946,663 | 2,988,118 | 2,174,707 | 794,738 | 2,969,446 | 133,252 |
| | Total | 3,047,573 | 1,741,658 | 4,789,230 | 3,249,138 | 1,441,800 | 4,690,938 | 201,565 |
| Midwest | Residential | 2,108,673 | 1,699,726 | 3,808,399 | 2,262,849 | 1,489,985 | 3,752,834 | 154,176 |
| | Nonresidential | 3,552,196 | 1,918,084 | 5,470,280 | 3,605,200 | 1,804,900 | 5,410,099 | 53,004 |
| | Total | 5,660,869 | 3,617,810 | 9,278,679 | 5,868,049 | 3,294,885 | 9,162,934 | 207,180 |
| South | Residential | 7,081,951 | 5,245,358 | 12,327,309 | 7,979,435 | 4,224,364 | 12,203,799 | 897,484 |
| | Nonresidential | 6,930,720 | 3,653,569 | 10,584,289 | 7,254,178 | 3,286,389 | 10,540,567 | 323,458 |
| | Total | 14,012,671 | 8,898,927 | 22,911,598 | 15,233,613 | 7,510,753 | 22,744,365 | 1,220,942 |
| West | Residential | 5,561,119 | 2,991,729 | 8,552,848 | 6,447,822 | 2,041,616 | 8,489,438 | 886,703 |
| | Nonresidential | 5,264,564 | 2,170,710 | 7,435,274 | 5,858,864 | 1,523,252 | 7,382,116 | 594,300 |
| | Total | 10,825,683 | 5,162,439 | 15,988,122 | 12,306,686 | 3,564,868 | 15,871,554 | 1,481,003 |
| United States | Residential | 15,757,860 | 10,731,808 | 26,489,668 | 17,764,536 | 8,403,027 | 26,167,563 | 2,006,676 |
| | Nonresidential | 17,788,935 | 8,689,026 | 26,477,961 | 18,892,949 | 7,409,279 | 26,302,228 | 1,104,013 |
| | Total | 33,546,795 | 19,420,834 | 52,967,629 | 36,657,485 | 15,812,306 | 52,469,791 | 3,110,689 |

*Sources:* Woods & Poole, 1998. Center for Urban Policy Research, Rutgers University.

## Table 6.18
## Residential, Nonresidential, and Total Units in Developed versus Undeveloped Locations in Counties—Uncontrolled- and Controlled-Growth Intracounty Scenario: 2000 to 2025
(One Unit of Nonresidential Space Equals 1,000 Square Feet)

| Region | Type of Development | Uncontrolled-Growth Scenario | | | Controlled-Growth Scenario | | | Difference in Developed Areas |
|---|---|---|---|---|---|---|---|---|
| | | Developed Areas | Un-developed Areas | Total Areas | Developed Areas | Un-developed Areas | Total Areas | |
| Northeast | Residential | 1,078,874 | 722,238 | 1,801,112 | 1,141,016 | 580,476 | 1,721,492 | 62,142 |
| | Nonresidential | 2,177,090 | 811,028 | 2,988,118 | 2,212,317 | 757,129 | 2,969,446 | 35,227 |
| | Total | 3,255,964 | 1,533,266 | 4,789,230 | 3,353,333 | 1,337,605 | 4,690,938 | 97,369 |
| Midwest | Residential | 2,249,086 | 1,559,313 | 3,808,399 | 2,377,728 | 1,375,106 | 3,752,834 | 128,642 |
| | Nonresidential | 3,774,942 | 1,695,338 | 5,470,280 | 3,799,728 | 1,610,371 | 5,410,099 | 24,786 |
| | Total | 6,024,028 | 3,254,651 | 9,278,679 | 6,177,457 | 2,985,477 | 9,162,934 | 153,428 |
| South | Residential | 7,968,455 | 4,358,854 | 12,327,309 | 8,664,346 | 3,539,452 | 12,203,799 | 695,891 |
| | Nonresidential | 7,596,162 | 2,988,126 | 10,584,289 | 7,868,704 | 2,671,863 | 10,540,567 | 272,541 |
| | Total | 15,564,617 | 7,346,980 | 2,911,598 | 16,533,050 | 6,211,315 | 22,744,365 | 968,433 |
| West | Residential | 6,401,650 | 2,151,198 | 8,552,848 | 6,831,430 | 1,658,008 | 8,489,438 | 429,780 |
| | Nonresidential | 6,109,785 | 1,325,489 | 7,435,274 | 6,288,370 | 1,093,746 | 7,382,116 | 178,585 |
| | Total | 12,511,435 | 3,476,687 | 15,988,122 | 13,119,801 | 2,751,753 | 15,871,554 | 608,365 |
| United States | Residential | 17,698,066 | 8,791,602 | 26,489,668 | 19,014,521 | 7,153,042 | 26,167,563 | 1,316,456 |
| | Nonresidential | 19,657,979 | 6,819,982 | 26,477,961 | 20,169,119 | 6,133,109 | 26,302,228 | 511,139 |
| | Total | 37,356,045 | 15,611,584 | 52,967,629 | 39,183,640 | 13,286,151 | 52,469,791 | 1,827,595 |

*Sources:* Woods & Poole, 1998. Center for Urban Policy Research, Rutgers University.

nonresidential units, a total of 9.3 million development units. The Northeast will receive 1.8 million residential units and 3.0 million nonresidential units, a total of 4.8 million development units. Projected 25-year development in the South is 1.5 times greater than the West, 2.5 times greater than the Midwest, and 5.0 times greater than the Northeast. Combined growth in the South and West, at close to 40 million development units, is three times greater than what will occur together in the Midwest and Northeast (14.0 million development units).

### Intercounty Shifts—Units

Under uncontrolled growth, of the 53 million development units, 33.6 million will be developed in urban and suburban counties; 19.4 million in rural and undeveloped counties (Table 6.17). Under controlled growth, 36.7 million development units will be built in urban and suburban counties; 15.8 million in rural and undeveloped counties. This represents a shift of 3 million development units to more urbanized areas under controlled growth on a base of 33.6 million units, or approximately a 10 percent shift. If the units that do not move under either scenario are removed from the comparison (21.5 million units), the shift of units is 3 million on a base of 12 million units or a movement of 25 percent. This represents the proportion of intercounty shifts of households and jobs under the controlled-growth scenario.

### Intracounty Shifts—Units

Table 6.18 shows the number of development units that are projected to be located in developed areas of counties as opposed to undeveloped areas under the uncontrolled- and controlled-growth scenarios. About 2 million more units will be located in developed areas of counties under the controlled-growth scenario. This is a difference of about 5 percent on a base of 37.3 million units in developed areas. Again, if nonmovers are removed, the percentage increases to about 12 percent. This represents the proportion of intracounty shifts of households and jobs under the controlled-growth scenario.

## RESULTS OF THE ASSESSMENT: LAND CONVERSION

This portion of the chapter examines the results of the two primary growth-control efforts on land conversion for various geographic divisions of the United States: the nation as a whole, the four large census regions, states, EAs, and counties. In each case, the differences between the two alternative growth scenarios will be attributed to either intercounty or intracounty control, or both. The discussion will first concern all land taken, and then the share of this land that is agricultural or environmentally fragile land. Agricultural lands are croplands, pasturelands, rangelands, and woodlands. Environmentally fragile lands are floodplains, wetlands, critical sensitive watersheds, steep slopes, sinkholes, erosion-prone lands, and forestlands. Of the environmentally fragile lands, forestlands encompass most of the unprotected lands of the final four categories.

## THE UNITED STATES AND ITS REGIONS

### Uncontrolled Growth

Growth in the United States over the period 2000 to 2025 will consume 18.83 million acres. Of the total acreage consumed, 7.09 million acres will be agricultural lands and 7.04 million acres will be environmentally fragile lands (Table 6.19). The remaining 4.7 million acres will be nonagricultural, nonfragile lands that exist usually in small quantities in most counties (unproductive, barren land and land awaiting development). In the South and West, this latter category of land exists in much larger quantities than it does in the other two regions. Of the total land in the United States that will be converted due to growth, almost three-quarters is some combination of agricultural and environmentally fragile lands.

With respect to the four main regions of the United States, the South converts almost 10 million acres (53 percent of the total nationwide); the West, 4.6 million acres (24.5 percent); the Midwest, 2.8 million acres (14.8 percent); and the Northeast, 1.4 million acres (7.8 percent) to accommodate growth. The South is the only region that converts proportionately more *total* land than its growth seems to call for. The South contributes about 53 percent of all converted land, although its residential and nonresidential growth is only 43 percent of total national growth (Table 6.20). The reverse is true in the West, Midwest, and Northeast regions—the percentage share of land consumed is less than their percentage share of growth (Table 6.20). The Midwest and South re-

## Table 6.19
## Lands Converted—Uncontrolled- and Controlled-Growth Scenarios United States and by Region: 2000 to 2025

| Region | Uncontrolled-Growth Scenario | | | | | Controlled-Growth Scenario | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total Land (Acres) | Percentage of Overall Land (%) | Agricultural Lands (Acres) | Environmentally Fragile Lands (Acres) | Other Lands (Acres) | Total Land (Acres) | Percentage of Overall Land (%) | Agricultural Lands (Acres) | Environmentally Fragile Lands (Acres) | Other Lands (Acres) |
| Northeast | 1,460,868 | 7.75 | 292,067 | 1,063,293 | 105,508 | 1,178,015 | 7.94 | 236,260 | 854,134 | 87,622 |
| Midwest | 2,789,832 | 14.81 | 1,750,966 | 646,016 | 392,850 | 2,350,390 | 15.84 | 1,467,463 | 556,811 | 326,116 |
| South | 9,969,932 | 52.92 | 3,605,201 | 4,468,081 | 1,896,650 | 7,830,912 | 52.78 | 2,802,737 | 3,472,339 | 1,555,836 |
| West | 4,612,290 | 24.48 | 1,443,842 | 866,835 | 2,301,613 | 3,471,379 | 23.40 | 1,085,980 | 655,507 | 1,729,892 |
| United States | 18,832,922 | 100.00 | 7,092,076 | 7,044,225 | 4,696,622 | 14,830,696 | 100.00 | 5,592,440 | 5,538,791 | 3,699,466 |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 6.20
## Percentage Growth versus Percentage Land Conversion United States and by Region—Uncontrolled-Growth Scenario: 2000 to 2025

| Region | Growth | Total Land | Agricultural Land | Environmentally Fragile Land | Other Land (e.g., Barren) |
|---|---|---|---|---|---|
| Northeast | 9.0 | 7.8 | 4.1 | 15.1 | 2.2 |
| Midwest | 17.5 | 14.8 | 24.7 | 9.2 | 8.4 |
| South | 43.3 | 52.9 | 50.8 | 63.4 | 40.4 |
| West | 30.2 | 24.5 | 20.4 | 12.3 | 49.0 |
| United States | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 6.21
## Acres Developed per Residential, Nonresidential, and Combined Residential and Nonresidential Unit—Uncontrolled-Growth Scenario: 2000 to 2025

| Region | Residential | Nonresidential | Combined |
|---|---|---|---|
| Northeast | 0.523 | 0.174 | 0.305 |
| Midwest | 0.460 | 0.190 | 0.301 |
| South | 0.646 | 0.190 | 0.435 |
| West | 0.386 | 0.177 | 0.289 |
| United States | 0.527 | 0.184 | 0.356 |

*Source:* Center for Urban Policy Research, Rutgers University.

gions convert a far greater percentage of all *agricultural* land than their percentage of overall growth. The South and the Northeast convert a significantly greater share of environmentally fragile land than their overall growth represents (Table 6.20).

For each housing unit and 1,000 square feet of nonresidential space constructed (equal to approximately two jobs) in the South, 0.44 of an acre of land is converted; in the Northeast, 0.31 of an acre is converted; in the Midwest, 0.20 of an acre is converted; and in the West, 0.29 of an acre is converted. On a national average, for every single housing unit and 1,000 square feet of nonresidential space constructed, 0.36 of an acre of land is converted (Table 6.21).

## Controlled Growth

Under the controlled-growth scenario, 14.83 million acres of land are consumed nationwide (Table 6.19). This is a saving of 4 million acres over the period 2000 to 2025. For the same amount of development that would take place nationwide, i.e., the creation of 26.5 million housing units and nonresidential space to house approximately 49.5 million jobs (26.5 billion square feet of nonresidential space), 4 million fewer acres would be required to accommodate development (Table 6.22). Controlled-growth land savings in the United States contribute to an average of a 0.073-acre reduction in lot size nationwide, or close to 3,200 square feet for every residential and nonresidential unit developed (Table 6.23).

The overall land savings would include 1.5 million acres of agricultural land and 1.5 million acres of environmentally fragile land (Table 6.20). Of the 4-million-acre land savings, approximately 2.4 million acres are saved as the result of intercounty household and job redirection; 1.6 million are saved due to intracounty redirection of households and jobs. In other words, 60 percent of the land savings is due to the redirection of households and jobs from outer to inner counties; 40 percent is achieved by keeping growth close to the center of all counties (Table 6.24).

As was discussed earlier, the first percentage is analogous to land savings in sprawl locations; the second is analogous to land savings in all other locations. To calculate all savings in sprawl locations while being consistent with the prior definition of sprawl, a share of the second percentage must be added to the first percentage to account for land savings in uncontrolled-sprawl locations achieved through intracounty control. This adds approximately 18 percent to the 60 percent. Thus, savings in sprawl locations amount to 78 percent of all land savings (Table 6.24).

Courtesy of C. Galley

Courtesy of C. Galley

Of the 4 million acres of land that are saved overall, 2.14 million acres are in the South; 1.14 million acres are in the West; 0.44 million acres are in the Midwest; and 0.28 million acres are in the Northeast (Table 116). The West saves almost one-quarter of the land that would be developed in that region; the South, 21.5 percent; the Northeast, 19.3 percent; and the Midwest, 15.7 percent. The South alone saves more than 800,000 acres of agricultural lands and close to 1 million acres of environmentally fragile lands. The combined saving in the West in these two categories of land is 570,000 acres; in the Midwest, it is 375,000 acres; and in the Northeast, it is 265,000 acres. In the West, two-thirds of the combined land savings is agricultural lands; in the Midwest, this figure is 75 percent. In the Northeast, 80 percent of the combined agricultural and environmentally fragile land savings is in the environmentally fragile land category.

The Midwest has the least overall savings from intercounty development movement, with approximately 45 percent of the land savings coming from this movement. Like the Midwest, the South is below the national average of 60 percent, with 58 percent. The Northeast is slightly above the national average at 61 percent, and the West is considerably over the national average at 69 percent (Table 6.24).

As was the case for the nation, intercounty redirection of growth is not the only source of land saving in sprawl locations. Land saving in sprawl locations due to intercounty household and employment relocation

**Table 6.22**
**Lands Saved—Uncontrolled- and Controlled-Growth Scenarios**
**United States and by Region: 2000 to 2025**
(in Acres)

| Region | Total Land | Agricultural Lands | Environmentally Fragile Lands | Other Lands |
|---|---|---|---|---|
| Northeast | 282,853 | 55,807 | 209,160 | 17,886 |
| Midwest | 439,446 | 283,503 | 89,205 | 66,735 |
| South | 2,139,017 | 802,464 | 995,742 | 340,814 |
| West | 1,140,915 | 357,862 | 211,328 | 571,721 |
| United States | 4,002,231 | 1,499,636 | 1,505,434 | 997,156 |

*Source:* Center for Urban Policy Research, Rutgers University.
*Note:* In this table and in all subsequent tables, positive values under the category "savings" are savings; negative values are costs.

**Table 6.23**
**Acres Developed per Combined Residential and Nonresidential Unit**
**Uncontrolled- and Controlled-Growth Scenarios: 2000 to 2025**

| Region | Uncontrolled | Controlled | Difference | Percentage Difference |
|---|---|---|---|---|
| Northeast | 0.305 | 0.251 | 0.054 | 17.7 |
| Midwest | 0.301 | 0.256 | 0.055 | 15.0 |
| South | 0.435 | 0.344 | 0.091 | 20.9 |
| West | 0.289 | 0.219 | 0.070 | 24.2 |
| United States | 0.356 | 0.283 | 0.073 | 20.5 |

*Source:* Center for Urban Policy Research, Rutgers University.

**Table 6.24**
**Intercounty, Intracounty, and Sprawl**
**Land Savings in the United States and by Region: 2000 to 2025**

| Region | Total Savings (Acres) | Intercounty Savings for All Counties | | Intracounty Savings for Uncontrolled Counties | | Intracounty Savings for All Other Counties | | Total Savings in Sprawl Locations | |
|---|---|---|---|---|---|---|---|---|---|
| | | (Acres) | (%) | (Acres) | (%) | (Acres) | (%) | (Acres) | (%) |
| Northeast | 282,853 | 172,276 | 60.8 | 34,022 | 12.0 | 76,963 | 27.2 | 206,297 | 72.8 |
| Midwest | 439,442 | 199,308 | 45.4 | 77,649 | 17.7 | 162,485 | 37.0 | 276,957 | 63.0 |
| South | 2,139,017 | 1,249,296 | 58.4 | 402,308 | 18.8 | 487,413 | 22.8 | 1,651,604 | 77.2 |
| West | 1,140,916 | 786,809 | 69.0 | 211,521 | 18.5 | 142,586 | 12.5 | 998,330 | 87.5 |
| United States | 4,002,231 | 2,407,688 | 60.1 | 725,500 | 18.1 | 869,447 | 21.7 | 3,133,189 | 78.3 |

*Source:* Center for Urban Policy Research, Rutgers University.

is joined by intracounty savings in those sprawl locations that could not undergo intercounty control. Land savings in sprawl locations as a percentage of all land savings in a region are as follows: Northeast, 73 percent; Midwest, 63 percent; South, 77 percent; and West, 87 percent (Table 6.22).

## STATES

### Uncontrolled Growth

The states that have the greatest amount of land conversion under uncontrolled growth basically parallel the states that have the largest combined residential and nonresidential growth during the period 2000 to

## Table 6.25
## Lands Converted—Uncontrolled- and Controlled-Growth Scenarios
## By State: 2000 to 2025

| State By Rank | Uncontrolled-Growth Scenario | | | | | Controlled-Growth Scenario | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total Land Converted (Acres) | Percentage of Overall Land Converted (%) | Agricultural Lands Converted (Acres) | Environmentally Fragile Lands Converted (Acres) | Other Lands Converted (Acres) | Total Land Converted (Acres) | Percentage of Overall Land Converted (%) | Agricultural Lands Converted (Acres) | Environmentally Fragile Lands Converted (Acres) | Other Lands Converted (Acres) |
| Florida | 1,654,899 | 8.78 | 493,984 | 626,238 | 534,677 | 1,307,775 | 8.81 | 378,429 | 486,794 | 442,553 |
| Texas | 1,554,474 | 8.25 | 1,140,598 | 218,791 | 195,085 | 1,149,415 | 7.75 | 858,213 | 150,567 | 140,636 |
| California | 1,386,030 | 7.36 | 548,427 | 254,713 | 582,891 | 959,250 | 6.47 | 383,307 | 195,910 | 380,033 |
| Georgia | 1,125,386 | 5.97 | 194,558 | 806,005 | 124,823 | 823,038 | 5.55 | 143,875 | 577,126 | 102,037 |
| North Carolina | 1,060,123 | 5.63 | 272,152 | 633,735 | 154,237 | 929,482 | 6.26 | 237,864 | 551,678 | 139,940 |
| Tennessee | 788,848 | 4.19 | 356,950 | 281,219 | 150,679 | 627,015 | 4.23 | 285,690 | 225,276 | 116,049 |
| Arizona | 606,876 | 3.22 | 148,552 | 30,262 | 428,062 | 512,049 | 3.45 | 122,481 | 26,640 | 362,928 |
| South Carolina | 599,010 | 3.18 | 106,646 | 366,679 | 125,686 | 498,019 | 3.36 | 91,766 | 308,592 | 97,660 |
| Virginia | 585,473 | 3.11 | 152,700 | 352,132 | 80,641 | 434,093 | 2.93 | 111,042 | 258,709 | 64,342 |
| Colorado | 507,771 | 2.70 | 212,664 | 43,155 | 251,952 | 345,847 | 2.33 | 154,864 | 26,428 | 164,555 |
| Alabama | 502,807 | 2.67 | 119,126 | 288,045 | 95,636 | 406,155 | 2.74 | 95,067 | 232,021 | 79,067 |
| Michigan | 437,282 | 2.32 | 190,603 | 172,979 | 73,700 | 363,104 | 2.45 | 151,723 | 147,266 | 64,115 |
| Washington | 420,955 | 2.23 | 75,765 | 218,106 | 127,084 | 327,191 | 2.21 | 63,328 | 166,304 | 97,559 |
| Maryland | 408,803 | 2.17 | 143,168 | 236,167 | 29,469 | 234,619 | 1.58 | 78,865 | 127,538 | 28,216 |
| Indiana | 396,908 | 2.11 | 298,538 | 63,258 | 35,113 | 330,162 | 2.23 | 252,225 | 50,335 | 27,602 |
| Ohio | 393,714 | 2.09 | 252,380 | 119,279 | 22,055 | 337,400 | 2.27 | 214,905 | 103,382 | 19,113 |
| Kentucky | 360,275 | 1.91 | 152,781 | 145,300 | 62,195 | 313,407 | 2.11 | 132,213 | 126,496 | 54,698 |
| Pennsylvania | 356,284 | 1.89 | 131,634 | 205,087 | 19,563 | 286,896 | 1.93 | 107,222 | 164,845 | 14,830 |
| Oregon | 350,848 | 1.86 | 60,794 | 133,305 | 156,749 | 250,976 | 1.69 | 48,925 | 99,591 | 102,460 |
| Wisconsin | 342,330 | 1.82 | 180,275 | 74,444 | 87,611 | 285,775 | 1.93 | 145,716 | 64,890 | 75,169 |
| Arkansas | 324,662 | 1.72 | 127,090 | 66,118 | 131,454 | 256,590 | 1.73 | 100,357 | 55,101 | 101,132 |
| Louisiana | 319,495 | 1.70 | 77,449 | 164,618 | 77,428 | 268,006 | 1.81 | 65,778 | 135,485 | 66,743 |
| Minnesota | 309,843 | 1.64 | 160,341 | 48,616 | 100,886 | 244,953 | 1.65 | 126,605 | 44,169 | 74,179 |
| Missouri | 296,095 | 1.57 | 145,438 | 117,980 | 32,677 | 249,917 | 1.68 | 120,886 | 100,806 | 28,224 |
| New York | 293,814 | 1.56 | 57,976 | 208,500 | 27,338 | 251,714 | 1.70 | 49,729 | 177,268 | 24,717 |
| Utah | 268,840 | 1.43 | 72,023 | 17,694 | 179,122 | 215,391 | 1.45 | 52,801 | 11,724 | 150,867 |
| Illinois | 255,703 | 1.36 | 209,893 | 36,349 | 9,461 | 215,494 | 1.45 | 172,874 | 33,893 | 8,728 |
| Mississippi | 237,411 | 1.26 | 54,051 | 122,806 | 60,554 | 205,763 | 1.39 | 47,032 | 105,587 | 53,144 |
| Oklahoma | 231,157 | 1.23 | 150,921 | 38,399 | 41,837 | 193,284 | 1.30 | 127,796 | 30,287 | 35,201 |
| New Mexico | 207,627 | 1.10 | 102,359 | 16,193 | 89,075 | 170,714 | 1.15 | 87,307 | 13,280 | 70,127 |
| Nevada | 173,201 | 0.92 | 15,920 | 1,107 | 156,175 | 132,709 | 0.89 | 10,262 | 800 | 121,647 |
| Massachusetts | 170,483 | 0.90 | 20,912 | 130,036 | 19,535 | 134,721 | 0.91 | 18,484 | 102,106 | 14,132 |
| Idaho | 167,192 | 0.89 | 51,238 | 13,647 | 102,307 | 148,503 | 1.00 | 45,556 | 12,065 | 90,881 |
| Hawaii | 164,260 | 0.87 | 61,406 | 64,743 | 38,111 | 83,339 | 0.56 | 31,787 | 35,880 | 15,672 |
| New Jersey | 162,804 | 0.86 | 43,455 | 112,810 | 6,540 | 118,182 | 0.80 | 29,779 | 83,753 | 4,650 |
| Montana | 158,654 | 0.84 | 51,836 | 21,671 | 85,147 | 144,415 | 0.97 | 46,943 | 19,731 | 77,741 |
| Maine | 145,267 | 0.77 | 7,423 | 129,034 | 8,809 | 125,395 | 0.85 | 6,424 | 111,193 | 7,778 |
| West Virginia | 137,690 | 0.73 | 27,283 | 98,127 | 12,280 | 110,730 | 0.75 | 18,718 | 80,700 | 11,312 |
| New Hampshire | 129,230 | 0.69 | 6,256 | 108,553 | 14,420 | 97,865 | 0.66 | 4,502 | 80,324 | 13,039 |
| Iowa | 112,599 | 0.60 | 99,061 | 4,547 | 8,991 | 102,722 | 0.69 | 89,972 | 4,199 | 8,551 |
| Alaska | 107,513 | 0.57 | -3,264 | 50,493 | 60,284 | 97,636 | 0.66 | -3,022 | 45,577 | 55,082 |
| Wyoming | 92,523 | 0.49 | 46,123 | 1,747 | 44,654 | 83,359 | 0.56 | 41,441 | 1,578 | 40,340 |
| Kansas | 90,804 | 0.48 | 78,728 | 5,796 | 6,280 | 82,028 | 0.55 | 70,744 | 5,409 | 5,875 |
| Vermont | 90,565 | 0.48 | 13,555 | 67,707 | 9,303 | 81,529 | 0.55 | 12,157 | 60,895 | 8,477 |
| Delaware | 77,192 | 0.41 | 35,746 | 23,701 | 17,745 | 65,880 | 0.44 | 30,033 | 20,383 | 15,464 |
| South Dakota | 61,960 | 0.33 | 49,487 | 2,231 | 10,243 | 55,774 | 0.38 | 44,611 | 1,965 | 9,198 |
| Nebraska | 60,776 | 0.32 | 57,751 | 109 | 2,916 | 54,392 | 0.37 | 51,610 | 99 | 2,683 |
| Rhode Island | 57,532 | 0.31 | 5,373 | 52,159 | 0 | 33,656 | 0.23 | 3,237 | 30,419 | 0 |
| Connecticut | 54,889 | 0.29 | 5,483 | 49,406 | 0 | 48,057 | 0.32 | 4,726 | 43,331 | 0 |
| North Dakota | 31,818 | 0.17 | 28,471 | 429 | 2,918 | 28,669 | 0.19 | 25,594 | 397 | 2,678 |
| United States | 18,832,922 | 100.00 | 7,092,076 | 7,044,225 | 4,696,622 | 14,830,696 | 100.00 | 5,592,440 | 5,538,791 | 3,699,466 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* Washington, DC, is included in the nationwide (United States) totals.

2025 (Table 6.25). The top 20 land conversion states are listed below. Florida, Texas, California, Georgia, North Carolina, Tennessee, Arizona, South Carolina, Virginia, Colorado, and Alabama are the top 11 states in land conversion for development purposes. They will convert from 1,650,000 acres (Florida) to 503,000 acres (Alabama) during the next 25 years. This varies from a high of almost 9 percent of all land converted nationwide (Florida) to a low of less than 3 percent (Alabama). The next nine states are Michi-

## Table 6.26
## States Ranked by Total Land Converted
## State Land Conversion: 2000 to 2025

| States | Total Units (#) | Residential Units (#) | Non-residential Units (#) | Total Land Converted (Acres) | Original Acres per Unit (Acres) | Land Saved (Acres) | New Acres per Unit (Acres) | Percentage of Units in Urban/ Suburban Counties (%) | Percentage of Units in Developed Areas of Counties (%) |
|---|---|---|---|---|---|---|---|---|---|
| Florida | 4,745,878 | 2,759,325 | 1,986,554 | 1,654,900 | 0.3487 | 347,122 | 0.2756 | 69.8 | 84.6 |
| Texas | 5,277,686 | 2,966,076 | 2,311,610 | 1,554,476 | 0.2945 | 405,056 | 0.2180 | 84.0 | 77.8 |
| California | 6,543,746 | 3,273,550 | 3,270,196 | 1,386,029 | 0.2118 | 426,778 | 0.1478 | 78.6 | 90.2 |
| Georgia | 2,033,594 | 1,105,763 | 927,831 | 1,125,387 | 0.5534 | 302,348 | 0.4047 | 66.9 | 60.8 |
| North Carolina | 1,841,590 | 975,994 | 865,596 | 1,060,122 | 0.5757 | 130,636 | 0.5043 | 58.8 | 56.5 |
| Tennessee | 1,324,049 | 694,628 | 629,421 | 788,849 | 0.5958 | 161,838 | 0.4748 | 48.1 | 47.1 |
| Arizona | 1,982,408 | 1,220,764 | 761,644 | 606,876 | 0.3061 | 94,826 | 0.2607 | 83.1 | 79.2 |
| South Carolina | 1,071,909 | 611,604 | 460,305 | 599,009 | 0.5588 | 100,990 | 0.4712 | 47.5 | 58.6 |
| Virginia | 1,537,453 | 770,686 | 766,767 | 585,473 | 0.3808 | 151,382 | 0.2966 | 73.5 | 77.5 |
| Colorado | 1,432,856 | 743,815 | 689,041 | 507,774 | 0.3544 | 161,926 | 0.2444 | 76.3 | 74.0 |
| Alabama | 895,935 | 477,386 | 418,549 | 502,809 | 0.5612 | 96,654 | 0.4576 | 48.9 | 50.3 |
| Michigan | 1,352,791 | 586,350 | 766,441 | 437,280 | 0.3232 | 74,178 | 0.2712 | 65.3 | 64.0 |
| Washington | 1,629,174 | 923,304 | 705,870 | 420,953 | 0.2584 | 93,763 | 0.2042 | 83.0 | 75.9 |
| Maryland | 986,025 | 503,133 | 482,892 | 408,803 | 0.4146 | 174,183 | 0.2630 | 81.4 | 74.3 |
| Indiana | 1,098,153 | 510,820 | 587,333 | 396,914 | 0.3614 | 66,757 | 0.3050 | 47.6 | 54.5 |
| Ohio | 1,443,783 | 591,330 | 852,453 | 393,716 | 0.2727 | 56,307 | 0.2343 | 59.5 | 70.7 |
| Kentucky | 671,579 | 295,983 | 375,596 | 360,274 | 0.5365 | 46,868 | 0.4727 | 47.7 | 46.8 |
| Pennsylvania | 1,165,695 | 427,138 | 738,558 | 356,285 | 0.3056 | 69,385 | 0.2491 | 55.3 | 66.4 |
| Oregon | 859,702 | 458,359 | 401,343 | 350,850 | 0.4081 | 99,875 | 0.2866 | 63.8 | 61.7 |
| Wisconsin | 907,278 | 418,516 | 488,762 | 342,330 | 0.3773 | 56,559 | 0.3277 | 61.5 | 54.2 |
| Arkansas | 442,583 | 187,344 | 255,239 | 324,663 | 0.7336 | 68,078 | 0.5782 | 37.6 | 26.2 |
| Louisiana | 750,433 | 373,582 | 376,851 | 319,492 | 0.4257 | 51,487 | 0.3696 | 58.5 | 61.8 |
| Minnesota | 989,970 | 452,778 | 537,192 | 309,847 | 0.3130 | 64,894 | 0.2465 | 68.8 | 65.8 |
| Missouri | 805,082 | 344,787 | 460,295 | 296,090 | 0.3678 | 46,173 | 0.3235 | 58.0 | 57.1 |
| New York | 1,171,028 | 338,464 | 832,564 | 293,816 | 0.2509 | 42,105 | 0.2131 | 66.9 | 63.9 |
| Utah | 866,508 | 464,478 | 402,029 | 268,840 | 0.3103 | 53,449 | 0.2502 | 81.0 | 78.2 |
| Illinois | 1,348,653 | 431,013 | 917,640 | 255,702 | 0.1896 | 40,206 | 0.1619 | 79.7 | 81.7 |
| Mississippi | 442,255 | 214,313 | 227,941 | 237,413 | 0.5368 | 31,647 | 0.4659 | 42.7 | 39.8 |
| Oklahoma | 492,440 | 232,035 | 260,405 | 231,160 | 0.4694 | 37,873 | 0.3941 | 58.3 | 58.2 |
| New Mexico | 530,450 | 302,559 | 227,892 | 207,627 | 0.3914 | 36,913 | 0.3243 | 73.7 | 54.6 |
| Nevada | 867,205 | 488,084 | 379,121 | 173,202 | 0.1997 | 40,492 | 0.1526 | 94.3 | 83.6 |
| Massachusetts | 723,344 | 294,281 | 429,063 | 170,484 | 0.2357 | 35,761 | 0.1802 | 89.5 | 89.5 |
| Idaho | 375,300 | 197,315 | 177,985 | 167,193 | 0.4455 | 18,690 | 0.4011 | 62.6 | 41.7 |
| Hawaii | 336,394 | 179,915 | 156,479 | 164,259 | 0.4883 | 80,922 | 0.2505 | 77.0 | 48.0 |
| New Jersey | 807,694 | 305,594 | 502,100 | 162,806 | 0.2016 | 44,622 | 0.1618 | 84.7 | 85.2 |
| Montana | 208,190 | 102,583 | 105,607 | 158,654 | 0.7621 | 14,237 | 0.6937 | 22.0 | 16.5 |
| Maine | 231,578 | 127,705 | 103,873 | 145,265 | 0.6273 | 19,869 | 0.5422 | 53.3 | 29.1 |
| West Virginia | 224,649 | 80,435 | 144,214 | 137,688 | 0.6129 | 26,957 | 0.5592 | 42.5 | 23.4 |
| New Hampshire | 260,036 | 139,167 | 120,868 | 129,231 | 0.4970 | 31,367 | 0.4540 | 63.0 | 28.6 |
| Iowa | 401,738 | 123,790 | 277,948 | 112,601 | 0.2803 | 9,878 | 0.2558 | 54.9 | 57.0 |
| Alaska | 243,061 | 136,597 | 106,464 | 107,513 | 0.4423 | 9,877 | 0.4009 | 57.1 | 56.3 |
| Wyoming | 113,129 | 61,524 | 51,605 | 92,524 | 0.8179 | 9,167 | 0.7408 | 25.4 | 23.6 |
| Kansas | 362,235 | 131,153 | 231,082 | 90,805 | 0.2507 | 8,769 | 0.2271 | 72.5 | 68.5 |
| Vermont | 116,723 | 68,664 | 48,059 | 90,566 | 0.7759 | 9,037 | 0.6999 | 34.7 | 26.5 |
| Delaware | 132,302 | 79,024 | 53,278 | 77,192 | 0.5835 | 11,312 | 0.5065 | 55.9 | 68.0 |
| South Dakota | 168,828 | 64,459 | 104,369 | 61,959 | 0.3670 | 6,189 | 0.3303 | 53.3 | 49.5 |
| Nebraska | 191,224 | 42,459 | 148,765 | 60,965 | 0.3188 | 6,390 | 0.2825 | 67.3 | 79.1 |
| Rhode Island | 287,402 | 115,235 | 172,166 | 60,781 | 0.2115 | 23,875 | 0.1891 | 82.1 | 68.9 |
| Connecticut | 121,909 | 57,639 | 64,269 | 57,531 | 0.4719 | 6,832 | 0.2654 | 84.9 | 60.8 |
| North Dakota | 112,767 | 38,168 | 74,599 | 31,816 | 0.2821 | 3,146 | 0.2542 | 75.7 | 67.8 |
| D. C. | 41,240 | 0 | 41,240 | 2,227 | 0.0540 | -5,414 | 0.0560 | 100.0 | 100.0 |

*Source:* Center for Urban Policy Research, Rutgers University.
*Note:* One nonresidential unit equals 1,000 square feet.

gan, Washington, Maryland, Indiana, Ohio, Kentucky, Pennsylvania, Oregon, and Wisconsin. These states vary from about 440,000 to 340,000 acres converted during the 25-year period—from 2.2 percent to 1.8 percent of all land converted. The top-20 land conversion states together convert 73.5 percent of all land converted during the period.

Most states convert between one-quarter and three-quarters of an acre for each combined residential and nonresidential development unit (Table 6.26). Usu-

## Table 6.27
## Lands Saved—Uncontrolled- and Controlled-Growth Scenarios By State: 2000 to 2025

| State by Rank | Total Land (Acres) | Agricultural Lands (Acres) | Environmentally Fragile Lands (Acres) | Other Lands (Acres) |
|---|---|---|---|---|
| Florida | 347,122 | 115,555 | 139,444 | 92,125 |
| Texas | 405,056 | 282,385 | 68,224 | 54,449 |
| California | 426,778 | 165,120 | 58,803 | 202,858 |
| Georgia | 302,348 | 50,684 | 228,879 | 22,786 |
| North Carolina | 130,636 | 34,288 | 82,057 | 14,296 |
| Tennessee | 161,838 | 71,260 | 55,944 | 34,630 |
| Arizona | 94,826 | 26,071 | 3,621 | 65,134 |
| South Carolina | 100,990 | 14,879 | 58,086 | 28,025 |
| Virginia | 151,382 | 41,658 | 93,423 | 16,299 |
| Colorado | 161,926 | 57,800 | 16,727 | 87,397 |
| Alabama | 96,654 | 24,059 | 56,024 | 16,568 |
| Michigan | 74,178 | 38,880 | 25,713 | 9,585 |
| Washington | 93,763 | 12,437 | 51,802 | 29,525 |
| Maryland | 174,183 | 64,302 | 108,629 | 1,253 |
| Indiana | 66,757 | 46,313 | 12,923 | 7,511 |
| Ohio | 56,307 | 37,475 | 15,898 | 2,942 |
| Kentucky | 46,868 | 20,567 | 18,804 | 7,496 |
| Pennsylvania | 69,385 | 24,412 | 40,242 | 4,734 |
| Oregon | 99,875 | 11,869 | 33,714 | 54,289 |
| Wisconsin | 56,559 | 34,559 | 9,553 | 12,442 |
| Arkansas | 68,078 | 26,733 | 11,017 | 30,322 |
| Louisiana | 51,487 | 11,670 | 29,134 | 10,685 |
| Minnesota | 64,894 | 33,736 | 4,447 | 26,707 |
| Missouri | 46,173 | 24,552 | 17,174 | 4,453 |
| New York | 42,105 | 8,247 | 31,232 | 2,621 |
| Utah | 53,449 | 19,223 | 5,970 | 28,256 |
| Illinois | 40,206 | 37,020 | 2,456 | 733 |
| Mississippi | 31,647 | 7,018 | 17,219 | 7,410 |
| Oklahoma | 37,873 | 23,125 | 8,113 | 6,635 |
| New Mexico | 36,913 | 15,051 | 2,914 | 18,948 |
| Nevada | 40,492 | 5,658 | 307 | 34,528 |
| Massachusetts | 35,761 | 2,428 | 27,931 | 5,403 |
| Idaho | 18,690 | 5,682 | 1,582 | 11,425 |
| Hawaii | 80,922 | 29,619 | 28,863 | 22,439 |
| New Jersey | 44,622 | 13,676 | 29,056 | 1,890 |
| Montana | 14,237 | 4,893 | 1,940 | 7,406 |
| Maine | 19,869 | 999 | 17,842 | 1,031 |
| West Virginia | 26,957 | 8,566 | 17,427 | 968 |
| New Hampshire | 31,367 | 1,755 | 28,229 | 1,381 |
| Iowa | 9,878 | 9,089 | 348 | 440 |
| Alaska | 9,877 | -242 | 4,916 | 5,203 |
| Wyoming | 9,167 | 4,681 | 169 | 4,314 |
| Kansas | 8,769 | 7,985 | 387 | 405 |
| Vermont | 9,037 | 1,398 | 6,812 | 826 |
| Delaware | 11,312 | 5,713 | 3,318 | 2,281 |
| South Dakota | 6,189 | 4,876 | 265 | 1,045 |
| Nebraska | 6,390 | 6,141 | 10 | 233 |
| Rhode Island | 23,875 | 2,135 | 21,741 | 0 |
| Connecticut | 6,832 | 757 | 6,075 | 0 |
| North Dakota | 3,146 | 2,877 | 32 | 240 |
| United States | 4,002,231 | 1,499,634 | 1,505,434 | 997,158 |

*Source:* Center for Urban Policy Research, Rutgers University.
*Note:* Washington, DC, is included in the nationwide (United States) totals.

Courtesy of J. Albert

ally, one unit of residential development occupies three-fifths of an acre, and one unit of nonresidential development (1,000 square feet of space) occupies one-fifth of an acre. There are noticeable deviations from that generalization, however. With respect to fast-growing states, California is considerably more efficient in accommodating resident and job growth than is the state of North Carolina. California can accommodate a growth of 3.3 million housing units and 3.3 billion square feet of nonresidential space using 1.386 million acres. North Carolina can accommodate only 0.98 million housing units and 0.87 billion square feet of nonresidential space using 1.060 million acres. California can accommodate 3.5 times as much growth using only 30 percent more land than North Carolina. The most efficient states in accommodating development in terms of acres of land used per combined unit of residential and nonresidential development are Illinois (0.19), Nevada (0.20), New Jersey (0.20), Rhode Island (0.21), and California (0.21) (Table 6.26). The least efficient states are Wyoming (0.82), Vermont (0.78), Montana (0.76), Arkansas (0.73), Maine (0.63), and West Virginia (0.61) (Table 6.26).

States also vary by the type of land taken for development purposes. Texas loses significant amounts of farmland (1.14 million acres, mainly pastureland and rangeland) to development. Close to three-quarters of the land lost to development in Texas is farmland. Georgia loses 806,000 acres of environmentally fragile land, or 72 percent of all future developed lands, to development. The largest losses in *agricultural* land, after the state of Texas, are California (548,427 acres); Florida (493,984 acres); Tennessee (356,950 acres); and Indiana (298,538 acres). The largest losses in *environmentally fragile land,* after Georgia, are North Carolina (633,735 acres); Florida (626,238 acres); South Carolina (366,679 acres); Alabama (288,045 acres); and Tennessee (281,219 acres) (Table 6.25).

Another characteristic of land development in states affecting land conversion under uncontrolled growth is the amount of land converted in the more-developed versus less-developed areas of counties. More-developed areas typically have a much higher density for residential and nonresidential development and use less land. At the state level, the amount of land developed in more-developed areas varies from a high of 90 percent to a low of 16 percent (Table 6.26). At the high end—wherein most development under uncontrolled growth takes place in more-developed areas—are California (90 percent); Massachusetts (89 percent); Florida (85 percent); New Jersey (85 percent); Nevada (84 percent); and Illinois (82 percent). At the low end—wherein development takes place primarily in undeveloped portions of counties—are Montana (16 percent); West Virginia (23 percent); Wyoming (24 percent); Arkansas (26 percent); and Vermont (26 percent).

## Controlled Growth

Under controlled growth, the largest amount of land savings is accomplished in the state of California, with 426,778 acres saved due to a combination of intercounty and intracounty redirection of households and jobs. California is followed in land savings by Texas (405,056 acres); Florida (347,122 acres); and Georgia (302,348 acres) (Table 6.27). Land savings of a magnitude significantly below these states are found in Maryland (174,183 acres); Colorado (161,926 acres); Tennessee (161,838 acres); Virginia (151,382 acres); North Carolina (130,636 acres); and South Carolina (100,990 acres). Of the above 10 states, which account for 2.36 million acres of the 4 million acres total land savings, all are found in the South and the West, and all but two are found in the South. Maryland saves the most land for the least amount of growth during the projection period (Table 6.27).

Courtesy of G Lowenstein

## Table 6.28
## Intercounty, Intracounty, and Sprawl Land Savings in States: 2000 to 2025

| State by Rank | Total Savings (Acres) | Intercounty Savings for All Counties | | Intracounty Savings for Uncontrolled Counties | | Intracounty Savings for All Other Counties | | Total Savings in Sprawl Locations | |
|---|---|---|---|---|---|---|---|---|---|
| | | (Acres) | (%) | (Acres) | (%) | (Acres) | (%) | (Acres) | (%) |
| Florida | 347,122 | 187,385 | 54.0 | 107,794 | 31.1 | 51,942 | 15.0 | 295,180 | 85.0 |
| Texas | 405,059 | 256,797 | 63.4 | 54,378 | 13.4 | 93,885 | 23.2 | 311,174 | 76.8 |
| California | 426,779 | 354,374 | 83.0 | 44,919 | 10.5 | 27,486 | 6.4 | 399,293 | 93.6 |
| Georgia | 302,350 | 213,298 | 70.5 | 15,926 | 5.3 | 73,126 | 24.2 | 229,224 | 75.8 |
| North Carolina | 130,638 | 12,828 | 9.8 | 71,040 | 54.4 | 46,770 | 35.8 | 83,868 | 64.2 |
| Tennessee | 161,831 | 98,882 | 61.1 | 27,285 | 16.9 | 35,665 | 22.0 | 126,166 | 78.0 |
| Arizona | 94,826 | 20,323 | 21.4 | 69,144 | 72.9 | 5,358 | 5.7 | 89,467 | 94.3 |
| South Carolina | 100,991 | 32,652 | 32.3 | 48,955 | 48.5 | 19,384 | 19.2 | 81,607 | 80.8 |
| Virginia | 151,384 | 104,898 | 69.3 | 2,973 | 2.0 | 43,513 | 28.7 | 107,871 | 71.3 |
| Colorado | 161,926 | 131,773 | 81.4 | 14,774 | 9.1 | 15,379 | 9.5 | 146,547 | 90.5 |
| Alabama | 96,654 | 55,112 | 57.0 | 17,560 | 18.2 | 23,983 | 24.8 | 72,671 | 75.2 |
| Michigan | 74,174 | 36,179 | 48.8 | 9,549 | 12.9 | 28,446 | 38.4 | 45,728 | 61.6 |
| Washington | 93,764 | 54,043 | 57.6 | 9,516 | 10.1 | 30,206 | 32.2 | 63,558 | 67.8 |
| Maryland | 174,183 | 148,164 | 85.1 | 3,726 | 2.1 | 22,293 | 12.8 | 151,890 | 87.2 |
| Indiana | 66,755 | 32,636 | 48.9 | 14,490 | 21.7 | 19,629 | 29.4 | 47,126 | 70.6 |
| Ohio | 56,311 | 27,846 | 49.5 | 11,749 | 20.9 | 16,716 | 29.7 | 39,595 | 70.3 |
| Kentucky | 46,868 | 19,777 | 42.2 | 8,907 | 19.0 | 18,185 | 38.8 | 28,683 | 61.2 |
| Pennsylvania | 69,386 | 47,157 | 68.0 | 10,478 | 15.1 | 11,752 | 16.9 | 57,634 | 83.1 |
| Oregon | 99,875 | 72,703 | 72.8 | 7,451 | 7.5 | 19,721 | 19.7 | 80,154 | 80.3 |
| Wisconsin | 56,557 | 22,010 | 38.9 | 13,286 | 23.5 | 21,261 | 37.6 | 35,296 | 62.4 |
| Arkansas | 68,072 | 49,453 | 72.6 | 8,278 | 12.2 | 10,340 | 15.2 | 57,731 | 84.8 |
| Louisiana | 51,489 | 21,619 | 42.0 | 11,838 | 23.0 | 18,032 | 35.0 | 33,457 | 65.0 |
| Minnesota | 64,891 | 41,817 | 64.4 | 2,932 | 4.5 | 20,143 | 31.0 | 44,749 | 69.0 |
| Missouri | 46,172 | 15,600 | 33.8 | 13,543 | 29.3 | 17,029 | 36.9 | 29,143 | 63.1 |
| New York | 42,103 | 22,422 | 53.3 | 4,030 | 9.6 | 15,651 | 37.2 | 26,452 | 62.8 |
| Utah | 53,450 | 33,909 | 63.4 | 10,591 | 19.8 | 8,949 | 16.7 | 44,501 | 83.3 |
| Illinois | 40,208 | 21,223 | 52.8 | 870 | 2.2 | 18,115 | 45.1 | 22,093 | 54.9 |
| Mississippi | 31,650 | 10,011 | 31.6 | 11,911 | 37.6 | 9,728 | 30.7 | 21,922 | 69.3 |
| Oklahoma | 37,873 | 18,443 | 48.7 | 5,436 | 14.4 | 13,994 | 36.9 | 23,879 | 63.1 |
| New Mexico | 36,913 | 14,840 | 40.2 | 10,468 | 28.4 | 11,605 | 31.4 | 25,308 | 68.6 |
| Nevada | 40,492 | 23,902 | 59.0 | 12,437 | 30.7 | 4,154 | 10.3 | 36,338 | 89.7 |
| Massachusetts | 35,761 | 21,356 | 59.7 | 3,719 | 10.4 | 10,686 | 29.9 | 25,075 | 70.1 |
| Idaho | 18,690 | 3,904 | 20.9 | 6,439 | 34.5 | 8,346 | 44.7 | 10,344 | 55.3 |
| Hawaii | 80,922 | 76,054 | 94.0 | 2,099 | 2.6 | 2,770 | 3.4 | 78,152 | 96.6 |
| New Jersey | 44,623 | 33,357 | 74.8 | 0 | 0.0 | 11,266 | 25.2 | 33,357 | 74.8 |
| Montana | 14,238 | 0 | 0.0 | 10,945 | 76.9 | 3,293 | 23.1 | 10,945 | 76.9 |
| Maine | 19,869 | 3,746 | 18.9 | 8,194 | 41.2 | 7,929 | 39.9 | 11,940 | 60.1 |
| West Virginia | 26,957 | 17,468 | 64.8 | 1,005 | 3.7 | 8,484 | 31.5 | 18,473 | 68.5 |
| New Hampshire | 31,367 | 19,494 | 62.1 | 4,361 | 13.9 | 7,512 | 23.9 | 23,855 | 76.1 |
| Iowa | 9,877 | 27 | 0.3 | 3,829 | 38.8 | 6,020 | 61.0 | 3,857 | 39.0 |
| Alaska | 9,876 | 0 | 0.0 | 7,910 | 80.1 | 1,966 | 19.9 | 7,910 | 80.1 |
| Wyoming | 9,167 | 985 | 10.7 | 4,829 | 52.7 | 3,353 | 36.6 | 5,814 | 63.4 |
| Kansas | 8,771 | 996 | 11.4 | 723 | 8.2 | 7,052 | 80.4 | 1,719 | 19.6 |
| Vermont | 9,037 | 73 | 0.8 | 2,429 | 26.9 | 6,535 | 72.3 | 2,502 | 27.7 |
| Delaware | 11,312 | 5,597 | 49.5 | 5,297 | 46.8 | 418 | 3.7 | 10,894 | 96.3 |
| South Dakota | 6,187 | 0 | 0.0 | 4,638 | 75.0 | 1,549 | 25.0 | 4,638 | 75.0 |
| Nebraska | 6,391 | 974 | 15.2 | 600 | 9.4 | 4,817 | 75.4 | 1,574 | 24.6 |
| Rhode Island | 23,875 | 22,819 | 95.6 | 0 | 0.0 | 1,056 | 4.4 | 22,819 | 95.6 |
| Connecticut | 7,239 | 1,852 | 25.6 | 811 | 11.2 | 4,576 | 63.2 | 2,663 | 36.8 |
| North Dakota | 3,149 | 0 | 0.0 | 1,439 | 45.7 | 1,709 | 54.3 | 1,439 | 45.7 |
| D. C. | -5,414 | -3,086 | 57.0 | 0 | 0.0 | -2,328 | 43.0 | -3,086 | 57.0 |
| United States | 4,002,636 | 2,407,688 | 60.2 | 725,500 | 18.1 | 869,447 | 21.7 | 3,133,189 | 78.3 |

*Source:* Center for Urban Policy Research, Rutgers University.

The largest savings of agricultural lands are found in Texas (282,385 acres), California (165,120 acres), and Florida (115,555 acres); the largest savings of environmentally fragile lands are found in Georgia (228,179 acres), Florida (139,144), and Maryland (108,629 acres). The largest savings of "other" lands are found in California (202,858 acres), Colorado (87,397 acres), and Arizona (65,134 acres) (Table 6.27).

Another factor influencing land savings in states is the percentage of overall land savings attributable to intercounty relocation of households and jobs. Although there is no direct correlation, there *is* a strong


Courtesy of USFWS/J. & K. Hollingsworth

relationship between a state's success in saving land and its ability to accomplish significant amounts of intercounty relocation of households and jobs. Many of the states displaying high percentages of land saved can attribute those savings to intercounty growth movement. The percentage of overall land savings due to this growth control strategy varies from 96 percent to 0 percent at the state level (Table 6.28). At the high end of the savings scale are Rhode Island (96 percent), Hawaii (94 percent), Maryland (85 percent), California (83 percent), and Colorado (81 percent). At the low end are Alaska, North Dakota, Montana, and Iowa (all 0 percent), Vermont (1 percent), North Carolina (10 percent), and Wyoming and Kansas (both 11 percent). Exceptions to the correlation between high percentage of intercounty moves and high levels of land savings are Hawaii and Rhode Island, which have high percentages of intercounty moves and low amounts of land savings, and North Carolina, which has a low percentage of intercounty moves and high amounts of land savings (Table 6.28).

Again, as was discussed earlier for both the United States as a whole and for its regions, there must be a discussion of the land saved in specifically designated sprawl locations. This includes intercounty land savings and the portion of intracounty land savings that occurs in a state's sprawl counties that cannot be controlled through intercounty movement of households and jobs. In order to calculate the amount of sprawl land savings in states, an increment must be added to the savings observed due to intercounty control. This increment amounts to an average of approximately 18 percent of all land savings. In states, the percentage of sprawl land saved to all land saved varies from highs in Hawaii (97 percent), Delaware (96 percent), Rhode Island (95 percent), Arizona (94 percent), California (93 percent), and Nevada (90 percent), to lows in Kansas (20 percent), Nebraska (25 percent), Vermont (28 percent), Connecticut (37 percent), and Iowa (39 percent) (Table 6.28).

## EAs

### Uncontrolled Growth

Land conversion in the EAs across the United States supports what has been generally presented for the United States as a whole, its regions, and its states. Most of the growth and land conversion is taking place in the South and the West. Of the top-30 EAs in growth and land conversion, 15 are in the South, eight are in the West, four are in the Northeast, and three are in the Midwest (Table 6.29).

The Atlanta, GA-AL-NC and Nashville, TN-KY EAs in the South clearly bear mentioning. The Atlanta EA converts the most land of any other EA over the period 2000 to 2025. To accommodate the growth of 1.5 million units of residential and nonresidential development, the Atlanta EA converts over 800,000 acres of land or an average of 0.51 of an acre per development unit (Table 6.30). The Nashville EA has an even greater land-conversion average. In support of growth of nearly 600,000 development units in the Nashville EA, 460,000 acres are converted, a conversion rate of close to three-quarters of an acre per unit (Table 6.30). On the other hand, the Los Angeles-Riverside-Orange, CA-AZ EA, in accommodating 2.8 million development units (nearly twice the development level of the Atlanta EA, and 4.5 times the level of the Nashville EA), converts only two-thirds the acreage of Atlanta and 120 percent of the acreage of the Nashville EA. The Los Angeles-Riverside-Orange, CA-AZ EA is developing at a level of 0.2 of an acre per development unit. High levels of land conversion per development unit, other than the Nashville EA, are occurring in the Lexington, KY EA (0.73 of an acre per unit); Jacksonville, FL EA (0.70 of an acre per unit); and the Knoxville, TN EA (0.68 of an acre per unit). On the other hand, low levels of land converted per development unit are found in the Mi-


Courtesy of R. Ewing

## Table 6.29
## Lands Converted in EAs by Type
## Uncontrolled- and Controlled-Growth Scenarios: 2000 to 2025

| | Uncontrolled-Growth Scenario | | | | | Controlled-Growth Scenario | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EAs by Rank | Total Land Converted (Acres) | Percentage of Overall Land Converted (%) | Agricultural Lands Converted (Acres) | Environmentally Fragile Lands Converted (Acres) | Other Lands Converted (Acres) | Total Land Converted (Acres) | Percentage of Overall Land Converted (%) | Agricultural Lands Converted (Acres) | Environmentally Fragile Lands Converted (Acres) | Other Lands Converted (Acres) |
| Atlanta | 800,288 | 4.25 | 122,880 | 650,546 | 26,862 | 554,948 | 3.74 | 84,357 | 451,855 | 18,736 |
| Wash.-Balti. | 665,674 | 3.53 | 209,193 | 397,193 | 59,288 | 400,775 | 2.70 | 115,328 | 231,269 | 54,178 |
| Los Angeles-River.-Orange | 546,906 | 2.90 | 138,076 | 53,354 | 355,476 | 308,028 | 2.08 | 82,715 | 38,900 | 186,413 |
| Orlando | 479,224 | 2.54 | 167,788 | 167,696 | 143,739 | 430,424 | 2.90 | 150,554 | 150,801 | 129,068 |
| Dallas-F. Wor. | 462,019 | 2.45 | 363,804 | 48,872 | 49,342 | 363,359 | 2.45 | 285,777 | 40,278 | 37,305 |
| Nashville | 459,877 | 2.44 | 275,487 | 52,091 | 132,299 | 349,915 | 2.36 | 215,090 | 35,811 | 99,013 |
| Denver-Boul.-Greeley | 455,159 | 2.42 | 193,606 | 38,365 | 223,188 | 298,206 | 2.01 | 137,714 | 22,047 | 138,445 |
| Houston-Gal.-Brazoria | 399,568 | 2.12 | 240,933 | 118,187 | 40,448 | 283,446 | 1.91 | 176,779 | 78,210 | 28,458 |
| Jacksonville | 388,588 | 2.06 | 46,443 | 278,161 | 63,984 | 290,230 | 1.96 | 34,826 | 203,988 | 51,416 |
| Boston-Wor.-Law.-Lo.-Bro., | 363,865 | 1.93 | 32,588 | 294,406 | 36,871 | 272,217 | 1.83 | 26,260 | 216,112 | 29,845 |
| New York-NNJ-Long Isl. | 341,540 | 1.81 | 48,240 | 262,120 | 31,179 | 281,066 | 1.89 | 39,333 | 216,764 | 24,969 |
| San Francisco-Oak.-S. Jose | 345,067 | 1.83 | 218,650 | 75,799 | 50,618 | 220,666 | 1.49 | 133,985 | 51,785 | 34,896 |
| Minneapolis-St. Paul | 298,943 | 1.59 | 150,635 | 42,053 | 106,255 | 230,528 | 1.55 | 116,749 | 37,580 | 76,199 |
| Seattle-Taco.-Bremerton | 269,545 | 1.43 | 17,153 | 175,967 | 76,424 | 197,327 | 1.33 | 12,846 | 131,933 | 52,548 |
| Portland-Salem | 267,092 | 1.42 | 52,155 | 108,964 | 105,973 | 175,544 | 1.18 | 40,580 | 76,205 | 58,759 |
| San Antonio | 266,330 | 1.41 | 192,261 | 30,238 | 43,831 | 192,451 | 1.30 | 146,800 | 17,786 | 27,865 |
| Phoenix-Mesa | 265,698 | 1.41 | 55,868 | 14,329 | 195,502 | 231,380 | 1.56 | 48,859 | 12,788 | 169,733 |
| Miami-Fort Lauderdale | 246,200 | 1.31 | 75,235 | 24,857 | 146,108 | 208,837 | 1.41 | 53,433 | 18,382 | 137,021 |
| Sacramento-Yolo | 234,350 | 1.24 | 85,588 | 72,663 | 76,099 | 196,646 | 1.33 | 74,505 | 59,658 | 62,483 |
| Las Vegas | 231,859 | 1.23 | 17,722 | 2,478 | 211,659 | 206,235 | 1.39 | 16,105 | 2,257 | 187,873 |
| Chicago-Gary-Kenosha | 225,504 | 1.20 | 189,401 | 32,787 | 3,316 | 179,608 | 1.21 | 147,570 | 28,925 | 3,113 |
| Charlotte-Gasto.-R. Hill | 224,779 | 1.19 | 72,625 | 136,416 | 15,738 | 196,279 | 1.32 | 63,852 | 118,457 | 13,970 |
| Austin-San Marcos | 220,786 | 1.17 | 175,261 | 17,674 | 27,850 | 142,470 | .96 | 110,782 | 12,327 | 19,360 |
| Raleigh-Dur.-Chapel Hill | 216,944 | 1.15 | 66,429 | 109,981 | 40,534 | 185,415 | 1.25 | 57,638 | 91,562 | 36,215 |
| Indianapolis | 213,955 | 1.14 | 170,129 | 31,779 | 12,047 | 181,207 | 1.22 | 146,261 | 25,252 | 9,694 |
| Tampa-St. Pet-Clearwater | 207,033 | 1.10 | 107,510 | 59,613 | 39,910 | 118,154 | .80 | 67,588 | 35,567 | 14,999 |
| Philadelphia-Wil.-Atl. City | 204,332 | 1.08 | 92,282 | 105,511 | 6,540 | 129,188 | .87 | 59,837 | 64,701 | 4,650 |
| Knoxville | 197,790 | 1.05 | 46,346 | 149,010 | 2,434 | 160,937 | 1.08 | 39,239 | 119,470 | 2,228 |
| Lexington, | 189,901 | 1.01 | 50,163 | 102,191 | 37,547 | 171,630 | 1.16 | 45,676 | 92,300 | 33,655 |
| Greensboro-Wins.-Sal-HP | 186,691 | .99 | 63,975 | 87,727 | 34,989 | 166,346 | 1.12 | 55,761 | 78,846 | 31,739 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The percentage of overall land converted is the ratio of land converted in the EA (or county) to the total land converted in the United States over the 25-year projection period.

ami-Fort Lauderdale, FL EA (0.17 of an acre per unit); Chicago-Gary-Kenosha, IL-IN-WI EA (0.18 of an acre per unit); Phoenix-Mesa, AZ-NM EA (0.19 of an acre per unit); Los Angeles-Riverside-Orange, CA-AZ EA (0.19 of an acre per unit); San Francisco-Oakland-San Jose, CA EA (0.21 of an acre per unit); the Seattle-Tacoma-Bremerton, WA EA (0.22 of an acre per unit); and the New York-Northern New Jersey-

## Table 6.30
## Units Developed in EAs and Land Converted—Land Conversion Summary: 2000 to 2025
(Top 30 EAs)

| EAs | Total Units (#) | Residential Units (#) | Non-residential Units (#) | Total Land Converted (Acres) | Original Acres per Unit (Acres) | Land Saved (Acres) | New Acres per Unit (Acres) | Percentage of Units in Urban/ Suburban Counties (%) | Percentage of Units in Developed Areas of Counties (%) |
|---|---|---|---|---|---|---|---|---|---|
| Atlanta | 1,556,336 | 872,215 | 684,121 | 800,288 | 0.5142 | 245,338 | 0.3580 | 75.3 | 64.7 |
| Washington-Baltimore | 1,836,241 | 902,435 | 933,806 | 665,675 | 0.3625 | 264,899 | 0.2270 | 82.3 | 77.6 |
| Los Angeles-Rivers.-Orange | 2,834,266 | 1,269,603 | 1,564,663 | 546,906 | 0.1930 | 238,878 | 0.1107 | 79.4 | 93.8 |
| Orlando | 1,129,006 | 692,982 | 436,024 | 479,225 | 0.4245 | 48,801 | 0.3812 | 56.9 | 80.8 |
| Dallas-Fort Worth | 1,838,462 | 1,031,242 | 807,220 | 462,021 | 0.2513 | 98,659 | 0.1978 | 86.9 | 81.8 |
| Nashville | 595,314 | 330,977 | 264,337 | 459,878 | 0.7725 | 109,962 | 0.5906 | 34.5 | 33.1 |
| Denver-Boulder-Greeley | 1,368,513 | 712,343 | 656,170 | 455,160 | 0.3326 | 156,954 | 0.2208 | 78.6 | 76.6 |
| Houston-Galveston-Brazoria | 1,454,861 | 822,189 | 632,672 | 399,567 | 0.2746 | 116,122 | 0.1952 | 87.7 | 73.6 |
| Jacksonville | 553,635 | 315,580 | 238,055 | 388,586 | 0.7019 | 98,355 | 0.5244 | 45.8 | 61.4 |
| Boston-Worces.-Lawrence-Lowell-Brocktn, | 1,091,630 | 496,148 | 595,482 | 363,867 | 0.3333 | 91,650 | 0.2532 | 83.7 | 71.1 |
| New York-N. New Jersey-Long Island | 1,573,171 | 470,668 | 1,102,503 | 347,619 | 0.2210 | 60,471 | 0.1846 | 82.7 | 73.1 |
| San Francisco-Oakland-S. Jose | 1,645,638 | 849,514 | 796,123 | 345,067 | 0.2097 | 124,402 | 0.1354 | 78.0 | 90.7 |
| Minneapolis-St. Paul | 944,183 | 446,306 | 497,876 | 298,944 | 0.3166 | 68,418 | 0.2468 | 66.6 | 67.5 |
| Seattle-Tacoma-Bremerton | 1,244,204 | 693,721 | 550,483 | 269,544 | 0.2166 | 72,219 | 0.1592 | 89.4 | 80.8 |
| Portland-Salem | 788,336 | 430,118 | 358,218 | 267,093 | 0.3388 | 91,551 | 0.2260 | 73.7 | 69.3 |
| San Antonio | 739,307 | 424,496 | 314,811 | 266,330 | 0.3602 | 73,877 | 0.2607 | 75.5 | 76.5 |
| Phoenix-Mesa | 1,390,280 | 838,516 | 551,763 | 265,698 | 0.1911 | 34,317 | 0.1664 | 91.6 | 90.3 |
| Miami-Fort Lauderdale | 1,441,174 | 779,764 | 661,409 | 246,201 | 0.1708 | 37,362 | 0.1453 | 91.9 | 96.0 |
| Sacramento-Yolo | 641,652 | 374,326 | 267,326 | 234,349 | 0.3652 | 37,703 | 0.3074 | 51.0 | 75.4 |
| Las Vegas | 830,101 | 475,717 | 354,384 | 231,859 | 0.2793 | 25,624 | 0.2484 | 82.8 | 79.2 |
| Chicago-Gary-Kenosha | 1,246,960 | 442,450 | 804,510 | 225,502 | 0.1808 | 45,891 | 0.1471 | 89.3 | 85.4 |
| Charlotte-Gastonia-R. Hill | 488,203 | 263,434 | 224,769 | 224,778 | 0.4604 | 28,498 | 0.4021 | 63.0 | 66.6 |
| Austin-San Marcos | 475,642 | 267,689 | 207,953 | 220,787 | 0.4642 | 78,319 | 0.3005 | 72.7 | 70.1 |
| Raleigh-Durham-Chapel Hill | 503,701 | 274,456 | 229,244 | 216,943 | 0.4307 | 31,527 | 0.3680 | 73.2 | 67.2 |
| Indianapolis | 638,537 | 313,103 | 325,434 | 213,955 | 0.3351 | 32,756 | 0.2836 | 48.7 | 61.9 |
| Tampa-St. Petersburg-Clearwater | 739,338 | 432,611 | 306,727 | 207,033 | 0.2800 | 88,879 | 0.1591 | 85.3 | 90.3 |
| Philadelphia-Wilmington-Atlantic City | 764,268 | 352,266 | 412,002 | 204,332 | 0.2674 | 75,143 | 0.1864 | 73.4 | 81.1 |
| Knoxville | 289,612 | 157,014 | 132,598 | 197,790 | 0.6829 | 36,856 | 0.5570 | 40.1 | 36.3 |
| Lexington, | 260,636 | 129,736 | 130,900 | 189,900 | 0.7286 | 18,275 | 0.6590 | 29.8 | 28.1 |
| Greensboro-Winston-Salem-High Point | 337,344 | 162,374 | 174,970 | 186,691 | 0.5534 | 20,347 | 0.4931 | 55.2 | 55.2 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* One nonresidential unit equals 1,000 square feet.

Long Island, NY-NJ-CT-PA-MA-VT EA (0.22 of an acre per unit) (Table 6.30).

In total lands converted, the top-10 EAs are (1) Atlanta, GA-AL-NC, (2) Washington-Baltimore, DC-MD-VA-WV-PA, (3) Los Angeles-Riverside-Orange, CA-AZ, (4) Orlando, FL, (5) Dallas-Fort Worth, TX-AR-OK, (6)Nashville, TN-KY, (7) Denver-Boulder-Greeley, CO-KS-NE, (8) Houston-Galveston-Brazoria, TX, (9) Jacksonville, FL-GA, and (10)

**Table 6.31**
**Lands Saved in EAs by Type**
**Uncontrolled- and Controlled-Growth Scenarios: 2000 to 2025**
(Top 30 EAs)

| EA by Rank | Total Land (Acres) | Agricultural Lands (Acres) | Environmentally Fragile Lands (Acres) | Other Lands (Acres) |
|---|---|---|---|---|
| Atlanta | 245,338 | 38,523 | 198,691 | 8,126 |
| Washington-Baltimore | 264,899 | 93,865 | 165,924 | 5,110 |
| Los Angeles-Riverside-Orange | 238,878 | 55,361 | 14,454 | 169,063 |
| Orlando | 48,801 | 17,234 | 16,895 | 14,671 |
| Dallas-Fort Worth | 98,659 | 78,028 | 8,595 | 12,038 |
| Nashville | 109,962 | 60,397 | 16,279 | 33,286 |
| Denver-Boulder-Greeley | 156,954 | 55,892 | 16,318 | 84,743 |
| Houston-Galveston-Brazoria | 116,122 | 64,155 | 39,977 | 11,990 |
| Jacksonville | 98,355 | 11,617 | 74,174 | 12,568 |
| Boston-Worcester-Lawrence.-Lowell-Bro., | 91,650 | 6,327 | 78,294 | 7,027 |
| New York-North New Jersey-Long Island | 60,471 | 8,908 | 45,356 | 6,210 |
| San Francisco-Oakland-San Jose | 124,402 | 84,665 | 24,014 | 15,722 |
| Minneapolis-St. Paul | 68,418 | 33,886 | 4,472 | 30,056 |
| Seattle-Tacoma-Bremerton | 72,219 | 4,308 | 44,035 | 23,876 |
| Portland-Salem | 91,551 | 11,576 | 32,759 | 47,214 |
| San Antonio | 73,877 | 45,461 | 12,452 | 15,967 |
| Phoenix-Mesa | 34,317 | 7,009 | 1,541 | 25,768 |
| Miami-Fort Lauderdale | 37,362 | 21,802 | 6,475 | 9,086 |
| Sacramento-Yolo | 37,703 | 11,082 | 13,005 | 13,616 |
| Las Vegas | 25,624 | 1,617 | 221 | 23,786 |
| Chicago-Gary-Kenosha | 45,891 | 41,831 | 3,862 | 203 |
| Charlotte-Gastonia-Rock Hill | 28,498 | 8,773 | 17,959 | 1,768 |
| Austin-San Marcos | 78,319 | 64,479 | 5,347 | 8,490 |
| Raleigh-Durham-Chapel Hill | 31,527 | 8,791 | 18,419 | 4,319 |
| Indianapolis | 32,756 | 23,868 | 6,527 | 2,352 |
| Tampa-St. Petersburg-Clearwater | 88,879 | 39,922 | 24,047 | 24,910 |
| Philadelphia-Wilmington-Atlantic City | 75,143 | 32,444 | 40,810 | 1,890 |
| Knoxville | 36,856 | 7,107 | 29,540 | 206 |
| Lexington | 18,275 | 4,487 | 9,891 | 3,893 |
| Greensboro-Winston-Salem-High Point | 20,347 | 8,214 | 8,881 | 3,250 |

*Source:* Center for Urban Policy Research, Rutgers University.

Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH-RI-VT (Table 6.29). These EAs vary in rank order from 800,000 to below 400,000 acres of land converted over a 25-year period. These are also sites of significant commitment to development of agricultural lands and environmentally fragile lands. In the Dallas-Fort Worth, TX EA, 365,000 of 462,000 acres converted are agricultural acres. In Houston-Galveston-Brazoria, TX EA, 240,000 agricultural acres of 400,000 total acres are converted. In the Chi-

cago-Gary-Kenosha, IL-IN-WI EA, 190,000 acres out of 225,000 total acres are converted (Table 6.29).

With regard to environmentally fragile lands, 650,000 acres of the 800,000 acres converted in the Atlanta, GE-AL-NC EA are environmentally fragile, as are nearly 400,000 of the 665,000 acres converted in the Washington-Baltimore, DC-MD-VA-WV-PA EA. Other significant potential losses of environmentally fragile lands are in the Jacksonville, FL-GA EA (278,000 of 388,000 acres); the Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH-RI-VT EA (294,000 of 338,000 acres); and the New York-Northern New Jersey-Long Island, NY-NJ-CT-PA-MA-VT EA (262,000 of 342,000 acres). Significant conversion of other lands occurs in the Los Angeles-Riverside-Orange, CA-AZ EA (355,000 acres); the Denver-Boulder-Greeley, CO-KS-NE EA (223,000 acres); and the Las Vegas, NV-AZ-UT EA (212,000 acres) (Table 6.29).

## Controlled Growth

The controlled-growth scenario viewed for the top-12 EAs in land conversion shows an upper level of land saving of 265,000 to 240,000 acres (Washington-Baltimore, DC-MD-VA-WV-PA; Atlanta, GA-AL-NC; and Los Angeles-Riverside-Orange, CA-AZ) and a lower level of 40,000 to 60,000 acres (Orlando, FL; New York-Northern New Jersey-Long Island, NY-NJ-CT-PA-MA-VT) (Table 6.31). Expanding the group to the top-30 land conversion EAs, the land savings drop as low as 18,000 acres (Lexington, KY). The largest saving of most agricultural land by far is in the Washington-Baltimore, DC-MD-VA-WV-PA EA (94,000 acres), followed by the San Francisco-Oakland-San Jose, CA EA (84,000 acres) (Table 6.31). Sites that save the greatest number of acres of environmentally fragile lands are in the Atlanta, GA-AL-NC and the Washington-Baltimore, DC-MD-VA-WV-PA EAs (199,000 acres and 166,000 acres, respectively) (Table 6.31). The greatest number of "other" (e.g., barren) acres saved is in the Los Angeles-Riverside-Orange, CA-AZ EA (169,000 acres) (Table 6.31).

Within EAs, there seems to be a close correlation between the percentage development in urban and suburban counties and the percentage development in developed portions of counties (Table 6.30). This is generally related to a higher land saving as a result of growth-control measures in these EAs. In the Nashville, TN-KY EA, that is not the case. This is because peripheral density of development is so low that even

Courtesy of C. Galley

the movement of a small fraction of development units into urban density locations saves a considerable amount of land. On the whole, however, aggregate land saved in EAs, due to the applied growth-control measures, follows trends observed at the region and state levels (Table 6.30).

Land conversion savings in sprawl counties are of key interest and different from the aggregate savings discussed thus far. Land savings in sprawl counties include the savings achieved from intercounty shifts of households and jobs for those counties that can be controlled, as well as the savings related to the movement to more-developed areas in an individual county for the portion of sprawl counties that cannot be subject to intercounty control. These savings are shown for EAs in Table 6.32. Intercounty shifts provide the biggest source of land saving for sprawl counties. For the top-12 EAs in land conversion, this ranges from a high of 238,000 acres (Los Angeles-Riverside-Orange, CA-AZ EA) to a low of 36,000 acres (New York-Northern New Jersey-Long Island, NY-NJ-CT-PA-MA-VT EA) (Table 6.32). The percentage of all land savings attributed to intercounty savings ranges

## Table 6.32
## Intercounty, Intracounty, and Sprawl Land Savings in EAs: 2000 to 2025

| EA by Rank | Total Savings (Acres) | Intercounty Savings for All Counties | | Intracounty Savings for Uncontrolled Counties | | Intracounty Savings for All Other Counties | | Total Savings in Sprawl Locations | |
|---|---|---|---|---|---|---|---|---|---|
| | | (Acres) | (%) | (Acres) | (%) | (Acres) | (%) | (Acres) | (%) |
| Atlanta | 245,342 | 187,935 | 76.6 | 4,503 | 1.8 | 52,903 | 21.6 | 192,438 | 78.4 |
| Washington-Baltimore | 264,900 | 223,639 | 84.4 | 0 | 0.0 | 41,261 | 15.6 | 223,639 | 84.4 |
| Los Angeles-River.-Orange | 238,877 | 237,614 | 99.5 | 11,716 | 4.9 | -10,453 | -4.4 | 249,330 | 104.4 |
| Orlando | 48,801 | 0 | 0.0 | 30,565 | 62.6 | 18,235 | 37.4 | 30,565 | 62.6 |
| Dallas-Fort Worth. | 98,660 | 53,737 | 54.5 | 8,028 | 8.1 | 36,895 | 37.4 | 61,765 | 62.6 |
| Nashville | 109,959 | 77,622 | 70.6 | 16,986 | 15.4 | 15,351 | 14.0 | 94,608 | 86.0 |
| Denver-Boul.-Greeley | 156,953 | 131,773 | 84.0 | 10,021 | 6.4 | 15,159 | 9.7 | 141,795 | 90.3 |
| Houston-Gal.-Brazoria | 116,122 | 74,950 | 64.5 | 21,388 | 18.4 | 19,784 | 17.0 | 96,338 | 83.0 |
| Jacksonville | 98,356 | 61,414 | 62.4 | 22,330 | 22.7 | 14,611 | 14.9 | 83,745 | 85.1 |
| Boston-Wor.-Law.-Lo.-Bro., | 91,649 | 63,803 | 69.6 | 8,080 | 8.8 | 19,767 | 21.6 | 71,882 | 78.4 |
| New York-NNJ-Long Isl. | 60,883 | 36,914 | 60.6 | 811 | 1.3 | 23,157 | 38.0 | 37,726 | 62.0 |
| San Francisco-Oak.-S. Jose | 124,403 | 114,551 | 92.1 | 1,268 | 1.0 | 8,585 | 6.9 | 115,818 | 93.1 |
| Minneapolis-St. Paul | 68,418 | 46,969 | 68.7 | 0 | 0.0 | 21,449 | 31.3 | 46,969 | 68.7 |
| Seattle-Taco.-Bremerton | 72,219 | 49,604 | 68.7 | 1,508 | 2.1 | 21,107 | 29.2 | 51,112 | 70.8 |
| Portland-Salem | 91,551 | 76,386 | 83.4 | 0 | 0.0 | 15,164 | 16.6 | 76,386 | 83.4 |
| San Antonio | 73,876 | 47,073 | 63.7 | 10,362 | 14.0 | 16,442 | 22.3 | 57,435 | 77.7 |
| Phoenix-Mesa | 34,317 | 0 | 0.0 | 32,736 | 95.4 | 1,581 | 4.6 | 32,736 | 95.4 |
| Miami-Fort Lauderdale | 37,362 | 32,392 | 86.7 | 3,365 | 9.0 | 1,605 | 4.3 | 35,757 | 95.7 |
| Sacramento-Yolo | 37,704 | 13,677 | 36.3 | 18,901 | 50.1 | 5,125 | 13.6 | 32,578 | 86.4 |
| Las Vegas | 25,625 | 0 | 0.0 | 24,889 | 97.1 | 736 | 2.9 | 24,889 | 97.1 |
| Chicago-Gary-Kenosha | 45,892 | 26,590 | 57.9 | 0 | 0.0 | 19,302 | 42.1 | 26,590 | 57.9 |
| Charlotte-Gasto.-R. Hill | 28,499 | 2,108 | 7.4 | 9,884 | 34.7 | 16,507 | 57.9 | 11,991 | 42.1 |
| Austin-San Marcos | 78,319 | 62,931 | 80.4 | 8,315 | 10.6 | 7,073 | 9.0 | 71,246 | 91.0 |
| Raleigh-Dur.-Chapel Hill | 31,527 | 7,712 | 24.5 | 14,337 | 45.5 | 9,477 | 30.1 | 22,049 | 69.9 |
| Indianapolis | 32,752 | 13,162 | 40.2 | 11,634 | 35.5 | 7,956 | 24.3 | 24,796 | 75.7 |
| Tampa-St. Pet-Clearwater | 88,878 | 71,375 | 80.3 | 0 | 0.0 | 17,503 | 19.7 | 71,375 | 80.3 |
| Philadelphia-Wil.-Atl. City | 75,144 | 68,565 | 91.2 | 1,123 | 1.5 | 5,456 | 7.3 | 69,688 | 92.7 |
| Knoxville | 36,852 | 21,518 | 58.4 | 7,683 | 20.8 | 7,652 | 20.8 | 29,201 | 79.2 |
| Lexington, | 18,274 | 2,700 | 14.8 | 5,382 | 29.5 | 10,191 | 55.8 | 8,083 | 44.2 |
| Greensboro-Wins.-Sal-HP | 20,346 | 0 | 0.0 | 15,338 | 75.4 | 5,008 | 24.6 | 15,338 | 75.4 |

*Source:* Center for Urban Policy Research, Rutgers University.

from 99.5 percent (Los Angeles-Riverside-Orange, CA-AZ EA) to 60.6 percent (New York-Northern New Jersey-Long Island, NY-NJ-CT-PA-MA-VT EA). Additional land savings in sprawl counties are added to the intercounty total in EAs to account for the intracounty savings for uncontrolled-sprawl counties. In the top-12 land-conversion EAs, this ranges from additional savings of 53,000 acres (in the Atlanta, GA-AL-NC EA) to 14,000 acres (in the Jacksonville, FL-GA EA). This amounts to, on average,

an additional 18 percent land savings in sprawl counties in the EAs (Table 6.32).

# COUNTIES

## Uncontrolled Growth

The absolute level of land conversion in counties is without question a southern and western phenomenon. Forty-eight of the top-50 counties in land conversion in the United States are almost equally distributed in the South (25) and West (23). The remaining two counties are found in the Northeast (Table 6.33).

In terms of projected development, the largest growth of development units will be experienced in Maricopa County, AZ (1.275 million), San Diego County, CA (1.082 million), Los Angeles County, CA (817,000), Harris County, TX (794,000), Orange County, CA (702,000), and Clark County, NV (687,000). At the 400,000 to 500,000 development unit level are Bexar County, TX; Broward County, FL; Orange County, FL; Palm Beach County, FL; Hillsborough County, FL; San Bernardino, CA; and Riverside, CA. These are by far the true growth centers of the United States. These counties convert land at a rate from 0.05 to 0.15 of an acre per unit (Table 6.33).

The common denominator of the significantly growing locations listed above is small lot size. These are also locations of significant development within or near developed areas in the counties. The most significantly growing counties and the locations where the most land is being converted nationwide, also are frequently centers of growth in their EAs. In almost all of the above locations, these counties are suburban or urban centers.

Courtesy of R. Ewing

This array of counties masks somewhat the growth that is taking place in smaller-size counties. Most of the counties listed above have populations of more than 2 million. Yet, 90 percent of the household growth takes place in counties of less than 2 million in population. These are rural and undeveloped locations of considerably lower density, more single-family development and more development outside the developed portions of the county.

The top-20 counties vary in land converted from approximately 160,000 acres (Maricopa, AZ) to 65,000 acres (Fayette, GA) over the 25-year period (Table 6.33). The difference in land conversion per unit within the top-20 land conversion counties varies from 0.10 acre (Orange County, CA) to 1.5 acres per unit (Lake County, FL). Maricopa County, AZ (0.12 of an acre per unit) accommodates almost 15 to 20 times the level of development of Lake County, FL, on only 35 percent more acreage (Table 6.33).

In terms of various types of land converted, significant locations of potential agricultural land losses are Williamson County, TX, (84,000 acres); Rutherford County, TN (63,000 acres); Brazoria County, TX (49,000 acres); Williamson County, TN (46,000 acres); and Bexar County, TX (43,000 acres) (Table 6.34).

Significant sites of environmentally fragile land losses are Brunswick County, NC (62,000 acres); St. Johns County, FL (61,500 acres); Baldwin County, AL (54,500 acres); Fayette County, GA (49,000 acres); Sevier County, TN (49,000 acres); and Worcester County, MA (43,000 acres). Significant "other" land losses will take place in the counties of Maricopa, AZ (110,000 acres); Yavapai, AZ (79,000 acres); Washington County, UT (66,000 acres); Clark County, NV (66,000 acres); and Los Angeles County, CA (59,000 acres) (Table 6.34).

Courtesy of G. Lowenstein

**Table 6.33**
**Counties Ranked by Total Land Converted—County Land Conversion: 2000 to 2025**
(Top 50 Counties)

| Counties | Total Units (#) | Residential Units (#) | Non-residential Units (#) | Total Land Converted (Acres) | Original Acres per Unit (Acres) | Land Saved (Acres) | New Acres per Unit (Acres) | Percentage of Units in Urban/ Suburban Counties (%) | Percentage of Units in Developed Areas of Counties (%) |
|---|---|---|---|---|---|---|---|---|---|
| Maricopa, AZ | 1,274,148 | 763,608 | 510,541 | 158,677 | 0.1245 | 23,569 | 0.1060 | 100.0 | 96.7 |
| Riverside, CA | 431,019 | 261,192 | 169,827 | 157,593 | 0.3656 | 114,455 | 0.2965 | 0.0 | 82.8 |
| Yavapai, AZ | 94,542 | 69,053 | 25,490 | 113,477 | 1.2003 | 12,828 | 1.1417 | 0.0 | 0.0 |
| Pasco, FL | 159,721 | 122,727 | 36,994 | 110,727 | 0.6933 | 67,371 | 0.5633 | 0.0 | 73.4 |
| Lake, FL | 71,611 | 52,319 | 19,292 | 110,628 | 1.5449 | 10,546 | 1.3976 | 0.0 | 0.0 |
| San Diego, CA | 1,082,149 | 597,998 | 484,151 | 110,445 | 0.1021 | 13,655 | 0.0894 | 100.0 | 100.0 |
| San Bernar., CA | 433,006 | 245,959 | 187,047 | 108,470 | 0.2505 | 70,979 | 0.2279 | 0.0 | 98.6 |
| Williamson, TX | 124,010 | 86,078 | 37,932 | 97,861 | 0.7891 | 50,788 | 0.7185 | 0.0 | 56.4 |
| Benton, AR | 79,832 | 47,116 | 32,716 | 92,000 | 1.1524 | 23,439 | 1.0614 | 0.0 | 1.3 |
| Baldwin, AL | 74,086 | 48,267 | 25,819 | 84,292 | 1.1378 | 9,325 | 1.0303 | 0.0 | 0.0 |
| Rutherford, TN | 78,216 | 45,079 | 33,137 | 83,445 | 1.0669 | 7,027 | 0.9770 | 0.0 | 0.0 |
| Washington, UT | 74,509 | 47,069 | 27,440 | 82,301 | 1.1046 | 7,145 | 1.0087 | 0.0 | 0.0 |
| Clark, NV | 687,431 | 388,189 | 299,242 | 79,928 | 0.1163 | 12,436 | 0.0982 | 100.0 | 95.7 |
| St. Johns, FL | 69,643 | 53,365 | 16,278 | 77,322 | 1.1103 | 10,219 | 0.9635 | 0.0 | 40.7 |
| Maui+Kala., HI | 83,429 | 50,652 | 32,777 | 74,940 | 0.8982 | 53,043 | 0.8195 | 0.0 | 0.0 |
| Marion, FL | 59,413 | 43,046 | 16,367 | 73,120 | 1.2307 | 8,297 | 1.0911 | 0.0 | 28.1 |
| Harris, TX | 793,811 | 402,851 | 390,960 | 71,695 | 0.0903 | 4,285 | 0.0782 | 100.0 | 99.1 |
| Brunswick, NC | 43,469 | 33,178 | 10,291 | 68,773 | 1.5821 | 6,651 | 1.4291 | 0.0 | 3.6 |
| Carroll, MD | 50,456 | 29,955 | 20,500 | 68,708 | 1.3617 | 46,344 | 1.0890 | 0.0 | 0.0 |
| Fayette, GA | 45,165 | 29,431 | 15,734 | 65,804 | 1.4570 | 43,653 | 1.2018 | 0.0 | 0.8 |
| Manatee, FL | 182,964 | 109,504 | 73,461 | 65,697 | 0.3591 | 28,192 | 0.2857 | 0.0 | 91.4 |
| Placer, CA | 114,877 | 75,556 | 39,322 | 61,772 | 0.5377 | 9,312 | 0.4567 | 0.0 | 64.9 |
| Beaufort, SC | 46,105 | 27,079 | 19,026 | 61,592 | 1.3359 | 29,254 | 0.9724 | 0.0 | 0.0 |
| Pima, AZ | 321,968 | 206,519 | 115,449 | 61,276 | 0.1903 | 17,358 | 0.1364 | 100.0 | 92.2 |
| Comal, TX | 44,469 | 33,079 | 11,389 | 60,836 | 1.3681 | 39,130 | 0.9529 | 0.0 | 0.3 |
| Collier, FL | 87,023 | 53,801 | 33,222 | 60,252 | 0.6924 | 10,467 | 0.5721 | 0.0 | 66.0 |
| Deschutes, OR | 63,609 | 38,619 | 24,990 | 59,181 | 0.9304 | 41,100 | 0.7809 | 0.0 | 0.0 |
| Sussex, DE | 39,674 | 27,319 | 12,355 | 59,127 | 1.4903 | 7,601 | 1.3371 | 0.0 | 0.0 |
| Brazoria, TX | 59,598 | 39,836 | 19,762 | 57,567 | 0.9659 | 37,787 | 0.6251 | 0.0 | 33.2 |
| Williamson, TN | 62,847 | 38,150 | 24,697 | 55,842 | 0.8885 | 9,288 | 0.9024 | 0.0 | 25.4 |
| Orange, FL | 436,002 | 214,231 | 221,772 | 55,729 | 0.1278 | 8,107 | 0.1092 | 100.0 | 97.5 |
| Clackamas, OR | 115,338 | 68,346 | 46,992 | 55,554 | 0.4817 | 34,541 | 0.4079 | 0.0 | 71.4 |
| Hillsbo., FL | 424,542 | 234,061 | 190,481 | 55,500 | 0.1307 | 4,835 | 0.1076 | 100.0 | 94.6 |
| Sevier, TN | 51,534 | 31,984 | 19,550 | 55,486 | 1.0767 | 4,945 | 0.9807 | 0.0 | 0.0 |
| Kern, CA | 109,342 | 64,723 | 44,619 | 55,480 | 0.5074 | 27,811 | 0.4142 | 0.0 | 65.2 |
| Hawaii, HI | 56,717 | 37,511 | 19,205 | 54,892 | 0.9678 | 29,789 | 0.8765 | 0.0 | 0.0 |
| Santa Rosa, Fl | 67,765 | 49,612 | 18,152 | 52,865 | 0.7801 | 8,882 | 0.6491 | 0.0 | 68.4 |
| L. Angeles, CA | 816,787 | 252,134 | 564,652 | 52,520 | 0.0643 | -28,656 | 0.0564 | 100.0 | 100.0 |
| Broward, FL | 472,218 | 250,559 | 221,660 | 52,462 | 0.1111 | 9,502 | 0.0935 | 100.0 | 98.9 |
| Pinal, AZ | 61,564 | 44,113 | 17,451 | 52,303 | 0.8496 | 6,165 | 0.7494 | 0.0 | 36.8 |
| Sonoma, CA | 105,031 | 68,244 | 36,788 | 52,193 | 0.4969 | 33,847 | 0.4003 | 0.0 | 68.7 |
| Henry, GA | 42,749 | 28,254 | 14,495 | 52,143 | 1.2197 | 34,370 | 1.0153 | 0.0 | 23.8 |
| Orange, CA | 702,516 | 293,959 | 408,557 | 52,137 | 0.0742 | 1,733 | 0.0652 | 100.0 | 100.0 |
| Douglas, CO | 73,896 | 43,524 | 30,372 | 51,638 | 0.6988 | 38,147 | 0.5664 | 0.0 | 51.6 |
| Paulding, GA | 29,295 | 24,346 | 4,949 | 51,629 | 1.7624 | 31,258 | 1.5069 | 0.0 | 0.0 |
| Charles, MD | 37,323 | 22,735 | 14,587 | 51,209 | 1.3721 | 29,625 | 1.1050 | 0.0 | 0.0 |
| Bexar, TX | 523,243 | 278,594 | 244,649 | 50,546 | 0.0966 | 5,754 | 0.0804 | 100.0 | 95.1 |
| Palm Beach, FL | 427,868 | 272,677 | 155,192 | 49,001 | 0.1145 | 14,550 | 0.1010 | 100.0 | 100.0 |
| Montgome., TX | 154,787 | 112,584 | 42,203 | 48,956 | 0.3163 | 14,372 | 0.2562 | 100.0 | 0.0 |
| Worcester, MA | 85,882 | 46,589 | 39,293 | 48,751 | 0.5677 | 22,291 | 0.5031 | 0.0 | 78.5 |

*Source:* Center for Urban Policy Research, Rutgers University.
*Note:* One nonresidential unit equals 1,000 square feet.

## Controlled Growth

Under controlled growth, considerable savings take place in land conversion levels in counties. In Riverside County, CA, 114,500 of 157,500 acres are saved (Table 6.35). In Pasco County, FL, 67,000 of 111,000 acres are saved. In San Bernardino County, CA, 70,000 of 108,000 acres are saved; in Williamson County, TX, 50,000 of 98,000 acres are saved; in Maui County, HI, 53,000 of 75,000 acres are saved; in Carroll County, MD, 46,000 of 68,000 acres are saved; in Fayette County, GA, 44,000 of 66,000 acres are saved; and in Deschutes County, OR, 41,000 of 59,000 acres are saved (Table 6.35).

Courtesy of T. Delcorso

In the above locations the following types of land are saved (Table 6.35):

| County | Acres | Type of Land |
|---|---|---|
| Riverside County, CA | 94,000 | Barren |
| Pasco County, FL | 35,000 | Agricultural |
| San Bernardino, CA | 64,500 | Barren |
| Williamson County, TX | 43,500 | Agricultural |
| Maui County, HI | 21,000 | Agricultural |
| Carroll County, MD | 25,000 | Agricultural |
| Fayette County, GA | 33,000 | Environ. Fragile |
| Deschutes County, OR | 31,000 | Barren |

Lands are saved in counties due to the forces of intercounty and intracounty household and employment shifts. These vary significantly by county. Maricopa County's growth cannot be controlled by intercounty transfers, thus all of its savings come from intracounty controls. The same is true for Lake County, FL; San Diego County, CA; Rutherford County, TN; Washington County, UT; Clark County, NV; St. Johns County, FL; Marion County, FL; and Brunswick County, NC (Table 6.36).

On the other hand, land savings in Pasco County, FL; San Bernardino County, CA; Williamson County, TX; Benton County, AR; Maui County, HI; Carroll County, MD; and Fayette County, GA, have been primarily created by intercounty household and employment shifts (Table 6.36).

Counties such as Baldwin, AL, and Yavapai, AZ, have land savings that accrue due to a combination of the above forces. Most of the counties included here are sprawl counties and contribute heavily to overall sprawl savings in EAs, states, regions, and the United States as a whole (Table 6.36).

## CONCLUSION

Over the period 2000 to 2025, under normal or traditional development, the United States will lose 18.8 million acres to development. During this period, private developers will build 26.5 million housing units and 26.5 billion square feet of nonresidential space, the latter to house a growth of 49.5 million jobs. Land will be converted at a rate of approximately 0.6 of an acre per residential unit and 0.2 of an acre per 1,000 square feet of nonresidential space. This level of land conversion need not take place.

## Table 6.34
## Lands Converted in Counties by Type—
## Uncontrolled- and Controlled-Growth Scenarios: 2000 to 2025
(Top 50 Counties)

| Counties by Rank | Uncontrolled-Growth Scenario | | | | | Controlled-Growth Scenario | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total Land Converted (Acres) | Percentage of Overall Land Converted (%) | Agricultural Lands Converted (Acres) | Environmentally Fragile Lands Converted (Acres) | Other Lands Converted (Acres) | Total Land Converted (Acres) | Percentage of Overall Land Converted (%) | Agricultural Lands Converted (Acres) | Environmentally Fragile Lands Converted (Acres) | Other Lands Converted (Acres) |
| Maricopa, AZ | 158,677 | 0.84 | 25,058 | 4,463 | 129,156 | 135,108 | 0.91 | 21,336 | 3,800 | 109,972 |
| Riverside, CA | 157,593 | 0.84 | 20,188 | 7,236 | 130,169 | 43,138 | 0.29 | 5,526 | 1,981 | 35,631 |
| Yavapai, AZ | 113,477 | 0.60 | 16,877 | 7,880 | 88,720 | 100,649 | 0.68 | 14,969 | 6,989 | 78,691 |
| Pasco, FL | 110,727 | 0.59 | 57,092 | 26,156 | 27,480 | 43,356 | 0.29 | 22,355 | 10,241 | 10,760 |
| Lake, FL | 110,628 | 0.59 | 22,262 | 25,370 | 62,996 | 100,083 | 0.67 | 20,140 | 22,952 | 56,992 |
| San Diego, CA | 110,445 | 0.59 | 28,753 | 18,068 | 63,624 | 96,790 | 0.65 | 25,198 | 15,834 | 55,758 |
| San Bernar., CA | 108,470 | 0.58 | 8,188 | 1,777 | 98,505 | 37,491 | 0.25 | 2,830 | 614 | 34,047 |
| Williamson, TX | 97,861 | 0.52 | 83,774 | 3,152 | 10,935 | 47,073 | 0.32 | 40,297 | 1,516 | 5,260 |
| Benton, AR | 92,000 | 0.49 | 46,177 | 296 | 45,527 | 68,562 | 0.46 | 34,413 | 221 | 33,928 |
| Baldwin, AL | 84,292 | 0.45 | 10,811 | 54,563 | 18,919 | 74,967 | 0.51 | 9,615 | 48,527 | 16,826 |
| Rutherford, TN | 83,445 | 0.44 | 63,336 | 2,905 | 17,204 | 76,419 | 0.52 | 58,004 | 2,660 | 15,756 |
| Washington, UT | 82,301 | 0.44 | 8,353 | 1,470 | 72,478 | 75,156 | 0.51 | 7,628 | 1,343 | 66,185 |
| Clark, NV | 79,928 | 0.42 | 1,131 | 109 | 78,688 | 67,492 | 0.45 | 955 | 92 | 66,445 |
| St. Johns, FL | 77,322 | 0.41 | 8,324 | 61,579 | 7,419 | 67,104 | 0.45 | 7,224 | 53,442 | 6,439 |
| Maui+Kala., HI | 74,940 | 0.40 | 29,503 | 27,662 | 17,775 | 21,897 | 0.15 | 8,621 | 8,083 | 5,194 |
| Marion, FL | 73,120 | 0.39 | 21,875 | 43,673 | 7,572 | 64,823 | 0.44 | 19,393 | 38,717 | 6,713 |
| Harris, TX | 71,695 | 0.38 | 59,101 | 12,594 | 0 | 67,410 | 0.45 | 55,568 | 11,842 | 0 |
| Brunswick, NC | 68,773 | 0.37 | 4,961 | 62,863 | 949 | 62,123 | 0.42 | 4,481 | 56,785 | 857 |
| Carroll, MD | 68,708 | 0.36 | 36,664 | 32,044 | 0 | 22,363 | 0.15 | 11,933 | 10,430 | 0 |
| Fayette, GA | 65,804 | 0.35 | 15,817 | 49,987 | 0 | 22,151 | 0.15 | 5,324 | 16,827 | 0 |
| Manatee, FL | 65,697 | 0.35 | 38,623 | 1,215 | 25,860 | 37,504 | 0.25 | 22,048 | 694 | 14,762 |
| Placer, CA | 61,772 | 0.33 | 11,847 | 26,751 | 23,174 | 52,460 | 0.35 | 10,061 | 22,719 | 19,680 |
| Beaufort, SC | 61,592 | 0.33 | 3,151 | 21,616 | 36,825 | 32,337 | 0.22 | 1,654 | 11,349 | 19,334 |
| Pima, AZ | 61,276 | 0.33 | 33,774 | 849 | 26,653 | 43,917 | 0.3 | 24,206 | 609 | 19,102 |
| Comal, TX | 60,836 | 0.32 | 28,378 | 17,126 | 15,332 | 21,707 | 0.15 | 10,126 | 6,111 | 5,471 |
| Collier, FL | 60,252 | 0.32 | 12,111 | 12,226 | 35,915 | 49,785 | 0.34 | 10,007 | 10,102 | 29,676 |
| Deschutes, OR | 59,181 | 0.31 | 3,521 | 11,564 | 44,096 | 18,081 | 0.12 | 1,076 | 3,533 | 13,472 |
| Sussex, DE | 59,127 | 0.31 | 25,913 | 15,469 | 17,745 | 51,526 | 0.35 | 22,582 | 13,480 | 15,464 |
| Brazoria, TX | 57,567 | 0.31 | 49,369 | 8,198 | 0 | 19,781 | 0.13 | 16,964 | 2,817 | 0 |
| Williamson, TN | 55,842 | 0.30 | 46,126 | 9,717 | 0 | 46,553 | 0.31 | 38,453 | 8,100 | 0 |
| Orange, FL | 55,729 | 0.30 | 26,191 | 14,441 | 15,097 | 47,622 | 0.32 | 22,381 | 12,340 | 12,901 |
| Clackamas, OR | 55,554 | 0.29 | 8,563 | 28,482 | 18,509 | 21,014 | 0.14 | 3,239 | 10,774 | 7,001 |
| Hillsbo., FL | 55,500 | 0.29 | 41,244 | 14,256 | 0 | 50,665 | 0.34 | 37,651 | 13,014 | 0 |
| Sevier, TN | 55,486 | 0.29 | 5,977 | 49,509 | 0 | 50,541 | 0.34 | 5,444 | 45,097 | 0 |
| Kern, CA | 55,480 | 0.29 | 31,172 | 3,240 | 21,068 | 27,670 | 0.19 | 15,547 | 1,616 | 10,508 |
| Hawaii, HI | 54,892 | 0.29 | 16,915 | 20,268 | 17,709 | 25,103 | 0.17 | 7,736 | 9,269 | 8,099 |
| Santa Rosa, Fl | 52,865 | 0.28 | 7,124 | 34,642 | 11,099 | 43,984 | 0.3 | 5,927 | 28,822 | 9,235 |
| L. Angeles, CA | 52,520 | 0.28 | 5,174 | 8,969 | 38,377 | 81,176 | 0.55 | 7,998 | 13,863 | 59,316 |
| Broward, FL | 52,462 | 0.28 | 3,222 | 1,948 | 47,293 | 42,961 | 0.29 | 2,638 | 1,595 | 38,728 |
| Pinal, AZ | 52,303 | 0.28 | 20,228 | 1,668 | 30,407 | 46,137 | 0.31 | 17,843 | 1,471 | 26,822 |
| Sonoma, CA | 52,193 | 0.28 | 28,952 | 23,241 | 0 | 18,347 | 0.12 | 10,177 | 8,170 | 0 |
| Henry, GA | 52,143 | 0.28 | 13,032 | 39,111 | 0 | 17,774 | 0.12 | 4,442 | 13,332 | 0 |
| Orange, CA | 52,137 | 0.28 | 28,417 | 12,128 | 11,591 | 50,404 | 0.34 | 27,473 | 11,725 | 11,206 |
| Douglas, CO | 51,638 | 0.27 | 28,653 | 5,590 | 17,395 | 13,491 | 0.09 | 7,486 | 1,460 | 4,545 |
| Paulding, GA | 51,629 | 0.27 | 2,622 | 49,007 | 0 | 20,371 | 0.14 | 1,035 | 19,336 | 0 |
| Charles, MD | 51,209 | 0.27 | 9,733 | 41,476 | 0 | 21,584 | 0.15 | 4,102 | 17,482 | 0 |
| Bexar, TX | 50,546 | 0.27 | 42,642 | 7,904 | 0 | 44,792 | 0.3 | 37,787 | 7,005 | 0 |
| Palm Beach, FL | 49,001 | 0.26 | 28,849 | 9,865 | 10,288 | 34,451 | 0.23 | 20,283 | 6,935 | 7,233 |
| Montgome., TX | 48,956 | 0.26 | 14,828 | 34,128 | 0 | 34,584 | 0.23 | 10,475 | 24,109 | 0 |
| Worcester, MA | 48,751 | 0.26 | 4,393 | 44,358 | 0 | 26,460 | 0.18 | 2,384 | 24,076 | 0 |

*Source:* Center for Urban Policy Research, Rutgers University.

*Note:* The percentage of overall land converted is the ratio of land converted in the EA (or county) to the total land converted in the United States over the 25-year projection period.

With two types of growth-control measures in place, almost one-quarter of this land conversion could be avoided without compromising growth or altering housing markets. The first measure would employ the equivalent of an urban growth boundary in EAs to direct growth to the more-developed urban and suburban counties and away from rural and undeveloped counties; 2.4 million acres could be saved through this redirection. The second measure would use an equivalent of an urban service area in individual counties and direct development to developed as opposed to undeveloped areas in the same county;

## Table 6.35
## Lands Saved in Counties by Type—
## Uncontrolled- and Controlled-Growth Scenarios: 2000 to 2025
(Top 50 Counties)

| County by Rank | Total Land (Acres) | Agricultural Lands (Acres) | Environmentally Fragile Lands (Acres) | Other Lands (Acres) |
|---|---|---|---|---|
| Maricopa, AZ | 23,569 | 3,722 | 663 | 19,184 |
| Riverside, CA | 114,455 | 14,662 | 5,255 | 94,538 |
| Yavapai, AZ | 12,828 | 1,908 | 891 | 10,029 |
| Pasco, FL | 67,371 | 34,737 | 15,914 | 16,720 |
| Lake, FL | 10,546 | 2,122 | 2,418 | 6,005 |
| San Diego, CA | 13,655 | 3,555 | 2,234 | 7,866 |
| San Bernardino, CA | 70,979 | 5,358 | 1,163 | 64,458 |
| Williamson, TX | 50,788 | 43,477 | 1,636 | 5,675 |
| Benton, AR | 23,439 | 11,764 | 75 | 11,598 |
| Baldwin, AL | 9,325 | 1,196 | 6,036 | 2,093 |
| Rutherford, TN | 7,027 | 5,333 | 245 | 1,449 |
| Washington, UT | 7,145 | 725 | 128 | 6,292 |
| Clark, NV | 12,436 | 176 | 17 | 12,243 |
| St. Johns, FL | 10,219 | 1,100 | 8,138 | 980 |
| Maui + Kalawao, HI | 53,043 | 20,883 | 19,579 | 12,581 |
| Marion, FL | 8,297 | 2,482 | 4,956 | 859 |
| Harris, TX | 4,285 | 3,532 | 753 | 0 |
| Brunswick, NC | 6,651 | 480 | 6,079 | 92 |
| Carroll, MD | 46,344 | 24,731 | 21,614 | 0 |
| Fayette, GA | 43,653 | 10,493 | 33,160 | 0 |
| Manatee, FL | 28,192 | 16,574 | 521 | 11,097 |
| Placer, CA | 9,312 | 1,786 | 4,033 | 3,493 |
| Beaufort, SC | 29,254 | 1,497 | 10,267 | 17,491 |
| Pima, AZ | 17,358 | 9,568 | 241 | 7,551 |
| Comal, TX | 39,130 | 18,252 | 11,015 | 9,862 |
| Collier, FL | 10,467 | 2,104 | 2,124 | 6,239 |
| Deschutes, OR | 41,100 | 2,445 | 8,031 | 30,624 |
| Sussex, DE | 7,601 | 3,331 | 1,989 | 2,281 |
| Brazoria, TX | 37,787 | 32,405 | 5,381 | 0 |
| Williamson, TN | 9,288 | 7,673 | 1,616 | 0 |
| Orange, FL | 8,107 | 3,810 | 2,101 | 2,196 |
| Clackamas, OR | 34,541 | 5,324 | 17,708 | 11,508 |
| Hillsbo., FL | 4,835 | 3,593 | 1,242 | 0 |
| Sevier, TN | 4,945 | 533 | 4,412 | 0 |
| Kern, CA | 27,811 | 15,625 | 1,624 | 10,561 |
| Hawaii, HI | 29,789 | 9,180 | 10,999 | 9,610 |
| Santa Rosa, Fl | 8,882 | 1,197 | 5,820 | 1,865 |
| Los Angeles, CA | -28,656 | -2,823 | -4,894 | -20,939 |
| Broward, FL | 9,502 | 583 | 353 | 8,565 |
| Pinal, AZ | 6,165 | 2,385 | 197 | 3,585 |
| Sonoma, CA | 33,847 | 18,775 | 15,071 | 0 |
| Henry, GA | 34,370 | 8,590 | 25,779 | 0 |
| Orange, CA | 1,733 | 945 | 403 | 385 |
| Douglas, CO | 38,147 | 21,167 | 4,129 | 12,851 |
| Paulding, GA | 31,258 | 1,588 | 29,670 | 0 |
| Charles, MD | 29,625 | 5,630 | 23,995 | 0 |
| Bexar, TX | 5,754 | 4,854 | 900 | 0 |
| Palm Beach, FL | 14,550 | 8,566 | 2,929 | 3,055 |
| Montgomery, TX | 14,372 | 4,353 | 10,019 | 0 |
| Worcester, MA | 22,291 | 2,008 | 20,283 | 0 |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 6.36
## Intercounty, Intracounty, and Sprawl Land Savings in Counties: 2000 to 2025
(Top 50 Counties)

| County by Rank | Total Savings (Acres) | Intercounty Savings | | Intracounty Savings | | Total Savings in Sprawl Locations | |
|---|---|---|---|---|---|---|---|
| | | (Acres) | (%) | (Acres) | (%) | (Acres) | (%) |
| Maricopa, AZ | 23,569 | 0 | 0.0 | 23,569 | 100.0 | 23,569 | 100.0 |
| Riverside, CA | 114,455 | 104,217 | 91.1 | 10,238 | 8.9 | 114,455 | 100.0 |
| Yavapai, AZ | 12,828 | 2,472 | 19.3 | 10,357 | 80.7 | 12,829 | 100.0 |
| Pasco, FL | 67,371 | 56,999 | 84.6 | 10 ,372 | 15.4 | 56,999 | 84.6 |
| Lake, FL | 10,546 | 0 | 0.0 | 10,546 | 100.0 | 10,546 | 100.0 |
| San Diego, CA | 13,655 | 0 | 0.0 | 13,655 | 100.0 | 0 | 0.0 |
| San Bernar., CA | 70,979 | 68,037 | 95.9 | 2,942 | 4.1 | 68,037 | 95.9 |
| Williamson, TX | 50,788 | 42,473 | 83.6 | 8,315 | 16.4 | 50,788 | 100.0 |
| Benton, AR | 23,439 | 16,714 | 71.3 | 6,725 | 28.7 | 23,439 | 100.0 |
| Baldwin, AL | 9,325 | 2,053 | 22.0 | 7,272 | 78.0 | 9,325 | 100.0 |
| Rutherford, TN | 7,027 | 0 | 0.0 | 7,027 | 100.0 | 7,027 | 100.0 |
| Washington, UT | 7,145 | 0 | 0.0 | 7,145 | 100.0 | 7,145 | 100.0 |
| Clark, NV | 12,436 | 0 | 0.0 | 12,437 | 100.0 | 12,437 | 100.0 |
| St. Johns, FL | 10,219 | 0 | 0.0 | 10,219 | 100.0 | 10,219 | 100.0 |
| Maui+Kala., HI | 53,043 | 50,944 | 96.0 | 2,099 | 4.0 | 53,043 | 100.0 |
| Marion, FL | 8,297 | 0 | 0.0 | 8,297 | 100.0 | 8,297 | 100.0 |
| Harris, TX | 4,285 | -6,005 | -140.1 | 10,290 | 240.1 | -6,005 | -140.1 |
| Brunswick, NC | 6,651 | 0 | 0.0 | 6,651 | 100.0 | 6,651 | 100.0 |
| Carroll, MD | 46,344 | 44,256 | 95.5 | 2,088 | 4.5 | 44,256 | 95.5 |
| Fayette, GA | 43,653 | 41,509 | 95.1 | 2,144 | 4.9 | 41,509 | 95.1 |
| Manatee, FL | 28,192 | 18,791 | 66.7 | 9,401 | 33.3 | 28,192 | 100.0 |
| Placer, CA | 9,312 | 0 | 0.0 | 9,312 | 100.0 | 9,312 | 100.0 |
| Beaufort, SC | 29,254 | 26,338 | 90.0 | 2,916 | 10.0 | 29,254 | 100.0 |
| Pima, AZ | 17,358 | 0 | 0.0 | 17,358 | 100.0 | 17,358 | 100.0 |
| Comal, TX | 39,130 | 37,173 | 95.0 | 1,957 | 5.0 | 39,130 | 100.0 |
| Collier, FL | 10,467 | 0 | 0.0 | 10,467 | 100.0 | 10,467 | 100.0 |
| Deschutes, OR | 41,100 | 39,593 | 96.3 | 1,507 | 3.7 | 39,593 | 96.3 |
| Sussex, DE | 7,601 | 2,304 | 30.3 | 5,297 | 69.7 | 7,601 | 100.0 |
| Brazoria, TX | 37,787 | 35,635 | 94.3 | 2,151 | 5.7 | 37,786 | 100.0 |
| Williamson, TN | 9,288 | 3,562 | 38.4 | 5,726 | 61.7 | 9,288 | 100.0 |
| Orange, FL | 8,107 | 0 | 0.0 | 8,107 | 100.0 | 0 | 0.0 |
| Clackamas, OR | 34,541 | 30,624 | 88.7 | 3,917 | 11.3 | 30,624 | 88.7 |
| Hillsbo., FL | 4,835 | -3,926 | -81.2 | 8,760 | 181.2 | -3,926 | -81.2 |
| Sevier, TN | 4,945 | 0 | 0.0 | 4,945 | 100.0 | 4,945 | 100.0 |
| Kern, CA | 27,811 | 23,285 | 83.7 | 4,525 | 16.3 | 23,285 | 83.7 |
| Hawaii, HI | 29,789 | 27,394 | 92.0 | 2,396 | 8.0 | 27,394 | 92.0 |
| Santa Rosa, Fl | 8,882 | 0 | 0.0 | 8,882 | 100.0 | 8,882 | 100.0 |
| L. Angeles, CA | -28,656 | -4,343 | 15.2 | -24,313 | 84.8 | -4,343 | 15.2 |
| Broward, FL | 9,502 | 2,937 | 30.9 | 6,565 | 69.1 | 2,937 | 30.9 |
| Pinal, AZ | 6,165 | 0 | 0.0 | 6,165 | 100.0 | 6,165 | 100.0 |
| Sonoma, CA | 33,847 | 30,524 | 90.2 | 3,322 | 9.8 | 30,524 | 90.2 |
| Henry, GA | 34,370 | 32,291 | 94.0 | 2,079 | 6.0 | 32,291 | 94.0 |
| Orange, CA | 1,733 | 850 | 49.0 | 883 | 50.9 | 850 | 49.0 |
| Douglas, CO | 38,147 | 36,321 | 95.2 | 1,826 | 4.8 | 36,321 | 95.2 |
| Paulding, GA | 31,258 | 29,121 | 93.2 | 2,137 | 6.8 | 29,121 | 93.2 |
| Charles, MD | 29,625 | 27,548 | 93.0 | 2,077 | 7.0 | 27,548 | 93.0 |
| Bexar, TX | 5,754 | -3,117 | -54.2 | 8,871 | 154.2 | -3,117 | -54.2 |
| Palm Beach, FL | 14,550 | 9,422 | 64.8 | 5,128 | 35.2 | 9,422 | 64.8 |
| Montgome., TX | 14,372 | 6,385 | 44.4 | 7,987 | 55.6 | 14,372 | 100.0 |
| Worcester, MA | 22,291 | 18,573 | 83.3 | 3,719 | 16.7 | 22,292 | 100.0 |

*Source:* Center for Urban Policy Research, Rutgers University.

Courtesy of C. G. Lindbloom Associates

an additional 1.6 million acres could be saved through this redirection. The first saving relates to the amount of land that could be saved by controlling growth in sprawl counties; the second relates to a land saving that would come from controlling "sprawl-like" growth in all counties, including sprawl counties. In actuality, counting the land saved from establishing an urban service area in sprawl counties that could not have their growth controlled through an urban growth boundary, land saved in sprawl locations amounts to nearly 20 percent of the land converted nationwide, and 80 percent of all land saved.

Included within overall land savings are approximately 1.5 million acres of agricultural land, 1.5 million acres of environmentally fragile land, and 1.0 million acres of other lands (e.g., barren). In terms of absolute land conversion, most of the land converted due to sprawl and other low-level growth takes place in the South (53 percent) and West (24.5 percent); much less takes place in the Midwest (15 percent) and Northeast (7.5 percent). Resultantly, most of the land saving is in the South (53.5 percent) and the West (28.5 percent); much less is observed in the Midwest (11.0 percent) and in the Northeast (7.0 percent).

The distribution of land conversion and land savings for states, EAs, and counties basically follows the above distributions. Of the top-10 states in land conversion and land saving, all are in the South (7) and West (3) regions of the United States. Of the top-30 EAs in land conversion and land saving, one-half are in the South (15), one-quarter are in the West (8), and the remaining quarter are split between the Northeast (4) and the Midwest (3). Of the top-50 counties in land conversion and land savings, almost all (48) are in the South (25) and West (23); those that remain are in the Northeast (2).

What does the foregoing analysis imply? It clearly communicates that significant land savings can be achieved by both intercounty (60 percent) and intracounty (40 percent) land development controls. These controls produce a 4-million-acre land saving over the next 25 years, one-quarter of all land converted, without significantly impacting real property markets. This land saving encompasses both sprawl locations and "sprawl-like" locations. The saving in sprawl locations amounts to 80 percent of the savings in all locations.

Courtesy of R. Ewing

# VII

# Water and Sewer Infrastructure in the United States:

## Requirements under Sprawl and Alternative Development

## INTRODUCTION

This chapter begins the analysis of the infrastructure requirements and costs of uncontrolled or "sprawl" growth versus controlled or "compact/smart" growth, with the focus on water and sewer infrastructure and costs.

The question to be addressed is whether growth that is constrained in both its intercounty and intracounty movement (i.e., directed from one county to another so it will occur within the most developed county and directed from the periphery of a county to the center) uses less water and sewer infrastructure than if it is not constrained.

The analysis herein is built on the two national development alternatives discussed earlier. Both development alternatives involve growth of a magnitude that produces 53 million development units nationwide (26.49 million residential, 26.48 million nonresidential) over the 25-year period 2000 to 2025. Approximately 23 million of these combined residential and nonresidential development units will be in the South, 16 million in the West, 9.3 million in the Midwest, and 4.8 million in the Northeast.

In the uncontrolled-growth scenario, of the 53 million development units, 33.6 million will be in urban and suburban counties and 19.4 million will be in rural and undeveloped counties. In a controlled-growth scenario resulting from intercounty growth positioning, 36.7 million development units will be built in urban and suburban counties and 15.8 million will be built in rural and undeveloped counties. In the controlled-growth scenario, this represents a shift of 3.1 million development units to the more urban and suburban locations on a base of 33.6 million, a shift of more than 9.2 percent.

In a controlled-growth scenario resulting from intracounty growth positioning, about 2 million development units are relocated to the developed areas of counties. These development units experience a 20 percent increase in density, or a 10 percent increase in floor-area ratio (FAR). In the undeveloped areas under controlled growth, approximately 20 percent of the residential units are developed in cluster developments wherein density is twice as high as the prevailing density of undeveloped areas. In addition, under the controlled-growth scenario, one-quarter more units are developed as single-family attached or multifamily units rather than single-family detached or mobile home units.

**Table 7.1**
**Water and Sewer Service Structure**

| County Development Type | Developed Areas | Undeveloped Areas |
|---|---|---|
| Urban and Urban Center | Public water and sewer | Public water and sewer with extended mains |
| Suburban | Public water and sewer with extended mains | Community package system |
| Rural Center, Rural, and Undeveloped | Community package system | Individually drilled wells and installed septic systems |

*Source:* Center for Urban Policy Research, Rutgers University.

# CONCEPTUAL OVERVIEW AND ASSESSMENT MODEL

Water-based utility requirements vary directly with water and sewer demand. Water demand relates to the number of people in a dwelling unit or per 1,000 square feet of nonresidential space, also taking into consideration whether the properties they occupy have lawns that are watered regularly. Water service is people and property driven, and models or standards of water use take both of these types of demands into account. The specific means of obtaining and distributing water varies with the level of development of a community, and density is often the surrogate for level of development. Water hookups from public systems are primarily an urban service. These can be expanded into adjacent areas of urban counties and to the developed areas of suburban counties. In the undeveloped areas of suburban counties, package water treatment facilities are often the norm. This is also the case for developed areas of rural and undeveloped counties. Water service in undeveloped areas of rural and undeveloped counties is answered by individually dug or drilled wells. These sources of water service, which vary by area, will be presumed to meet the needs of the household and employment growth under the two basic growth scenarios. This distribution of type of service by type of county is shown in Table 7.1.

Sewer demand (sanitary sewers only) is a function of the number of gallons of occupant-driven water consumption that remains in the system and ultimately must be disposed of. While it parallels water demand, sewer demand involves lower amounts because not all of the water remains in the system for disposal. This remaining quantity varies from 80 percent to 97 percent of the total water consumption for residential and nonresidential uses. Sewer hookups from public systems like those for water are primarily an urban or urban-extended service. Otherwise, sewer services are delivered in package plants or through septic systems. The specific types of sewer service for county types and development areas follow similar declensions as those discussed for water service. Sewer service types that will be utilized to meet the demands of household and employment growth under the two scenarios, by county type and development location, are also shown in Table 7.1.

## Utility Demand

The typical standard for water consumption can be as high as 185 gallons per day per person (the national average per capita in 1999 was 112 gallons per day). Nondomestic water use is approximately 5 percent to 20 percent of this number. The average number of persons per projected new household is approximately 2.59 (60.73 million persons in 23.45 million new households). Using a larger household size for single-family detached homes nationwide (approximately 2.86 persons) plus an appropriate amount of outdoor water use (64 gallons per unit), a daily consumption of 321 gallons per day is determined for single-family detached housing. Deducting outdoor water use (the water that does not remain in the system, i.e., 64 gallons), a sewer consumption rate for a single-family detached housing unit is calculated at 257 gallons per day. This procedure is used to define an EDU (equivalent dwelling unit) for water and sewer use for each type of unit. In single-family attached and multifamily housing, the water and sewer demand is reduced to account for both reduction in household size and outdoor water consumption. The water demand of mobile homes is approximately two-thirds the water demand of single-family detached units and about the same as single-family attached units. In actuality, the household size of mobile homes is approximately 25 percent smaller

**Table 7.2**
**Water and Sewer Demand by Structure Type**

| Structure Type | Water Demand (gallons per unit per day) | Sewer Demand (gallons per unit per day) |
|---|---|---|
| **Residential** | | |
| Single-Family Detached | 321 | 257 |
| Single-Family Attached | 211 | 190 |
| Multifamily Housing | 163 | 155 |
| Mobile Homes | 211 | 201 |
| **Nonresidential** | | |
| Office | 100 | 97 |
| Retail | 180 | 175 |
| Industrial | 80 | 78 |
| Warehouse | 40 | 39 |

*Source:* New Jersey Office of State Planning for the water model; Pennsylvania Department of Environmental Protection for the sewer model. Data interpretation by the Center for Urban Policy Research, Rutgers University.

**Table 7.3**
**Water and Sewer Laterals**

| Structure Type | Laterals (Trunk Line Connections) |
|---|---|
| **Residential** | |
| Single-Family Detached | 1 for 1 unit |
| Single-Family Attached | 1 for 2 units |
| Multifamily | 1 for 4 units |
| Mobile Homes | 1 for 1 unit |
| **Nonresidential** | |
| Office | 1 for 25 units (25,000 sq.ft.) |
| Retail | 1 for 10 units (10,000 sq.ft.) |
| Industrial | 1 for 10 units (10,000 sq.ft.) |
| Warehouse | 1 for 50 units (50,000 sq.ft.) |

*Source:* Center for Urban Policy Research, Rutgers University.

and their external water usage is about 85 percent lower than single-family detached housing, resulting in two-thirds the level of water consumption. The water and sewer demand by type of residential unit is presented in Table 7.2.

To place nonresidential uses on a per-unit basis, each 1,000 square feet of nonresidential space is defined as a single unit. Using the relationship between employees and space occupancy that established structure requirements when computing land conversion, the water and sewer demand is defined for each nonresidential unit. Water consumption is approximately 35 to 40 gallons per day per employee. Employees per 1,000 square feet are 3.0, 2.5, 1.5, and 1.0 for office, retail, industrial, and warehouse uses, respectively. In all uses except retail and industrial, individual employee requirements were used exclusively to establish water and sewer demand. For retail uses, demand was increased to account for customer use of public restrooms. For industrial uses, product use and internal cleaning increased water consumption per employee by one-third. For all nonresidential uses, outdoor water use is 2 percent to 3 percent of the total water demand. Nonresidential demand numbers do not include fire equipment testing requirements (e.g., sprinkler systems). These are not included due to the lack of nationwide uniformity of requirements for system testing in new construction.

## Water and Sewer Connections (Laterals)

Water and sewer interceptors, or mains, are connected to single or multiple residential and nonresidential units by laterals. The schedule relating laterals to units,


Courtesy of C. Galley

Table 7.3, has been incorporated into the water and sewer model. The square footage per lateral cited for nonresidential connections corresponds to the nominal building size for that use. Water and sewer laterals are fully counted for each unit developed in all counties. In remote areas of rural and undeveloped counties, housing is exclusively single-family detached, and these units are served by individual wells and septic systems. Individual wells and septic systems account for approximately 30 percent of future growth. These are counted in the same fashion as water and sewer laterals but are priced differently. Water and sewer lateral counts for various geographies of analysis include wells and septic systems, each counted as single laterals.

### Water and Sewer Costs

Water and sewer services are provided to the vast majority of new users as a shared cost of the entire system at full capacity. This is commonly referred to as the hookup or "tap-in" fee. The "tap-in" fee and the shared cost of a unit's lateral make up the cost of connecting to water and sewer systems.

The individual costs of water and sewer infrastructure are calculated by drawing from a variety of Northeast regional sources, specifically selected engineering firms and municipal authorities in the Middle Atlantic region. The cost of the four types of water and sewer services (public, public extended, package systems, and on-site services [wells and septic]) are established per EDU and variously targeted to urban, suburban, and rural counties. Nominal installation costs of water and sewer laterals are 10 percent higher in suburban versus rural counties and 20 percent higher in urban as opposed to suburban counties, due to the difficulty of working in higher-density areas. Additionally, urban county costs also reflect the increased replacement costs of their aging infrastructure. The cost of the individual on-site wells or septic includes the costs of pumping and transfer equipment. The cost of the water laterals includes individual or shared meters. Residential water and sewer costs by housing type are shown in Table 7.4. Nonresidential water and sewer costs by type are found in Table 7.5.

Clustering occurs in 20 percent of the single-family dwellings located in the outer portions of rural and undeveloped counties. In these clustered developments, package water and sewer systems replace wells and septic fields. The costs for these community systems are less per unit and equivalent to similar systems in the developed areas of those counties.

Finally, the nominal costs for water and sewer services shown in Tables 7.4 and 7.6, are adjusted county by county to account for the differences in labor costs that exist nationally and regionally. The average household income in 2000 dollars in Bergen County, New Jersey, is $137,000; in Lincoln County, West Virginia, it is $42,000. Approximately 70 percent of water and sewer costs are adjusted by the local labor rate, which is assumed to vary nationwide by the difference in current household income. Water and sewer lateral costs in Bergen County, New Jersey, are $4,250; in Lincoln County, West Virginia, they are $2,050.

## RESULTS OF THE ASSESSMENT

The remainder of this chapter focuses on the results of the water and sewer infrastructure analysis. The two basic alternative growth scenarios are played out nationwide in terms of water and sewer demand and resulting water and sewer infrastructure and costs. Information is presented for:(1) the United States and its four regions; (2) individual states; (3) EAs; and


Courtesy of C. Galley

**Table 7.4**
**Residential Water and Sewer Costs**
(Unit Costs in Dollars)

| County Type | Areas | Utility | Single-Family Detached | | Single-Family Attached | | Multifamily Units | | Mobile Homes | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Tap-In | Lateral | Tap-In | Lateral | Tap-In | Lateral | Tap-In | Lateral |
| Rural, Undeveloped and Rural Center | Developed | Water | 2,000 | 1,080 | 1,700 | 720 | 1,495 | 320 | 1,495 | 1,080 |
| | | Sewer | 4,300 | 900 | 3,650 | 540 | 3,220 | 320 | 3,220 | 900 |
| | Undeveloped | Water | 3,600 | N/A | N/A | N/A | N/A | N/A | 3,600 | N/A |
| | | Sewer | 6,000 | N/A | N/A | N/A | N/A | N/A | 6,000 | N/A |
| Suburban | Developed | Water | 1,600 | 1,200 | 1,360 | 800 | 1,200 | 400 | 1,200 | 1,200 |
| | | Sewer | 3,200 | 1,000 | 2,720 | 600 | 2,400 | 400 | 2,400 | 1,000 |
| | Undeveloped | Water | 2,000 | 1,200 | 1,700 | 800 | N/A | N/A | N/A | N/A |
| | | Sewer | 4,300 | 1,000 | 3,655 | 600 | N/A | N/A | N/A | N/A |
| Urban and Urban Center | Developed | Water | 1,310 | 1,320 | 1,115 | 880 | 980 | 440 | 980 | 1,320 |
| | | Sewer | 2,810 | 1,100 | 2,395 | 660 | 2,110 | 330 | 2,110 | 1,100 |
| | Undeveloped | Water | 1,760 | 1,320 | 1,495 | 880 | N/A | N/A | N/A | N/A |
| | | Sewer | 3,520 | 1,100 | 2,995 | 660 | N/A | N/A | N/A | N/A |

*Source:* American Water Works Association Research Foundation, Denver, Colorado; adjusted by the Center for Urban Policy Research, Rutgers University.

**Table 7.5**
**Nonresidential Water and Sewer Costs**
(Unit Costs in Dollars)

| County Type | Areas | Utility | Office | | Retail | | Industrial | | Warehouse | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Tap-In | Lateral | Tap-In | Lateral | Tap-In | Lateral | Tap-In | Lateral |
| Rural, Undeveloped, and Rural Center | Developed | Water | 240 | 130 | 400 | 216 | 440 | 238 | 280 | 151 |
| | | Sewer | 516 | 108 | 860 | 180 | 946 | 198 | 602 | 126 |
| | Undeveloped | Water | 432 | N/A | 720 | N/A | 792 | N/A | 504 | N/A |
| | | Sewer | 720 | N/A | 1,200 | N/A | 1,320 | N/A | 840 | N/A |
| Suburban | Developed | Water | 192 | 144 | 320 | 240 | 352 | 264 | 224 | 168 |
| | | Sewer | 384 | 120 | 640 | 200 | 704 | 220 | 448 | 140 |
| | Undeveloped | Water | 240 | 144 | 400 | 240 | 440 | 264 | 280 | 168 |
| | | Sewer | 516 | 120 | 860 | 200 | 946 | 220 | 602 | 140 |
| Urban and Urban Center | Developed | Water | 157 | 158 | 262 | 264 | 288 | 290 | 183 | 185 |
| | | Sewer | 337 | 132 | 562 | 220 | 618 | 242 | 393 | 154 |
| | Undeveloped | Water | 211 | 158 | 352 | 264 | 387 | 290 | 246 | 185 |
| | | Sewer | 422 | 132 | 704 | 220 | 774 | 242 | 493 | 154 |

*Source:* American Water Works Association Research Foundation, Denver, Colorado; adjusted by the Center for Urban Policy Research, Rutgers University.

(4) counties. In each case, the uncontrolled- and controlled-growth scenarios are examined in terms of water and sewer demand (gallonage per day); water and sewer laterals (connections required); and water and sewer costs—laterals plus "tap-in" fees. The water and sewer infrastructure analysis begins with a discussion of the two growth scenarios at the national level.

# THE UNITED STATES AND ITS REGIONS

## Uncontrolled Growth

Projected nationwide residential and nonresidential growth during the period 2000 to 2025 will require additional local water and sewer capacity for the daily

## Table 7.6
## Water and Sewer Demand—Uncontrolled- and Controlled-Growth Scenarios
## United States and by Region: 2000 to 2025

| Region | Water Demand | | | | Sewer Demand | | | |
|---|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth (Kgal/day) | Controlled Growth (Kgal/day) | Demand Savings (Kgal/day) | Percentage Savings (%) | Uncontrolled Growth (Kgal/day) | Controlled Growth (Kgal/day) | Demand Savings (Kgal/day) | Percentage Savings (%) |
| Northeast | 768,937 | 760,085 | 8,853 | 1.2 | 681,600 | 683,486 | -1,886 | -0.3 |
| Midwest | 1,550,915 | 1,533,035 | 17,880 | 1.2 | 1,384,302 | 1,381,539 | 2,763 | 0.2 |
| South | 4,214,494 | 4,146,452 | 68,041 | 1.6 | 3,727,526 | 3,723,420 | 4,106 | 0.1 |
| West | 3,067,670 | 3,013,395 | 53,975 | 1.8 | 2,725,955 | 2,723,975 | 1,980 | 0.1 |
| **United States** | **9,602,016** | **9,452,967** | **148,749** | **1.5** | **8,519,383** | **8,512,420** | **6,963** | **0.1** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 7.7
## Water and Sewer Laterals—Uncontrolled- and Controlled-Growth Scenarios
## United States and by Region: 2000 to 2025

| Region | Water and Sewer Laterals Combined | | | | Residential Water and Sewer Laterals | | | |
|---|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth (#) | Controlled Growth (#) | Lateral Savings (#) | Percentage Savings (%) | Uncontrolled Growth (#) | Controlled Growth (#) | Lateral Savings (#) | Percentage Savings (%) |
| Northeast | 3,406,558 | 3,068,422 | 338,137 | 9.9 | 3,005,164 | 2,667,486 | 337,678 | 11.2 |
| Midwest | 7,109,570 | 6,604,438 | 505,131 | 7.1 | 6,370,428 | 5,871,604 | 498,823 | 7.8 |
| South | 21,242,770 | 19,116,320 | 2,126,452 | 10.0 | 19,835,014 | 17,712,454 | 2,122,560 | 10.7 |
| West | 14,107,696 | 12,456,114 | 1,651,582 | 11.7 | 13,140,278 | 11,493,036 | 1,647,244 | 12.5 |
| **United States** | **45,866,594** | **41,245,294** | **4,621,303** | **10.1** | **42,350,884** | **37,744,580** | **4,606,304** | **10.9** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 7.8
## Water and Sewer Infrastructure—Uncontrolled- and Controlled-Growth Scenarios
## United States and by Region: 2000 to 2025

| Region | Water Infrastructure Costs | | | Sewer Infrastructure Costs | | | Total Infrastructure Costs | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Percentage Savings (%) |
| Northeast | 6,151 | 5,681 | 470 | 9,864 | 9,070 | 794 | 16,015 | 14,751 | 1,264 | 7.9 |
| Midwest | 11,692 | 11,098 | 594 | 18,701 | 17,741 | 962 | 30,393 | 28,839 | 1,556 | 5.1 |
| South | 32,411 | 30,290 | 2,121 | 52,162 | 48,736 | 3,426 | 84,573 | 79,026 | 5,547 | 6.6 |
| West | 22,552 | 20,967 | 1,585 | 36,234 | 33,577 | 2,657 | 58,786 | 54,544 | 4,242 | 7.2 |
| **United States** | **72,806** | **68,036** | **4,770** | **116,961** | **109,124** | **7,839** | **189,767** | **177,160** | **12,609** | **6.6** |

*Source:* Center for Urban Policy Research, Rutgers University.

provision of more than 9 billion gallons of water and the treatment of more than 8 billion gallons of sewage (Table 7.6). With a projected population growth of more than 60.7 million, this amounts to an average of 106.5 gallons of water and 90.0 gallons of sewage per day per person. In addition to drilled wells, septic systems, package treatment plants, and distribution and collection mains, more than 45 million

Courtesy of C. Galley

laterals (one-half water, one-half sewer) will have to be constructed to connect the new dwellings and places of employment to existing or new water and sewer mains (Table 7.7). Total water and sewer infrastructure costs will be close to $190 billion, with water being the smaller portion (40 percent) of the combined cost (Table 7.8).

## Water and Sewer Demand

Of the four main census regions of the United States, the South will require the largest amount of new water and sewer infrastructure (44 percent of the nationwide total), as it will experience the greatest amount of growth over the next 25 years (Table 7.6). In 2025, the South will require 4.2 billion gallons of domestic water and 3.7 billion gallons of sewer capacity daily. The West will experience the second largest growth of the census regions and will require an additional daily capacity of 3.1 billion and 2.7 billion gallons of water and sewer, respectively, 32 percent of total added capacity nationwide. The Northeast and the Midwest combined will require one quarter (4.4 billion gallons) of future water and sewerage capacity, with the Midwest requiring twice (2.9 billion gallons per day) that of the Northeast (1.5 billion gallons per day).

## Water and Sewer Laterals

The number of water and sewer laterals in a region is a composite of the residential and nonresidential structures in a county and the number of counties in a region. Since there are an equal number of water and sewer laterals for each specific type of residential and nonresidential unit (each one serving one unit or each one serving multiple units), the total number of water and sewer laterals (or equivalents)[1] presented for any geography are equal. Table 7.7 presents the laterals required for both water and sewer. The number of future water and sewer laterals is proportional to a region's overall water and sewer demand. Therefore, the region with the largest overall future demand (the South), will generally have the largest number of required future water and sewer laterals (21.2 million). The remaining regions' required water and sewer laterals are, in order, the West (14.1 million); the Midwest (7.1 million); and the Northeast (3.4 million). More than 90 percent of infrastructure requirements respond to the needs of residential as opposed to nonresidential units.

[1] A drilled well or septic system is counted the same as a water or sewer lateral in the unit count, but is priced differently.

## Water and Sewer Costs

Water and sewer costs are the sum of the component infrastructure costs. These include treatment plants, storage tanks, distribution and collection mains, and the local laterals to the collection mains. They also include wells and septic systems in the remote areas of rural and undeveloped counties. The South, during the period 2000 to 2025, will spend $32.4 billion for water and $52.2 billion for sewer infrastructure (Table 7.8). The West will spend $22.6 billion for water and $36.2 billion for sewer; the Midwest will spend $11.7 billion for water and $18.7 billion for sewer; and the Northeast will spend $6.2 billion for water and $9.9 billion for sewer.

# Controlled Growth

## Water and Sewer Demand

Nationally, under the controlled-growth scenario, additional water and sewer capacity are reduced by almost 150 million and 7 million gallons per day, respectively (Table 7.6). Both of these amount to virtually no reduction, because most of the water consumption is fixed with domestic use, which does not vary between alternatives. There is a 1.5 percent saving in water and sewer capacity during the period 2000 to 2025, due exclusively to a change from "more" lawn-watering residential units (single-family) to "less" lawn-watering residential units (multifamily). Nonresidential demand remains essentially the same due to the low rate of lawn watering for these types of uses and very little change in types of units under the two scenarios. The largest percentage reduction occurs in the West region in water demand with 54.0 million gallons per day (1.8 percent) saved and in the Midwest region for sewerage, with 2.8 million gallons per day (0.2 percent) saved. The smallest numerical and percentage savings occur in the Northeast and Midwest for water, with 8.9 million and 17.9 million gallons per day (1.2 percent) saved, respectively. The Northeast experiences a modest increase in sewer demand of 1.9 million gallons of sewer per day. The largest absolute savings occur in the South, with 68.0 million gallons of water saved per day (1.6 percent) and 4.1 million gallons of sewage (0.1 percent) saved.


Courtesy of G Lowenstein


Courtesy of C. Galley

## Water and Sewer Laterals

The 45.8 million new water and sewer laterals (including 13.8 million wells and septic systems) under the uncontrolled-growth scenario are reduced to 41.2 million new water and sewer laterals (including 114.4 million wells and septic systems) under the controlled-growth scenario, a saving of 4.6 million laterals, or 10 percent, under the controlled-growth scenario (Table 7.7). The South had the largest absolute reduction in laterals of 2.1 million (a 10.0 percent reduction), while the West had the largest percentage reduction in laterals of 11.7 percent (1.7 million laterals). The Northeast region had the smallest absolute reduction in laterals of 0.3 million (a 9.9 percent reduction), while the Midwest had the smallest percentage reduction of laterals at 7.1 percent (0.5 million laterals). These savings are entirely the result of reductions in residential laterals. Under the controlled-growth scenario, as more households settle in units within urban and developed suburban counties or in the urbanized areas of all counties where there are more single-family attached and multifamily units, the number of laterals is reduced. No reduction occurs in nonresidential laterals, since laterals are related to structures and their nominal size remains the same except for a small change in FAR, which does not affect the number of laterals.

## Water and Sewer Costs

The total cost for water and sewer infrastructure under the controlled-growth scenario is $177.2 billion, compared to $189.9 billion under the uncontrolled-growth scenario (Table 7.8). That is a $12.6 billion or 7 percent saving. The saving of $5.5 billion in the South is by far the largest dollar value. The water and sewer infrastructure savings in the South equal one-half the savings nationwide. The 6.6 percent saving is the same as the national average. In the West, a $4.2 billion reduction in infrastructure costs amounts to a saving of 7.2 percent. The infrastructure savings in the Northeast and Midwest regions together are about half the savings evidenced in the West. The savings in these two regions total $2.8 billion, 7.9 percent in the Northeast and only 5.1 percent in the Midwest. In all regions, savings in sewer costs are 1.8 times the dollar magnitude of those observed for water costs.

The savings in the water and sewer infrastructure, laterals, and cost between the uncontrolled- and controlled-growth scenarios are related primarily to differences in the number of laterals serving the more intense uses under the latter scenario. The number of laterals required is related to housing type. The dispersion and spatial relationship of housing units (characterized by type) determine the length and complexity of water and sewer distribution and collection mains, which translate directly to cost. Housing type and location affect the number of water and sewer laterals and resultant costs.

# STATES

## Uncontrolled Growth

### Water and Sewer Demand

The states that have the greatest amount of water and sewer demand under uncontrolled growth parallel the states that have the largest combined residential and nonresidential growth and, resultantly, the largest land conversion for the projection period 2000 to 2025. Table 7.9 lists the states in descending order of total water and sewer capacity required. The top 20 states will need new water and sewer capacity at a rate of 7.4 billion and 6.5 billion gallons per day, respectively. Forty percent of the nation's states (20) require three-quarters of the nation's future water and sewer capacity for the period 2000 to 2025. The three fastest-growing states (California, Texas, and Florida) each require two to four times the future water and sewer capacity of the next three fastest-growing states (Georgia, Arizona, and North Carolina). California, Texas, and Florida's needs range from 0.9 billion to 1.3 billion gallons of water per day and 0.8 billion to 1.2 billion gallons of sewage capacity per day. Georgia, Arizona, and North Carolina will each require new water and sewer capacity at rates of 0.4 billion and 0.3 billion gallons, respectively, per day.

### Water and Sewer Laterals

Table 7.10 is a tabulation of state water and sewer laterals listed in descending order of their individual requirements for each. The top 20 states will require 34.6 million new water and sewer laterals or 75 percent of the nation's new water and sewer laterals for the period 2000 to 2025. The top three fastest-growing states (California, Texas, and Florida) will have two to two and a half times the number of water and sewer laterals required by the next three fastest-growing states (Georgia, Arizona, and North Carolina). The individual needs of the top three states range from 4.3 million laterals (Florida) to 5.2 million laterals (California).

### Water and Sewer Costs

The cost of water and sewer infrastructure is the cost of water and sewer laterals or equivalents (wells or septic for remote rural areas). The top 20 states will pay for their new water and sewer capacity by anteing up $55.2 billion and $88.6 billion, respectively (Table 7.11). This represents three-quarters of the nation's costs for water and sewer infrastructure during the period 2000 to 2025. The top three fastest-growing states (California, Texas, and Florida) will each pay 2.5 to 3 times the amount being paid by the

Courtesy of G. Lowenstein

## Table 7.9
## Water and Sewer Demand—Uncontrolled- and Controlled-Growth Scenarios by State: 2000 to 2025

| State | Water Demand | | | | Sewer Demand | | | |
|---|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth (Kgal/day) | Controlled Growth (Kgal/day) | Demand Savings (Kgal/day) | Percentage Savings (%) | Uncontrolled Growth (Kgal/day) | Controlled Growth (Kgal/day) | Demand Savings (Kgal/day) | Percentage Savings (%) |
| California | 1,326,976 | 1,301,456 | 25,521 | 1.9 | 1,198,100 | 1,198,852 | -751 | -0.1 |
| Texas | 998,000 | 983,189 | 14,811 | 1.5 | 877,447 | 877,680 | -234 | 0.0 |
| Florida | 930,612 | 916,588 | 14,024 | 1.5 | 833,073 | 832,677 | 396 | 0.0 |
| Georgia | 383,078 | 377,638 | 5,440 | 1.4 | 334,929 | 336,248 | -1,318 | -0.4 |
| Arizona | 346,135 | 338,671 | 7,464 | 2.2 | 304,330 | 301,972 | 2,359 | 0.8 |
| North Carolina | 341,213 | 338,118 | 3,095 | 0.9 | 304,163 | 304,517 | -353 | -0.1 |
| Washington | 307,114 | 298,051 | 9,063 | 3.0 | 272,389 | 268,089 | 4,300 | 1.6 |
| Virginia | 276,062 | 259,296 | 16,766 | 6.1 | 241,888 | 232,842 | 9,046 | 3.7 |
| Colorado | 252,898 | 246,918 | 5,980 | 2.4 | 220,032 | 219,751 | 281 | 0.1 |
| Tennessee | 244,873 | 241,852 | 3,020 | 1.2 | 215,365 | 215,671 | -306 | -0.1 |
| Illinois | 234,008 | 232,827 | 1,181 | 0.5 | 212,786 | 213,893 | -1,107 | -0.5 |
| Ohio | 233,840 | 233,874 | -34 | 0.0 | 209,884 | 211,218 | -1,334 | -0.6 |
| Michigan | 210,439 | 208,463 | 1,976 | 0.9 | 185,444 | 185,702 | -259 | -0.1 |
| New York | 191,346 | 192,871 | -1,525 | -0.8 | 173,441 | 175,757 | -2,316 | -1.3 |
| Indiana | 186,734 | 182,819 | 3,915 | 2.1 | 166,061 | 163,870 | 2,191 | 1.3 |
| South Carolina | 186,146 | 181,209 | 4,938 | 2.7 | 163,381 | 160,736 | 2,645 | 1.6 |
| Maryland | 184,633 | 168,655 | 15,977 | 8.7 | 160,469 | 150,945 | 9,524 | 5.9 |
| Minnesota | 180,129 | 179,895 | 235 | 0.1 | 158,713 | 160,738 | -2,025 | -1.3 |
| Pennsylvania | 178,353 | 185,684 | -7,331 | -4.1 | 158,008 | 168,055 | -10,047 | -6.4 |
| Utah | 170,451 | 168,616 | 1,835 | 1.1 | 149,409 | 149,411 | -2 | 0.0 |
| Nevada | 164,814 | 162,157 | 2,657 | 1.6 | 148,094 | 148,249 | -155 | -0.1 |
| Oregon | 157,679 | 161,018 | -3,339 | -2.1 | 140,618 | 145,665 | -5,047 | -3.6 |
| Wisconsin | 152,626 | 146,956 | 5,671 | 3.7 | 133,519 | 130,111 | 3,408 | 2.6 |
| Alabama | 149,510 | 148,479 | 1,031 | 0.7 | 131,908 | 131,696 | 212 | 0.2 |
| Missouri | 138,283 | 134,923 | 3,360 | 2.4 | 123,684 | 121,741 | 1,943 | 1.6 |
| New Jersey | 134,947 | 121,143 | 13,804 | 10.2 | 120,711 | 109,332 | 11,379 | 9.4 |
| Louisiana | 121,441 | 119,541 | 1,900 | 1.6 | 108,791 | 108,683 | 107 | 0.1 |
| Massachusetts | 110,164 | 116,485 | -6,321 | -5.7 | 97,650 | 105,486 | -7,836 | -8.0 |
| Kentucky | 106,370 | 104,295 | 2,075 | 2.0 | 95,577 | 94,278 | 1,299 | 1.4 |
| New Mexico | 102,845 | 101,309 | 1,536 | 1.5 | 89,615 | 89,414 | 201 | 0.2 |
| Oklahoma | 89,655 | 88,586 | 1,068 | 1.2 | 81,048 | 80,819 | 229 | 0.3 |
| Arkansas | 75,025 | 74,528 | 497 | 0.7 | 66,938 | 67,072 | -134 | -0.2 |
| Mississippi | 73,510 | 73,111 | 399 | 0.5 | 64,960 | 64,937 | 23 | 0.0 |
| Idaho | 70,040 | 69,226 | 814 | 1.2 | 60,204 | 59,563 | 641 | 1.1 |
| Hawaii | 68,935 | 67,178 | 1,757 | 2.5 | 58,923 | 58,820 | 103 | 0.2 |
| Iowa | 60,995 | 60,688 | 307 | 0.5 | 55,988 | 55,972 | 16 | 0.0 |
| Kansas | 57,645 | 57,084 | 561 | 1.0 | 51,899 | 51,953 | -54 | -0.1 |
| Nebraska | 49,774 | 49,329 | 445 | 0.9 | 44,467 | 44,483 | -17 | 0.0 |
| New Hampshire | 46,362 | 34,984 | 11,379 | 24.5 | 39,098 | 30,160 | 8,938 | 22.9 |
| Alaska | 44,146 | 43,611 | 535 | 1.2 | 37,755 | 37,755 | 0 | 0.0 |
| Maine | 38,157 | 37,955 | 201 | 0.5 | 31,533 | 31,534 | 0 | 0.0 |
| Montana | 36,601 | 36,557 | 44 | 0.1 | 31,223 | 31,223 | 0 | 0.0 |
| West Virginia | 31,221 | 25,655 | 5,566 | 17.8 | 27,607 | 23,104 | 4,503 | 16.3 |
| South Dakota | 29,286 | 29,161 | 125 | 0.4 | 26,332 | 26,332 | 0 | 0.0 |
| Connecticut | 28,144 | 28,655 | -511 | -1.8 | 25,753 | 26,331 | -578 | -2.2 |
| Delaware | 22,492 | 21,624 | 868 | 3.9 | 19,481 | 18,809 | 673 | 3.5 |
| Rhode Island | 21,686 | 22,663 | -977 | -4.5 | 18,980 | 20,435 | -1,455 | -7.7 |
| Vermont | 19,778 | 19,645 | 133 | 0.7 | 16,426 | 16,397 | 29 | 0.2 |
| Wyoming | 18,736 | 18,628 | 108 | 0.6 | 15,263 | 15,213 | 50 | 0.3 |
| North Dakota | 17,156 | 17,016 | 139 | 0.8 | 15,526 | 15,526 | 0 | 0.0 |
| **Top 20 States** | **7,363,039** | **7,236,690** | **126,350** | **1.7** | **6,539,310** | **6,528,621** | **10,690** | **0.2** |
| **United States** | **9,601,716** | **9,452,967** | **148,749** | **1.5** | **8,519,383** | **8,512,420** | **6,963** | **0.1** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 7.10
## Water and Sewer Laterals—Uncontrolled- and Controlled-Growth Scenarios by State: 2000 to 2025

| State | Water and Sewer Laterals Combined | | | | Residential Water and Sewer Laterals | | |
|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth (#) | Controlled Growth (#) | Lateral Savings (#) | Percentage Savings (%) | Uncontrolled Growth (#) | Controlled Growth (#) | Lateral Savings (#) |
| California | 5,218,128 | 4,377,066 | 841,063 | 16.1 | 4,775,292 | 3,937,348 | 837,945 |
| Texas | 4,912,146 | 4,405,936 | 506,210 | 10.3 | 4,615,318 | 4,108,730 | 506,588 |
| Florida | 4,289,520 | 3,799,550 | 489,971 | 11.4 | 4,023,294 | 3,533,840 | 489,454 |
| Georgia | 1,985,680 | 1,778,329 | 207,352 | 10.4 | 1,859,931 | 1,653,189 | 206,742 |
| Arizona | 1,874,065 | 1,684,425 | 189,640 | 10.1 | 1,780,124 | 1,591,339 | 188,785 |
| North Carolina | 1,725,162 | 1,618,443 | 106,720 | 6.2 | 1,610,273 | 1,503,348 | 106,925 |
| Washington | 1,558,882 | 1,388,596 | 170,287 | 10.9 | 1,470,676 | 1,300,893 | 169,782 |
| Virginia | 1,314,315 | 1,087,952 | 226,363 | 17.2 | 1,211,350 | 988,302 | 223,048 |
| Colorado | 1,240,879 | 1,077,861 | 163,019 | 13.1 | 1,154,104 | 991,936 | 162,168 |
| Tennessee | 1,323,197 | 1,203,064 | 120,133 | 9.1 | 1,234,583 | 1,114,865 | 119,718 |
| Illinois | 843,571 | 782,886 | 60,685 | 7.2 | 721,818 | 661,484 | 60,334 |
| Ohio | 1,096,312 | 1,051,165 | 45,147 | 4.1 | 983,969 | 939,391 | 44,578 |
| Michigan | 1,076,932 | 999,418 | 77,513 | 7.2 | 972,320 | 894,784 | 77,536 |
| New York | 723,537 | 700,854 | 22,683 | 3.1 | 608,706 | 584,618 | 24,089 |
| Indiana | 961,427 | 884,624 | 76,803 | 8.0 | 881,008 | 805,565 | 75,443 |
| South Carolina | 1,113,407 | 1,031,201 | 82,206 | 7.4 | 1,053,715 | 971,509 | 82,206 |
| Maryland | 872,394 | 686,274 | 186,120 | 21.3 | 806,167 | 623,936 | 182,231 |
| Minnesota | 816,599 | 752,124 | 64,475 | 7.9 | 739,920 | 675,414 | 64,506 |
| Pennsylvania | 843,198 | 751,501 | 91,697 | 10.9 | 746,311 | 649,696 | 96,615 |
| Utah | 803,688 | 748,673 | 55,015 | 6.8 | 752,811 | 697,478 | 55,333 |
| Nevada | 707,022 | 609,141 | 97,881 | 13.8 | 657,539 | 559,338 | 98,202 |
| Oregon | 843,279 | 805,931 | 37,348 | 4.4 | 792,224 | 753,693 | 38,531 |
| Wisconsin | 764,762 | 690,003 | 74,759 | 9.8 | 697,400 | 624,396 | 73,004 |
| Alabama | 912,700 | 875,927 | 36,773 | 4.0 | 858,483 | 822,055 | 36,427 |
| Missouri | 662,759 | 608,111 | 54,648 | 8.2 | 603,225 | 550,948 | 52,277 |
| New Jersey | 544,129 | 458,702 | 85,428 | 15.7 | 480,922 | 401,296 | 79,626 |
| Louisiana | 659,237 | 584,845 | 74,392 | 11.3 | 612,006 | 538,077 | 73,929 |
| Massachusetts | 479,749 | 442,308 | 37,441 | 7.8 | 420,548 | 383,075 | 37,473 |
| Kentucky | 574,892 | 542,613 | 32,279 | 5.6 | 523,918 | 492,284 | 31,634 |
| New Mexico | 566,699 | 531,221 | 35,478 | 6.3 | 537,796 | 502,531 | 35,265 |
| Oklahoma | 425,717 | 393,274 | 32,443 | 7.6 | 390,129 | 357,767 | 32,362 |
| Arkansas | 388,696 | 362,598 | 26,098 | 6.7 | 353,568 | 327,615 | 25,953 |
| Mississippi | 424,249 | 411,832 | 12,417 | 2.9 | 392,271 | 379,994 | 12,277 |
| Idaho | 382,662 | 375,739 | 6,924 | 1.8 | 363,003 | 356,615 | 6,388 |
| Hawaii | 347,110 | 307,489 | 39,620 | 11.4 | 325,215 | 285,620 | 39,595 |
| Iowa | 249,487 | 239,052 | 10,435 | 4.2 | 211,075 | 200,659 | 10,416 |
| Kansas | 233,745 | 215,490 | 18,255 | 7.8 | 204,492 | 186,198 | 18,294 |
| Nebraska | 205,778 | 192,198 | 13,580 | 6.6 | 182,398 | 168,794 | 13,605 |
| New Hampshire | 255,163 | 174,532 | 80,632 | 31.6 | 238,668 | 158,265 | 80,403 |
| Alaska | 229,542 | 216,195 | 13,347 | 5.8 | 214,949 | 201,602 | 13,347 |
| Maine | 242,829 | 237,468 | 5,361 | 2.2 | 228,091 | 222,730 | 5,362 |
| Montana | 211,095 | 210,177 | 918 | 0.4 | 197,998 | 197,081 | 918 |
| West Virginia | 172,712 | 136,519 | 36,193 | 21.0 | 154,093 | 119,103 | 34,990 |
| South Dakota | 129,880 | 125,723 | 4,156 | 3.2 | 114,969 | 110,812 | 4,156 |
| Connecticut | 90,520 | 89,316 | 1,204 | 1.3 | 70,151 | 69,817 | 335 |
| Delaware | 142,369 | 128,206 | 14,162 | 9.9 | 135,915 | 121,444 | 14,470 |
| Rhode Island | 99,908 | 89,219 | 10,689 | 10.7 | 90,794 | 79,989 | 10,805 |
| Vermont | 127,525 | 124,522 | 3,003 | 2.4 | 120,972 | 118,001 | 2,972 |
| Wyoming | 124,644 | 123,602 | 1,043 | 0.8 | 118,547 | 117,562 | 985 |
| North Dakota | 68,318 | 63,644 | 4,674 | 6.8 | 57,834 | 53,160 | 4,674 |
| **Top 20 States** | **34,593,040** | **30,809,941** | **3,783,100** | **10.9** | **32,001,689** | **28,227,664** | **3,774,026** |
| **United States** | **45,866,595** | **41,245,295** | **4,621,302** | **10.1** | **42,350,884** | **37,744,580** | **4,606,304** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 7.11
## Water and Sewer Infrastructure Costs—Uncontrolled- and Controlled-Growth Scenarios by State: 2000 to 2025

| State | Water Infrastructure Costs | | | Sewer Infrastructure Costs | | | Total Infrastructure Costs | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Percentag Savings (%) |
| California | 9,107 | 8,361 | 746 | 14,701 | 13,392 | 1,309 | 23,808 | 21,754 | 2,054 | 8.6 |
| Texas | 7,082 | 6,642 | 440 | 11,170 | 10,503 | 667 | 18,252 | 17,145 | 1,107 | 6.1 |
| Florida | 7,035 | 6,625 | 410 | 11,419 | 10,766 | 653 | 18,454 | 17,392 | 1,063 | 5.8 |
| Georgia | 3,013 | 2,827 | 186 | 4,845 | 4,534 | 311 | 7,858 | 7,361 | 497 | 6.3 |
| Arizona | 2,725 | 2,580 | 145 | 4,393 | 4,197 | 195 | 7,117 | 6,777 | 340 | 4.8 |
| North Carolina | 2,656 | 2,544 | 112 | 4,311 | 4,149 | 162 | 6,967 | 6,693 | 274 | 3.9 |
| Washington | 2,328 | 2,166 | 162 | 3,683 | 3,437 | 246 | 6,011 | 5,603 | 409 | 6.8 |
| Virginia | 2,187 | 1,932 | 254 | 3,464 | 3,064 | 400 | 5,651 | 4,997 | 654 | 11.6 |
| Colorado | 2,076 | 1,866 | 210 | 3,342 | 2,985 | 357 | 5,418 | 4,852 | 567 | 10.5 |
| Tennessee | 1,973 | 1,850 | 123 | 3,221 | 3,013 | 209 | 5,195 | 4,863 | 332 | 6.4 |
| Illinois | 1,602 | 1,532 | 70 | 2,491 | 2,383 | 108 | 4,092 | 3,915 | 178 | 4.3 |
| Ohio | 1,741 | 1,689 | 52 | 2,810 | 2,713 | 97 | 4,551 | 4,403 | 148 | 3.3 |
| Michigan | 1,828 | 1,722 | 106 | 2,918 | 2,751 | 167 | 4,746 | 4,473 | 274 | 5.8 |
| New York | 1,336 | 1,308 | 28 | 2,125 | 2,071 | 54 | 3,460 | 3,379 | 81 | 2.4 |
| Indiana | 1,501 | 1,409 | 92 | 2,453 | 2,302 | 151 | 3,953 | 3,711 | 242 | 6.1 |
| South Carolina | 1,564 | 1,468 | 96 | 2,560 | 2,407 | 153 | 4,124 | 3,875 | 249 | 6.0 |
| Maryland | 1,552 | 1,274 | 278 | 2,467 | 1,999 | 469 | 4,019 | 3,273 | 746 | 18.6 |
| Minnesota | 1,306 | 1,251 | 55 | 2,079 | 1,983 | 95 | 3,384 | 3,235 | 150 | 4.4 |
| Pennsylvania | 1,470 | 1,327 | 142 | 2,387 | 2,137 | 251 | 3,857 | 3,464 | 393 | 10.2 |
| Utah | 1,140 | 1,078 | 62 | 1,783 | 1,686 | 98 | 2,924 | 2,763 | 160 | 5.5 |
| Nevada | 1,189 | 1,112 | 77 | 1,888 | 1,782 | 106 | 3,077 | 2,894 | 183 | 5.9 |
| Oregon | 1,216 | 1,150 | 66 | 1,974 | 1,846 | 128 | 3,190 | 2,995 | 194 | 6.1 |
| Wisconsin | 1,228 | 1,121 | 107 | 1,981 | 1,809 | 171 | 3,208 | 2,930 | 278 | 8.7 |
| Alabama | 1,268 | 1,209 | 59 | 2,072 | 1,957 | 115 | 3,340 | 3,165 | 174 | 5.2 |
| Missouri | 1,014 | 949 | 65 | 1,633 | 1,528 | 105 | 2,647 | 2,477 | 170 | 6.4 |
| New Jersey | 1,107 | 959 | 148 | 1,739 | 1,495 | 244 | 2,846 | 2,454 | 392 | 13.8 |
| Louisiana | 973 | 882 | 92 | 1,573 | 1,425 | 149 | 2,547 | 2,306 | 240 | 9.4 |
| Massachusetts | 869 | 881 | -12 | 1,375 | 1,402 | -27 | 2,244 | 2,282 | -39 | -1.7 |
| Kentucky | 840 | 801 | 39 | 1,364 | 1,302 | 62 | 2,205 | 2,103 | 101 | 4.6 |
| New Mexico | 767 | 738 | 30 | 1,227 | 1,173 | 54 | 1,994 | 1,911 | 84 | 4.2 |
| Oklahoma | 596 | 565 | 32 | 957 | 907 | 50 | 1,553 | 1,472 | 82 | 5.3 |
| Arkansas | 598 | 560 | 38 | 986 | 919 | 68 | 1,584 | 1,479 | 106 | 6.7 |
| Mississippi | 602 | 583 | 19 | 988 | 953 | 35 | 1,590 | 1,536 | 54 | 3.4 |
| Idaho | 538 | 527 | 11 | 867 | 850 | 17 | 1,405 | 1,377 | 28 | 2.0 |
| Hawaii | 573 | 520 | 53 | 914 | 805 | 109 | 1,486 | 1,325 | 162 | 10.9 |
| Iowa | 417 | 407 | 10 | 666 | 651 | 15 | 1,083 | 1,058 | 25 | 2.3 |
| Kansas | 418 | 400 | 18 | 656 | 631 | 25 | 1,074 | 1,031 | 43 | 4.0 |
| Nebraska | 313 | 302 | 11 | 486 | 472 | 14 | 799 | 774 | 25 | 3.1 |
| New Hampshire | 445 | 313 | 133 | 733 | 515 | 218 | 1,179 | 828 | 351 | 29.8 |
| Alaska | 405 | 391 | 14 | 651 | 631 | 20 | 1,055 | 1,022 | 33 | 3.1 |
| Maine | 355 | 345 | 10 | 582 | 565 | 17 | 937 | 910 | 27 | 2.9 |
| Montana | 298 | 292 | 6 | 492 | 482 | 10 | 790 | 774 | 16 | 2.0 |
| West Virginia | 251 | 202 | 49 | 412 | 330 | 82 | 663 | 532 | 131 | 19.8 |
| South Dakota | 210 | 205 | 5 | 343 | 335 | 8 | 553 | 539 | 14 | 2.5 |
| Connecticut | 212 | 212 | 0 | 342 | 341 | 1 | 554 | 553 | 2 | 0.3 |
| Delaware | 203 | 190 | 12 | 325 | 303 | 21 | 527 | 494 | 34 | 6.4 |
| Rhode Island | 174 | 158 | 16 | 281 | 253 | 28 | 455 | 411 | 44 | 9.7 |
| Vermont | 183 | 178 | 5 | 301 | 293 | 8 | 484 | 471 | 13 | 2.7 |
| Wyoming | 191 | 186 | 5 | 319 | 311 | 8 | 510 | 497 | 12 | 2.4 |
| North Dakota | 115 | 111 | 3 | 188 | 183 | 4 | 302 | 294 | 8 | 2.6 |
| **Top 20 States** | **55,221** | **51,454** | **3,767** | **88,622** | **82,471** | **6,150** | **143,845** | **133,928** | **9,917** | **6.9** |
| **United States** | **72,806** | **68,036** | **4,770** | **116,961** | **109,122** | **7,839** | **189,767** | **177,158** | **12,609** | **6.6** |

*Source:* Center for Urban Policy Research, Rutgers University.

next three fastest-growing states for future water and sewer infrastructure costs. Their costs range from $7.0 billion to $9.1 billion for water infrastructure and $11.4 billion to $14.7 billion for sewer infrastructure.

## Controlled Growth

### Water and Sewer Demand

Under the controlled-growth scenario, water demand is reduced from 9.60 billion to 9.45 billion gallons per day, a saving of 148.7 million gallons; sewer demand is reduced from 8.52 billion to 8.51 billion gallons per day, a saving of 6.9 million gallons (Table 7.9). In the top 20 states, representing three-quarters of future national demand, water demand is reduced from 7.36 billion to 7.24 billion gallons per day, a saving of 126.4 million gallons; sewer demand is reduced from 6.54 billion to 6.53 billion gallons per day, a saving of 10.7 million gallons. Of the top three states, California evidences a saving of 25.5 million gallons of water per day and a negligible increase of 0.8 million gallons of sewage per day. While relatively insignificant overall, this is twice the level of saving of the next two fastest-growing states (Texas and Florida) and five times more than the average saving of Georgia, Arizona, and North Carolina. The state that saves the most proportionally is New Hampshire, with a water demand saving of 24.5 percent (11.4 million gallons per day) and a sewer demand saving of 22.9 percent (8.9 million gallons per day). This occurs because Massachusetts's urban counties are part of the New Hampshire EA and retain some of New Hampshire's sprawl under the controlled-growth scenario.

Expanding on the preceding examples, a number of states like Massachusetts exhibit increases in water and sewer demand under the controlled-growth scenario because of the concentrations of urban counties within their boundaries that are receiving growth from rural and undeveloped counties outside their state boundaries but within the same EA. Five states in the Northeast region (Connecticut, Massachusetts, New York, Pennsylvania, and Rhode Island) and one in the West (Oregon) increase their overall water demand for this reason. The total increase is 19.0 million gallons per day for the five states. Seventeen states increase their overall sewer demand for similar reasons; their total increase is 32.8 million gallons per day.

Courtesy of USFWS/J. & K. Hollingsworth

### Water and Sewer Laterals

For the United States as a whole, the total number of laterals reduced under controlled growth is 4.6 million (Table 7.10). The top 20 states, representing three-quarters of the growth of water and sewer infrastructure nationwide, reduce the number of future water and sewer laterals under controlled growth from 34.6 million to 30.8 million, a saving of 3.8 million laterals. The top 20 states represent 83 percent of the savings in water and sewer laterals nationwide. Of the top three states, California evidences a saving of 0.8 million water and sewer laterals. That saving is 1.7 times the level of the next two states (Texas and Florida) and four times the level of the following two states (Georgia and Arizona). Florida and Texas evidence savings of 0.5 million laterals each. Georgia and Arizona save approximately 0.2 million laterals due to the controlled-growth scenario. The state that saves proportionally the most is New Hampshire, for the reasons stated above, with an overall saving of 31.6 percent, or 0.08 million laterals.

### Water and Sewer Costs

Under the controlled-growth scenario, the total cost of the water and sewer infrastructure is reduced to $177.2 billion, a saving of $12.6 billion, or 7 percent, over the 25-year period ending in 2025 (Table 7.11). The top 20 states, again representing 75 percent of the water and sewer costs nationwide, reduce their costs from $143.8 billion to $133.9 billion, a saving of $9.9 billion, or 6.9 percent. Of the top three states, California evidences water and sewer infrastructure savings of $2.1 billion. These savings are twice the level of the next two fastest-growing states (Texas and Florida) and four times the level of the two states that follow (Georgia and Arizona). Texas and Florida evidence savings of about $1.1 billion each. The figures for Georgia and Arizona are $497 million and $340 million, respectively.

# EAs

## Uncontrolled Growth

### Water and Sewer Demand

Water demand and sewer demand impact infrastructure requirements in the EAs throughout the United States and generally follow the pattern presented for the United States as a whole, its regions, and its states. Most of the new water and sewer demand and resultant infrastructure growth are taking place in the southern and western EAs. Water and sewer demand and infrastructure growth are directly related to the household and employment growth of these areas. Of the top 30 EAs in water and sewer demand, 10 are in the South, 11 are in the West, four are in the Northeast, and five are in the Midwest (Table 7.12). Two-thirds of future water and sewer demand occurs in the South and West. The table is rank-ordered by future water and sewer demand requirements.

The top 30 EAs nationwide must be able to provide an additional 6.1 billion gallons of daily water capacity and an additional 5.4 billion gallons of daily sewage capacity. The additional water and sewer capacities demanded in these EAs represent more than 60 percent of the future water and sewer capacity requirement nationwide.

The Los Angeles-Riverside-Orange, CA-AZ EA in the West region is noteworthy. In the earlier discussion of future water and sewer demand by state, California had by far the largest future water and sewer demand requirements. The Los Angeles-Riverside-Orange, CA-AZ EA is the largest contributor to California's future water and sewer demand. This EA alone requires more sewer and water capacity than any other EA in the nation. It is the only EA to require more than 500 million gallons each of future daily water and sewer capacity—1.08 billion in total. There are no other EAs across the nation that even approach these requirement levels. The next three EAs in terms of demand (Washington-Baltimore, DC-MD-VA-WV-PA, Dallas-Fort Worth, TX-AR-OK, and San Francisco-Oakland-San Jose, CA) are at only 60 percent to 70 percent of that level; the remaining six of the top 10 are at 40 percent to 50 percent of the Los Angeles-Riverside-Orange, CA-AZ EA level.

Courtesy of W. Dolphin

### Water and Sewer Laterals

The number of laterals needed to provide the water and sewer capacity for the top 30 EAs is displayed in Table 7.13. EAs are again ranked by future water demand requirements. The number of laterals are either water or sewer, since one of each serves one or more units. The top 30 EAs—17.5 percent of all EAs nationwide—represent close to 60 percent of the nation's required water and sewer laterals.

As was the case for water and sewer demand, the Los Angeles-Riverside-Orange, CA-AZ EA stands out from the rest of the EAs in the number of future water and sewer laterals required. This EA will require more than 1.1 million water laterals and approximately 900,000 sewer laterals in the next 25 years—more than 2 million water and sewer laterals in total. Both the Atlanta, GA-AL-NC EA and the Washington-Baltimore, DC-MD-VA-WV-PA EA convert more land than Los Angeles-Riverside-Orange, CA-AZ EA, but Los Angeles-Riverside-Orange, CA-AZ EA houses 30 percent more future growth and thus 30 percent more water and sewer laterals than the other two EAs. In the Los Angeles-Riverside-Orange, CA-AZ EA, there are more residential units constructed per acre than in the Atlanta, GA-AL-NC EA or in the Washington-Baltimore, DC-MD-VA-WV-PA EA. In fact, the Los Angeles-Riverside-Orange, CA-AZ EA has the third lowest land acreage conversion per unit in the top 30 EAs (Table 6.30). Only the Phoenix-Mesa, AZ-NM EA and the Miami-Fort Lauderdale, FL EAs have lower land acreage per unit of development converted.

### Water and Sewer Costs

The cost of water and sewer infrastructure directly follows the demand and lateral requirements. The top 30 EAs will incur costs of $72.8 billion and

## Table 7.12
## Water and Sewer Demand—
## Uncontrolled- and Controlled-Growth Scenarios by EA: 2000 to 2025
(Top 30 EAs)

| EA | Water Demand | | | | Sewer Demand | | | |
|---|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth (Kgal/day) | Controlled Growth (Kgal/day) | Demand Savings (Kgal/day) | Percentage Savings (%) | Uncontrolled Growth (Kgal/day) | Controlled Growth (Kgal/day) | Demand Savings (Kgal/day) | Percentage Savings (%) |
| Los Angeles-River.-Orange, CA-AZ | 564,202 | 548,806 | 15,396 | 2.7 | 516,463 | 515,027 | 1,436 | 0.3 |
| Washington-Balti., DC-MD-VA-WV-PA | 337,327 | 326,937 | 10,390 | 3.1 | 295,152 | 295,217 | -65 | 0.0 |
| Dallas-Fort Worth, TX-AR-OK | 336,516 | 330,492 | 6,024 | 1.8 | 297,967 | 297,898 | 68 | 0.0 |
| San Francisco-Oak.-San Jose, CA | 335,584 | 328,610 | 6,974 | 2.1 | 300,095 | 300,146 | -51 | 0.0 |
| Atlanta, GA-AL-NC | 296,037 | 289,614 | 6,423 | 2.2 | 256,035 | 255,968 | 67 | 0.0 |
| Houston-Gal.-Brazoria, TX | 278,065 | 274,449 | 3,616 | 1.3 | 241,502 | 241,502 | 0 | 0.0 |
| Miami-F. Lau., FL | 268,191 | 262,573 | 5,618 | 2.1 | 245,078 | 244,649 | 429 | 0.2 |
| Denver-Boulder-Gree., CO-KS-NE | 241,996 | 236,019 | 5,977 | 2.5 | 210,561 | 210,280 | 281 | 0.1 |
| Phoenix-Mesa, AZ-NM | 241,041 | 237,159 | 3,882 | 1.6 | 212,815 | 212,815 | 0 | 0.0 |
| New York-North. NJ-L. Isl., NY-NJ-CT-PA-MA-VT | 237,959 | 235,641 | 2,318 | 1.0 | 213,488 | 213,092 | 396 | 0.2 |
| Seattle-Tacoma-Bremerton, WA | 233,435 | 229,878 | 3,556 | 1.5 | 207,163 | 207,202 | -39 | 0.0 |
| Orlando, FL | 233,142 | 230,676 | 2,466 | 1.1 | 206,551 | 206,551 | 0 | 0.0 |
| Chicago-Gary-Keno., IL-IN-WI | 221,710 | 219,094 | 2,616 | 1.2 | 199,288 | 199,145 | 144 | 0.1 |
| San Diego, CA | 216,887 | 213,200 | 3,687 | 1.7 | 197,361 | 197,361 | 0 | 0.0 |
| Boston-Wor.-Law.-Lowell-Brocktn, MA-NH-RI-VT | 177,802 | 173,337 | 4,465 | 2.5 | 155,133 | 155,097 | 36 | 0.0 |
| Minneapolis-St. Paul, MN-WI-IA | 173,940 | 171,114 | 2,825 | 1.6 | 153,079 | 152,803 | 276 | 0.2 |
| Las Vegas, NV-AZ-UT | 158,512 | 155,895 | 2,617 | 1.7 | 141,752 | 141,752 | 0 | 0.0 |
| Salt Lake City-Ogden, UT-ID | 150,158 | 148,323 | 1,835 | 1.2 | 132,204 | 132,205 | -2 | 0.0 |
| Portland-Salem, OR-WA | 147,748 | 144,998 | 2,750 | 1.9 | 130,837 | 130,836 | 1 | 0.0 |
| San Antonio, TX | 147,103 | 144,821 | 2,282 | 1.6 | 129,996 | 129,996 | 0 | 0.0 |
| Tampa-St. Peter.-Clearwater, FL | 143,698 | 140,704 | 2,994 | 2.1 | 128,434 | 128,416 | 18 | 0.0 |
| Sacramento-Yolo, CA | 131,448 | 130,055 | 1,393 | 1.1 | 114,228 | 114,132 | 97 | 0.1 |
| Philadelphia-Wil.-Atlantic City, PA-NJ-DE-MD | 127,435 | 124,052 | 3,383 | 2.7 | 111,077 | 111,319 | -242 | -0.2 |
| Nashville, TN-KY | 113,315 | 111,083 | 2,233 | 2.0 | 98,318 | 98,432 | -114 | -0.1 |
| Jackson., FL-GA | 111,934 | 110,841 | 1,093 | 1.0 | 100,539 | 100,539 | 0 | 0.0 |
| Indianapolis, IN-IL | 111,299 | 110,195 | 1,103 | 1.0 | 99,264 | 99,264 | 0 | 0.0 |
| Detroit-Ann Arbor-Flint, MI | 109,317 | 108,112 | 1,205 | 1.1 | 97,615 | 97,878 | -263 | -0.3 |
| Raleigh-Durham-Chapel Hill, NC | 95,710 | 94,332 | 1,379 | 1.4 | 85,414 | 85,446 | -32 | 0.0 |
| Charlotte-Gasto.-Rock Hill, NC-SC | 91,700 | 90,577 | 1,123 | 1.2 | 81,373 | 81,373 | 0 | 0.0 |
| Columbus, OH | 85,480 | 84,523 | 956 | 1.1 | 76,902 | 76,902 | 0 | 0.0 |
| **Top 30 EAs** | **6,118,688** | **6,006,109** | **112,579** | **1.8** | **5,435,684** | **5,433,243** | **2,441** | **0.0** |
| **United States** | **9,601,716** | **9,452,967** | **148,749** | **1.5** | **8,519,383** | **8,512,420** | **6,963** | **0.1** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 7.13
## Water and Sewer Laterals—
## Uncontrolled- and Controlled-Growth Scenarios by EA: 2000 to 2025
(Top 30 EAs)

| EA | Water and Sewer Laterals Combined | | | | Residential Water and Sewer Laterals | | |
|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth (#) | Controlled Growth (#) | Lateral Savings (#) | Percentage Savings (%) | Uncontrolled Growth (#) | Controlled Growth (#) | Lateral Savings (#) |
| Los Angeles-River.-Orange, CA-AZ | 2,026,692 | 1,549,597 | 477,096 | 23.5 | 1,818,211 | 1,344,357 | 473,854 |
| Washington-Balti., DC-MD-VA-WV-PA | 1,542,736 | 1,261,021 | 281,714 | 18.3 | 1,412,630 | 1,131,520 | 281,111 |
| Dallas-Fort Worth, TX-AR-OK | 1,588,166 | 1,390,788 | 197,378 | 12.4 | 1,483,679 | 1,286,527 | 197,152 |
| San Francisco-Oak.-San Jose, CA | 1,410,073 | 1,203,512 | 206,561 | 14.6 | 1,298,704 | 1,092,557 | 206,146 |
| Atlanta, GA-AL-NC | 1,536,204 | 1,348,322 | 187,882 | 12.2 | 1,442,703 | 1,255,206 | 187,498 |
| Houston-Gal.-Brazoria, TX | 1,417,234 | 1,285,186 | 132,048 | 9.3 | 1,332,669 | 1,200,621 | 132,048 |
| Miami-F. Lau., FL | 1,012,315 | 839,066 | 173,249 | 17.1 | 929,013 | 756,322 | 172,691 |
| Denver-Boulder-Gree., CO-KS-NE | 1,177,136 | 1,014,256 | 162,880 | 13.8 | 1,094,221 | 932,191 | 162,029 |
| Phoenix-Mesa, AZ-NM | 1,230,818 | 1,099,220 | 131,597 | 10.7 | 1,163,250 | 1,031,653 | 131,597 |
| New York-North. NJ-L. Isl., NY-NJ-CT-PA-MA-VT | 928,543 | 865,394 | 63,149 | 6.8 | 783,718 | 721,405 | 62,314 |
| Seattle-Tacoma-Bremerton, WA | 1,133,733 | 1,004,736 | 128,997 | 11.4 | 1,064,435 | 935,390 | 129,045 |
| Orlando, FL | 1,130,105 | 1,051,553 | 78,553 | 7.0 | 1,068,410 | 989,857 | 78,553 |
| Chicago-Gary-Keno., IL-IN-WI | 848,015 | 777,836 | 70,180 | 8.3 | 740,964 | 671,248 | 69,716 |
| San Diego, CA | 795,728 | 678,865 | 116,864 | 14.7 | 728,542 | 611,678 | 116,864 |
| Boston-Wor.-Law.-Lowell-Brocktn, MA-NH-RI-VT | 841,228 | 712,600 | 128,628 | 15.3 | 759,247 | 630,853 | 128,394 |
| Minneapolis-St. Paul, MN-WI-IA | 796,456 | 718,375 | 78,082 | 9.8 | 724,613 | 647,366 | 77,247 |
| Las Vegas, NV-AZ-UT | 691,927 | 607,671 | 84,256 | 12.2 | 645,815 | 561,559 | 84,256 |
| Salt Lake City-Ogden, UT-ID | 685,096 | 630,081 | 55,015 | 8.0 | 638,717 | 583,384 | 55,333 |
| Portland-Salem, OR-WA | 749,778 | 674,663 | 75,116 | 10.0 | 703,404 | 628,377 | 75,028 |
| San Antonio, TX | 705,128 | 627,974 | 77,154 | 10.9 | 665,334 | 588,180 | 77,154 |
| Tampa-St. Peter.-Clearwater, FL | 701,009 | 581,515 | 119,494 | 17.0 | 658,857 | 539,076 | 119,780 |
| Sacramento-Yolo, CA | 643,558 | 603,556 | 40,002 | 6.2 | 608,865 | 569,012 | 39,853 |
| Philadelphia-Wil.-Atlantic City, PA-NJ-DE-MD | 639,845 | 507,915 | 131,930 | 20.6 | 584,912 | 452,778 | 132,134 |
| Nashville, TN-KY | 642,547 | 558,800 | 83,747 | 13.0 | 604,414 | 520,748 | 83,666 |
| Jackson., FL-GA | 568,561 | 516,947 | 51,615 | 9.1 | 536,011 | 484,397 | 51,615 |
| Indianapolis, IN-IL | 568,723 | 521,633 | 47,089 | 8.3 | 525,249 | 478,159 | 47,089 |
| Detroit-Ann Arbor-Flint, MI | 503,260 | 454,483 | 48,777 | 9.7 | 436,000 | 387,013 | 48,987 |
| Raleigh-Durham-Chapel Hill, NC | 460,112 | 415,874 | 44,238 | 9.6 | 429,223 | 384,825 | 44,399 |
| Charlotte-Gasto.-Rock Hill, NC-SC | 448,549 | 415,344 | 33,204 | 7.4 | 419,527 | 386,322 | 33,204 |
| Columbus, OH | 402,718 | 369,382 | 33,337 | 8.3 | 371,108 | 337,771 | 33,337 |
| **Top 30 EAs** | **27,825,996** | **24,286,165** | **3,539,832** | **12.7** | **25,672,444** | **22,140,351** | **3,532,094** |
| **United States** | **45,866,595** | **41,245,295** | **4,621,302** | **10.1** | **42,350,884** | **37,744,581** | **4,606,304** |

*Source:* Center for Urban Policy Research, Rutgers University.

Courtesy of A. Nelessen

$117.0 billion to provide for additional water and sewer capacity, respectively (Table 7.14). This represents close to 63 percent of the nation's total costs for water and sewer for the period 2000 to 2025. Since infrastructure costs reflect the plant, mains, and lateral costs, it is not surprising that the Los Angeles-Riverside-Orange, CA-AZ EA stands out among other EAs in future infrastructure costs. At a future cost of $9.4 billion, this EA exhibits costs 1.3 to 1.5 times those of the next four infrastructure demand-ranked EAs. The Los Angeles-Riverside-Orange, CA-AZ EA has by far the highest future water and sewer infrastructure costs in the nation. It is interesting that the Washington-Baltimore, DC-MD-VA-WV-PA; Dallas-Fort Worth, TX-AR-OK; San Francisco-Oakland-San Jose, CA; and Atlanta, GA-AL-NC EAs, which have larger amounts of land converted, have water and sewer costs only two-thirds that of Los Angeles-Riverside-Orange, CA-AZ EA. In the previous paragraph, the large number of high-density residential units in the Los Angeles-Riverside-Orange, CA-AZ EA as compared to the Washington-Baltimore, DC-MD-VA-WV-PA EA was discussed. However, not mentioned was the fact that the proportionally large number of future single-family units within the Los Angeles-Riverside-Orange, CA-AZ EA dominates overall water service costs. The economies gained by using shorter distribution and collection mains (density) are negated by the cost of the number of single-family units to be serviced.

## Controlled Growth

### Water and Sewer Demand

Under the controlled-growth scenario, overall water demand is reduced from 9.60 billion to 9.45 billion gallons per day, a saving of 148.7 million gallons. Sewer demand is reduced from 8.52 billion to 8.51 billion gallons per day, a saving of 7.0 million gallons (Table 7.12). The top 30 EAs representing 60 percent of national water and sewer demand have water demand reduced from 6.1 billion to 6.0 billion gallons per day, a saving of 112.6 million gallons. These same EAs have sewer demand reduced slightly to 5.4 billion gallons per day, saving 2.4 million gallons per day. Again, while the demand saving is relatively minor, two EAs have by far the most water demand savings. The two are in the top five EAs in terms of projected growth. These are the Los Angeles-Riverside-Orange, CA-AZ and Washington-Baltimore, DC-MD-VA-WV-PA EAs. The Los Angeles-Riverside-Orange, CA-AZ EA under the controlled-growth scenario evidences a saving of 15.4 million gallons in water capacity per day. The Washington-Baltimore, DC-MD-VA-WV-PA EA follows with savings of

## Table 7.14
## Water and Sewer Infrastructure Costs—
## Uncontrolled- and Controlled-Growth Scenarios by EA: 2000 to 2025
(Top 30 EAs)

| | Water Infrastructure Costs | | | Sewer Infrastructure Costs | | | Total Infrastructure Costs | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EA | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Percentage Savings (%) |
| Los Angeles-River.-Or., CA-AZ | 3,577 | 3,132 | 445 | 5,822 | 5,008 | 813 | 9,399 | 8,140 | 1,259 | 13.4 |
| Washington-Balti., DC-MD-VA-WV-PA | 2,777 | 2,437 | 339 | 4,398 | 3,817 | 581 | 7,175 | 6,255 | 920 | 12.8 |
| Dallas-Fort Worth, TX-AR-OK | 2,428 | 2,273 | 155 | 3,810 | 3,599 | 211 | 6,238 | 5,872 | 366 | 5.9 |
| San Francisco-Oak.-San Jose, CA | 2,480 | 2,301 | 178 | 3,979 | 3,632 | 346 | 6,458 | 5,934 | 524 | 8.1 |
| Atlan., GA-AL-NC | 2,371 | 2,201 | 170 | 3,785 | 3,501 | 284 | 6,156 | 5,703 | 454 | 7.4 |
| Houston-Gal.-Brazoria, TX | 2,071 | 1,953 | 118 | 3,266 | 3,078 | 188 | 5,337 | 5,031 | 306 | 5.7 |
| Miami-F. Lau., FL | 1,940 | 1,774 | 166 | 3,092 | 2,850 | 242 | 5,032 | 4,624 | 408 | 8.1 |
| Denver-Boulder-Gree., CO-KS-NE | 1,983 | 1,775 | 208 | 3,187 | 2,833 | 354 | 5,170 | 4,609 | 561 | 10.9 |
| Phoenix-Mesa, AZ-NM | 1,807 | 1,719 | 88 | 2,833 | 2,724 | 109 | 4,640 | 4,443 | 197 | 4.2 |
| New York-North. NJ-L. Isl., NY-NJ-CT-PA-MA-VT | 1,889 | 1,812 | 77 | 2,949 | 2,822 | 127 | 4,837 | 4,633 | 204 | 4.2 |
| Seattle-Tacoma-Bremerton, WA | 1,752 | 1,645 | 108 | 2,754 | 2,595 | 159 | 4,507 | 4,240 | 267 | 5.9 |
| Orlando, FL | 1,708 | 1,646 | 62 | 2,771 | 2,689 | 82 | 4,479 | 4,335 | 144 | 3.2 |
| Chicago-Gary-Keno., IL-IN-WI | 1,570 | 1,486 | 84 | 2,426 | 2,295 | 131 | 3,996 | 3,782 | 215 | 5.4 |
| San Diego, CA | 1,493 | 1,411 | 82 | 2,336 | 2,242 | 94 | 3,829 | 3,654 | 176 | 4.6 |
| Boston-Wor.-Law.-Lowell-Brocktn, MA-NH-RI-VT | 1,492 | 1,355 | 137 | 2,397 | 2,176 | 220 | 3,889 | 3,531 | 358 | 9.2 |
| Minneapolis-St. Paul, MN-WI-IA | 1,269 | 1,195 | 74 | 2,026 | 1,899 | 127 | 3,294 | 3,094 | 201 | 6.1 |
| Las Vegas, NV-AZ-UT | 1,130 | 1,065 | 64 | 1,806 | 1,725 | 82 | 2,936 | 2,790 | 146 | 5.0 |
| Salt Lake City-Ogden, UT-ID | 967 | 908 | 59 | 1,495 | 1,403 | 92 | 2,461 | 2,311 | 151 | 6.1 |
| Portland-Salem, OR-WA | 1,094 | 987 | 107 | 1,756 | 1,565 | 191 | 2,850 | 2,552 | 298 | 10.5 |
| San Antonio, TX | 1,011 | 937 | 75 | 1,603 | 1,489 | 115 | 2,615 | 2,425 | 189 | 7.2 |
| Tampa-St. Peter.-Clearwater, FL | 1,045 | 958 | 88 | 1,679 | 1,526 | 153 | 2,724 | 2,484 | 240 | 8.8 |
| Sacra.-Yolo, CA | 1,031 | 991 | 40 | 1,674 | 1,614 | 60 | 2,705 | 2,605 | 100 | 3.7 |
| Philadelphia-Wil.-Atlantic City, PA-NJ-DE-MD | 1,152 | 927 | 225 | 1,858 | 1,462 | 396 | 3,010 | 2,389 | 620 | 20.6 |
| Nashville, TN-KY | 997 | 911 | 86 | 1,657 | 1,509 | 148 | 2,654 | 2,420 | 234 | 8.8 |
| Jackson., FL-GA | 894 | 835 | 59 | 1,473 | 1,369 | 104 | 2,367 | 2,204 | 163 | 6.9 |
| Indianapolis, IN-IL | 878 | 832 | 46 | 1,429 | 1,354 | 74 | 2,306 | 2,186 | 120 | 5.2 |
| Detroit-Ann Arbor-Flint, MI | 973 | 899 | 74 | 1,525 | 1,409 | 117 | 2,498 | 2,307 | 191 | 7.6 |
| Raleigh-Durham-Chapel Hill, NC | 746 | 704 | 42 | 1,197 | 1,135 | 62 | 1,942 | 1,839 | 103 | 5.3 |
| Charlotte-Gasto.-Rock Hill, NC-SC | 703 | 668 | 35 | 1,124 | 1,077 | 47 | 1,827 | 1,745 | 82 | 4.5 |
| Columbus, OH | 618 | 585 | 32 | 1,000 | 953 | 47 | 1,617 | 1,538 | 79 | 4.9 |
| **Top 30 EAs** | **45,845** | **42,324** | **3,521** | **73,106** | **67,351** | **5,755** | **118,951** | **109,675** | **9,276** | **7.8** |
| **United States** | **72,806** | **68,036** | **4,770** | **116,961** | **109,124** | **7,839** | **189,767** | **177,160** | **12,609** | **6.6** |

*Source:* Center for Urban Policy Research, Rutgers University.

10.4 million gallons in water capacity per day. These savings are 2.5 times and 1.5 times the savings, respectively, of the next three water service-demanding EAs—the Dallas-Fort Worth, TX-AR-OK EA; San Francisco-Oakland-San Jose, CA EA; and the Atlanta, GA-AL-NC EA. Since the number of units does not change (all relocated households and jobs remain within an EA), the savings must be primarily attributed to changes in residential housing nondomestic water consumption resulting from differing housing mixes under the two alternatives.

### Water and Sewer Laterals

The total number of water and sewer laterals is reduced from 45.8 million to 41.2 million laterals in the controlled-growth scenario, a saving of 4.6 million laterals (Table 7.13). The top 30 EAs, representing 60 percent of the required number of future water and sewer laterals nationwide, incur a reduction of 3.5 million water and sewer laterals, from 27.8 million to 24.3 million. The Los Angeles-Riverside-Orange, CA-AZ EA and Washington-Baltimore, DC-MD-VA-WV-PA EA are worth noting. The Los Angeles-Riverside-Orange, CA-AZ EA exhibits a saving of 477,000 water and sewer laterals, which is equivalent to the next two EAs combined (Washington-Baltimore, DC-MD-VA-WV-PA and Dallas-Fort Worth, TX-AR-OK EAs). The Washington-Baltimore, DC-MD-VA-WV-PA EA has a saving of 282,000 water and sewer laterals. The EA that evidences the greatest proportional water and sewer lateral saving is the Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD EA with a saving of 20.6 percent, or 132,000 laterals.

### Water and Sewer Costs

Under controlled growth, the total cost of water and sewer infrastructure nationwide is reduced from $190 billion to $177 billion, a saving of $13 billion or 6.6 percent over the 25-year period 2000 to 2025 (Table 7.14). The top 30 EAs, representing 60 percent of the water and sewer costs nationwide, reduce their costs from $119 billion to $109.7 billion, a saving of $9.3 billion, or 7.8 percent. The Los Angeles-Riverside-Orange, CA-AZ and Washington-Baltimore, DC-MD-VA-WV-PA EAs stand out. The Los Angeles-Riverside-Orange, CA-AZ EA evidences water and sewer infrastructure savings of $1.26 billion. Those savings are one-third larger than the next EA and equal to the sum of the savings of the next two EAs. The Washington-Baltimore, DC-MD-VA-WV-PA EA is next, with total infrastructure savings of $920 million. The EA that saves the most proportionally is the Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD EA with savings of 20.6 percent, or $620 million.

## COUNTIES

### Uncontrolled Growth

### Water and Sewer Demand

Table 7.15 presents the top 50 counties ranked by future water and sewer demand. These 50 counties (out of 3,091 counties) account for more than one-third of the future water and sewer demand nationwide, or 6.53 billion gallons. All but four of these counties are in the South and West, where the bulk of the 2000 to 2025 residential and nonresidential growth is occurring. The two counties with the largest future water and sewer demand are also the two counties wherein the largest amount of development is taking place. Maricopa, AZ, and San Diego, CA, both require approximately 400 million gallons of combined future water and sewer capacity per day over the period 2000 to 2025. The next four counties (Los Angeles, CA; Harris, TX; Orange, CA; and Clark, NV) require 250 million to 300 million gallons of combined water and sewer capacity per day.

### Water and Sewer Laterals

The top 50 counties require a total of 14 million laterals to satisfy their future water and sewer demand for the period 2000 to 2025 (Table 7.16). Maricopa, AZ, and San Diego, CA, are the counties with the largest number of future water and sewer laterals, requiring a total of 1.1 million and 0.8 million, respectively. The counties with next highest number of required future water and sewer laterals are Harris, TX (0.6 million) and Clark, NV, (0.5 million).

### Water and Sewer Costs

Table 7.17 presents the water and sewer infrastructure costs for the top 50 counties in water and sewer demand. Their cost, which amounts to 22 percent of national cost, is $60.2 billion. Thus, 1.6 percent of the counties nationwide contain 22 percent of future water and sewer infrastructure costs. The two highest demand counties have water and sewer infrastructure

## Table 7.15
## Water and Sewer Demand—
## Uncontrolled- and Controlled-Growth Scenarios by County: 2000 to 2025
(Top 50 Counties)

| | Water Demand | | | | Sewer Demand | | | |
|---|---|---|---|---|---|---|---|---|
| County | Uncontrolled Growth (Kgal/day) | Controlled Growth (Kgal/day) | Demand Savings (Kgal/day) | Percentage Savings (%) | Uncontrolled Growth (Kgal/day) | Controlled Growth (Kgal/day) | Demand Savings (Kgal/day) | Percentage Savings (%) |
| Maricopa, AZ | 220,541 | 216,671 | 3,869 | 1.8 | 194,690 | 194,690 | 0 | 0.0 |
| San Diego, CA | 216,887 | 213,200 | 3,687 | 1.7 | 197,361 | 197,361 | 0 | 0.0 |
| Los Angeles, CA | 152,159 | 280,999 | -128,840 | -84.7 | 144,939 | 267,996 | -123,057 | -84.9 |
| Harris, TX | 137,969 | 152,434 | -14,464 | -10.5 | 122,545 | 137,002 | -14,456 | -11.8 |
| Orange, CA | 131,351 | 142,434 | -11,083 | -8.4 | 121,776 | 133,715 | -11,939 | -9.8 |
| Clark, NV | 129,764 | 127,147 | 2,617 | 2.0 | 117,129 | 117,129 | 0 | 0.0 |
| Bexar, TX | 98,645 | 106,172 | -7,527 | -7.6 | 87,723 | 95,830 | -8,107 | -9.2 |
| Tarrant, TX | 98,555 | 96,562 | 1,994 | 2.0 | 87,594 | 87,594 | 0 | 0.0 |
| Riverside, CA | 96,134 | 34,075 | 62,060 | 64.6 | 84,680 | 30,625 | 54,055 | 63.8 |
| San Bernardino, CA | 90,497 | 34,996 | 55,501 | 61.3 | 80,475 | 31,632 | 48,843 | 60.7 |
| Broward, FL | 85,723 | 83,841 | 1,882 | 2.2 | 79,457 | 79,112 | 345 | 0.4 |
| Orange, FL | 83,819 | 82,664 | 1,155 | 1.4 | 75,726 | 75,726 | 0 | 0.0 |
| Hillsborough, FL | 83,335 | 91,777 | -8,441 | -10.1 | 75,414 | 83,929 | -8,515 | -11.3 |
| Palm Beach, FL | 79,903 | 62,127 | 17,776 | 22.2 | 71,827 | 57,306 | 14,521 | 20.2 |
| King, WA | 78,270 | 89,999 | -11,729 | -15.0 | 71,579 | 83,546 | -11,967 | -16.7 |
| Dade, FL | 66,427 | 94,165 | -27,738 | -41.8 | 62,049 | 88,053 | -26,003 | -41.9 |
| Dallas, TX | 66,153 | 77,642 | -11,489 | -17.4 | 60,407 | 72,175 | -11,768 | -19.5 |
| Fairfax, DC | 65,138 | 63,949 | 1,189 | 1.8 | 58,060 | 58,060 | 0 | 0.0 |
| Salt Lake, UT | 63,513 | 70,547 | -7,034 | -11.1 | 56,652 | 63,779 | -7,127 | -12.6 |
| Sacramento, CA | 62,779 | 65,127 | -2,348 | -3.7 | 55,678 | 58,498 | -2,820 | -5.1 |
| Contra Costa, CA | 62,083 | 61,157 | 926 | 1.5 | 54,823 | 54,823 | 0 | 0.0 |
| Santa Clara, CA | 59,849 | 83,519 | -23,670 | -39.5 | 55,097 | 77,553 | -22,456 | -40.8 |
| Pima, AZ | 55,716 | 54,732 | 984 | 1.8 | 49,518 | 49,518 | 0 | 0.0 |
| Cobb, GA | 53,965 | 53,058 | 907 | 1.7 | 46,793 | 46,793 | 0 | 0.0 |
| Wake, NC | 52,806 | 51,742 | 1,064 | 2.0 | 46,631 | 46,631 | 0 | 0.0 |
| Arapahoe, CO | 52,463 | 51,197 | 1,266 | 2.4 | 47,074 | 47,074 | 0 | 0.0 |
| Mecklenburg, NC | 51,920 | 50,886 | 1,034 | 2.0 | 46,055 | 46,055 | 0 | 0.0 |
| Collin, TX | 50,264 | 49,340 | 923 | 1.8 | 43,108 | 43,108 | 0 | 0.0 |
| Oakland, MI | 49,474 | 49,240 | 234 | 0.5 | 44,920 | 45,112 | -192 | -0.4 |
| Gwinnett, GA | 47,713 | 46,949 | 765 | 1.6 | 41,315 | 41,315 | 0 | 0.0 |
| Pierce, WA | 46,668 | 44,583 | 2,085 | 4.5 | 41,708 | 40,073 | 1,635 | 3.9 |
| El Paso, TX | 45,755 | 45,634 | 121 | 0.3 | 40,911 | 41,126 | -214 | -0.5 |
| Seminole, FL | 45,263 | 44,547 | 717 | 1.6 | 39,799 | 39,799 | 0 | 0.0 |
| Franklin, OH | 44,158 | 45,119 | -960 | -2.2 | 40,197 | 41,747 | -1,550 | -3.9 |
| Travis, TX | 43,130 | 56,324 | -13,194 | -30.6 | 38,477 | 51,260 | -12,783 | -33.2 |
| Shelby, TN | 42,769 | 42,239 | 530 | 1.2 | 37,826 | 37,826 | 0 | 0.0 |
| Fort Bend, TX | 41,344 | 41,151 | 194 | 0.5 | 34,714 | 34,714 | 0 | 0.0 |
| Snohomish, WA | 41,166 | 39,260 | 1,906 | 4.6 | 36,369 | 35,224 | 1,145 | 3.1 |
| Alameda, CA | 40,326 | 66,004 | -25,678 | -63.7 | 37,276 | 61,301 | -24,025 | -64.5 |
| Washington, OR | 40,277 | 39,682 | 596 | 1.5 | 35,649 | 35,649 | 0 | 0.0 |
| Lake, IL | 38,870 | 38,542 | 327 | 0.8 | 34,455 | 34,455 | 0 | 0.0 |
| Cook, IL | 38,514 | 56,392 | -17,878 | -46.4 | 37,553 | 54,381 | -16,828 | -44.8 |
| Fresno, CA | 37,053 | 36,584 | 470 | 1.3 | 33,524 | 33,524 | 0 | 0.0 |
| Duval, FL | 36,806 | 49,822 | -13,016 | -35.4 | 33,841 | 45,719 | -11,878 | -35.1 |
| Denton, TX | 36,637 | 35,999 | 639 | 1.7 | 32,044 | 32,044 | 0 | 0.0 |
| Ventura, CA | 36,612 | 16,986 | 19,626 | 53.6 | 33,150 | 15,442 | 17,707 | 53.4 |
| Du Page, IL | 35,888 | 36,484 | -596 | -1.7 | 32,342 | 33,361 | -1,018 | -3.1 |
| Montgomery, TX | 35,760 | 30,268 | 5,492 | 15.4 | 28,627 | 24,367 | 4,259 | 14.9 |
| Utah, UT | 35,596 | 23,304 | 12,292 | 34.5 | 31,550 | 20,807 | 10,742 | 34.0 |
| El Paso, CO | 34,122 | 32,434 | 1,688 | 4.9 | 29,688 | 28,534 | 1,154 | 3.9 |
| **Top 50 Counties** | **3,440,529** | **3,559,706** | **-119,169** | **-3.5** | **3,090,795** | **3,253,093** | **-162,297** | **-5.3** |
| **United States** | **9,602,016** | **9,452,967** | **148,749** | **1.5** | **8,519,383** | **8,512,420** | **6,963** | **0.1** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 7.16
## Water and Sewer Laterals—
## Uncontrolled- and Controlled-Growth Scenarios by County: 2000 to 2025
(Top 50 Counties)

| County | Water and Sewer Laterals Combined | | | | Residential Water and Sewer Laterals | | |
|---|---|---|---|---|---|---|---|
| | Uncontrolled Growth (#) | Controlled Growth (#) | Lateral Savings (#) | Percentage Savings (%) | Uncontrolled Growth (#) | Controlled Growth (#) | Lateral Savings (#) |
| Maricopa, AZ | 1,084,696 | 953,798 | 130,898 | 12.1 | 1,021,826 | 890,926 | 130,898 |
| San Diego, CA | 795,728 | 678,864 | 116,864 | 14.7 | 728,542 | 611,678 | 116,864 |
| Los Angeles, CA | 356,252 | 652,030 | -295,778 | -83.0 | 278,418 | 537,454 | -259,036 |
| Harris, TX | 606,918 | 624,736 | -17,820 | -2.9 | 553,312 | 571,132 | -17,820 |
| Orange, CA | 411,258 | 390,776 | 20,480 | 5.0 | 360,244 | 335,062 | 25,182 |
| Clark, NV | 517,460 | 433,202 | 84,256 | 16.3 | 478,166 | 393,910 | 84,256 |
| Bexar, TX | 419,284 | 411,570 | 7,714 | 1.8 | 387,828 | 380,114 | 7,714 |
| Tarrant, TX | 417,552 | 358,956 | 58,596 | 14.0 | 385,662 | 327,066 | 58,596 |
| Riverside, CA | 462,412 | 141,238 | 321,174 | 69.5 | 438,326 | 133,344 | 304,984 |
| San Bernardino, CA | 388,898 | 132,884 | 256,014 | 65.8 | 364,386 | 123,124 | 241,262 |
| Broward, FL | 284,148 | 231,096 | 53,052 | 18.7 | 254,386 | 205,006 | 49,380 |
| Orange, FL | 324,160 | 287,620 | 36,540 | 11.3 | 291,884 | 255,344 | 36,540 |
| Hillsborough, FL | 346,492 | 355,340 | -8,848 | -2.6 | 319,860 | 328,160 | -8,300 |
| Palm Beach, FL | 332,708 | 211,296 | 121,412 | 36.5 | 313,160 | 194,190 | 118,970 |
| King, WA | 283,062 | 284,440 | -1,380 | -0.5 | 249,576 | 246,792 | 2,784 |
| Dade, FL | 201,548 | 287,676 | -86,128 | -42.7 | 176,232 | 254,964 | -78,732 |
| Dallas, TX | 237,952 | 240,574 | -2,622 | -1.1 | 207,806 | 207,482 | 324 |
| Fairfax, DC | 264,268 | 233,746 | 30,520 | 11.5 | 241,660 | 211,140 | 30,520 |
| Salt Lake, UT | 266,096 | 269,370 | -3,274 | -1.2 | 242,612 | 243,964 | -1,352 |
| Sacramento, CA | 268,374 | 257,000 | 11,374 | 4.2 | 250,986 | 238,524 | 12,464 |
| Contra Costa, CA | 271,724 | 245,078 | 26,646 | 9.8 | 257,208 | 230,562 | 26,646 |
| Santa Clara, CA | 208,910 | 270,124 | -61,214 | -29.3 | 185,634 | 239,904 | -54,270 |
| Pima, AZ | 296,744 | 256,498 | 40,248 | 13.6 | 281,514 | 241,266 | 40,248 |
| Cobb, GA | 257,276 | 232,062 | 25,214 | 9.8 | 242,312 | 217,098 | 25,214 |
| Wake, NC | 234,194 | 203,622 | 30,572 | 13.1 | 217,970 | 187,400 | 30,572 |
| Arapahoe, CO | 205,946 | 171,706 | 34,240 | 16.6 | 188,074 | 153,832 | 34,240 |
| Mecklenburg, NC | 216,184 | 186,638 | 29,546 | 13.7 | 199,578 | 170,032 | 29,546 |
| Collin, TX | 253,130 | 227,826 | 25,304 | 10.0 | 242,106 | 216,802 | 25,304 |
| Oakland, MI | 181,834 | 168,660 | 13,174 | 7.2 | 153,666 | 140,492 | 13,174 |
| Gwinnett, GA | 221,998 | 201,266 | 20,732 | 9.3 | 208,946 | 188,214 | 20,732 |
| Pierce, WA | 229,016 | 212,278 | 16,736 | 7.3 | 216,408 | 201,808 | 14,600 |
| El Paso, TX | 204,314 | 192,348 | 11,966 | 5.9 | 192,380 | 180,140 | 12,240 |
| Seminole, FL | 201,354 | 180,758 | 20,596 | 10.2 | 191,974 | 171,378 | 20,596 |
| Franklin, OH | 161,148 | 144,520 | 16,628 | 10.3 | 141,850 | 125,222 | 16,628 |
| Travis, TX | 180,736 | 207,820 | -27,082 | -15.0 | 163,012 | 186,908 | -23,898 |
| Shelby, TN | 184,910 | 169,806 | 15,104 | 8.2 | 166,218 | 151,114 | 15,104 |
| Fort Bend, TX | 221,748 | 217,288 | 4,458 | 2.0 | 213,474 | 209,014 | 4,458 |
| Snohomish, WA | 196,148 | 173,182 | 22,964 | 11.7 | 186,300 | 164,682 | 21,618 |
| Alameda, CA | 133,058 | 211,976 | -78,918 | -59.3 | 114,482 | 189,458 | -74,976 |
| Washington, OR | 179,040 | 160,638 | 18,404 | 10.3 | 166,586 | 148,184 | 18,404 |
| Lake, IL | 161,186 | 152,142 | 9,044 | 5.6 | 146,354 | 137,310 | 9,044 |
| Cook, IL | 39,862 | 90,366 | -50,504 | -126.7 | 0 | 43,824 | -43,824 |
| Fresno, CA | 141,850 | 126,628 | 15,222 | 10.7 | 130,772 | 115,550 | 15,222 |
| Duval, FL | 132,640 | 186,686 | -54,046 | -40.7 | 116,288 | 170,334 | -54,046 |
| Denton, TX | 181,036 | 160,496 | 20,540 | 11.3 | 173,682 | 153,142 | 20,540 |
| Ventura, CA | 136,052 | 61,422 | 74,630 | 54.9 | 121,330 | 55,534 | 65,796 |
| Du Page, IL | 131,498 | 121,116 | 10,384 | 7.9 | 116,200 | 105,004 | 11,198 |
| Montgomery, TX | 224,432 | 185,984 | 38,448 | 17.1 | 218,796 | 180,346 | 38,448 |
| Utah, UT | 155,962 | 97,196 | 58,766 | 37.7 | 147,866 | 91,174 | 56,692 |
| El Paso, CO | 164,052 | 148,522 | 15,530 | 9.5 | 153,024 | 138,980 | 14,044 |
| **Top 50 Counties** | **13,977,248** | **12,800,864** | **1,176,376** | **8.4** | **12,798,876** | **11,594,084** | **1,204,792** |
| **United States** | **45,866,595** | **41,245,295** | **4,621,302** | **10.1** | **42,350,884** | **37,744,581** | **4,606,304** |

*Source:* Center for Urban Policy Research, Rutgers University.

## Table 7.17
## Water and Sewer Infrastructure Costs—
## Uncontrolled- and Controlled-Growth Scenarios by County: 2000 to 2025
(Top 50 Counties)

| | Water Infrastructure Costs | | | Sewer Infrastructure Costs | | | Total Infrastructure Costs | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| County | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Uncontrolled Growth ($M) | Controlled Growth ($M) | Cost Savings ($M) | Percentage Savings (%) |
| Maricopa, AZ | 1,615 | 1,532 | 83 | 2,515 | 2,413 | 102 | 4,130 | 3,945 | 185 | 4.5 |
| San Diego, CA | 1,493 | 1,411 | 82 | 2,336 | 2,242 | 94 | 3,829 | 3,653 | 176 | 4.6 |
| Los Angeles, CA | 716 | 1,418 | -701 | 1,098 | 2,221 | -1,123 | 1,814 | 3,639 | -1,824 | -100.6 |
| Harris, TX | 956 | 1,035 | -79 | 1,463 | 1,604 | -141 | 2,419 | 2,639 | -220 | -9.1 |
| Orange, CA | 834 | 873 | -40 | 1,275 | 1,352 | -77 | 2,109 | 2,225 | -117 | -5.5 |
| Clark, NV | 875 | 816 | 59 | 1,382 | 1,310 | 73 | 2,257 | 2,126 | 132 | 5.8 |
| Bexar, TX | 618 | 640 | -23 | 946 | 993 | -48 | 1,564 | 1,633 | -71 | -4.5 |
| Tarrant, TX | 644 | 603 | 41 | 997 | 948 | 49 | 1,641 | 1,551 | 90 | 5.5 |
| Riverside, CA | 723 | 226 | 497 | 1,225 | 386 | 840 | 1,948 | 612 | 1,337 | 68.6 |
| San Bernardino, CA | 612 | 220 | 392 | 1,055 | 382 | 673 | 1,667 | 602 | 1,065 | 63.9 |
| Broward, FL | 558 | 531 | 27 | 887 | 866 | 22 | 1,445 | 1,397 | 49 | 3.4 |
| Orange, FL | 532 | 507 | 25 | 826 | 796 | 31 | 1,358 | 1,303 | 56 | 4.1 |
| Hillsborough, FL | 548 | 600 | -52 | 854 | 946 | -91 | 1,402 | 1,546 | -143 | -10.2 |
| Palm Beach, FL | 692 | 499 | 193 | 1,088 | 798 | 291 | 1,780 | 1,297 | 484 | 27.2 |
| King, WA | 556 | 614 | -57 | 861 | 965 | -105 | 1,417 | 1,579 | -162 | -11.4 |
| Dade, FL | 361 | 553 | -192 | 554 | 862 | -307 | 915 | 1,415 | -499 | -54.5 |
| Dallas, TX | 441 | 494 | -53 | 683 | 781 | -98 | 1,124 | 1,275 | -151 | -13.4 |
| Fairfax, DC | 548 | 523 | 25 | 835 | 803 | 32 | 1,383 | 1,326 | 57 | 4.1 |
| Salt Lake, UT | 388 | 414 | -26 | 591 | 637 | -46 | 979 | 1,051 | -72 | -7.4 |
| Sacramento, CA | 425 | 430 | -5 | 654 | 668 | -14 | 1,079 | 1,098 | -19 | -1.8 |
| Contra Cos., CA | 466 | 445 | 20 | 710 | 685 | 25 | 1,176 | 1,130 | 45 | 3.8 |
| Santa Clara, CA | 409 | 564 | -155 | 619 | 864 | -245 | 1,028 | 1,428 | -400 | -38.9 |
| Pima, AZ | 449 | 422 | 27 | 777 | 743 | 35 | 1,226 | 1,165 | 62 | 5.1 |
| Cobb, GA | 416 | 397 | 19 | 637 | 614 | 23 | 1,053 | 1,011 | 42 | 4.0 |
| Wake, NC | 398 | 371 | 27 | 627 | 588 | 39 | 1,025 | 959 | 66 | 6.4 |
| Arapahoe, CO | 430 | 403 | 27 | 675 | 643 | 32 | 1,105 | 1,046 | 59 | 5.3 |
| Mecklen., NC | 363 | 337 | 25 | 558 | 527 | 32 | 921 | 864 | 57 | 6.2 |
| Collin, TX | 411 | 385 | 26 | 626 | 593 | 33 | 1,037 | 978 | 59 | 5.7 |
| Oakland, MI | 416 | 404 | 12 | 629 | 614 | 15 | 1,045 | 1,018 | 27 | 2.6 |
| Gwinnett, GA | 349 | 333 | 17 | 535 | 515 | 20 | 884 | 848 | 37 | 4.2 |
| Pierce, WA | 317 | 303 | 15 | 485 | 466 | 19 | 802 | 769 | 34 | 4.2 |
| El Paso, TX | 235 | 229 | 6 | 352 | 345 | 7 | 587 | 574 | 13 | 2.2 |
| Seminole, FL | 319 | 305 | 14 | 495 | 478 | 18 | 814 | 783 | 32 | 3.9 |
| Franklin, OH | 260 | 256 | 4 | 401 | 401 | 0 | 661 | 657 | 4 | 0.6 |
| Travis, TX | 284 | 352 | -69 | 437 | 552 | -115 | 721 | 904 | -184 | -25.5 |
| Shelby, TN | 280 | 267 | 13 | 424 | 407 | 17 | 704 | 674 | 30 | 4.3 |
| Fort Bend, TX | 315 | 308 | 7 | 485 | 471 | 14 | 800 | 779 | 21 | 2.6 |
| Snohomish, WA | 284 | 262 | 21 | 445 | 414 | 31 | 729 | 676 | 52 | 7.1 |
| Alameda, CA | 245 | 409 | -164 | 374 | 635 | -261 | 619 | 1,044 | -425 | -68.7 |
| Washington, OR | 256 | 244 | 13 | 392 | 377 | 15 | 648 | 621 | 28 | 4.3 |
| Lake, IL | 349 | 340 | 8 | 524 | 514 | 10 | 873 | 854 | 18 | 2.1 |
| Cook, IL | 127 | 216 | -90 | 188 | 322 | -133 | 315 | 538 | -223 | -70.8 |
| Fresno, CA | 231 | 216 | 14 | 397 | 377 | 19 | 628 | 593 | 33 | 5.3 |
| Duval, FL | 217 | 312 | -95 | 333 | 486 | -152 | 550 | 798 | -247 | -44.9 |
| Denton, TX | 248 | 235 | 13 | 382 | 366 | 16 | 630 | 601 | 29 | 4.6 |
| Ventura, CA | 286 | 132 | 154 | 486 | 225 | 262 | 772 | 357 | 416 | 53.9 |
| Du Page, IL | 281 | 277 | 4 | 429 | 425 | 3 | 710 | 702 | 7 | 1.0 |
| Montgome., TX | 300 | 251 | 50 | 498 | 416 | 82 | 798 | 667 | 132 | 16.5 |
| Utah, UT | 204 | 132 | 71 | 309 | 202 | 107 | 513 | 334 | 178 | 34.7 |
| El Paso, CO | 230 | 216 | 14 | 357 | 337 | 20 | 587 | 553 | 34 | 5.8 |
| **Top 50 Counties** | **23,510** | **23,262** | **244** | **36,711** | **36,575** | **145** | **60,221** | **59,837** | **389** | **0.6** |
| **United States** | **72,806** | **68,036** | **4,770** | **116,961** | **109,124** | **7,839** | **189,767** | **177,160** | **12,609** | **6.6** |

*Source:* Center for Urban Policy Research, Rutgers University.

Courtesy of R. Ewing

costs of approximately $4 billion through 2025. The combined water and sewer costs for Maricopa County, AZ, are $4.1 billion; for San Diego County, CA, they are $3.8 billion.

## Controlled Growth

### Water and Sewer Demand

Under the controlled-growth scenario, the top 50 counties, representing in excess of one-third of future national demand for water and sewer capacity, had a combined demand of 6.81 billion gallons per day, an increase of 281 million gallons per day (Table 7.15). Under the controlled-growth scenario, individual counties experience increases or decreases in households and employment due to intercounty movement. County water and sewer demand under controlled growth reflects these aggregate changes. As shown in Table 7.15, controlled sprawling rural and undeveloped counties have moderate decreases in demand; established urban and suburban counties have large increases in demand. Many of the significant top-50 counties are urban and suburban counties whose demand actually increases under the controlled-growth scenario. This shows that the top 50 counties actually increase in water and sewer demand under the controlled-growth scenario.

For individual counties, future (2000 to 2025) infrastructure requirements can change dramatically under the two alternatives. Six counties are particularly noteworthy. These are Alameda, Los Angeles, Riverside, San Bernardino, and Santa Clara counties in California and Dade County in Florida. Riverside, CA, and San Bernardino, CA, are relieved of millions of gallons per day of required future water and sewer capacity. Riverside saves 116 million gallons of combined future water and sewer capacity; San Bernardino saves 104 million gallons of combined future water and sewer capacity per day. On the other hand, Los Angeles County must supply an additional 252 million gallons of combined water and sewer capacity per day over the projected period. Santa Clara County must supply an additional 52 million gallons of combined water and sewer capacity per day, while Alameda County must supply approximately the same amount. Dade County, Florida, must provide an additional 54 million gallons of combined water and sewer capacity per day.

### Water and Sewer Laterals

The number of water and sewer laterals saved by the top 50 counties under the controlled-growth scenario parallels savings noted for the EAs (Table 7.16). The top 50 counties save 1.2 million of the 4.6 million water laterals saved overall. In less than 2 percent of the counties, one-quarter of the total water and sewer laterals is saved. The most pronounced examples of water and sewer lateral change are the three California counties previously discussed. Riverside County saves 321,000 water and sewer laterals, San Bernardino County saves 256,000 laterals, while Los An-

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Courtesy of G. Lowenstein

geles County increases its required future water and sewer laterals by 296,000.

### Water and Sewer Costs

The changes in water and sewer lateral requirements are directly reflected in a county's future infrastructure costs. Table 7.17 lists future water and sewer infrastructure costs for the top-50 water and sewer demand counties. The combined cost of $60 billion represents nearly 32 percent of all future water and infrastructure costs. As far as the top 50 counties are concerned, the infrastructure cost differential under the two scenarios is negligible. Both growth scenarios occasion $60 billion in combined infrastructure costs for future water and sewer demand. Riverside and San Bernardino Counties in California save $1.3 billion and $1.1 billion in future water and sewer infrastructure costs, respectively. Los Angeles County, CA, incurs extra water and sewer infrastructure costs of $1.8 billion.

## CONCLUSION

During the period from 2000 to 2025, under traditional or uncontrolled development, the United States will expend more than $190 billion to provide necessary water and sewer infrastructure. Water and sewer systems will have to be expanded to accommodate the more than 18 billion gallons of additional water and sewer capacity needed. These delivery and collection systems will require close to 46 million laterals (or equivalents) to service new residential and nonresidential structures. The full extent of this projected infrastructure and its attending costs can be avoided through more sensible growth patterns.

With both intercounty and intracounty growth-control measures in place, more than 155 million gallons of water and sewer demand per day can be saved without depriving residential or nonresidential users of this fundamental utility. No domestic water use is curtailed; instead, buildings are situated in greater mass and lawn sprinkling becomes more efficient. The new development pattern also allows for a less extensive delivery and collection system (street mains) resulting in lower tap-in costs. The housing contributes to a smaller number of water and sewer laterals to service an equivalent number of residential and nonresidential occupants. The combined cost saving of lower tap-in fees and 4.6 million fewer laterals amounts to an infrastructure saving of $12.6 billion over the projection period.

When determining the effect of redirecting growth into more urbanized counties in the controlled-growth scenario, the analysis did not include the availability of excess capacity in these areas. The use of available capacity in these developed areas would have reduced the need for capacity expansion, interceptor construction, and laterals, and thus adding to the projected savings attained with the controlled-growth scenario.

The South, which is the fastest-growing region, incurs the most development infrastructure costs and thus realizes the greatest savings of the four United States regions. It does not have to provide 68.0 million gallons of water per day, nor process 4.1 million gallons of daily sewage. Laterals are reduced in the region by more than 2.1 million. The South saves $5.5 billion by not engaging in unnecessary water and sewer infrastructure construction. These are savings of 2 percent of the uncontrolled-growth water and sewer demand and 10 percent in the number of constructed water and sewer laterals. There is a 7 percent overall cost-of-infrastructure saving for this region.


Courtesy of C. Galley

Courtesy of C. Galley

The West, the second fastest-growing region, experiences similar percentage savings. Since its growth is less than that of the South, the absolute savings are less: a 56.0 million gallon saving in water and sewer demand; a 1.7 million saving in water and sewer laterals; and a $4.2 billion saving in water and sewer lateral costs. The Northeast and the Midwest together save one-half the levels of saving registered in the West. Their combined total savings are 27.6 million gallons of water and sewer demand per day, 0.8 million water and sewer laterals, and $2.8 billion in water and sewer lateral costs.

The water and sewer demand savings reported above are clearly not the most significant element of the overall infrastructure analysis. Water and sewer demand are discussed only as a prelude to analyzing the magnitude and cost of the water and sewer infrastructure. The infrastructure analysis concentrates on the basic components of infrastructure, including variations within and between county development types. Costing is developed for each of these variations, taking into account varying regional wage structures. The alternative-growth scenario infrastructure components, costs, and savings are an accurate yet conservative view of their future incidence in the United States over the forthcoming multidecade period.

Courtesy of R. Ewing