Transit Cooperative Research Program

TCRP REPORT 74

Sponsored by the Federal Transit Administration



Costs of Sprawl—2000

TRANSPORTATION RESEARCH BOARD

NATIONAL RESEARCH COUNCIL

TRANSIT COOPERATIVE RESEARCH PROGRAM

TCRP REPORT 74

Costs of Sprawl—2000

ROBERT W. BURCHELL
GEORGE LOWENSTEIN
WILLIAM R. DOLPHIN
CATHERINE C. GALLEY
Center for Urban Policy Research
Rutgers, The State University of New Jersey
New Brunswick, NJ

ANTHONY DOWNS
The Brookings Institution
Washington, DC

SAMUEL SESKIN
KATHERINE GRAY STILL
Parsons Brinckerhoff Quade and Douglas, Inc.
Portland, OR

TERRY MOORE
ECONorthwest
Eugene, OR

SUBJECT AREAS
Planning and Administration • Public Transit

Research Sponsored by the Federal Transit Administration in Cooperation with the Transit Development Corporation

TRANSPORTATION RESEARCH BOARD — NATIONAL RESEARCH COUNCIL

NATIONAL ACADEMY PRESS
WASHINGTON, D.C. — 2002

TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions*, published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transportation Association (APTA), *Transportation 2000*, also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA, the National Academies, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

Research problem statements for TCRP are solicited periodically but may be submitted to TRB by anyone at any time. It is the responsibility of the TOPS Committee to formulate the research program by identifying the highest priority projects. As part of the evaluation, the TOPS Committee defines funding levels and expected products.

Once selected, each project is assigned to an expert panel, appointed by the Transportation Research Board. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, TCRP project panels serve voluntarily without compensation.

Because research cannot have the desired impact if products fail to reach the intended audience, special emphasis is placed on disseminating TCRP results to the intended end users of the research: transit agencies, service providers, and suppliers. TRB provides a series of research reports, syntheses of transit practice, and other supporting material developed by TCRP research. APTA will arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by urban and rural transit industry practitioners.

The TCRP provides a forum where transit agencies can cooperatively address common operational problems. The TCRP results support and complement other ongoing transit research and training programs.

TCRP REPORT 74

Project H-10 FY'95
ISSN 1073-4872
ISBN 0-309-06719-7
Library of Congress Control Number 2001135536

Price $35.00

NOTICE

The project that is the subject of this report was a part of the Transit Cooperative Research Program conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council. Such approval reflects the Governing Board's judgment that the project concerned is appropriate with respect to both the purposes and resources of the National Research Council.

The members of the technical advisory panel selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and while they have been accepted as appropriate by the technical panel, they are not necessarily those of the Transportation Research Board, the National Research Council, the Transit Development Corporation, or the Federal Transit Administration of the U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical panel according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

To save time and money in disseminating the research findings, the report is essentially the original text as submitted by the research agency. This report has not been edited by TRB.

Special Notice

The Transportation Research Board, the National Research Council, the Transit Development Corporation, and the Federal Transit Administration (sponsor of the Transit Cooperative Research Program) do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the clarity and completeness of the project reporting.

Published reports of the

TRANSIT COOPERATIVE RESEARCH PROGRAM

are available from:

Transportation Research Board
National Research Council
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

and can be ordered through the Internet at
http://www.national-academies.org/trb/bookstore

Printed in the United States of America

FOREWORD

By Staff
Transportation Research Board

Urban sprawl is a topic that interests urban planners, economists, environmentalists, sociologists, transportation professionals, policymakers, public officials, academics in many fields, and the general public. *TCRP Report 74*, which represents the second and final phase of TCRP Project H-10, "The Costs of Sprawl—Revisited," will therefore be of interest to those engaged in the discussions and debates about urban sprawl and its effects. The report was prepared by Robert Burchell, George Lowenstein, William Dolphin, and Catherine Galley of the Center for Urban Policy Research, Rutgers, The State University of New Jersey; Anthony Downs of The Brookings Institution; Samuel Seskin and Katherine Gray Still of Parsons Brinkerhoff Quade and Douglas, Inc.; and Terry Moore of ECONorthwest.

TCRP Report 74 is the culmination of more than 5 years of research led by Rutgers University. As with most reports on this controversial topic, there was not unanimous agreement among the panel of reviewers in support of the research approach or the conclusions reached; nevertheless, the research results are well documented and clearly presented.

The report includes 16 chapters, which are divided into the following four parts:

- **Part I—Setting the Scene.** The first five chapters of the report provide background information. Chapter 1 addresses sprawl and its historical context in the United States. Chapter 2 defines the terms and describes the databases used in the research project; in particular, the chapter explains the advantages of the county-level analysis used in this national study. Focusing on the period 2000 to 2025, Chapter 3 discusses projected growth in the United States by region, by economic area, and by county. Chapter 4 presents analysis results regarding the incidence of sprawl and the potential for its control through a controlled-growth scenario. Chapter 5 includes an analysis of sprawl in 15 economic areas.
- **Part II—The Impact of Sprawl on Resources.** Chapters 6 through 10 present the results of five different models: land conversion, water and sewer infrastructure, local road infrastructure, local public-service costs, and real estate development costs. In each case, model results are presented and compared by region, by state, by county, and by economic area for projected sprawl development and for the controlled-growth scenario for the United States as a whole. The findings include resource consumption and the associated financial implications.
- **Part III—The Personal Costs of Sprawl.** Chapters 11, 12, and 13 examine the personal costs of sprawl, including its impact on individual travel costs (for both privately operated vehicles and transit), quality of life, and the livability of cities. Each chapter presents the results of different modeling analyses. Chapters 11 and 12 include comparisons between the controlled- and noncontrolled-growth scenarios. Chapter 13 seeks out empirical evidence regarding possible relationships between urban sprawl and urban decline.

- **Part IV—Dealing with Sprawl.** Chapter 14 examines 13 benefits of sprawl, which are grouped into four categories: housing, transportation, land planning, and quality-of-life and social benefits. Chapter 15 is directed to policymakers and those interested in taking remedial action against the negative effects of sprawl. Various tactics and strategies for reducing the negative effects of sprawl are presented and evaluated. Chapter 16 identifies more than 40 topics for future research on sprawl and its impacts.

Also included are seven technical appendixes, a glossary, a bibliography, an index, and a list of acronyms and abbreviations.

Contents

PREFACE

ACRONYMS AND ABBREVIATIONS

EXECUTIVE SUMMARY **1**
Introduction 1
Part I—Setting the Scene 2
Part II—The Resource Impacts of Sprawl 9
Part III—The Personal Costs of Sprawl 13
Part IV—Dealing with Sprawl 17
Conclusion 20

PART I—SETTING THE SCENE **23**
Introduction to Part I 25

I—SPRAWL AND ITS HISTORICAL CONTEXT **27**
Study Objective 27
Sprawl in the New Millennium—Where Have We Been and Where Are We Going? 28
Modeling Sprawl and Its Impacts 38
Conclusion 40

II—DEFINITIONS AND DATABASES **43**
Introduction 43
Section of County Level for Analysis 43
Database 46
Characterizing Land-Use Differences among Counties 54
Characterizing Sprawl among Counties 58
Conclusion 59

III—U.S. GROWTH 63
Introduction 63
Growth in the U.S. and the Individual States 63
Growth in U.S. Regions 66
Growth in EAs 78
Growth in Counties 81
Conclusion 83

IV—SPRAWL AND ITS CONTROL 85
Introduction 85
Uncontrolled-Growth Scenario 86
Where Is Sprawl Taking Place in the United States? 89
Controlling Sprawl in the United States 99
Summary 111

V—ANALYSIS OF SPRAWL'S INCIDENCE 117
Introduction 117
The Section of Example EAs 117
Atlanta, GA-AL-NC EA (EA 40) 118
Austin-San Marcos, TX EA (EA 130) 122
Birmingham, AL EA (EA 78) 124
Chicago-Gary-Kenosha, IL-IN-WI EA (EA 64) 128
Denver-Boulder-Greeley, CO-KS-NE EA (EA 141) 131
Las Vegas, NV-AZ-UT EA (EA 153) 135
Lexington, KY-TN-VA-WV EA (EA 47) 138
Los Angeles-Riverside-Orange, CA-AZ EA (EA 160) 142
Miami-Fort Lauderdale, FL EA (EA 31) 145
Minneapolis-St. Paul, MN-WI-IA EA (EA 107) 148
NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA (EA 10) 152
Portland-Salem, OR-WA EA (EA 167) 156
Raleigh-Durham-Chapel Hill, NC EA (EA 19) 159
Tucson, AZ EA (EA 159) 162
Washington-Baltimore, DC-MD-VA-WV-PA EA (EA 13) 164
Conclusion 168

PART II—THE IMPACT OF SPRAWL ON RESOURCES 171
Introduction to Part II 173

VI—LAND CONVERSION IN THE UNITED STATES 175
Introduction 175
Conceptual Overview 175
The Assessment Model 178
Land Supply and Land of Various Types 188
Results of the Assessment: Residential and Nonresidential Growth 192
Results of the Assessment: Land Conversion 194
The United States and Its Regions 194
States 197
EAs 203
Counties 209
Conclusion 211

VII—WATER AND SEWER INFRASTRUCTURE IN THE UNITED STATES 217

Introduction 217
Conceptual Overview and Assessment Model 218
Results of the Assessment 220
The United States and Its Regions 221
States 225
EAs 230
Counties 235
Conclusion 240

VIII—LOCAL ROAD INFRASTRUCTURE IN THE UNITED STATES 243

Introduction 243
Conceptual Overview and Assessment Model 243
Results of the Assessment: The United States and Its Regions 248
States 249
EAs 251
Counties 257
Conclusion 259

IX—LOCAL PUBLIC-SERVICE COSTS IN THE UNITED STATES 261

Introduction 261
Background 261
Conceptual Overview and Assessment Model 262
Fiscal Parameters Used in the Analysis 269
Results of the Assessment: Fiscal Impact 272
The United States and Its Regions 272
States 275
EAs 277
Counties 279
Conclusion—Local Public-Service Costs in the United States 281

X—REAL ESTATE DEVELOPMENT COSTS IN THE UNITED STATES 283

Introduction 283
Conceptual Overview and Assessment Model 284
Results of the Assessment: The United States and Its Regions 289
States 293
EAs 297
Counties 302
Conclusion 306

PART III—THE PERSONAL COSTS OF SPRAWL 309

Introduction to Part III 311

XI—TRAVEL MILES AND COSTS IN THE UNITED STATES 313

Introduction 313
Data 313
Model Development 315
Travel Model Results 319
Time Variables 322
Private Vehicle Costs 326

Transit Costs 332
Full Costs of Travel 336
Results of the Assessment 337
The United States and Its Regions 339
States 342
EAs 345
Counties 348
Conclusion 351

XII—QUALITY OF LIFE IN THE UNITED STATES 353
Introduction 353
Quality-of-Life Model 354
Gabriel's Initial Variables 355
Manipulations of the Gabriel Variables 359
Results of the Assessment 361
The United States and Its Regions 363
States 365
EAs 367
Counties 369
Conclusion 371

XIII—RELATING SPRAWL TO URBAN DECLINE 373
Introduction 373
The Relationship between Sprawl and Urban Decline 373
Statistical Analysis Based on an Initial Definition of Sprawl and Urban Decline 381
Statistical Analysis Based on Variables Used in the Remainder of the Study 415
Reexamining the Linkages between Sprawl and Urban Decline 426
Conclusion 435

PART IV—DEALING WITH SPRAWL 441
Introduction to Part IV 443

XIV—THE BENEFITS OF SPRAWL 445
Identifying the Benefits of Sprawl 445
Measuring and Valuing the Benefits of Sprawl 445
Conclusions 479

XV—DEVELOPING POLICIES IN RESPONSE TO SPRAWL 483
Introduction 483
The Sprawl-Generating Process in Specific Parts of Metropolitan Areas 484
Outcomes of the Sprawl-Generating Process That Require Remedies 484
Characteristics of the U.S. Metropolitan Growth Process to Consider When Formulating Policies in Response to Sprawl 489
Negative Effects of Sprawl Related to Urban Decline 492
What Broad Remedial Strategies Might Address Sprawl's Negative Effects? 493
Tactics for Encouraging More Spatially Compact Metropolitan Development 496
Tactics for Reducing Society's Current Heavy Dependence on Private Automobiles for Ground Transportation 501
Reducing the Financial Dependence of Each Local Government's Revenues on the Property Values and Sales Taxes Occurring within Its Own Boundaries 507
Providing Opportunities for Low-Income and Minority Households to Move Out of Concentrated-Poverty Neighborhoods 511

Introducing New Elements of Urban Design into Land-Use Planning 517
Revitalizing Concentrated-Poverty and Other Neighborhoods in Inner-Core Areas 519
Some Initial Aspects of Creating Regional Agencies to Review and Coordinate Land-Use Plans Drawn Up by Individual Localities 526

XVI—FUTURE RESEARCH ON SPRAWL 537
Introduction 537
Defining and Measuring Sprawl 537
Growth and Sprawl 539
Sprawl and Developable Agricultural and Environmentally Fragile Land Impacts 539
Sprawl and Infrastructure Impacts 540
Sprawl and Transportation Impacts 541
Sprawl and Quality-of-Life Impacts 542
Sprawl and Social Impacts 543
Sprawl and Public Choice 545
Government Structure and Policies 546
Sprawl and Private-Sector Activities 546
New Tools for Sprawl Control 547
Benefits of Sprawl 547
Criteria for Rating Research Suggestions 547
Conclusion 551

APPENDIXES 553
Appendix A—Special County Definitions 555
Appendix B—Numeric Codes and Names for EAs 556
Appendix C—Growth Rate Threshold Values Defining Significant Sprawl for EAs 558
Appendix D—162 Urbanized Areas 560
Appendix E—Sprawl Index Summary Table 563
Appendix F—Independent Variables Used in the Regression Analysis Relating Sprawl To Urban Decline 567
Appendix G—Explanation of the Definition of Sprawl 572

GLOSSARY 575

BIBLIOGRAPHY 579

INDEX 591

COOPERATIVE RESEARCH PROGRAMS STAFF

ROBERT J. REILLY, *Director, Cooperative Research Programs*
CHRISTOPHER JENKS, *Manager, Transit Cooperative Research Program*
DIANNE S. SCHWAGER, *Senior Program Officer*
EILEEN P. DELANEY, *Managing Editor*
BETH HATCH, *Assistant Editor*

PROJECT PANEL H-10

GORDON AOYAGI, *Montgomery County, MD* (Chair)
SCOTT BAKER, *AECOM Consulting, Fairfax, VA,* formerly *KPMG Peat Marwick, McLean, VA*
RICHARD G. BICKEL JR., *Delaware Valley Regional Planning Commission, Philadelphia, PA*
THOMAS BLACK, *Lincoln Institute of Land Policy, Falls Church, VA*
LEWIS BOLAN, *Bolan Smart Associates, Inc., Washington, DC*
GARY L. BROSCH, *University of South Florida*
GREG BYRNE, *City of Fort Collins, CO*
DON CHEN, *STPP, Washington, DC*
ELIZABETH A. DEAKIN, *University of California, Berkeley*
PATRICK T. DECORLA-SOUZA, *Federal Highway Administration*
PATRICIA S. NETTLESHIP, *Nettleship Group, Inc., Santa Monica, CA*
JANET OAKLEY, *American Association of State Highway and Transportation Officials*
KENNETH J. WARREN, *Milwaukee County Transit System*
RICHARD P. STEINMANN, *FTA Liaison Representative*
KIMBERLY FISHER, *TRB Liaison Representative*

Preface

Sprawl is spread-out development that consumes significant amounts of natural and man-made resources, including land and public works infrastructure of various types. Sprawl also adds to overall travel costs due to increasing use of the automobile to access work and residence locations more widely spaced due to the sprawl phenomenon. Furthermore, sprawl appears to deconcentrate centers and takes away from the multiplicity of purpose that neighborhoods once delivered. Yet sprawl has benefits. It offers access to less-expensive housing and opportunities for homeownership at the periphery of metropolitan areas. It provides congestion management in automobile-dominated metropolitan areas by creating the suburban-to-suburban trip and by better equalizing the percentages of the commuting population involved in reverse and forward commutes.

To date, the sprawl issue has been approached from polar opposite viewpoints. Those against sprawl decry its resource consumption, contribution to urban ills, and the public's distaste for it. Those who are comfortable with sprawl cite its ability to deliver homeownership, the potential for real estate investment gains, and life style satisfaction. The aforementioned attributes, all characteristics of sprawl, as well as opponent and proponent views are presented in *Costs of Sprawl—Revisited,* which is the literature search and companion document to this study.

The interesting aspect of the sprawl phenomenon is that its critics and proponents are probably both right, yet each side is absolutely unwilling to acknowledge the merits of the other's view. The purpose of this volume is to project historic national development patterns (sprawl, or uncontrolled growth) into the future and measure the impacts of such development compared to another development future. This second development future is one emphasizing more contained development (compact or "smart" growth), which has its own impacts. The two sets of impacts are then compared to derive the costs of sprawl, which essentially are the savings incurred due to the differences between compact and sprawl growth.

The costs of sprawl are calculated from 25-year growth projections where resulting impacts are recorded in each of 3,100 counties nationwide. Unique regional definitions of urban, suburban, rural, and undeveloped counties are formulated according to density and prior levels of development. Then sprawl is defined as significant residential and nonresidential development in rural and undeveloped counties. Sprawl is subsequently controlled both within a region and within a county to contain growth in the most developed portions of each, using the equivalent of urban growth boundaries at the regional level and urban service areas at the county level. A future with and without controls generates the differences in development in particular locations. Differences in coun-

ties with respect to land conversion rates, road development requirements, housing unit mix and costs, public-service availability and costs, quality of life, and socioeconomic characteristics, accessed differently under the two growth scenarios, determine growth impacts. The difference between the two analyses provides empirical evidence of the likely impact of a future with sprawl as opposed to one where it is reduced.

In 2002, the American public is well aware of sprawl, bombarded as it is by statistics on sprawl's aggressive appetite for land and infrastructure. Huge land conversion and road mileage numbers precede statements that there is insufficient land remaining for future development needs, that America has been paved over to the detriment of future generations. Public services are said to be more expensive because development is spread out—for example, school bus service and police patrol costs are increased due to the greater distribution of these activities over space. On the other hand, there are those who deny any differential in costs related to development under sprawl conditions, citing experts who point to the increased public safety, better schools, and lower taxes of peripheral locations and claiming that quality of life is better there as a result. They also frequently point out that housing is less expensive the farther one is from the metropolitan center.

The analyses carried out in this study demonstrate that both arguments have merit. There are high infrastructure and land conversion costs associated with sprawl, yet quality of life is higher and housing costs are lower in locations characterized by sprawl development. This reports looks very carefully at the many costs and benefits of sprawl and concludes that there is clearly evidence of each.

Costs and benefits are not weighed on a balanced scale, however. There appear to be more costs than benefits, even though the magnitude of these costs to the general public is not nearly what has been chronicled in the popular press. On the other hand, the level of resource consumption resulting from development is increasing in the United States, and this increase is not related to need. There is no reason to support two underutilized systems of infrastructure when one fully subscribed system will do. Growth need not "skip" to the farthest and least-expensive location in the metropolitan area, with the expectation that infrastructure will be put in place, if adequate undeveloped space exists closer in. Thus, while sprawl is not the villain it has been portrayed to be, it is without question an unnecessary and increasing drain on natural resources. More-compact development patterns produce savings that are both profound and measurable. It makes sense to pursue these development savings.

Acronyms and Abbreviations

AAA	American Automobile Association
AAPE	Average absolute percent error
AVHRR	Advanced Very High Resolution Radiometer
B	Billion or a regression coefficient
BART	Bay Area Rapid Transit
BEA	Bureau of Economic Analysis
Beta	Normalized or standardized regression coefficient
CBD	Central Business District
CDC	Community Development Corporation
CNT	Center for Neighborhood Technology
DOT	U.S. Department of Transportation
EA	Economic Area
EDU	Equivalent dwelling units
EPA	Environmental Protection Agency
Exp(x)	The number *e* raised to the *x* power
FAR	Floor-area ratio
FBI	Federal Bureau of Investigation
FHWA	Federal Highway Administration
FIRE	Finance, insurance, and real estate
GAO	Government Accounting Office
GDP	General Development Plans
GIS	Geographic Information System
HH	Household
HOV	Highway Occupancy Vehicle
HPMS	Highway Performance Monitoring System
HUD	Housing and Urban Development
K	Thousand
M	Million
MF	Multifamily

Mgal	Millions of gallons
MH	Mobile home
Mils	Dollars per $1,000 of equalized property value
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
NASA	National Aeronautics and Space Administration
NIMBY	Not in my backyard
NOAA	National Oceanic and Atmospheric Administration
NPTS	National Personal Transportation Survey
NRI	National Resource Inventory
NS	Nonsprawl
PMT	Person-miles traveled
PMTPOV	Daily person-miles traveled in privately operated vehicles
PMTTRAN	Daily person-miles traveled by transit
POV	Privately operated vehicle
PUMS	Public Use Microdata Sample
R	Rural (county development type)
RC	Rural center (county development type)
RERC	Real Estate Research Corporation
RMA	Rand McNally's Ranally Metro Area
S	Suburban (county development type)
S-C	Sprawl-controlled county
S-NC	Sprawl-noncontrolled county
SIC	Standard Industrial Classification
SFA	Single-family attached dwelling unit
SFD	Single-family detached dwelling unit
STPP	Surface Transportation Policy Project
TAZ	Traffic Analysis Zone
TIP	Transportation Improvement Program
U	Urban (county development type)
UA	Urbanized Area (U.S. Census Bureau designation)
UC	Urban center (county development type)
UGB	Urban growth boundary
UND	Undeveloped (county development type)
USGS	U.S. Geological Survey
VMT	Vehicle-miles traveled
WEFA	Formerly Wharton Econometric Forecasting Associates

Executive Summary

Procedures and Findings

INTRODUCTION

Critics of suburban sprawl maintain that the predominance of this growth form over the past 50 years has had significant harmful impacts on American society. It has thwarted mass transit development, separated rich and poor, caused unnecessary travel, consumed fragile land, and generated excessive public expenditures. On the other side of the discussion, there are those who believe that sprawl is as American as apple pie and that citizens are getting what they want: single-family homes on large lots, safe communities with good school systems, and metropolitan locations far from the pace and problems of urban populations.

The objective of this study is to provide policymakers and citizens with credible quantitative measures of the relative costs and benefits of two different forms of metropolitan growth. The analysis that is undertaken monitors the 25-year growth of households and employment in the United States, positioning that growth differently in counties according to sprawl versus controlled- or smart-growth futures for each of the Economic Areas (EAs) defined by the U.S. Census, Bureau of Economic Analysis (BEA). Thus, a 25-year projection of growth in households and a similar-period projection of growth in jobs are allocated differently in counties according to sprawl versus controlled-growth development patterns. These two different futures—one of low-density sprawl development at the outer reaches of the metropolitan area, and the other of more compact, centrally oriented development—form the bases for the analysis of the different scenarios' demands for land, infrastructure, housing, and public services. Over the projection period, household growth and employment growth are maintained comparably at the EA level, and household size is iterated and adjusted to maintain similarly comparable gross population counts.

The purpose of this effort is threefold. First, it seeks to define and determine the incidence of sprawl in the United States. That is, if sprawl is characterized as *significant* residential and nonresidential growth in rural and undeveloped counties, then which specific state and county locations are the sites of significant sprawl growth nationally? The second purpose of the analysis is to determine the resource and personal impacts that sprawl growth occasions. What are the land conversion, infrastructure, public service, property development, travel, quality-of-life and social impact differences between sprawl and an alternative development form, controlled growth? Finally, the third purpose of the analysis is to seek out benefits of sprawl, if any, and their magnitude, as well as current and future curative measures to counteract sprawl.

PART I—SETTING THE SCENE

The County as the Geographic Unit of Analysis

The *county* is the basic geographic unit used to identify and analyze locations of residential and nonresidential development. The county is selected because (1) it is the smallest consistent non-educational unit of U.S. government for which a large number of existing demographic variables required for this and future components of the study are consistently available; (2) it is a reasonable number of subdivisions of the United States as a whole—approximately 3,100 individual subjurisdictions; (3) projections of major demographic variables are available at this level (Woods & Poole Economics, Wharton Economic Forecasting Associates, and the like); and (4) the problems of rapid growth, and the economic and political incentives needed to redirect this growth, increasingly require a geographic area that is larger than a municipality and can nest comfortably within a region.

Any plausible redirection of growth from one area to another must account for economic interrelationships that exist among the counties. In other words, if households and jobs are to be directed elsewhere to control sprawl, those locations must lie within the commuting patterns that link households and jobs in an area. The Economic Area, or EA, developed by the Bureau of Economic Analysis (BEA), fulfills this requirement. The EA is one of the few data aggregations that brings together metropolitan and nonmetropolitan locations into an economically related geographic area. It can be viewed as similar to an extended metropolitan area.

Within an EA, counties are classified according to their existing levels of development. The six land-use development classifications are urban center, urban, suburban, rural center, rural, and undeveloped. The classification, which is density-based, denotes a county as more or less developed relative to the other counties of its region and is an important consideration in determining where population is to be redirected under the alternative, or controlled-growth, scenario. The density thresholds for the classifications vary according to state density groupings that differ by region of the country; for example, an urban location in New Jersey would have a much higher density than an urban location in Wyoming.

The study also employs a subcounty unit of analysis by targeting growth to urbanized areas within counties (developed areas) and away from rural areas in these same counties (developing areas or rest of county). Thus, while the county is the focus of most projections, these projections extend to subcounty areas where these areas exist.

Growth in the United States

In 2000, the United States is a country of 281 million people, found within 103 million households, holding 159 million jobs, and earning $6.4 trillion in annual income (see Table ES.1). Over the period 2000 to 2025, population will grow by 61 million, households by 24 million, employment by 49 million, and annual income by $4 trillion (Woods & Poole [1998] and the Center for Urban Policy Research). The four census regions will grow unevenly over the 2000 to 2025 projection period. The South and West will have the highest growth rates of population, households, employment, and income (see Table ES.1). Together, the South and West represent about 80 percent of future population and household growth, and nearly 70 percent of future employment and income growth.

Every list of the fastest-growing states, EAs, and counties is dominated by entries from both the South and West regions. A substantial concentration of the nation's significant growth is found in a relatively small number of geographic areas. Three of 50 states, 10 of 172 EAs, and 40 of nearly 3,100 counties contain one-third of the nation's household growth. Almost all of these are in the South and the West. Significant growth in the United States is a concentrated phenomenon. Therefore, almost all projections of sprawl and its effects will be concentrated in the South and West regions of the United States.

Defining Sprawl in U.S. Counties

To gauge the incidence of sprawl, it is first necessary to define empirically the concept of sprawl. One of the most difficult tasks of this study is in fact to define sprawl. The difficulty is compounded if an attempt is made to define sprawl empirically. Sprawl is low-density, leapfrog development that is characterized by unlimited outward extension. In other words, sprawl is significant residential or nonresidential development in a relatively pristine setting. In nearly every instance, this development is low density, it has leapt over other development to become

established in an outlying area, and its very location indicates that it is unbounded. The Rutgers models have developed and quantified these concepts.

The definition of sprawl employed in this study is based on rapid and significant growth in rural and undeveloped counties. Numerous analyses of the statistical rate of population growth define the upper quartile as an indicator of significant growth or at least as a separator between significant and average growth. The upper quartile within an EA will be used to define significant growth in this study. All analyses of growth must contain both a relative and an absolute dimension. If growth is taking place in a rural or undeveloped location at a multiple of the level of normal growth (in this case 160 percent of the national average absolute level), the location is defined as sprawling, regardless of its relative rate of growth within an EA. Therefore, sprawl is taking place in nonurban locations (rural and undeveloped counties[1]) if either of the following sets of criteria is met:

1. (a) The county's *growth rate* is in the upper quartile of the EA's annual county household and employment growth rates; (b) the county's *growth rate* exceeds the average annual national county growth rate; and (c) the county's *absolute level of growth* exceeds 40 percent of the average annual absolute county growth.

or

2. The county's *absolute level of growth* exceeds 160 percent of the average annual absolute county growth.

The above criteria are used to classify counties as sprawl or nonsprawl for two time periods: 1980 to 2000 and 2000 to 2025. Based on their sprawl status during these time periods, counties are then assigned the following sprawl designations:

- *nonsprawl*—counties that *do not* meet the sprawl criteria during both the 1980 to 2000 period and the 2000 to 2025 period;
- *sustained sprawl*—counties that *do* meet the sprawl criteria in both time periods;
- *growing sprawl*—counties that *do not* meet the sprawl criteria for the 1980 to 2000 period but *do* meet the criteria for the 2000 to 2025 period; and
- *decreasing sprawl*—counties that *do* meet the sprawl criteria for the 1980 to 2000 period but *do not* meet the criteria for the 2000 to 2025 period. Sprawl in these counties is decreasing, usually because it has skipped over to another, more distant county, not because curative measures are in effect.

The Occurrence of Sprawl or Uncontrolled Growth

Table ES.2 shows the number of counties (by county development classification) experiencing sprawl resulting from the 25 years of projected household and employment growth. Overall, 742 of 3,091 counties, or 24 percent of all counties, will experience significant sprawl over the period 2000 to 2025. Of the 742 sprawl counties, 598 will be rural and undeveloped counties; 144 will be suburban and rural center counties. Proportionately, sprawl is found in 22 percent of rural and undeveloped counties and 54 percent of suburban and rural center counties.

While sprawl development may only be present in a significant sense in 24 percent of U.S. counties, it will affect 13.1 million of the 23.5 million new households during the period 2000 to 2025. Sprawl will affect 56 percent of all future household growth in the United States.

Of the three types of sprawl that characterize its occurrence in counties (increasing sprawl, decreasing sprawl, sustained sprawl), the most significant, by far, is sustained sprawl. Sustained sprawl is present in 431 or almost 60 percent of the counties that exhibit sprawl. The next most significant type, decreasing sprawl is present in 24 percent of the counties (177), followed by growing sprawl, involving 18 percent of the counties (134). Even if sprawl is decreasing (i.e., it was present in the first period [1980 to 2000] but is not present in the second [2000 to 2025]), it is usually just under the threshold that triggers sprawl for the second period and still involves a significant number of households.

On a national basis, sprawl is taking place, both relatively and absolutely, to a much greater degree in the South and West than it is in the Northeast and Midwest. Sprawl and growth parallel each other's locations, but they are not absolutely identical.

[1] A portion of the suburban counties and most rural center counties are also involved in the definition of sprawl. Their role is to ensure that sprawl hasn't been overlooked in relatively developed places; however, even though there is substantial representation, they contribute only a very small component of the overall sprawl development that is taking place.

Table ES.1
U.S. Growth by Region: 2000 to 2025
Population, Households, Employment, and Income

Region	2000	2025	2000–2025 Growth	
			Number	Growth Rate
	Population (#, in 000s)			(%)
Northeast	53,594	57,223	3,629	6.8
Midwest	64,393	73,061	8,668	13.5
South	100,237	127,538	27,301	27.2
West	63,198	84,328	21,130	33.4
Total	281,422	342,150	60,728	21.6
	Households (#, in 000s)			(%)
Northeast	19,955	21,431	1,476	7.4
Midwest	24,773	28,223	3,450	13.9
South	35,863	46,526	10,663	29.7
West	22,654	30,519	7,865	34.7
Total	103,245	126,699	23,454	22.7
	Employment (#, in 000s)			(%)
Northeast	29,964	36,013	6,049	20.2
Midwest	39,821	50,278	10,457	26.3
South	54,157	73,179	19,022	35.1
West	35,448	49,338	13,890	39.2
Total	159,390	208,808	49,418	31.0
	Income (in millions of 1992 dollars)			(%)
Northeast	1,403,731	2,032,287	628,556	44.8
Midwest	1,507,569	2,287,786	780,217	51.8
South	2,012,882	3,490,513	1,477,631	73.4
West	1,426,246	2,541,805	1,115,559	78.2
Total	6,350,428	10,352,391	4,001,963	63.0

Sources: U.S. Department of Commerce, Bureau of the Census (2000). Projection data from Woods & Poole (1998). Data interpretation by the Center for Urban Policy Research, Rutgers University.

Table ES.2
Sprawl by County Type under Uncontrolled Growth: 2000 to 2025

County Sprawl Designation	Rural and Undeveloped	Suburban and Rural Center	Urban Center and Urban	Total
Nonsprawl	2,128	121	100	2,349
Uncontrolled Sprawl	598	144	0	742
Total Counties	2,726	265	100	3,091

Source: Center for Urban Policy Research, Rutgers University.

The Alternative Growth Scenario—Controlling Sprawl Growth

Controlled growth is defined as limiting a significant share of development to already developed counties or to areas as close to already developed locations as possible. This happens in two ways. The first method limits the amount of growth taking place in the outer counties by redirecting it to inner counties. This is accomplished by drawing the equivalent of an urban growth boundary around the developed counties and by allowing only a portion of the growth to go to the less-developed counties (*intercounty* sprawl development). A second method of controlling sprawl limits the outward movement of growth in a single county (*intracounty* sprawl development). This is accomplished by establishing an urban service area in a

county and containing most of the growth within that service area. In the second method, a boundary is drawn around the existing concentration of growth in a county. The rest of the county is "protected" from significant development because of the unavailability of adequate public services there. The two methods of control form the compact- or controlled-growth scenario.

The next several paragraphs describe the management process used to achieve controlled growth and the degree to which this procedure is successful in controlling sprawl. In the intercounty component of the controlled-growth scenario, sprawl is limited by redirecting growth from fast-growth rural, undeveloped, and developing suburban counties to urban center, urban, rural center, and developed suburban counties. 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. To be "sprawl controlled" a county from which growth is sent must have its growth reduced to 75 percent of the *sprawl-growth threshold.*

The objective is to significantly reduce sprawl in all nonurban locations by 25 percent or more from their sprawl-growth thresholds. However, those counties that receive growth (primarily urban center, urban, or developed suburban counties) also must remain below the sprawl-growth thresholds. Counties that receive growth can accept household or employment growth only until they reach 75 percent of their upper-quartile growth rate limits. A further consideration for urban areas in the Northeast census divisions (New England, Middle Atlantic, and East North Central) is that urban and urban center counties can receive no more than one-quarter additional growth. This prevents excessive growth from being sent to declining urban locations, given their current market conditions or levels of urban distress.

In the intracounty component of the controlled-growth scenario, development is relocated to the developed (urbanized) portions of counties. Development is subject to a 20 percent increase in density or a 10 percent increase in floor-area ratio (FAR). Under controlled growth, approximately 20 percent of the residential units in the undeveloped portions (nonurbanized portions) of counties are developed in cluster developments wherein density is twice as high as the prevailing density of the undeveloped areas. In addition, under the controlled-growth scenario, one-quarter more units are developed as single-family attached or multifamily units as opposed to single-family detached or mobile home units.

In the controlled-growth scenario, both intercounty and intracounty methods of sprawl control are assumed to be in effect and to be contributing to the impacts that are measured. In the sprawl control discussion that follows, only intercounty movement of households and employment is viewed.

The Ability to Control Sprawl in the United States

Under the controlled-growth scenario, household and job growth in sprawl-growth counties is redirected to other more developed counties within the EA. The objective is to significantly reduce the amount of residential and nonresidential growth occurring in sprawling locations (rural, undeveloped, developing suburban, and developing rural center counties). A one-quarter or greater reduction in growth in these locations is a demonstrable change for these areas. A classification of *controlled sprawl* is established to describe counties in which sprawl growth has been reduced through purposeful redirection of households and jobs.

Table ES.3 shows the number of counties with sprawl under the controlled-growth scenario. Overall, the redirection of households and employment to other more-developed counties can control (i.e., significantly reduce) sprawl in 420 (57 percent) of the 742 counties that had been expected to experience sprawl. The improvement is greatest for sprawling rural and undeveloped counties compared with suburban and rural center counties. This can be illustrated by comparing the numbers in Tables ES.2 and ES.3. Approximately 60 percent (356 counties) of the 598 rural and undeveloped counties projected to experience sprawl during the 2000 to 2025 period can be moved to the controlled sprawl classification. The comparable controlled sprawl figure for the 144 suburban and rural center counties projected to experience sprawl during the same period is about 45 percent (64 counties).

Table ES.4 summarizes the redirection of households and jobs by region under the controlled-growth scenario. Overall, 11 percent of new households and 6 percent of new jobs are directed away from counties of decreasing, sustained, and growing sprawl conditions. These percentages may seem relatively low, but they represent 2.6 million households and 3.1 million jobs. Redirection allows a significant number of counties to experience reductions in the amount of sprawl occurring within them while basically maintaining the locational preferences of market-driven

Table ES.3
Sprawl by County Type under Controlled Growth: 2000 to 2025

County Sprawl Designation	Rural and Undeveloped	Suburban and Rural Center	Urban Center and Urban	Total
Nonsprawl	2,128	121	100	2,349
Remaining Sprawl	242	80	0	322
Controlled Sprawl	356	64	0	420
Total Counties	2,726	265	100	3,091

Source: Center for Urban Policy Research, Rutgers University.

Table ES.4
Controlled Growth: Household 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 Growth (#, in 000s)	210	1,138	298	915	2,561
Percentage Redirected Growth # (%)	14.2	10.7	8.6	11.6	10.9
Percentage of U.S. Total (%)	8.2	44.5	11.6	35.7	100.0
Jobs					
Projected Growth (#, in 000s)	6,049	19,022	10,457	13,890	49,418
Redirected Growth (#, in 000s)	422	915	462	1,338	3,137
Percentage Redirected Growth # (%)	7.0	4.8	4.4	9.6	6.3
Percentage of U.S. Total (%)	13.5	29.2	14.7	42.6	100.0

Source: Center for Urban Policy Research, Rutgers University.

Table ES.5
Controlled Growth: Household and Employment Redirection Summary by County Type

	Undeveloped and Rural	Rural Center and Suburban		Urban and Urban Center	Total
Variable	Redirect From	Redirect From	Redirect To	Redirect To	Projected Growth
Households					
Projected Growth (#, in 000s)	8,829	9,329		5,296	23,454
Redirected Growth (#, in 000s)	2,078	482	730	1,830	2,560
Percentage Redirected Growth # (%)	23.5	5.2	7.8	34.6	10.9
Jobs					
Projected Growth (#, in 000s)	15,491	17,315		16,612	49,418
Redirected Growth (#, in 000s)	2,366	771	623	2,514	3,137
Percentage Redirected Growth # (%)	15.3	4.5	3.6	15.1	6.3

Source: Center for Urban Policy Research, Rutgers University.

households. The results of redirection are greatest in the West, both absolutely and relatively. Approximately 12 percent of new households and 10 percent of new jobs in this region are redirected. The West Region accounts for 36 percent and 43 percent, respectively, of the total U.S. households and jobs that can be redirected (see Table ES.4).

The South Region is second highest in terms of total amount of redirected growth. Eleven percent of the household growth and 5 percent of the job growth are redirected in this region. Altogether, about 45 percent of the redirected future households and 29 percent of the redirected future jobs are located in the South (see Table ES.4).

The numerical amount of redirected growth in either the South or the West amounts to three times the redirected household growth and twice the redirected employment growth of either the Northeast or the Midwest Regions. In the South and West Regions 1,138,000 and 915,000 future *households*, respectively, are redirected to control sprawl; 915,000 and 1,338,000 *jobs*, respectively, are also redirected to control sprawl. In the Northeast and Midwest Regions, 210,000 and 298,000 future *households* are redirected, respectively; more than 400,000 future *jobs* are also redirected in each of these regions.

Table ES.5 summarizes the redirection of households and jobs by county development type. Nearly one-quarter of the household growth and more than 15 percent of the employment growth projected to occur in rural and undeveloped counties are redirected—primarily to urban and urban center counties. The category for suburban and rural center counties plays a dual role, as it includes both sending and receiving locations. A relatively small proportion of jobs and households is redirected to or from these locations. Urban and urban center counties, on the other hand, serve only as receiving locations in the redirection scenario. The bulk of the redirected growth is targeted for urban and urban center counties; 35 percent of their household growth and 15 percent of their employment growth results from development redirected from other counties. On a national basis, 11 percent of household growth and 6 percent of employment growth can be redirected from sprawling, rural, undeveloped, and developing suburban counties to closer-in urban or urban center counties.

What does this mean? It means that through purposeful redirection of households and jobs, about 55 percent of the counties where sprawl is taking place can be "cooled down" significantly from their prior sprawl-growth trends. For the remaining 45 percent of sprawl locations, households and jobs cannot be redirected elsewhere, but local officials may be able to keep development closer-in by using urban service areas or similar strategies. If the United States were to initiate a war on sprawl, sprawl could be reduced in only a little more than one-half of the counties experiencing sprawl. Yet, this would still involve both a significant number of households and jobs and a meaningful change for each of these counties. In the other half of the counties, the place that received the growth would itself be placed in a sprawling condition if this transfer took place.

Case Studies of Sprawl Control

To determine exactly how the growth-control regimen plays out at the metropolitan level, 15 metropolitan areas were selected for case study. In these areas, individual counties are profiled to determine: (1) the plausibility of their development designation (urban center, urban, suburban, rural center, rural, and undeveloped), both absolutely and relatively; (2) the degree to which they lost or gained population and whether or not this population change is reasonable; and (3) whether sprawl can be controlled in these locations, and, if so, the underlying reasons why it can be controlled.

Case study Economic Areas (EAs) are selected for their general recognizability and their contributions to sprawl nationwide. The locations selected include (1) the EA for which the largest absolute growth increment during the next 25 years is projected (Los Angeles-Riverside, CA-AZ EA) and an EA for which a much more modest growth increment is projected (Austin-San Marcos, TX); (2) an EA that encompasses close to 90 counties (New York-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT EA) and an EA that encompasses only a few counties (Tucson, AZ EA); (3) an EA that exhibits significant amounts of sprawl and the ability to accommodate most of it (Atlanta, GA-AL-NC EA) and an EA that exhibits relatively little sprawl but has difficulty accommodating any of it (Lexington, KY-TN-VA-WV EA); (4) an EA that encompasses large core areas that can serve as receiving locations (Chicago-Gary-Kenosha, IL-IN-WI EA) and an EA that encompasses small core areas wherein little growth can be absorbed (Tucson, AZ EA); and (5) EAs exhibiting planned responses to growth control (Portland-Salem, OR-WA and Lexington, KY-TN-VA-WV EAs) and EAs that exhibit unbridled growth areas (Los Angeles-Riverside, CA-AZ and Las Vegas, NV-AZ-UT EAs).

The case studies show that the development designations appear to correctly reflect the county's position in the metropolitan area. An urban area in Montana is definitely an urban area, even though its density is not much different from that of a suburban area in New Jersey. Further, under the controlled-growth scenario, the amount of growth that would be received by the urban counties attempting to expand their growth would be reasonable, as would be the amount of growth sent away by the rural counties. A fact in evidence in most EAs is that most of the rural and undeveloped counties are not sprawling, and their

Table ES.6
Lands Converted—Uncontrolled-Growth Scenario by Type
United States and by Region: 2000 to 2025

Region	Uncontrolled-Growth Scenario				
	Total Land (Acres)	Percentage of Overall Land (%)	Agricultural Lands (Acres)	Environmentally Fragile Lands (Acres)	Other Lands (Acres)
Northeast	1,460,868	7.8	292,067	1,063,293	105,508
Midwest	2,789,832	14.8	1,750,966	646,016	392,850
South	9,969,932	52.9	3,605,201	4,468,081	1,896,650
West	4,612,290	24.5	1,443,842	866,835	2,301,613
United States	18,832,922	100.0	7,092,076	7,044,225	4,696,622

Source: Center for Urban Policy Research, Rutgers University.

Table ES.7
Lands Saved—Controlled-Growth Scenario—Intercounty and Intracounty Redirection of Growth
United States and by Region: 2000 to 2025

Region	Total Savings (Acres)	Intercounty Savings		Intracounty Savings	
		(Acres)	(%)	(Acres)	(%)
Northeast	282,853	172,276	60.8	110,985	39.2
Midwest	439,446	199,308	45.4	240,134	54.6
South	2,139,017	1,249,296	58.4	889,721	41.6
West	1,140,915	786,809	69.0	354,107	31.0
United States	4,002,231	2,407,688	60.1	1,594,947	39.9

Source: Center for Urban Policy Research, Rutgers University.

Table ES.8
Lands Saved—Controlled-Growth Scenario by Type—United States and by Region: 2000 to 2025

Region	Total Land		Agricultural Lands (Acres)	Environmentally Fragile Lands (Acres)	Other Lands (Acres)
	(Acres)	(%)			
Northeast	282,853	7.1	55,807	209,160	17,886
Midwest	439,446	11.0	283,503	89,205	66,735
South	2,139,017	53.4	802,464	995,742	340,814
West	1,140,915	28.5	357,862	211,328	571,721
United States	4,002,231	100.0	1,499,636	1,505,434	997,156

Source: Center for Urban Policy Research, Rutgers University.

growth remains the same under the two scenarios as does the growth of many of the developed counties under the both scenarios. Where counties change population, the change is indeed reasonable, especially since this change is considered to take place over an extended period.

Why is sprawl controllable in some areas, and not in others? The greatest potential for controlling sprawl in multiple counties of an EA exists where there is relatively slow growth in the EA and where there are enough urban center, urban, or suburban counties in the EA, to receive this growth. Controlling sprawl is most difficult where there is rapid growth in the counties of an EA and where there are not enough urban centers, urban or suburban counties, to receive this growth. Given this analysis, sprawl is controllable in the New York-Northern NJ- Long Island, NY-NJ-CT-PA-MA-VT EA and in the Chicago-Gary-Kenosha, IL-IN-WI EA. Sprawl can be only minimally controlled in the Denver-Boulder-Greeley, CO-KS-NE EA and in the Miami-Fort Lauderdale, FL EA; it can not be controlled through intercounty growth redistribution in the Tucson, AZ EA and in the Las Vegas, NV-AZ-UT EA.

PART II—THE RESOURCE IMPACTS OF SPRAWL

Land Conversion

Given the aforementioned projections using the uncontrolled-growth scenario, over the next 25 years, the United States will convert 18.8 million acres of land (see Table ES.6) to build 26.5 million new housing units and 26.5 billion square feet of new nonresidential space, the latter to accommodate a growth of 49.4 million jobs. Land will be converted at a rate of approximately 0.6 acres per residential unit and 0.2 acres per 1,000 square feet of nonresidential space. This projected level of land conversion need not take place.

The land conversion requirements are determined by translating the households and employment projections into demand for residential and nonresidential land. The process accounts for both vacancy of structures and other land development requirements that consume extra land. The model uses different densities, development locations, and housing types for uncontrolled (sprawl) growth and controlled growth to calculate the total land converted as well as the amount of agricultural and environmentally fragile land converted under each development scenario.

Almost one-quarter of this land conversion could be avoided through simple growth control measures without compromising growth or altering housing markets. Nearly 2.5 million acres could be saved by employing the equivalent of an urban growth boundary in EAs to direct growth away from rural and undeveloped counties to the more-developed urban and suburban counties (Table ES.7). An additional 1.6 million acres could be saved through the use of an urban service area within a county to direct development away from undeveloped areas to developed areas in the same county. Included in the overall land savings are approximately 1.5 million acres of agricultural land, 1.5 million acres of environmentally fragile land, and 1.0 million other lands (e.g., barren, etc.). These as well as the savings by region are shown in Table ES.8.

In terms of absolute land conversion under the uncontrolled-growth scenario (see Table ES.6), most of the land converted takes place in the South (53 percent) and West (24 percent); a much smaller percentage of overall land conversion takes place in the Midwest (15 percent) and in the Northeast (8 percent). As a result (see Table ES.8), most of the land saved under the controlled-growth scenario is in the South (54 percent) and in the West (29 percent); the Midwest and the Northeast realize lower percentages of land saved—11 percent and 7 percent, respectively.

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

Significant land savings can be achieved by both intercounty (60 percent) and intracounty (40 percent) land development controls. These controls produce a saving of 4 million acres over the next 25 years—nearly one-quarter of all land converted—without significantly impacting real property markets (see Table ES.7 in conjunction with Table ES.6).

Water and Sewer Infrastructure

During the period from 2000 to 2025, under traditional development or uncontrolled growth, developers and local governments in the United States will expend more than $190 billion to provide necessary water and sewer infrastructure (Table ES.9). 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 in excess of 45 million laterals to service new residential and nonresidential structures. The full extent of this projected infrastructure requirement and its attending costs can be avoided through more sensible growth patterns.

With both intercounty and intracounty growth-control measures in place, more than 150 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 reduced or more efficient. The new development pattern also allows for a less extensive delivery and collection system

Table ES.9
Water and Sewer Infrastructure—Uncontrolled- and Controlled-Growth Scenarios
United States and by Region: 2000 to 2025

Region	Total Water and Sewer Demand			Total Water and Sewer Laterals			Total Infrastructure Costs		
	Uncontrolled Growth (Mgal/day)	Controlled Growth (Mgal/day)	Demand Savings (Mgal/day)	Uncontrolled Growth (000)	Controlled Growth (000)	Lateral Savings (000)	Uncontrolled Growth ($M)	Controlled Growth ($M)	Cost Savings ($M)
Northeast	1,451	1,444	7	3,406	3,068	338	16,015	14,751	1,264
Midwest	2,935	2,915	21	7,110	6,604	505	30,393	28,839	1,556
South	7,942	7,870	72	21,243	19,116	2,126	84,573	79,026	5,547
West	5,794	5,737	56	14,108	12,456	1,652	58,786	54,544	4,242
United States	18,121	17,965	156	45,867	41,245	4,621	189,767	177,160	12,609

Source: Center for Urban Policy Research, Rutgers University.

Table ES.10
Local Road Infrastructure—Uncontrolled- and Controlled-Growth Scenarios
United States and by Region: 2000 to 2025

Region	Total Lane-Miles Required			Total Road Cost		
	Uncontrolled Growth (miles)	Controlled Growth (miles)	Savings (miles)	Uncontrolled Growth ($B)	Controlled Growth ($B)	Savings ($B)
Northeast	288,059	281,251	6,809	135.77	129.57	6.20
Midwest	284,164	266,614	17,550	130.76	122.15	8.61
South	885,944	806,955	78,989	376.99	338.07	38.92
West	586,011	501,055	84,957	283.49	227.52	55.98
United States	2,044,179	1,855,874	188,305	927.01	817.31	109.70

Source: Center for Urban Policy Research, Rutgers University.
Note: Alaska is not included in the West region.

(street mains), resulting in lower tap-in fees. The new housing pattern contributes to a smaller number of water and sewer laterals needed to serve 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 infrastructure savings of $12.6 billion over the projection period (Table ES.9).

The savings in water and sewer demand reported above are clearly not the most significant element of the overall infrastructure analysis. The infrastructure analysis focuses on the cost of 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 controlled-growth scenario projections for infrastructure components, costs, and savings provide an accurate, conservative view of their incidence in the United States during the forthcoming 25-year period.

The South, which exhibits the most absolute growth, incurs the most development infrastructure costs and therefore realizes the greatest savings under the controlled-growth scenario. The region does not have to provide 68.0 million gallons of water per day, nor does it need to 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 (Table ES.9). The region can realize a savings of 2 percent of the uncontrolled-growth water and sewer demand, a savings of 10 percent in the number of constructed water and sewer laterals, and a savings of 7 percent of the overall cost of infrastructure.

The West, which exhibits the next greatest absolute growth, experiences similar savings percentages under the controlled-growth scenario. Since its growth is less than that of the South, the absolute savings are less: a saving of 56.0 million in water and sewer demand; a saving of 1.7 million in water and sewer laterals; and a saving of $4.2 billion in water and sewer lateral costs (Table ES.9). The Northeast and the Mid-

west together realize approximately one-half the levels of savings 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.

Local Road Infrastructure

The demand for additional lane-mile capacity of local roads is related to the distribution and density of population. The Rutgers Road Model relates population density to road density based on historical incidence within the counties. Through regression analysis, an ideal relationship between lane-mile density and population density is generated for both the developed and undeveloped portions of counties.

Using the projected population density in 2025 and the derived relationship between lane-mile density and population density, an ideal level of lane-miles is established for each area of the county. The model then predicts the need for new road construction by comparing the ideal level of required lane-miles with the existing lane-miles found in a county. A variable cost factor is then applied to project future road costs. The model does not project the costs associated with land acquisition, bridges, or the repair or upkeep of roads.

For the projection period 2000 to 2025, under traditional or uncontrolled growth, the United States will spend more than $927 billion to provide necessary road infrastructure amounting to an additional 2.0 million lane-miles of local roads (Table ES.10). Under controlled growth, 1.9 million lane-miles of local roads will be required, amounting to $817 billion in local road costs. Overall, a saving of 188,300 lane-miles of local roads and $110 billion can be achieved with more-compact growth patterns. This is a saving of 9.2 percent in local lane-miles and 11.8 percent in local road costs. Why are the savings not greater? Under either scenario, some development takes place in the outer reaches of metropolitan areas and local roads must be built. Even in the close-in areas where growth is redirected, local roads must be widened to accommodate development, resulting in additional lane-miles of local roads.

Thus, whether you have sprawl or controlled growth, approximately 2 million lane-miles (potentially minus 9 percent) of local roads must be put in place and $927 billion (potentially minus 12 percent) must be spent. A controlled-growth regimen obviously reduces these outlays. While not extraordinary, savings clearly are in evidence. Thus, appreciable savings in lane-miles constructed and dollar costs committed could be achieved under a growth regimen emphasizing more-compact development patterns.

Local Public-Service Costs

An analysis of the fiscal impacts of public service requires the calculation of (1) costs, (2) revenues, and (3) net fiscal impacts. These, in turn, will be discussed below.

Nationwide per capita costs, averaged and weighted for the counties in which development will take place under uncontrolled-growth conditions, are approximately $2,267 per capita and $120 per employee (see ES.11). These average weighted county costs are about 10 percent higher per capita and per worker in developed areas ($2,473 and $129, respectively) and about 20 percent lower in undeveloped areas ($1,833 and $92, respectively). Nationwide per capita costs for development under controlled growth are about 3 percent lower than they are under uncontrolled growth conditions.

Total annual revenues are $1,229 per capita and $537 per employee (see ES.13). About two-thirds of per capita revenues come from the property tax; almost all of the per-employee revenues come from this source. As is the case for costs, revenues per capita and per employee are 10 percent higher in developed areas ($1,346 and $607, respectively) and 20 percent lower in undeveloped areas ($999 and $362, respectively). Nationwide per capita revenues for development under controlled growth are about 5 percent lower than they are under uncontrolled-growth conditions.

Residential equalized valuation per capita nationwide under the uncontrolled-growth scenario amounts to $42,249 per capita; nonresidential valuation per employee is $30,349 (Table ES.11). The combined equalized valuation produces a local tax rate of $2.00 per $100 assessed valuation. Tax bases per capita and per employee are 10 percent higher in developed areas of counties ($46,244 and $32,862, respectively) and 15 percent to 25 percent lower in undeveloped areas ($36,919 and $22,538, respectively). Nationwide tax base per capita for development under controlled-growth conditions is about 7 percent lower than it is under uncontrolled-growth conditions.

During the period 2000 to 2025, under traditional or uncontrolled-growth development, the nation will

Table ES.11
Post Hoc Weighted Average Fiscal Parameters for Developed and Undeveloped Areas: Uncontrolled- and Controlled-Growth Scenarios
(in Dollars)

	Developed Areas		Undeveloped Areas		Overall	
	Per Capita	Per Worker	Per Capita	Per Worker	Per Capita	Per Worker
Uncontrolled-Growth Scenario						
Expenditures	2,473	129	1,833	92	2,267	120
Revenues						
Tax and Nontax	997	607	692	362	894	537
Intergovernmental Transfers	349	N/A	307	N/A	335	N/A
Total	1,346	607	999	362	1,229	537
Equalized Tax Base	46,244	32,862	36,919	22,538	42,249	30,349
Equalized Tax Rate ($ per $1 val.)	0.020		0.018		0.020	
Controlled-Growth Scenario						
Expenditures	2,388	125	1,729	87	2,203	117
Revenues						
Tax and Nontax	912	585	592	355	825	533
Intergovernmental Transfers	356	N/A	312	N/A	344	N/A
Total	1,268	585	904	355	1,169	533
Equalized Tax Base	42,529	31,849	31,536	22,073	39,452	29,745
Equalized Tax Rate ($ per $1 val.)	0.021		0.018		0.020	

Source: Center for Urban Policy Research, Rutgers University.

Table ES.12
Fiscal Impact—Uncontrolled- and Controlled-Growth Scenarios
United States and by Region: 2000 to 2025
(in $Million)

	Uncontrolled-Growth Scenario			Controlled-Growth Scenario			Difference: Controlled minus Uncontrolled
Region	Costs	Revenues	Impact	Costs	Revenues	Impact	
Northeast	9,329	11,170	1,841	9,252	12,928	3,676	1,835
Midwest	18,914	15,352	-3,562	18,340	16,339	-2,001	1,561
South	58,441	38,845	-19,532	57,655	39,062	-18,531	1,001
West	56,558	34,023	-22,535	53,942	31,215	-22,728	-192
United States	143,242	99,389	-43,788	139,190	99,544	-39,583	4,205

Source: Center for Urban Policy Research, Rutgers University.

Table ES.13
Aggregate Property Development Costs—Uncontrolled- and Controlled-Growth Scenarios
United States and by Region: 2000 to 2025
(in $Billions)

	Uncontrolled Growth			Controlled Growth			Savings			
Region	Residential	Non-residential	Total Costs	Residential	Non-residential	Total Costs	Residential	Non-residential	Total Savings	Percentage Savings
Northeast	434.5	256.1	690.6	385.9	250.3	636.2	48.6	5.8	54.4	7.9
Midwest	565.6	402.8	968.4	522.7	393.8	916.5	42.9	9.1	51.9	5.4
South	1,711.6	761.5	2,473.1	1,554.0	748.7	2,302.7	157.6	12.8	170.4	6.9
West	1,665.6	577.7	2,243.3	1,530.5	569.3	2,099.8	135.1	8.4	143.5	6.4
United States	4,377.3	1,998.1	6,375.4	3,993.0	1,962.1	5,955.1	360.2	38.4	420.3	6.6

Source: Center for Urban Policy Research, Rutgers University.

expend $143.2 billion annually for public services and will collect annual revenues in the amount of $99.4 billion, resulting in an annual fiscal impact deficit of $43.8 billion by 2025 (see Table ES.12 for national and regional values).

Under controlled-growth development, for the same projection period, the nation will expend annually $139.2 billion in local public-service costs—a decrease of $4 billion (Table ES.12). The decrease in costs is possible because, under controlled-growth development, more development will take place in developed areas where public services may be more expensive, but public-service demand can be absorbed more readily due to the excess capacity found there. This $4 billion annual decrease in costs (to $139.2 billion) will be paired against a similar aggregate annual revenue amount of approximately $99.5 billion. This will yield an overall reduced net fiscal impact deficit of nearly $40 billion annually by 2025 under the controlled-growth scenario. Thus, in 2025, this would amount to a positive fiscal impact difference of $4.2 billion annually under the controlled-growth versus uncontrolled-growth scenario.

Sprawl and Real Estate Development Costs

For the projection period 2000 to 2025, under traditional or uncontrolled growth, individuals and businesses in the United States will spend more than $4 trillion to develop the residential and nonresidential structures necessary to accommodate the nation's household and employment growth (Table ES.13). A combined saving of $420 billion in occupancy costs can be achieved through more-centralized growth and more-compact development patterns. This is a saving of greater than 6 percent in overall property development investment costs. Are the savings significant?

Average residential housing cost will decrease from $167,038 to $154,035 under the controlled-growth scenario, lowering the average housing cost nationwide for new housing occupants by $13,003, or 7.8 percent (Table ES.14). Ideally, the purchase price individual home buyers will pay will reflect this savings. The specific savings will certainly vary by housing type. The greatest savings will be realized in the cost of single-family detached dwellings—almost $11,095 per dwelling unit. Mobile homes will offer the smallest cost savings, $5,167 per dwelling unit. The cost of attached and multifamily housing will actually increase by $4,529 and $1,612 per unit, respectively, under the controlled-growth scenario. Savings of approximately $865 per unit (1,000 square feet) (1.1 percent), or an average of 86.5 cents per square foot, will be in evidence for nonresidential development.

Are the approaches used to manage growth, saving natural and man-made resources from consumption, cost-effective? Are the processes used to contain development too intrusive or growth limiting? Do they increase the cost of housing? Property development cost savings are significant enough to conclude that the growth-control regimen, in addition to saving natural and man-made resources, reduces residential and nonresidential occupancy costs in a region by offering greater variety in structure types and by slightly increasing density. Growth controls, in the presence of slightly increased density and more non-single-family housing types, do not increase the price of housing in locations where they are put in place. There is, however, a cost amenity reduction (smaller units and lots) that has not been calculated here.

PART III—THE PERSONAL COSTS OF SPRAWL

Travel Miles and Costs

A regression-based travel model is developed to predict person-miles of travel as a function of urban form. The results of the regression model are paired with a population allocation model to provide estimates of miles traveled and costs of travel under the two alternative development futures. The results of this pairing show a national decrease of 49.6 million in daily travel miles and an associated decrease of $24.1 million in daily travel costs under the controlled-growth scenario (See Tables ES.15 and ES.16, respectively). Both of these figures include increases in the transit component of overall travel costs under the controlled-growth scenario.

The controlled-growth scenario decreases overall daily travel miles by 4 percent and daily travel costs by 2.4 percent. In the process of achieving these savings, miles traveled daily in privately operated vehicles (POVs) are decreased by 4.7 percent and miles traveled in transit are increased by 19 percent.

By directing more growth to urban/suburban counties as opposed to rural/undeveloped counties and closer to existing developments in all counties, fu-

Table ES.14
Property Development Costs per Unit—Uncontrolled- and Controlled-Growth Scenarios
United States and by Region: 2000 to 2025
(in Dollars)

	Uncontrolled Growth		Controlled Growth		Residential Savings		Nonresidential Savings	
Region	Residential	Non-residential	Residential	Non-residential	Unit Savings	Percentage Savings	Unit Savings	Percentage Savings
Northeast	246,418	85,705	228,329	84,277	18,089	7.3	1,428	1.7
Midwest	150,377	73,643	140,907	72,789	9,470	6.3	854	1.2
South	140,118	71,945	128,381	71,033	11,737	8.4	912	1.3
West	196,747	77,695	181,793	77,119	14,954	7.6	576	0.7
United States	167,038	75,463	154,035	74,598	13,003	7.8	865	1.1

Source: Center for Urban Policy Research, Rutgers University.

Table ES.15
Additional Daily Travel Miles in Privately Owned Vehicles (POV) and Transit
Uncontrolled- and Controlled-Growth Scenarios—United States and by Region: 2000 to 2025
(in $Millions)

	Uncontrolled-Growth Scenario			Controlled-Growth Scenario			Difference—Savings		
Region	POV	Transit	Total Travel	POV	Transit	Total Travel	POV	Transit	Total Travel
Northeast	87.2	1.4	88.6	81.0	1.7	82.7	6.3	-0.3	5.9
Midwest	178.1	4.6	182.7	171.5	5.2	176.6	6.6	-0.6	6.0
South	541.3	15.7	557.0	517.4	18.2	535.5	24.0	-2.5	21.5
West	386.9	13.2	400.1	367.5	16.4	383.9	19.3	-3.2	16.1
United States	1,193.5	34.8	1,228.4	1,137.3	41.5	1,178.8	56.2	-6.6	49.6

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

Table ES.16
Additional Daily Travel Costs in Privately Owned Vehicles (POV) and Transit
Uncontrolled- and Controlled-Growth Scenarios—United States and by Region: 2000 to 2025
(in $Millions)

	Uncontrolled-Growth Scenario			Controlled-Growth Scenario			Difference—Savings		
Region	POV	Transit	Total Travel	POV	Transit	Total Travel	POV	Transit	Total Travel
Northeast	69,229	1,812	71,041	64,701	2,330	67,031	4,527	-517	4,010
Midwest	138,670	6,364	145,034	134,428	7,244	141,673	4,242	-881	3,361
South	421,409	21,296	442,704	406,586	24,788	431,374	14,823	-3,492	11,330
West	309,554	18,275	327,829	299,565	22,895	322,460	9,989	-4,619	5,369
United States	938,861	47,746	986,608	905,281	57,256	962,537	33,581	-9,510	24,071

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

ture miles traveled daily in transit will increase by 20 percent. The costs of these increases, combined with POV decreases, serve to decrease overall daily travel costs. This occurs in a context that makes only 900 counties applicable to this reduction since 2,200 of 3,100 counties in the United States are not involved in the intercounty population shifts that make possible much of the travel differences that occur between the two growth alternatives.

Sprawl and Quality of Life

Quality of life is difficult to quantify. To allow quality of life to be understood and measured, a *places-rated* method generally must be used. If one can se-

lect variables that meaningfully separate places, and those places, once distinguished, are recognizable as different by a judging population, then a places-rated scheme can be used for more rigorous analysis. That is the procedure employed here.

Variables from a recognized econometric procedure to rate quality of life are augmented and altered to attain a recognizable ordering of counties in five states: New Jersey, South Carolina, Florida, Arizona, and Oregon. The judging panel reflected the combined experience of the research team. The variables are then applied to all counties of the United States to develop an initial rating for each county. For those counties with both developed and undeveloped areas—approximately 490 counties, or 15 percent of all counties—the 26 variables are divided into two sets of 13 variables each to describe the counties' developed and undeveloped portions. Counties, EAs, states, regions, and the United States as a whole can have a people-experienced quality-of-life change determined by the number of people moving to a county and the conditions found there under the two alternative growth scenarios.

The analysis found that, overall, movement to more-central places by new residents under a controlled-growth regimen does not appreciably alter experienced quality of life at any level of viewing (county, EA, state, region). Neither the counties, the EAs, nor the states show significant variations in quality of life for new residents as a result of experiencing the closer-in living of the controlled-growth regimen. In individual instances, there may be some changes in the quality of life experienced; on the whole, however, little change is found.

Thus, at least at the county level, it cannot be said that controlled growth will lead to either improved or lower quality of life. This is a tentative, though important, finding because literature in the field is full of unsubstantiated claims favoring both positions. While the above analysis is far from the last word on controlled growth and quality of life, the findings do shed some light on the complexity of the issue as well as the likely proportion of jurisdictions involved in quality-of-life changes under a controlled-growth regimen.

Sprawl and Urban Decline

The study also explored the relationships between suburban sprawl and urban decline. Two specific aspects of this issue are analyzed: Is there a significant connection between sprawl and urban decline? If so, does sprawl aggravate urban decline? Several statistical approaches were employed to explore these suggested relationships and to establish the extent of their influence on one another.

A sprawl index and an urban decline-distress index are derived with the largest number of potentially causal variables. The component variables for each index are entered into a multiple regression analysis simultaneously. Independent variables are eliminated until the largest correlation is achieved between cause (sprawl) and effect (urban decline).

The following conclusions emerge from the study's empirical examination of the relationship between suburban sprawl and urban decline:

- The concentration of low-income households within the older core areas appears to be the single most important factor leading to the withdrawal of many viable households and firms from central cities and into outlying areas. In most commentaries about urban decline, the withdrawal of viable households from cities is attributed mainly to secondary conditions produced by concentrated poverty—high crime rates, poor-quality schools, and low levels of public services—not to the concentration of poverty itself.
- The racial attitude of whites toward living with minorities—especially African Americans—is the single most important factor causing the concentration of poverty, and of minorities, in central-cities.
- Three variables embodying aspects of suburban sprawl have a statistically significant relationship to greater urban decline and distress, as measured by the urban decline-distress index: (1) greater local government fragmentation, (2) greater overall metropolitan-area residential segregation, and (3) higher ratios of the percentage of poor in cities to the percentage of poor in suburbs. The three variables are all indirectly related to the exclusionary behavior of suburban housing markets.
- Several other factors closely associated with suburban sprawl seem to have no impact on city population growth rates or urban decline and distress. If sprawl has some role in the decline of cities, that influence is not being exerted through (1) unlimited outward extension of new development, (2) leapfrog development, (3) low-density residential and nonresidential development,

Table ES.17
Are the Alleged Benefits of Sprawl True Benefits to Society as a Whole?

Benefits of Sprawl	Perceived as a Benefit by Many People	Actually Caused by Sprawl or its Traits	Appears Widespread in Regions of the U.S.	Has Serious Negative Side Effects	Perceived as a Disadvantage by Many People	Unequivocally a Net Benefit to Society as a Whole
Lower land and housing costs	**Yes**	**Yes**	**Probably**	**No**	Partly	**Probably**
Larger average lot size	**Yes**	**Yes**	**Yes**	**No**	**No**	**Yes**
Larger home and room sizes	**Yes**	Not clear	Not clear	**No**	**No**	No, because actual extent of occurrence is not clear
Reflects low-density preferences	**Yes**	**Yes**	**Yes**	**No**	Unclear, some say not enough other choices are available	**Yes**
Shorter commuting time	Probably	Not clear	Not clear	**No**	Yes, because longer driving distances are involved	Not clear
Less-intensive traffic congestion	Only by a few people	Not clear	Not clear	**No**	Yes	No, because actual extent of occurrence is not clear
Lower overall transport costs	No	No	No	**No**	Yes	No
More efficient use of infill sites	Only by a few people	**Yes**	Not clear	**No**	Yes	No, because actual extent of occurrence is not clear
Neighborhoods with lower crime rates	**Yes**	Partly	**Yes**	Yes, partly caused by exclusionary behavior	**Yes**	No, because partly caused by exclusionary behavior
Better-quality public schools	**Yes**	Partly	**Yes**	Yes, partly caused by exclusionary behavior	Yes	No, because partly caused by exclusionary behavior
Greater consumer life-style choices	**Yes**	**Yes**	**Yes**	Yes, helps perpetuate exclusionary behavior	Yes	**Yes**
More homogeneous communities	**Yes**	**Partly**	**Yes**	Yes, based directly upon very exclusionary behavior	Yes	No, because based directly upon very exclusionary behavior
Stronger citizen participation and influence in local governments	**Yes**	**Yes**	**Yes**	Yes, helps perpetuate exclusionary behavior	**No**	**Probably**

Source: Anthony Downs, The Brookings Institution.
Note: Shaded cells show conditions supporting value of benefits

or (4) extensive dominance of urban transportation by automotive vehicles.

- Urban decline as measured by losses of city population is indeed a cumulative process, consistent with the hypothesis that urban decline contains self-aggravating elements.
- The linking of the U.S. development process to urban decline remains to be tested conclusively.

The analysis could easily lead to three erroneous conclusions: (1) that sprawl has contributed nothing to urban decline in the past; (2) that the sprawl-dominated growth process can be continued unchanged without any danger of aggravating urban decline in the future; and (3) that there is nothing wrong with continuing the low-density elements of the growth process in the future, since those elements have not contributed to urban decline. The low-density elements that constitute sprawl clearly contribute to other adverse outcomes.

PART IV—DEALING WITH SPRAWL

The Benefits of Sprawl

A preliminary inventory of possible benefits of sprawl identified in an earlier literature search (Burchell et. al 1998) is reviewed in detail to determine the benefits of sprawl to society as a whole and to specific groups within society.

The results of subjecting the perceived benefits of sprawl to six credibility measures are summarized in Table ES.17. Three of the 13 benefits of sprawl are indeed "true" net benefits to society as a whole, and two others probably fit into this category. The three potential benefits that clearly have merit are (1) larger average lot sizes at a distance from the center of a metropolitan area; (2) reflection of consumer preferences for low-density living; and (3) the provision of consumer households with more combinations of tax levels and social services than would occur under nonsprawl development. The two that are probably beneficial are (1) lower land and housing costs obtained when moving farther from each region's center, and (2) stronger citizen participation and influence in small, fragmented local governments rather than large, single political jurisdictions.

Only one universal benefit is definitely not a "true" benefit, because an earlier analysis showed that this condition did not really exist. This benefit is that sprawl produces lower overall transportation costs than more-compact forms of development. The transportation analysis showed that overall transportation costs would be higher under continued sprawl development than under more-compact development forms.

Four other conditions cannot be considered unequivocal benefits to society because it is not clear that they exist at a great enough scale across the nation to be socially significant. These are shorter commuting times, less-intensive traffic congestion, larger home and room sizes, and more efficient use of infill sites.

The remaining three benefits of sprawl are not unequivocally beneficial to society because they have seriously negative side effects or consequences: access to better-quality schools and access to neighborhoods with lower crime rates in peripheral areas distant from regional centers, and creation of relatively homogeneous neighborhoods. These conditions are surely perceived as benefits by the residents of those peripheral areas, but such neighborhoods achieve these benefits by engaging in economically and socially exclusionary practices that accentuate the consequent concentration of very poor households in inner-core, high-poverty neighborhoods. Therefore, the conditions that the residents of these outlying areas perceive as benefiting them cannot be considered unequivocally good for society.

The same criticism might be made about two other benefits of sprawl, both of which are based on the fragmentation of governance powers over land uses among many relatively small municipalities or towns. These are (1) a wider range of choices about combinations of tax and public-service levels and (2) greater citizen participation and influence in local government decision making. Neither wider choice of tax and public-service combinations nor greater citizen influence is inherently harmful to low-income households, though the outcomes of both benefits can produce such harm to poor households in inner-core, high-poverty neighborhoods. Moreover, both these conditions are widespread and highly valued by millions of Americans—enough so that they are regarded in this study as net benefits to society.

Surveying the results of the analysis of sprawl's benefits, is it possible to arrive at an overall conclusion concerning whether sprawl's "true" benefits—and others that surely contribute some positive results to many households—make sprawl an acceptable development form? Sprawl has benefits that can be measured, and these are reasonably significant. It has more costs that can be measured, and these are more significant. Sprawl has some benefits that cannot be measured empirically; these may be significant. Overall, from what can be measured, sprawl has more costs than benefits.

Developing Policies in Response to Sprawl

To formulate specific policies in response to sprawl's negative effects, the study has reviewed the literature and discovered that antisprawl advocates have proposed seven basic policy strategies to achieve a response to sprawl. These seven strategies are also key elements in the many approaches to "smart growth" proposed by different organizations, government agencies, academic observers, and others during the past few years. Each policy strategy consists of a broadly defined means (a tactic) of counteracting what its proponents believe are one or more negative effects of sprawl.

Encouraging more spatially compact development. Not all tactics are equally effective in making future regional growth more compact. The following tactics are most likely to help accomplish that goal: (1) regional urban growth boundaries; (2) regional urban service areas; and (3) state aid contingent on local growth zones. The next group of tactics can contribute significantly to more-compact regional growth if used by most counties in the metropolitan area concerned: (1) large-lot zoning in rural areas; and (2) physical restrictions on developable land. Finally, the tactics that are not likely to be effective in making future regional growth more compact are: (1) local urban growth boundaries; (2) local urban service areas; (3) high development fees and exactions; (4) adequacy-of-facilities requirements; and (5) transferable development rights.

Reducing society's dependence on private automobiles. Greatly increasing taxes on gasoline is the only tactic likely to have much effect in reducing automobile dependence in U.S. metropolitan areas, and even this is likely to have little effect. U.S. automobile users will choose different types of automobiles before they will choose not to own an automobile. All other tactics would have little effect on the present high levels of use of privately owned vehicles for ground transportation. In theory, high license fees and sales taxes might have some impact, but those fees and taxes would have to be increased immensely to be effective. However, neither of these two tactics has much chance of achieving political acceptability in the absence of another energy crisis like the one that occurred in the 1970s. Those few tactics with relatively high political acceptability—constructing light-rail transit systems and more bikeways and pedestrian walks—would have little effect on reducing overall automobile dependency in U.S. metropolitan areas. It appears that effectively implementing this basic policy will be extremely difficult.

Reducing the financial dependence of local government's revenues on property values and sales taxes within its own boundaries. The biggest problem with the tactic of tax-base sharing has been the political difficulty of getting it adopted, because it essentially redistributes future tax burdens from one set of localities to another. The localities that gain from this redistribution include those with relatively low per capita property-tax bases, especially those without much commercial and industrial property. The localities that lose—at least from a short-term perspective—are those with high per capita property-tax bases, especially those containing large amounts of commercial and industrial development. However, this last group normally has much more political influence in state legislatures and can therefore successfully resist attempts to shift their future tax revenues to less fortunate places.

Providing opportunities for low-income and minority households to move out of concentrated-poverty neighborhoods. Two fundamental obstacles must be overcome to make this strategy work. First, there is a large gap between the economic capacity of low-income households and the market costs of renting or buying housing units in nonpoverty neighborhoods. Second, the residents of nonpoverty neighborhoods frequently and vehemently resist the entry of households whose incomes are much lower than their own—especially if the incumbent residents are predominantly white and the newcomers are predominantly African Americans.

The effectiveness of providing opportunities for households from concentrated-poverty areas to live in the suburbs depends heavily on the scale at which the associated tactics are implemented. Several tactics could be quite effective in a region if used at a relatively large scale; these include inclusionary zoning, the regional use of HUD housing vouchers, and permitting owners of large single-family homes to develop accessory apartments. Two of these three mechanisms (involving zoning and accessory apartments) could be implemented on a large scale with little total cost in public funds. Others are not likely to be effective in a direct way, either because they are mostly hortatory (e.g., appointing a state regulatory barriers commission) or because they are almost certain not to be implemented on any significant scale (e.g., a housing trust fund and local-zoning overrides).

Introducing new elements of urban design into land-use planning. Because most of these tactics are so narrow in scope and, for the most part, involve changing the rules and regulations that govern the creation of new residential subdivisions, it is not appropriate to evaluate them with the same criteria of desirability used to evaluate the other policy tactics described here.

In fact, the impacts of all of these tactics on the negative effects of sprawl would mainly be confined to the microscale rather than to the macroscale. Most of the tactics focus on the aesthetic and efficiency qualities within individual residential subdivisions, rather than on the areawide effects of sprawl. Hence, even if these tactics were employed at a large scale in a growing region, they would not have much impact on many of the key adverse effects of sprawl.

Revitalizing concentrated-poverty and other neighborhoods in inner-core areas. The most effective tactics for inner-core-area revitalization are reducing crime rates and increasing security, and improving the quality of public schools. The next most effective tactics are locating all new public facilities in inner-core areas and encouraging major institutions located there to make large investments in improving their surroundings. If carried out at a large enough scale in a single neighborhood, these two tactics in themselves have the potential to completely revitalize that neighborhood. That is also true of making vacant parcels available for immediate development by entrepreneurs (in the case of a single large vacant parcel developed as a unified project) and reducing or abating taxes (again, if done for a single large development project that dominates its neighborhood). However, these two tactics are most often done at a smaller scale, and therefore fall into the category discussed next.

Another set of tactics essentially removes general obstacles to long-term improvements in many neighborhoods but would not accomplish revitalization in any one area quickly. These tactics include streamlining all city approval and permit-granting procedures; reducing requirements for overly expensive building materials or methods; making vacant parcels available for immediate development by entrepreneurs; reducing or abating taxes on new or rehabilitated structures; using Community Development Block Grant funds to improve local amenities; ending rent controls; giving owners of large single-family homes the right to create accessory apartments; and ending restrictions on the use of mobile or manufactured housing.

The last tactic—using separate tax rates for land and buildings—is a long-run reform tactic that would take many years to have a major effect.

Creating regional agencies to review and coordinate land-use plans drawn up by individual localities. The resulting inherent tension between the regional effects of land-use decisions and the purely local perspective of those who make or regulate such decisions poses the single greatest challenge to effective and efficient planning and action within each region. Therefore, one key strategy for effectively coping with growth-related problems is to create one (or, in some cases, more than one) regional organization that has the responsibility and the legal and political authority to coordinate the land-use and other related plans developed by individual localities and other government bodies.

Future Research on Sprawl

Although this report is an important and necessary first step in the defining of sprawl and its impacts, much work remains to be done if this research is to bear fruit. The missing knowledge about sprawl and its impacts must be filled in. As such, a meaningful research agenda should be put into place. This means committing the transportation, land-use, and housing research communities to achieving this agenda and, by so doing, achieving the goal of a sustainable and fulfilling life for all citizens of the United States.

The report lists additional research efforts that must be undertaken to better understand sprawl. Each of the research agenda items described is given a score based on the following three evaluation criteria: societal importance, conceptual difficulty, and practical ease/costs of completion. From the list of future research items, about one-quarter, or 11, emerge with the highest combination score of societal importance, conceptualization ease, and lowest practical costs of implementation:

Defining and measuring sprawl. (1) Create a microdefinition of sprawl involving specific inclusion and arrangement of land-use elements.

Land consumption aspects of sprawl. (2) Determine average land consumption per capita or per household in the United States and use it to view the effects of various types of growth on inventories of critical lands. (3) Define or map prime agricultural land using soils or other criteria. (4) Determine at what percentage of market price a "taking" is initiated for various categories of privately held land.

Sprawl and infrastructure impacts. (5) Provide multipliers relative to value or scale of development which help to project the necessary future capital costs of serving this development.

Sprawl and transportation impacts. (6) Analyze the separate and intertwined impacts of regional, community, and neighborhood scale effects on travel behavior.

Sprawl and quality-of-life impacts. (7) Analyze statistically the relationship between housing costs and distance from the center of metropolitan areas.

Sprawl and social impacts. (8) Prepare an outreach guide on best practices to engage community groups in antisprawl efforts.

Sprawl and public choice. (9) Determine the extent of and sort through the various layers of consumer preference for sprawl development.

Sprawl and private-sector activities. (10) Determine ways that the market could be redirected to achieve antisprawl development patterns.

New tools for sprawl control. (11) Prepare a smart-growth handbook with techniques keyed to context of development.

What has been produced here is a listing of the research projects that are both important and relatively easy to carry out. That does not mean that other more difficult research should not be initiated. Those research topics are identified elsewhere in the report, but examples follow. Clearly research on the benefits of sprawl is underrepresented in the literature and must be undertaken. Additional studies must also follow on the relationship between sprawl and quality of life, and sprawl and urban decline. A better definition of sprawl must ensue; so too must a more-encompassing sprawl index.

CONCLUSION

Sprawl is an issue recognizable to the general public. Residents of the suburbs experience congestion, separation, and a loss of sense of community. They perceive that most shopping centers and strip malls are ugly and that the amount of land that is being consumed by development is leaving less land for future agriculture and open spaces. A small portion of the public has been introduced to a different way of organizing suburban neighborhoods. This new organization includes mixed land uses and housing types, new types of street and structure architecture, and the provision of central places and open space to make neighborhoods meaningful. Those who have been introduced to it like the concept, but only a small share of those eligible opt to purchase a home in such developments. Thus, between those who are unaware of an alternative development form and those who are aware and consciously seek the traditional development form, a large number of people have not challenged sprawl sufficiently to significantly alter development patterns. Why is this true? In terms of significant individual concern, traditional development has delivered all but a congestion-free environment. There is some minor dissatisfaction caused by the current aesthetics of development or land consumption per unit of development, which is double what it was in 1950, but on the whole, sprawl is delivering what most consumers want: safe neighborhoods, appreciating housing values, and unrestricted use of their automobiles. Complaints other than congestion, aesthetics, or resource consumption are relatively few.

On the other hand, one must recognize that in 1998, 72 percent of the 240 state or local ballot measures related to open-space protection, land conservation, parklands acquisition, and smart growth passed. The measures amounted to $7.5 billion in additional state and local conservation spending. Further, both major political parties have taken positions against urban sprawl. The National Association of Homebuilders, Fannie Mae, and the Mortgage Bankers Association have recently published monographs on the antidote to urban sprawl—smart growth.

This study has attempted to fairly place the evidence of sprawl and its impacts before the general public for review. It has been the purpose of the study to explain why the public and academics alike are so divided on the consequences of sprawl and why the topic has so defied understanding. Now with better understanding and more information, the two traditional positions—for and against current development patterns—need not be so polarized.

What has been found after four years of studying sprawl and its effects? First, sprawl is the dominant form of growth occurring in major metropolitan areas. Even in metropolitan areas where there is no net new growth, the transfer growth (i.e., growth that shifts from one area to another) is sprawl growth. Thus, in the United States in 2000, three basic conditions exist. There are rural or undeveloped counties (approximately 2,100 counties) in which a small amount of

growth or no growth is occurring. Growth is too inconsequential in these counties to be called sprawl, although its characteristics are clearly sprawl-like. There are urban centers and urban or developed suburban counties (approximately 250 counties) that are declining or growing slowly, not sprawling. In these counties, growth is negative or barely keeping up with decline. Also in this group are a few urban counties that are growing. However, most of the development occurring in these locations is not of the sprawl type. Finally, there are rural, undeveloped, or developing suburban counties (approximately 750 counties) where growth is initially all sprawl. This study focuses on the last group of counties to document the magnitude of sprawl and to analyze its effects.

The effects of sprawl growth are mixed. There appear to be more costs than benefits of sprawl growth, and many of these costs are measurable. Benefits of sprawl are fewer and often do not lend themselves to measurement. In terms of costs, sprawl development consumes land and various types of infrastructure to a level that compact development does not. Sprawl development also provides fewer positive fiscal impacts (more costs and less revenue) than compact development provides. Furthermore, sprawl development does not often come in a form that provides for significant amounts of attached or multifamily housing. Since a mix of housing types is not provided, primarily single-family units on larger lots at the periphery of the metropolitan area are chosen, and lower-priced urban housing markets are not. Overall, housing costs are greater under sprawl development. Finally, personal travel costs, primarily linked to the automobile, are higher in sprawl locations. This is due to an absence of transit and the inability to make nonmotorized forms of transportation attractive.

Sprawl does provide less expensive single-family housing at the periphery of metropolitan areas. It also provides congestion management: Sprawl creates the suburb-to-suburb work trip, making urban areas less congested and the overall traffic pattern less focused on the major centers within metropolitan areas. In addition, sprawl also allows households to choose a variety of community settings in which primarily single-family housing is available and local governments are small and accessible. Americans are generally satisfied with this choice.

On the other hand, retiring baby boomers and surges in immigration, are creating a new demand for centers and urban places. Of these, the locations that will receive sustained future development demand must be safe and interesting, and they must offer some share of the population the ability to access functioning public school systems.

The draw of more-centralized living places, must be viewed as, at best, an emerging trend. The vast preponderance of both initial and trade-up housing demand will require single-family housing in sprawl locations. This is the current and future pattern of development.

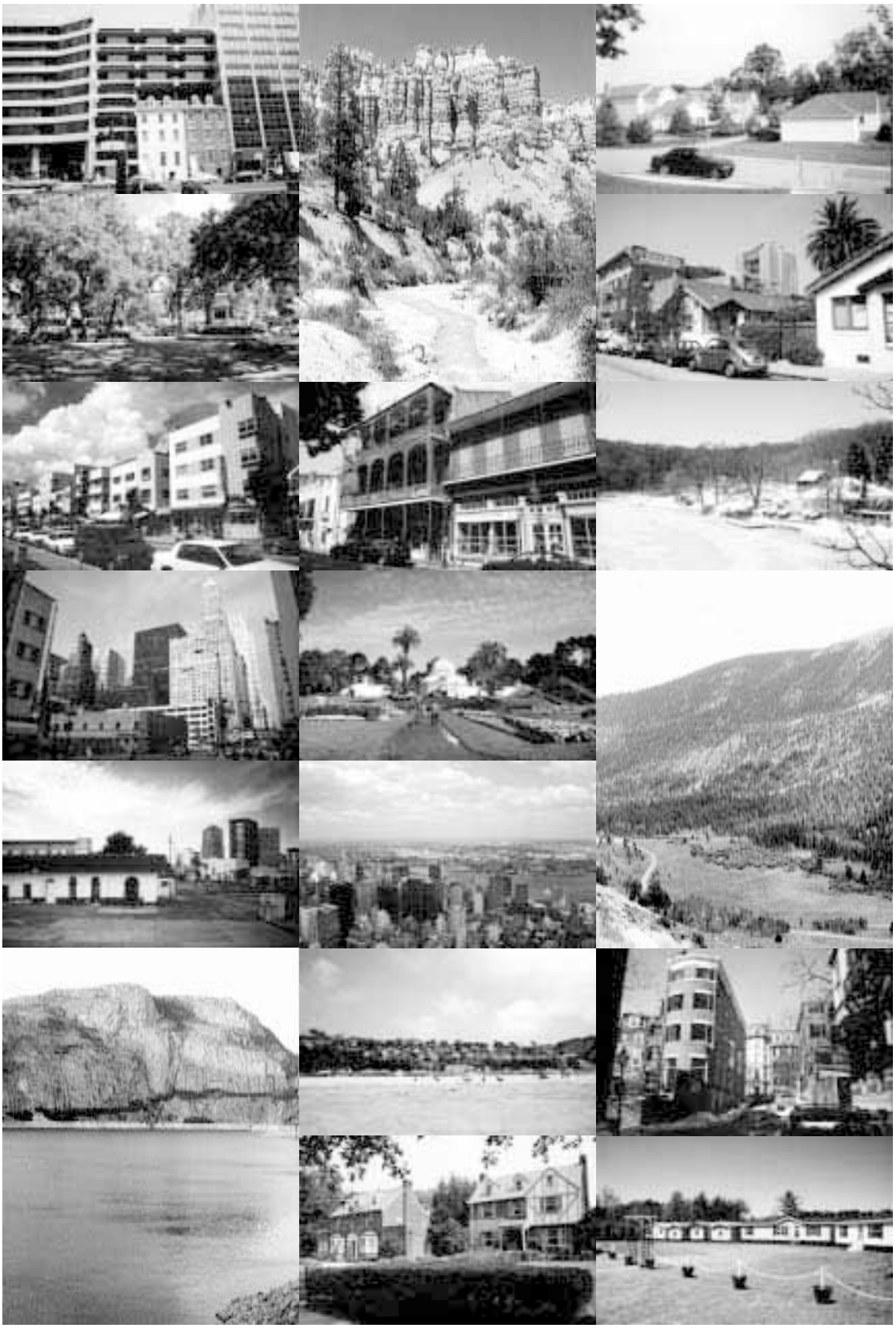
The cost of this locational pattern in dollar outlays and resources consumed is both continuously increasing and basically unnecessary to achieve a very high quality of life. Too much land and infrastructure are being consumed by development. Two sets of infrastructure are being created and both are underutilized: the one Americans are running away from (cities and older developed suburbs) and the one they never catch up with (the new spreading development). This development pattern results in overly high costs to local governments, developers, and housing consumers. As a result, taxes are increasing in the older communities due to excessive capacity in their infrastructure and in the sprawl developments due to the need for required systems to serve the new growth, including such such physical infrastructure items as community water and sewer.

It is possible to accommodate growth in another way—to be more centrally focused in development patterns and to consume fewer resources when development takes place. This is compact development, or smart growth. Smart growth allows all development that would have taken place under uncontrolled growth to occur, but it directs that development to locations where it is more efficient to provide public services. This allows appreciable savings in a relatively short period of time. Resources need not be as aggressively consumed, yet the amount of residential and nonresidential development is not altered. That is the message of this study. Sprawl produces costs in dollar outlays and in resources consumed, but these costs are deceivingly bearable in the short run. The benefits of unrestricted freedom of choice of neighborhood and lower housing costs seem worth the cost. In fact, they probably are. However, these benefits can be achieved through compact development with little loss of freedom of choice or housing value and with significant savings of man-made and natural resources. Smarter growth appears to be a reasonable approach and a relatively easy choice for future development in the United States. Committing to and implementing smart growth is a much more difficult task.

This page intentionally left blank.

PART I

SETTING THE SCENE



Introduction to Part I

Part 1 of *Costs of Sprawl—2000* focuses on a discussion of the magnitude of the current United States population as well as its projected growth. Sprawl is identified and quantified as an element of overall projected growth. Chapter 1 begins with a discussion of the historical evolution of sprawl, especially as it relates to the original separation of core and outer-city neighborhoods as well as cities and suburbs. The point being made here is that the same form of separation between sectors of a city or a city and its surrounding political jurisdictions has been in existence for a long period of time. A portion of this chapter also deals with future trends and their likely impact on development.

Both past and current trends are important. Although sprawl's origins are often linked almost exclusively to the rise of the automobile, sprawl clearly was present in the days of the streetcar, and earlier. Furthermore, both future immigration and retirement will affect the demand for housing in central places. Redirection of population as an antidote to sprawl cannot occur without the growth of central-city real estate markets. Once both growth origins and future trends are understood, the two growth alternatives are explicitly defined in chapter 2. Definitions of counties as urban, suburban, rural, and undeveloped, based on geographic location and density, and a definition of sprawl involving level and location of growth are incorporated.

In chapter 3, growth in the United States is projected for the nation as a whole, for regions, and for counties. This is the base projection used throughout the remainder of the study. Variations in growth by region and type of development are also discussed in this chapter.

In chapter 4, the two growth alternatives (one characterized by spread development, one by compact or "smart" development) are projected at the county level for all counties of the United States and the incidence of sprawl is measured nationally. Under the second scenario, sprawl is controlled by directing a portion of future county growth in population and employment to the county's most developed portions (intracounty redirection) and a portion of development from the outer counties of the metropolitan area to the inner counties (intercounty redirection). This manipulation of population and employment under compact development establishes the comparative base for all future impact analyses. Impact assessments are undertaken at the national level using all 172 economic areas.

Chapter 5 takes a closer look as this process unfolds in 15 specific economic areas. Economic areas in New York, Florida, Texas, California, Oregon, Illinois, and other states are examined to determine whether this type of redirection is both feasible and sensible, given the potential for development and prior growth rates of inclusive counties. These case studies establish the practicality of method; nationwide impacts are studied in Parts 2 and 3.

Courtesy of R. Ewing

I

Sprawl and Its Historical Context:

The Past and the Future

STUDY OBJECTIVE

On a weekly basis in the United States, the issue of land development and its negative effects is brought before the American people. In speeches known for their passion and evangelical nature, researchers from the National Trust, the Conservation Fund, the Sierra Club, the Audubon Society, the American Farmland Trust, the Environmental Protection Agency, the American Planning Association, and others call for "an end to reckless consumption of natural resources and the destruction of the American landscape." This is a call to stop sprawl, save land, build less development infrastructure, and reduce both the costs of development and the costs of providing public services to this development (Weitz 1999b).

Just as passionate are responses from the National Association of Homebuilders, Realtors, the Farm Bureau, and conservative institutes such as Heritage, Cato, Pacific, and Reason that claim American property rights are being abridged en route to fixing a development problem that is not broken. In their view, sprawl is suburban development that allows people to own a home, enjoy good public education, and live in safe environments at relatively low costs. In addition, supporters proclaim that congestion is bearable, the U.S. has a lot of resources, automobiles are efficient, people like what they have, and for the most part, the system works (Staley 1999a). Further, they caution that those who would tamper with the system do so at their own and society's risk (Shaw and Utt 2000).

The press is involved. In the summer of 1999 alone, the popular media repeatedly notified the public of the perils of sprawl. Sprawl was featured in a segment of CNN's *Year 2000 Millennium Series* that cited Arthur Levitt's 1950s Long Island, New Jersey, and Pennsylvania building activities as examples of what can be learned from the past and done better in the future. Governor Roy Barnes of Georgia was profiled in the July 1999 issue of *Newsweek* after he created a 13-county regional transportation agency (Georgia Regional Transportation Authority) to deal with Atlanta's traffic congestion and resultant failure to comply with the Clean Air Act amendments. In the August 1999 issue of *Business Week,* the 10th of "21 Ideas for the 21st Century" identified ways to combat urban sprawl as a "smart" strategy to improve both existing and new living environments (Burchell, Listokin, and Galley 2000). In the September 1999 issue of the *New Yorker*, two books on a new urbanist, antisprawl living environment, Celebration, FL, were reviewed. Finally, in a February 2001 edition of the *New York Times Book Review,* Peter Calthorpe and William Fulton's new book, *The Regional City: Planning for the End of Sprawl,* was reviewed. Sprawl and its impacts, correctly or incorrectly stated, are

becoming increasingly well known to the public at large (Lessard 2001).

The press is also caught up in the sprawl ping-pong game. Trying to be fair, journalists present information taken from both sides of the issue, with little ability to sort and distinguish between conflicting information. Often the same statistics and sources of data are presented with radically different interpretations. The American public is in a quandary. There is a general feeling on the part of most Americans that sprawl is ugly, it causes congestion, and the neighborhoods it creates have no sense of community. On the other hand, Americans, basically content with their lifestyle though willing to make course corrections, are unwilling to surrender what they have known for most of their lives.

It is the purpose of this study to carefully analyze the costs and benefits of sprawl and present this information fairly. This must begin with a basic discussion of definitions and data sources, an analysis of national growth, and, ultimately, projections of sprawl throughout the United States by differing levels of geography. First, though, it is necessary to discuss relevant historical forces and their impact on the geography of the United States. That is the focus of this chapter.

SPRAWL IN THE NEW MILLENNIUM—WHERE HAVE WE BEEN AND WHERE ARE WE GOING?

The Good Old Days—Unlimited Supply of Land and Resources

If the sprawl that we know today is characterized by low-density, leapfrog development and unlimited outward expansion, then this is clearly a reflection of the early settlement pattern of the United States. A central component of the nation's development history is the idea that the supply of land is unlimited. During the colonial period, the U.S. was perceived as a vast expanse of land and natural resources available to all comers. Whoever settled and controlled the land had free access to those resources. The British government aggressively promoted settlement of the frontier by granting large tracts of land to individual proprietors or companies. The cities that sprung up in those days were not major employment centers; instead they were oriented around shipping, warehousing, and other port activities whereby resources from America (e.g., furs, sugar, tobacco, wheat) were shipped to Europe and other countries in exchange for finished goods that the colonists could not produce for themselves (Turner 1986).

Following the American Revolution in 1776, a new constitutional government took over all western lands beyond the original 13 states, then helped expand the boundaries of the frontier by acquiring and/or surveying new lands for settlement (Turner 1986). Regional land offices sold or deeded land to settlers under favorable terms. In 1790, the population of the United States was about four million, somewhat evenly divided between the Northeast and South Regions (U.S. Department of Commerce 1999). Although settlers were also present in other regions, especially what is now the Midwest, their numbers were insignificant. *Because people needed to be relatively self-sufficient, and because the country's economy relied heavily on the exportation of agricultural commodities, people resided on lands in agricultural use—i.e., family farms or large plantations. More than 95 percent of the population lived in rural areas* (U.S. Department of Commerce 1999).

The recognition of geographic regions goes back to the colonial period of American history. By the eighteenth century, the names New England, the Middle Colonies, and the South had come to refer to major sections of the Atlantic seaboard. Each of these regions encompassed several adjacent colonies or areas of settlement. The regional designations reflected particularities of location, climate, topography, economic systems, ethnic composition of the settlers, and systems of local government. One early use of these areas in a statistical compilation dates from before the American Revolution, when the British government grouped the North American colonies into ma-

Courtesy of C. Galley

Courtesy of T. Delcorso

jor colonial regions to summarize foreign trade information. These regions were New England, Middle Colonies, Upper South, and Lower South.

These colonial groupings were the forerunners of the state combinations that appear in census publications. In fact, the area called New England in colonial times maintains its geographic identity to the present day; except for Vermont, which was part of New York. Much the same is true of the Middle Colonies; except for Delaware, which is now in the Census Bureau's South Atlantic Division, New Jersey, New York, and Pennsylvania remain the component states of the Middle Atlantic Division. (Maryland and Virginia constituted the Upper South; North Carolina, South Carolina, and Georgia, the Lower South.)

The 1800s were characterized by continuous westward expansion, aided by the discovery of gold in California and the extension of the railroad across the country. The Midwest was settled during the first half of the century, resulting in several new states joining the Union. By 1840, the nation had grown to 17 million people, with nearly 7 million each in the Northeast and South Regions, and about 3 million in the Midwest Region (U.S. Department of Commerce 1999).

Settlements on the West Coast began to emerge around the middle of the 1800s. Thousands of people migrated from the Midwest to Oregon beginning around 1830 (New Oregon Trail 1999). The Gold Rush of 1849 attracted people from all areas of the nation to California.

Between the 1850 and 1860 censuses, the Census Office divided the country into three great sections: (1) the Eastern on the Atlantic Coast; (2) the Western on the Pacific Coast; and (3) the Interior, encompassing the states of Alabama, Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Michigan, Mississippi, Missouri, Ohio, Tennessee, Texas, Wisconsin; the territories of Kansas, Minnesota, Nebraska; and the Unorganized Territory of Oklahoma.

In many respects, this foreshadowed the present arrangement of Census regions and divisions. The Northern Division of the Eastern Section is today's Northeast Region; the Southern Division of the Eastern Section comprises the present South Atlantic Division; the Southern Interior corresponds largely to today's East and West South Central Divisions; the Northern Interior resembles the Midwest Region; and the name Western Section still applies to much the same area now referred to as the West.

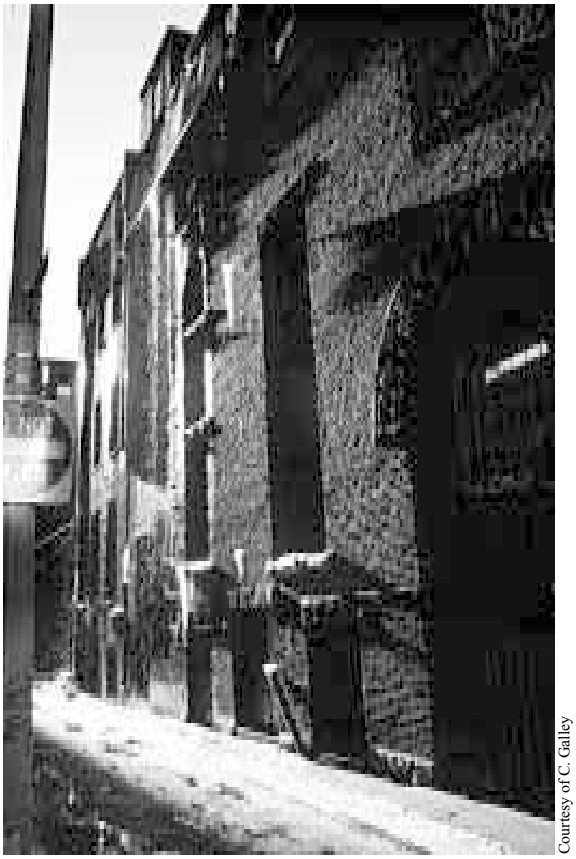
Although the West Region first officially appeared in census counts in 1860, with 179,000 people, it was not until 1890 that Census tabulations revealed that the "frontier" had become history (U.S. Department of Commerce 1999, Turner 1986). The continuous line that previously could be drawn across the West to delineate the frontier's boundary had finally reached the West Coast. At this time, the United States had 63 million people—three million in the West and 17 million to 20 million in each of the other three regions. The nation had grown from 17 million to 63 million over a 50-year period (U.S. Census 1999).

Even with the loss of the frontier, however, the supply of undeveloped land seemed enormous. *The majority of the land was undeveloped, agricultural, or rural. Large areas within the U.S. still remained relatively unsettled, although the expansion of the railroads, which reached Oregon in 1883, made interior lands more attractive to growth and development*. The railroad clearly played a crucial role in the development of the West. Railroad mileage during the last half of the nineteenth century expanded from 9,000 to 193,000 miles (Krueckeberg 1994).

From this period on, the West has shown more relative growth than any other region. Even during the Industrial Revolution, the out-migration of major urban areas during the 1960s and 1970s, and the ultimate reversal of the migration north starting in the late 1970s and early 1980s (postindustrial America), the West has continuously had the fastest growth rate of any U.S. region.

The Pre- and Postindustrial Revolution—Growth of Cities

Concurrent with the loss of the western frontier was the rise of cities as employment centers, primarily before the Industrial Revolution. Of the 50 largest cities today, only seven were incorporated before 1816; 39 were incorporated between 1816 and 1876; and only four have been incorporated since 1876. Preindustrial cities were different from industrial cities. The preindustrial cities were densely packed. They were compact walking cities. The radius of the largest cities did not extend over three miles. An examination today of the old central areas of cities such as Philadelphia, Boston, Baltimore, or Charleston reveals block after block of closely spaced town houses (Palen 1995). Lots were commonly only 20 feet wide and occasionally even narrower, with houses built right on the lot line. Front yards were nonexistent,



Courtesy of C. Galley

with houses even of the wealthy fronting on the sidewalk, which in turn was immediately adjacent to the street. Overall the American city mixed commercial, residential, and even manufacturing activities, but each large city had a few blocks of homes of the wealthy residents crowded near the center of the city. Often these elite homes were only a block or two from far more humble housing.

Cities were densely packed as a matter of practicality. Before the era of rapid and inexpensive mass transit, it was a major inconvenience to be outside of the central area. Thus, peripheral areas were given over largely to the poor and those on the fringes of society. In an era of slow, uncomfortable, and expensive transportation, the families of means took the center, and the poor were more likely to be relegated to the periphery (Palen 1995).

From 1760 to 1830, the Industrial Revolution was largely confined to England. During the mid to late 1800s, industrial growth became a key component of the U.S. economy. This was characterized by the meatpacking and steel industries in the Midwest, the

lumber and textile mills of the South, the ore mines in the West, and a variety of industries in the Northeast. Assembly-line production methods were adopted in industries where products had formerly been handmade. Many European immigrants now sought employment in the cities, whereas previously they would have helped to settle the frontier.

The introduction of industrialization initially encouraged centripetal rather than centrifugal forces. Urban densities increased, and cities became more crowded. Within the cities the new manufacturing plants and industrial factories concentrated in areas near but not in the central core. Since property at the very center of the city was too expensive for industrial usage, industry usually located in a ring surrounding the central core. An industrial city thus saw the preindustrial pattern of downtowns with a mixed residential and business usage being supplanted by the industrial pattern of downtown land being devoted to commerce and business, while the next zone was one of industry and tenements for minimally paid workers. *Whereas the nation's early pattern of growth and development had been one of spatial dispersal into undeveloped lands, it now began to shift toward one of growth in established urban areas.*

The 1890 and 1900 Census publications included data on land area and demographic items, such as the geographical distribution of counties and minor civil divisions, as well as city, urban, and rural populations. The introductory text of one 1890 Census report had a feature on the evolution of population concentrations in cities and the stage of its progress. It designated manufacturing as the predominant industry of the North Atlantic cities and agriculture as the predominant industry of the North Central states. It further characterized the South Atlantic and South Central states as almost entirely agricultural, in contrast to the West, where the leading industries were mining and grazing. Many of these were just outside major cities (U.S. Department of Commerce 1999).

Courtesy of C. Galley

This trend continued throughout the first half of the twentieth century. In 1900, most people lived or worked on a farm. Agriculture as a way of life, however, was in decline. From 1900 to 1950, the fruits of the Industrial Revolution led to agricultural operations that were larger and more automated, and the growth of large corporate operations in the agricultural industry began to render smaller family farms inefficient and outmoded. In the South, the cotton industry suffered from floods and boll weevil damage, leading to a loss of jobs (Morrill and Donaldson 1979). When European immigration came to a halt in the early 1900s, factory owners from the Northeast recruited unemployed blacks from the rural South, resulting in substantial migration—first to the Northeast cities and later to the Midwest (Morrill and Donaldson 1979).

The period from 1900 to 1950 was also characterized by rapid population growth and development. During this period, the U.S. population doubled, growing from 76.2 million to 151.3 million (U.S. Department of Commerce 1999). Although most of the population was distributed somewhat evenly among the Northeast, South, and Midwest Regions, the West was growing quickly, increasing its share of population from 6 percent in 1900 to 18 percent in 1950.

1950s to 1970s—Intrametropolitan Shifts

The next era in U.S. growth was the migration from urban to suburban areas by those who could afford it. The growth of suburbs was a reaction to the ills of industrial cities: dirt and grime, air pollution, high crime rates, and dilapidated housing owned by absentee landlords (Banfield 1970). Upwardly mobile city residents sought to become property owners, and they wanted single-family homes in clean, spacious suburbs among people with similar racial and ethnic backgrounds (Gans 1970). The expansion of streetcar and subway lines enabled people to live outside the cities where they were employed. Thus, the Industrial Revolution that had originally brought households into the cities now provided the means for them to leave it.

The period following the end of World War II in 1946 was one of especially rapid growth and construction

Courtesy of A. Nelessen

in the suburbs. Among the 20 largest cities in 1990, five had a population density of 10,000 or more per square mile, five had a density of 5,000 to 9,999, and 10 had a density under 5,000. Among the 20 largest cities in 1910 and in 1950, 13 had a population density of 10,000 or more per square mile, four had a density of 5,000 to 9,999, and three had a density under 5,000. A population that had grown up on the farm did not necessarily want to return to it.

Federal subsidies enabled many returning World War II veterans to obtain inexpensive mortgages for single-family homes, as well as assistance in attending college. Workers' residential locations were no longer bound by rail and transit lines as increasing auto ownership provided unprecedented freedom in allowing people to easily commute to jobs from any given point in the surrounding suburbs. The automobile made possible the development of previously inaccessible land not served by mass transit. It became a commuting necessity and created commuter suburbs. Commuter suburbs were built at lower densities than earlier suburbs that were tied to fixed transit lines.

Both newer and more established suburbs also began using the relatively new planning tool of zoning in order to exclude not only commercial activities but also inexpensive homes on small lots. Commuter suburbs built before the Second World War largely were bedroom suburbs. They remained dependent on the central city for employment, entertainment, major shopping, and most services.

In the 1960s, racial transition of neighborhoods and racially based rioting following the assassination of Dr. Martin Luther King also contributed to the decline of center cities and the growth of suburbs. This migration to the suburbs was further aided by the decline of manufacturing industries and the jobs they provided; hence, the inner city became even less desirable. Altogether, cities such as St. Louis, Buffalo, and Detroit lost from 35 percent to 47 percent of their population between 1950 and 1980.

By the 1970s, the postwar pattern seemed set. Whites, for a variety of racial, educational, lifestyle, and tax reasons, would continue to out-migrate to the suburbs. Racial minorities, on the other hand, with few exceptions would become ever more concentrated in the cities (Abrams 1967). The assumption that this is the inevitable future continues to be "popular wisdom" today, in spite of a quarter of a century of white inner-city revitalization and gentrification and black suburbanization.

By 1974, the year in which *The Costs of Sprawl* was published, 70 percent of the population lived in metropolitan areas, and more than one-half of this population lived in the suburbs (U.S. Department of Commerce 1970). The growing service and retail sectors, which were not dependent on locations near waterways, were following the population and locating in suburban areas. Traffic congestion and obsolete office space in older cities encouraged many corporate offices to move to new facilities near the labor market: the suburban rings outside central cities.

This was also an era of environmental awakening. Rachel Carson's *Silent Spring*, published in the 1960s, was instrumental in raising public consciousness about the dangers of uncontrolled industrial development. The far-reaching National Environmental Policy Act was passed in 1969. At about the same time, the destruction of dilapidated inner-city areas to accommodate regional expressways, with the concomitant placement of the former residents into high-rise buildings, had come to be seen as detrimental to community health. Concerns about global population growth, food and water supply, air pollution, loss of open space and viable farmland, consumption of fossil fuels, and loss of endangered species all contributed to the period of uncertainty and transition in U.S. development that formed the backdrop for the research in the original *Costs of Sprawl* study. *The public consciousness was shifting from one of exuberant growth and expansion—conquering the frontier, competing in the global industrial economy, achieving the American dream of suburban homeownership—to one of concern over the allocation of finite resources*.

Enter the Costs of Sprawl Study

The Costs of Sprawl was a landmark study because it clearly demonstrated what local officials had suspected but had not been able to prove: sprawl development was more expensive than alternative growth patterns. The economic forces that favored sprawl development could now be countered with the quantitative economic impacts that sprawl caused to taxpayers. Suburban sprawl was no longer defined in terms of subjective quality-of-life issues; it could now be defined in terms of quantified negative impacts (Real Estate Research Corporation 1974).

Courtesy of S. Pashman

The reality of this exuberance was short-lived because the research methods of the 1974 study were found wanting. The fact remained, however, that this document was used more frequently than anyone would have anticipated in various governmental hearings dealing with the ills of sprawl development (Burchell et al. 1998).

During the period since *The Costs of Sprawl* was published, planners and urban designers have continued to work on implementing alternatives to the sprawling, cul-de-sac suburban developments that had grown up in most metropolitan areas. Early on, these included the concept of satellite cities—planned cities deliberately located some distance from major cities in order to absorb the demand for residential and nonresidential development without contributing to center-city traffic congestion. More recently, the focus has shifted to town centers, traditional neighborhood development (TND), transport-oriented development (TOD), sustainable development, New Urbanism, and smart growth as concepts that attempt to combine balanced regional growth with the need to conserve and preserve resources (STPP and CNT 2000).

In spite of the emerging public consciousness about preservation of open space and agricultural land, however, market forces continue to favor sprawl development. New development continues to seek out nonmetropolitan and non-central-city locations, the percentage of single-family homes among all housing units has increased in the 1990s, and single-family house size has increased every year since 1970 in spite of continuously decreasing household size over an equivalent period of time. Yet, to be fair, the past 25 years have brought some changes in new development patterns. A variety of programs are in place to preserve wetlands, natural habitats, and forested/agricultural lands. However, new growth continues to occur in areas that should be considered inappropriate if available infrastructure, urban amenities, and developable land are to be used efficiently.


Courtesy of R. Ewing

Beyond the 1970s—Intermetropolitan Shifts

Starting in the 1970s, the South and West began to grow in earnest. Not only was there a push-pull phenomenon between urban and suburban locations in most established metropolitan areas (intrametropolitan shifts), there was a loss of the increment of growth from established metropolitan areas to newly forming metropolitan areas. Thus, the South and West Census regions were growing at the expense of the Northeast and Midwest. In the 1970s, it was a subtle trend; in the 1980s and 1990s, it accelerated. In 1960, 55 percent of 60 million housing units (33 million units) were in the Northeast and Midwest regions; in 2000, 55 percent of 115 million units were located in the South and West (63 million units). Over that forty-year period, housing units in the South and West increased by 36 million or 133 percent; housing units in the Northeast and Midwest increased by 19 million or 57 percent. This amounted to an almost doubling of absolute growth in the former. Thus, in northern metropolitan areas, in addition to push-pull urban and suburban intrametropolitan trends there was a lessening in the increment of absolute population gain.

This weakened the tax bases of northern cities tremendously. In the southern and western metropolitan areas, there was the push-pull forces of intrametropolitan shifts but the tremendous growth in size of the overall metropolitan area dampened their effects. In these areas city boundaries were also allowed to expand through annexation. This lessened somewhat the growth pressures on surrounding suburbs and further mitigated inner-city decline in these regions.

The 1980s and 1990s—The Force of Immigration

Starting in the mid-1960s and continuing through the 1990s, immigration increased slowly at first and then took off in the 1980s and 1990s. In the 1990s, as over 2.5 million native born Americans fled the nation's densest cities, over 2.3 million immigrants came in. The impacts were greatest in eight major cities: New York, Los Angeles, San Francisco, Miami, Chicago, Dallas, Houston, and Washington, DC. These cities received two-thirds of the estimated 20 million legal and a million illegal immigrants who arrived over the past quarter century (Myers 1999).

In 1930, one in four residents of New York, Chicago, Los Angeles, and San Francisco came from abroad. This was twice the national average. In 2000, one in three residents of these cities was foreign born. This was five times the national average. Thus, in 2000, large unique and/or coastal cities have prospered from immigration while large interior or second-order cities have not. Immigration has already helped select cities stem the tide of intrametropolitan and intermetropolitan shifts (Myers 1999).

The Next 25 Years—An Aging Population and an Electronically Oriented Economy

An effective approach to changing the pattern of development must be practical, and it must take into account emerging future trends. As the United States confronts 2000 and beyond, there are economic and cultural trends that will clearly affect development into the future. First and foremost, the concept of unlimited land and resources around existing areas of development no longer applies. Landscape archi-


Courtesy of R. Ewing

tects, planners, and economists of the future must now determine how available resources are to be allocated.

Regardless of how resources are to be allocated, certain aspects of overall growth trends are not likely to change. The United States has been adding 10 million to 12 million persons in five million housing units every five years over the past several decades, and it is likely to continue to do so for at least the next quarter century. The majority of this addition has been, and will continue to be, within U.S. Census-defined metropolitan areas.

The United States economy exited the first year of the new century in a fashion quite different than its departure from the final year of the old century. Growth in Gross Domestic Product (GDP) was red-hot in the fourth quarter of 1999 (8.3 percent); it was barely lukewarm in the fourth quarter of 2000. Fourth-quarter 2000 GDP growth was 1.0 percent, about one-sixth that of the same year-ending period of 1999. GDP growth in the second half of 2000 (1.8 percent) was less than 40 percent that of the first half (5.2 percent) (Hughes and Seneca 2001).

Thus, the United States entered the valley of slow growth in the third quarter of 2000, when GDP grew by only 2.2 percent. The fourth quarter then saw a further slowdown as the national economic psychology drastically shifted. In March 2001, the United States was in a recession; in September 2001, the economy nearly came to a halt. Nonetheless, the 1990s and 2000 were strong economically and produced the following trends:

- An economic expansion that lasted 125 months. This contributed to a resurgence of downtown cores such as Denver, Dallas, Houston, and Fort Lauderdale, as well as continued viability of high-end enclaves distant from major cities such as Bedford, New York; Princeton, New Jersey; Hopkington, Massachusetts; and Bend, Oregon.

- The highest GDP growth rate in 10 years. In 2000, the Gross Domestic Product of the United States was about $9 trillion and was growing at a rate (in constant dollars) of approximately 3 percent per year.

- In 1999 and 2000, the highest levels of single-family home production and resales in 20 years. For the 10-year period 1991 through 2000, more than one million single-family homes were built. Five million homes were resold annually since 1995. Sales and resales are beginning to diminish, but remain far above average.

- In 1999 and 2000, the lowest rate of unemployment in 30 years (peacetime or wartime). Until late 2001, there were current and future projected labor shortages in the South and West, particularly in industrial sectors requiring computer skills and in locations that were not gateways for immigrants.

- In 1999 and 2000, a consumer confidence level that was at a 30-year high. Although consumer confidence remains reasonably strong, it slipped noticeably in early 2001, and plummeted in late 2001.

These decade-long characteristics of the national economy encouraged specific types of growth:

- Sustained movement to the outer parts of the metropolitan area. Non-metropolitan and non-central-city growth is confirmed by the fact that 90 percent of residential building permits are sought in locations outside central-city counties. E-commerce will aid and abet this trend because work and shopping can be done at home at great distances from the city.

- Continued movement to the West and South following job migration. Three-quarters of projected household growth and two-thirds of projected job growth will take place in the South and West during the period 2000 to 2025.

- Continued movement to the Sunbelt as the beginning of a long-term trend of baby boomer retirement. The five counties encompassing San Diego, California; Miami-Dade, Florida; Fort Lauderdale, Florida; Las Vegas, Nevada; and Scottsdale, Arizona will have 10 percent of the nation's household growth over the next 25 years. The states of California, Florida, and Texas will experience 50 percent of the U.S. household growth over the same period.

These projected economic trends are linked with the following types of social trends:

- For the decade 2000 through 2010, half the net population growth is baby boomers aging into their fifties.

- A further aging into retirement of the baby boom generation after the year 2010 that will mean 30 percent of the nation's population is elderly, up from 13 percent in 1995. This market of the "yuppie elderly" will be one of the most valued and sought after groups for retirement housing in the history of the United States.

- Stability of the number of children under age five during the period 2000 to 2025; slight decline of the youth population aged five to 17. A growing racial generation gap in which the projected youth population will be 25 percent white and the elderly population 50 percent white.

- Unless impacted by the events of September 11, 2001, continued growth of the immigrant population from 2000 to 2025. This trend has made the United States the only developed country in the top twenty population growth countries. Currently, foreign-born households represent one out of 10 American households and more often reside in rental rather than ownership housing. They also concentrate in locations that the domestic population is moving from. Three-quarters of the arriving immigrant population is found in the six states of California, Texas, Florida, Illinois, New Jersey, and New York.

The foregoing economic and social trends have contributed to land-use patterns that will be evident in the future. These include the following:

- Primary residential growth in the form of the detached single-family home—70 percent of 1990 to 2000 new housing starts and the majority of existing rental housing is in the form of single-family detached homes. Yet, at a time when two-thirds of the American public own a home and mortgage debt is overtaking the national debt at five trillion dollars, the homeownership rates of whites under age 35, blacks, and Hispanics are only 60 percent of the national average.

Courtesy of G Lowenstein

- Increasing acreage and increasing size of new single-family homes. For the past three decades, both lot size and house size have increased regularly in square footage. Year 2000 lot and structure sizes, averaging 14,000 square feet and 2,400 square feet, respectively, are twice their 1970 counterparts, in part because the former market for "starter homes" has been taken over by condominiums and town houses.

- Existing land-use patterns aided by future housing trends. From the years after 2000 to the years after 2020, a movement from condominiums to larger homes as the children of baby boomers begin to raise their own children.

- Primary growth in nonresidential development of low-rise structures along or with direct access to major thoroughfares. The building industry continues to use highway access via motorized transportation as the prime determinant of employment location. Labor markets drive regional and metropolitan employment location decisions; road access drives local employment location decisions.

- The shopping center or its in-town replacement increasingly becoming the neighborhood center (e-commerce has an impact on goods acquisition but does not replace the retailing experience). Entertainment shopping including coffee bar, lounge chairs, food arcades, spas, and personal shoppers will make the mall or in-town retail a happening.

- Continued "chicken and egg" linkage between residential and nonresidential development as opposed to their simultaneous appearance as part of mixed-use facilities. Euclidean zoning continues to produce a separation of uses as the defining characteristic of the majority of American land development practice.

- The emergence of two mixed-use development locations: an inner-city location that requires significant public-private support to allow it to reach fruition, and an exurban "new community" setting that is the compromise reached between a desired exurban location and a feeling of central

place coupled with a bent for natural resource conservation.

- The emergence of the wholly prepackaged or piecemeal-built smart house, which now can be purchased with smart appliances, heating/cooling systems, computer/media rooms for $25,000, or prewired for $1,500 and added to incrementally. The home becomes more of a focus for work, play, and living.

- A rethinking of the house configuration (decreasing presence of the formal living and dining rooms) and type of vehicle (inroads on the sport utility vehicle by the all-wheel-drive sedan) as well as a reluctant movement to a hybrid vehicle as California-type energy shortages spread and inexpensive international oil disappears.

In accommodating the above trends*, the time has come to view the possibility for the next stage in the nation's settlement patterns to be development in capably performing established centers.* In the new century, there is a unique opportunity to change the prevailing pattern of land development and lay the groundwork for how land will be developed in the future. This can be done through more efficient use of the resources that are left behind as people continue to move outward in the metropolitan area. Redirection of a portion of growth to the inner-metropolitan area, combined with a more controlled movement outward, would consume far less capital and fewer natural resources and enable the achievement of more ambitious development goals (for example, meeting the needs of new households and employment and reinvigorating inner-metropolitan areas). In many cases, redirecting just 20 percent of the growth headed for areas outside central cities and inner suburbs would double or triple the growth projected for these inner areas (Burchell et al. 1999). This is smart growth, as opposed to sprawled growth. It goes without saying, however, that this requires a major cultural commitment to growing in a more controlled fashion.

Courtesy of G. Lowenstein

Courtesy of C. Galley

Difficulties of Controlling Sprawl

Patterns of urban sprawl are not easy to change. Sprawl represents a lack of coordinated development planning. Nationwide, within the zoning districts of 18,000 *local* governments, there is almost no ability to control the tempo and sequence of development. This is far different from construction of new communities, large planned-unit developments, or general development plans (GDPs), each owned by a single developer, wherein tempo and sequence of land use can be controlled by phase.

Sprawl occurs within a regional framework that is fragmented into many relatively small units separately controlled by different local governments, with differing rules and regulations concerning the development of land. These localities have very different fiscal resources. Some of the newer localities on the urban periphery receive large amounts of private non-


Courtesy of A. Nelessen

residential investment per capita. But others—especially those comprising central cities and inner suburbs—receive very low amounts of such investment per capita. As a result, "growth" in the core areas has a disproportionate number of low-value residential properties and high-service residents of these properties. Thus, these core areas have become increasingly unattractive to purchasers, fueling the search for new development on the fringes of core areas.

In addition, sprawl occurs because of a mind-set that believes the forces of economic development to be purely market determined, and as such not fully understood. Thus, land development professionals are expected to make decisions on how best to accommodate development *when* it occurs as opposed to deciding *where and when* this development should occur. Link the above concepts to Americans' constitutional right to own property; land invariably being cheaper at the periphery of metropolitan areas; the single-family detached home as the most sought after domicile; and a distrust of politicians that manifests itself in the approval of as-of-right development that meets ordinance requirements, and one can begin to appreciate the forces that affect the location and form of development in the United States.

MODELING SPRAWL AND ITS IMPACTS

Positive and Negative Impacts of Sprawl

A literature review in an earlier study (Burchell et al. 1998) pointed out twice as many negative (27) as positive (14) impacts of sprawl. Some of the negative impacts that can be quantified for analysis include

- raising both the private and public capital and operating costs of accommodating population growth;
- greater automobile usage and travel trip distance and a consequently greater consumption of fossil fuels;
- disproportionate (relative to population growth) consumption of agricultural and fragile environmental lands;
- increasing air pollution, water pollution, and soil erosion; and
- intensifying inner-city ills as a result of economic segregation and spatial mismatch of population and jobs.

On the other hand, those who feel comfortable with a metropolitan area produced by sprawl indicate that, in the larger scheme of things,

- capital and operating cost savings of compact growth are trivial;
- the automobile is the most democratic and efficient mode of trip choice, yielding travel times relatively constant over time;


Courtesy of T. Delcorso

Table 1.1
Characteristics of Sprawl and Its Alternative

Major Defining Characteristics	SCENARIO 1 Sprawl or Uncontrolled Growth Normal Growth in Rural and Undeveloped Counties	SCENARIO 2 Controlled Growth Less Growth in Rural and Undeveloped Counties
Low Density	• Prevailing density in all (urban center, urban, suburban, rural center, rural, or undeveloped) counties • Densities will be determined using information from the Census Survey of Construction, augmented with information from the literature review	• 25 percent increase in the share of single-family attached and multifamily dwellings in developed portions of counties • 20 percent density increase for new residential growth in urban center, urban, suburban, and rural center counties • 10 percent FAR increase for new nonresidential growth in developed portions of counties
Unlimited Outward Extension	• Existing projections of households and employment for all counties • All counties are given existing Woods & Poole household and employment projections, extended to 2025 by the Center for Urban Policy Research, Rutgers University.	• Household and employment projections for urban center, urban, developed-suburban, and rural center counties are increased; rural, undeveloped, and developing-suburban county projections are decreased • Urban service areas and growth boundaries help to hold population closer to existing concentrations
Leapfrog Development	• Redevelopment and infill development proceed in limited fashion • Little clustering of dwelling units or nonresidential space	• Redevelopment and infill development encouraged and actively pursued as part of population redirectives • Clustering in 20 percent of residential development in less developed portions of counties

Source: Center for Urban Policy Research, Rutgers University.

- land savings are certainly significant but the United States is a big place with a lot of land;
- necessary environmental controls are already in place, affecting both existing and alternative development trends; and
- the social ills of metropolitan development are too complex and too interwoven to pin on sprawl.

Overall, the literature is relatively consistent in unearthing the nature of sprawl impacts in five substantive areas: (a) land losses; (b) capital infrastructure costs for roads and water/sewer; (c) transportation impacts, (e.g., vehicle miles traveled and automobile versus transit use); (d) quality of life related to measures of satisfaction of place under sprawl, yet dislike of its visual outcome; and (e) social impacts related to the spatial mismatch of jobs/workers and the decline of urban tax bases. These sprawl impacts are the focus of this study and can be grouped into 12 categories within the five areas. Listed below, the categories represent either positive (P) or negative (N) sprawl impacts.

Land/Natural Habitat Preservation
1. All land consumption (N)
2. Agricultural/fragile environment land consumption (N)

Public-Private Capital and Operating Costs
3. Transportation infrastructure (N)
4. Water/sewer infrastructure (N)
5. Tax rates, operating costs (P)

Transportation/Travel Costs
6. Vehicle miles traveled (N)
7. Commuting times (P)
8. Automobile/transit use (N)


Courtesy of C. Galley

Quality of Life
9. Quality-of-life measurement (P)
10. Housing and business costs (P)

Social Issues
11. Spatial mismatch of housing and jobs (N)
12. Economic segregation, wealth differences (N)

Alternative Future Growth Patterns

To evaluate the benefits of alternative development, a future trend scenario of uncontrolled growth (sprawl) and an alternative scenario of controlled growth (smart growth) are defined (see Table 1.1). Each scenario will produce different impacts in the categories listed above. The modeling of these scenarios for population, households, employment, and income is the subject of the chapters that follow.

CONCLUSION

Currently, with some bumps along the way, the United States is growing bigger, wealthier, and more diverse. Notwithstanding the effects of 9/11, since the United States' beginning, it has expanded from coast to coast, from urban to exurban settings, and from frostbelt to sunbelt. The role of the United States as the primary superpower as well as the troubled economies of competing nations have put this country in its best relative economic position in 50 years. This is evident in the renewed strength of its cities, the continuing growth of prime suburbs, and the accelerating growth of nonmetropolitan areas.

There are only hints that housing of the future will be smaller, have fewer amenities, or be closer to the core of metropolitan areas. In addition, there is no clear vision of future land use in the United States. Technology advances could be a mixed blessing. The computer will allow workers greater freedom to detach from the worksite and possibly benefit work-oriented trip counts, but there is just as much indication that this could foster housing purchases at greater distances from the core of metropolitan areas. Further, the smart house, which can prepare meals that have been ordered via e-commerce, can become a work/play/living environment removed from both central place and neighborhood. The children of the baby boomers who now begin nesting and raising their own families may be much more able to avoid the core of the metropolitan area than generations preceding them.

The greatest wave of immigrants in history, half of them very talented and the other half minimum-wage candidates, are bound first for major central cities in just a handful of states. This will buoy housing demand in these locations, and counter trends of outward migration by the bulk of the U.S. moneyed domestic population. A large component of new citizens will become homeowners; first in the more central areas, and then like other Americans, increasingly farther out.


Courtesy of USWFS/M. Friend

Courtesy of T. Delcorso

The elderly in society increasingly will be composed of two segments, the youthful elderly (60 to 75 years old) and "old" elderly (75 to 90 years old). The first group will experience housing need and with faculties and money be oblivious to it; the second will experience housing need and with less faculties and money not have housing available to them. Society, in dealing with the elderly, will increasingly mold public policy to deal with the very different issues posed by the two subpopulations of this age cohort (Pitkin et al. 1997).

The "baby busters" in the age cohort 10 years behind the baby boomers will provide a blip of decreasing numbers and wealth before the arrival of the children of the baby boomers as new housing consumers.

The children of the baby boomers are already a multicultural generation. Their children, born in the early years of the millennium, will be only 25 percent Caucasian. There will be a generation gap of race between the baby boomers (who are 50 percent Caucasian) and people of the age of their grandchildren.

Midway between 2000 and 2025, what may be in evidence is a movement inward toward the center of metropolitan areas by baby boomers seeking more central retirement locations, and an out-migration toward the periphery by an increasingly wealthy immigrant population.

The poor throughout the next 25 years will move back and forth from city to inner suburb, depending upon housing demand by the more affluent in these areas. The mobile poor will seek faster-growing regions and leave behind the older industrial cities to the remaining poor, augmented in certain areas by the less educated of the immigrant population.

In the discussion of the population and employment shifts above, there is virtually no sign of a significantly altered demand for peripheral locations by large portions of most societal groups. There is both overwhelming continued desire for peripheral locations and an increment favoring more centralized locations. This latter increment should be the target of smart growth advocates. The specifics of this reality will be covered in the next chapter as growth is projected for these areas.

Courtesy of R. Ewing

II

Definitions and Databases

Database Development

INTRODUCTION

Chapters 3 and 4 examine growth and sprawl in the United States. Growth and sprawl, while having a lot in common, are also significantly different. The concept of sprawl introduced in this study is the occurrence of growth in places where it is difficult to provide public services—i.e., significant residential and nonresidential development in rural, undeveloped, and developing suburban counties.

In order to differentiate between locations of growth and locations of sprawl, a series of definitions must ensue that separate growth locations from sprawl locations. These relate to the expected growth and existing densities of individual counties. This definition of sprawl follows directly from the definition of sprawl developed in the literature. It is the purpose of this chapter to set the boundaries of this definition empirically and to describe the databases that will be used to project growth and sprawl in the United States.

SELECTION OF COUNTY LEVEL FOR ANALYSIS

In a national study, data must be available and consistent for all regions of the country to ensure comparable results. The county scale of analysis fulfills this requirement. Counties provide a comparable analytic unit that fully covers the United States and encompasses all other local municipalities. Data collected at the county level are readily available from county, state, and federal agencies. Additionally, land-use issues such as sprawl are increasingly seeking solutions at this geographic level because most of these jurisdictions have both land-use and political power and can be assembled into larger units to form a region.

History of Counties

Historically, the United States has had two basic units of local government: the town and the county. Each has been used to subdivide states into smaller areas and to give people local governance over these areas.


Courtesy of T. Delcorso

In New England, towns developed as the primary form of municipal government. Economic, geographic, and political realities contributed to this compact style. In northern Connecticut, western Massachusetts, New Hampshire, Rhode Island, Maine, and Vermont, rugged terrain and poor soil were not conducive to large agricultural developments. These would have required a unit of government covering large areas. Thick forests with wild animals and hostile Indians also fostered smaller, closer-knit settlements (Graves 1964). Cultural influences, such as the settlers' religious gatherings and their ties to the English form of government, further influenced the creation of the township form of government.

In the South, conditions were much different. Expansive agricultural areas, under French and Spanish plantation systems, required a physically larger type of government structure than the town form of government could provide. Virginia established the first counties in the 1600s (Menzel 1996). The physical size of the county, formed by joining several adjacent plantations, was well suited to the South's agricultural economy. In addition, friendlier Indians and fewer wild animals than were found in New England made the flat, larger, and lower-density county (as opposed to town) a strong form of local government. Similar conditions west of the Rocky Mountains also favored the development of a county structure to deliver local public services (Graves 1964).

The use of counties as building blocks of larger geographic areas in the 1850 U.S. Census foreshadowed later efforts in statistical and map presentations in the 1870, 1880, 1890, and 1900 censuses. The publications for the 1870 through the 1900 census reflected a continuous interest in the use of counties as geographic building blocks for regions, particularly those regions based on physiography, topography, drainage basins, or river systems. Over the period 1850 through 1900, the number of counties and statistically equivalent entities increased from 1,621 to 2,828; the 1900 layout of county areas and boundaries largely resembled the present pattern. For census purposes, counties were becoming a stable framework of geographic units; this development favored their use as building blocks for data tabulation and presentation. They also served the need for a smaller set of geographic units on which to base regional configurations.

A 1900 Census Office bulletin stated that in order for topographic divisions to serve statistical purposes, the lines between them must coincide with the boundaries of areas for which statistics are given separately by the Census. Since the smallest available entity at that time was the county, the Census adjusted the topographic division boundaries to coincide with county lines. Currently, one of the most basic operational rules of the Census Bureau's geographic hierarchy is that geographic statistical entities for presenting census data must correspond to the geographic units for which the information otherwise is collected or tabulated. In delineating the 1900 topographic divisions, the Census found that it was necessary to balance the different variables of geology, topography, altitude, rainfall, and temperature in order to create a physically homogeneous geographic entity enclosed by county boundaries.

Today, 48 of the 50 states actually support county-level governments, and all states use the county as a physical subdivision of the state for data aggregation. The county can be found in every state in the United States except Connecticut, Rhode Island, Louisiana, and Alaska. However, the parishes of Louisiana and the boroughs of Alaska function as county-level governments and are classified as such by the Bureau of the Census (U.S. Department of Commerce 1999). In Connecticut, the county system of government was eliminated in 1960. Yet, in Connecticut today, counties are mapped, fully encompass municipalities, and


Courtesy of T. Delcorso

pyramid evenly to the state as a whole (U.S. Department of Commerce 1999). Rhode Island "counties" are not governing entities, but rather geographic subdivisions used by state and federal agencies for data purposes (U.S. Department of Commerce 1999). Thus, although the town remains important in New England and the Midwest, the county is the most consistent form of territorial subdivision across the United States. In addition, in western states, the township system has declined during the past 50 years, and its functions have been transferred to the county (Delafons 1969).

Advantages of County-Level Analysis

Counties encompass and contain other municipal subdivisions such as cities and towns, as well as unincorporated areas that would not be captured by town or city data (Berkley and Fox 1978). In many instances, especially in the South, Midwest, and Southwest, the county is the only unit of noneducational local government. In rural areas throughout the United States, the county has an even more dominant role. In these areas, counties are increasingly the unit of government that dispenses educational services.

Because the county is the most consistently present noneducational government unit in the United States, it is the smallest geographical unit that can be used simultaneously to portray both growth and the incidence of sprawl in a national study. In the most significant growth region of the United States, the South, the county performs planning and zoning functions and also provides local public services. In fact, only 12 of the 50 states have continuous local government entities below the county.

These northeastern and midwestern states are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Wisconsin. In states such as Florida, counties by themselves perform the function of Metropolitan Planning Organizations (MPOs). They develop and oversee activities related to the Transportation Improvement Program (TIP), including residential and nonresidential development projections. Most U.S. Census–defined metropolitan areas are composites of urbanized counties linked by commuting patterns and other economic ties. Nonmetropolitan areas are also composites of counties.

Courtesy of G. Lowenstein

Another reason for selecting the county as a unit of analysis is that a variety of data are available at this geographic level. Federal agencies collect data for all U.S. counties, providing readily available, standardized information that makes socioeconomic comparisons of county aggregations or regions possible. The Bureau of Labor Statistics, for example, produces the Local Area Unemployment Statistics using county-level data. Similarly, geographically specified information is available from the BEA in its Local Area Personal Income Report. Much less employment-based data is available at the municipal-tract, or traffic-analysis-zone (TAZ) level. Some socioeconomic data at the municipal level is available, especially in the 12 aforementioned states, but in many instances, municipal data is reported only for a collection of specific incorporated areas and the balance of the unincorporated county. The *Complete USA Counties Statistical Abstract*, produced by the U.S. Census Bureau, includes information on all counties, but omits information on towns and cities with populations under 25,000. This means that, for confidentiality or cost reasons, many places are not included in town-level data. New Jersey, for instance, has all of its counties included, yet 481 of its 566 municipalities are omitted from this report. Thus, most of the prime data sources necessary for this study are county-based.

In addition to existing and historical data, projections of basic economic dimensions are also important. These are almost always available only at the county level as the geographic area of greatest specificity. The alternative growth scenarios developed later in this report utilize the Woods & Poole (1998) future growth projections for the Department of Commerce's defined EAs. These areas are aggregations of counties.

Yet another reason for selecting the county as the geographic area for analysis is that counties are playing an increasingly important governmental role in America. The growing suburbanization of the southern and western areas of the country has strengthened the authority and responsibilities of counties. In 1965, only 18 states gave counties the power of home rule. Twenty years later, this number had grown to 38 (Menzel 1996). Today, it is at 42. Growing regional problems, such as transportation and air quality, are being addressed at the county level. Counties are the representatives of Councils of Government (COGs) and Metropolitan Planning Organizations (MPOs), or they themselves perform that role. As the largest subdivision of the state, counties have historically operated as an agent of the state and often have the staff and budgets to serve in that capacity. County involvement, through zoning, land use, and taxation, will continue to make counties crucial players with increasing responsibilities for dealing with the problems of urban and suburban America.

DATABASE

U.S. Regions and Divisions

The U.S. Bureau of the Census provides summary statistics for the United States as a whole. Below the national level, the United States is divided into four Census regions—Northeast, South, Midwest, and West. These are further divided into nine Census divisions as follows:

Northeast	Midwest
New England	East North Central
Middle Atlantic	West North Central
South	**West**
South Atlantic	Mountain
East South Central	Pacific
West South Central	

Counties and County Equivalents

The *U.S. Census of Governments* lists 3,141 county-type areas as defined by the U.S. Department of Commerce, BEA. These are reduced by the U.S. Census Bureau to 3,091 county equivalents as summarized below.

Courtesy of C. Galley

Some independent cities encompassed by municipal boundaries are locations wherein both city and county functions are provided by city government. These locations are especially prevalent in Virginia. These independent cities are subsumed within functioning counties in accordance with the county definitions provided by the BEA. County-equivalent areas are also established by the Census. In New England, townships are summed, creating county-equivalent geographic areas. In Louisiana, the Census assumes that parishes are equivalent to counties for data aggregation purposes. For the purposes of this study, and to maintain consistency with the data source used for projections, three pairs of counties in the Midwest were consolidated. Additionally, in some rural areas, vast designated Census areas were combined and viewed as counties. Finally, in cases where boundaries between counties and independent cities (or counties and other counties) have changed within the span of the Woods & Poole database, new county groups were created to maintain consistency for historical and projection data. Appendix A lists the special county groupings that are used in this study.

The foregoing results in 3,091 actual or equivalent counties. These include 3,025 functioning county governments, 30 city–county consolidations, 14 independent cities (6 of which were historically city–county consolidations), and about 22 designated census areas, such as national parks and wilderness areas.

Table 2.1 shows the number of counties and county equivalents by state, with Washington, D.C., included among the states. The number in each state ranges from one (Washington, D.C.)[1] to 254 (Texas). New

[1] Although Washington, D.C., is included in most of the data analyses that follow, it is not broken out as a separate state.

Table 2.1
Counties, County Equivalents, and EAs by State

State	Unique Counties	County Equivalents	Total	EAs	
				Whole	Partial
Alabama	67		67	3	6
Alaska	7	4	11	1	0
Arizona	13	1	14	1	5
Arkansas	75		75	1	6
California	57	1	58	4	5
Colorado	63		63	0	4
Connecticut		8	8	0	1
Delaware	3		3	0	2
D. C.		1	1	0	1
Florida	66	1	67	6	3
Georgia	158	1	159	2	8
Hawaii	3	1	4	1	0
Idaho	43	1	44	1	5
Illinois	102		102	2	8
Indiana	92		92	1	6
Iowa	99		99	1	8
Kansas	105		105	1	5
Kentucky	120		120	1	6
Louisiana	64		64	3	4
Maine	16		16	2	0
Maryland	23	1	24	0	3
Massachusetts	12	2	14	0	2
Michigan	83		83	5	2
Minnesota	87		87	0	7
Mississippi	82		82	2	5
Missouri	114	1	115	2	8
Montana	55	1	56	2	3
Nebraska	93		93	2	7
Nevada	16	1	17	0	2
New Hampshire	10		10	0	1
New Jersey	21		21	0	2
New Mexico	31	1	32	1	7
New York	62		62	1	5
North Carolina	100		100	4	9
North Dakota	53		53	1	4
Ohio	88		88	3	4
Oklahoma	77		77	2	7
Oregon	36		36	0	5
Pennsylvania	67		67	3	8
Rhode Island		5	5	0	1
South Carolina	46		46	2	5
South Dakota	66		66	1	4
Tennessee	95		95	1	8
Texas	254		254	9	4
Utah	29		29	0	3
Vermont	14		14	0	3
Virginia	71	34	95	1	7
Washington	39		39	2	3
West Virginia	55		55	0	7
Wisconsin	70	1	71	3	7
Wyoming	23		23	0	4
Total	**3,025**	**66**	**3,091**	**78**	**229**

Sources: Center for Urban Policy Research, Rutgers University; U.S. Census Bureau; and BEA.


Courtesy of T. Delcorso

York, with 62 counties, represents the average. Although the smallest states generally have the fewest counties, the reverse is not necessarily true of the largest states. Alaska, the largest state, has only 11 counties, while Texas, the second largest state has 254, and California, the third largest, has 58. By Census region, the South has the largest number of counties (1,360), followed by the Midwest (1,081), the West (424), and the Northeast (226).

Counties of the United States are diverse in the size of their populations, ranging from 141 people in Loving, TX, to over 9 million in Los Angeles County, California (U.S. Department of Commerce 1999). Fifty percent of the population of the United States lives in just 6 percent (187) of its counties (U.S. Department of Commerce 1999).

Economic Nodes

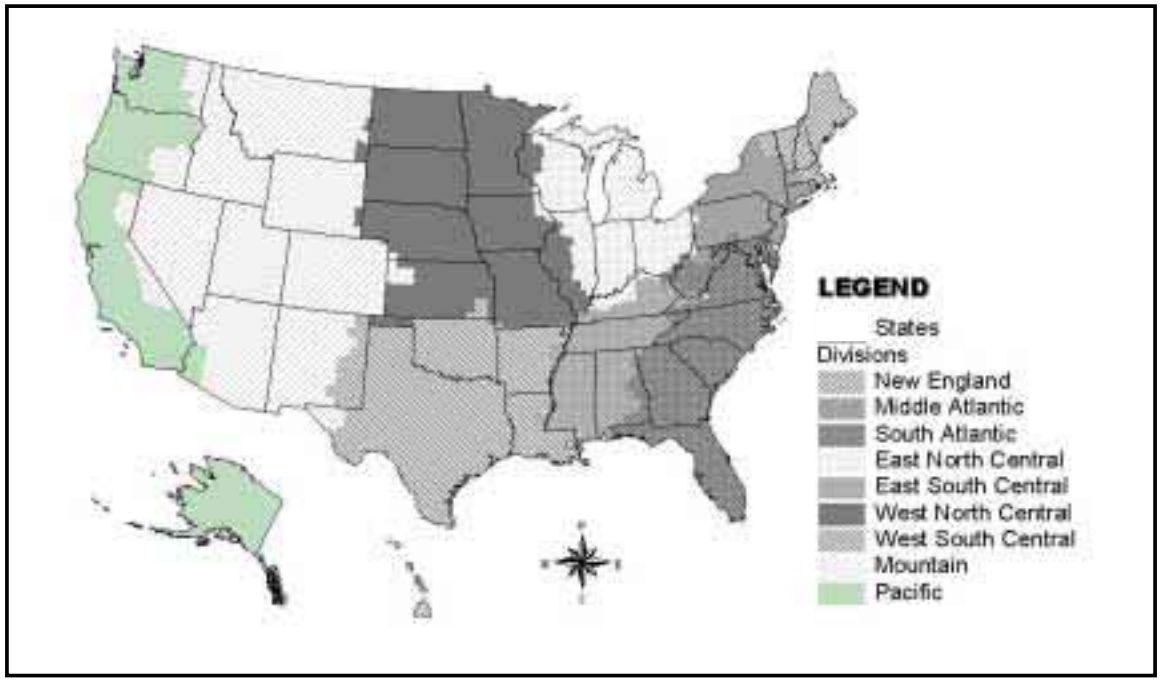
Economic nodes are single or multiple counties used to designate the center of an economic region. The U.S. Department of Commerce, BEA, aggregates counties into 310 county-based *metropolitan area nodes* and 38 county-based *nonmetropolitan area nodes,* for a total of 348 economic nodes. Of the 3,091 county equivalents, 836 are used in designating 310 metropolitan area nodes and 38 are used in designating 38 nonmetropolitan area nodes. Together, 874 counties are found within 348 metropolitan and nonmetropolitan area nodes. Each of the remaining 2,267 non-nodal counties is assigned to the node to which it is most closely related. Three-quarters of these counties are assigned to nodes on the basis of their largest county-to-county commuting flows. Other counties are assigned to nodes for other reasons, including, for instance, whose regional newspaper was predominant according to circulation data.

Economic Areas (EAs)

BEA assembles economic data on earnings by industry, employment by industry, total personal income, population, and per capita personal income for 172 EAs that are assembled by combining an average of two economic nodes. In some cases it is more, in some it is less. Each EA consists of one or more economic nodes as well as the non-nodal counties that are economically related to the nodes.


Courtesy of C. Galley

Figure 2.1
U.S. Divisions



Source: Center for Urban Policy Research, Rutgers University.

These EAs have as their focus an urban, urban center, established-suburban, or rural center county and are surrounded primarily by other developing-suburban, rural, and undeveloped counties. The unique aspect of BEA EAs is that they are the only source of economically interrelated areas that include rural and undeveloped (nonmetropolitan) counties. Thus, all land area of the United States is encompassed in BEA EAs, and the economic cohesiveness of an individual EA is based in part on how well rural and undeveloped counties relate to neighboring developing and developed counties. Thus, these areas have established ties that allow them to be whole economic units distinct from other whole economic units. U.S. Census Metropolitan Statistical Areas (MSAs) do not engage rural counties as part of their areas.

For these reasons, the 172 EAs, which combine the counties into meaningful regional entities, were chosen as the unit for analyzing growth and sprawl and redirecting sprawl growth to more central locations. These areas contain interrelated economic growth as well as locations within them where growth is taking place and probably should or should not take place as much. This is perfect for an analysis of sprawl.

The 172 EAs do not correspond exactly to the boundaries for states or to Census regions and divisions because the counties' economic interrelationships are the driving factor in the formulation of EAs. However, the correlation with the boundaries for Census divisions and regions is quite close. Figure 2.1 graphically depicts the boundaries of the nine Census divisions used in this study. A summary of the EAs composing each division follows. (See Appendices B and C for the full names, numerical designations, and locations of the EAs.)

Direct comparisons with state-related data are more difficult to establish due to the way in which EAs may contain significant portions of multiple states. Table 2.1 shows the distribution of counties and EAs by state. Seventy-eight of the 172 EAs are wholly contained within a state; the remaining 94 encompass portions of two or more states and actually appear as a portion of an EA associated with a state in 229 instances. Three states—Alaska, Hawaii, and Maine—have no partial EAs. Alaska and Hawaii are unique in that each is a single EA. Maine has two whole EAs. Texas is unique in its relatively large number (9) of whole EAs. These four states maintain their state identities when their counties are combined into EAs. Fifteen states are completely disaggregated into

multiple EAs that blend the characteristics of two or more states, and contain no whole EAs within their boundaries. These include New Jersey, Connecticut, New Hampshire, Rhode Island, Delaware, Maryland, Virginia, and others. For example, New Jersey's 21 counties are divided between two EAs: (1) New York-Northern New Jersey-Long Island, which in terms of majority of land area is assigned to New York State; and (2) Philadelphia-Wilmington-Atlantic City, which, under the same criterion, is assigned to the state of Pennsylvania. The remaining 31 states represent a middle ground between whole and partial EAs. Most, however, contain more partial than whole EAs.

EA Locations and Their Numeric Codes

Northeast	
New England	1–4
Middle Atlantic	5–12, 53, 54
South	
South Atlantic	13–42, 45, 46, 48, 81
East South Central	43, 44, 47, 71–80, 82
West South Central	83–92, 95, 124–138
Midwest	
East North Central	49–52, 55–70, 104, 105, 108
West North Central	93, 94, 96–123, 140–142
West	
Mountain	139, 143–159
Pacific	160–172

Figure 2.2 (A and B) shows counties within the framework of both the EA and state boundaries. Each EA has at least one node that dominates the economic activity in that area. In the more developed areas, there are multiple nodes and, expectedly, they are the urban, urban center, and multiple suburban counties.

Woods & Poole Database

Data

The source for the population, household, employment, and income projections used in this study is the Woods & Poole *1998 Regional Projections and Database*. This is a comprehensive county database of the United States containing more than 550 economic and demographic variables for every county for each year since 1970. The database includes such variables as detailed population data by age, sex, and race; employment and earnings by major industry; personal income by source; retail sales information by type of business; and data on the number of households, their sizes, and their incomes.

The employment data in the Woods & Poole database are a complete measure of the number of full- and part-time jobs by place of work. Historical data, 1969 to 1995, are from the U.S. Department of Commerce, BEA. The employment data are provided by one-digit standard industrial classification (SIC), as defined in the *1987 Standard Industrial Classification Manual* (U.S. Department of Commerce 1987). Over the years, some sectors have changed as new industries have emerged or vanished, entailing some reclassification. However, at the broad industry-group level used by Woods & Poole, there have been no changes since 1969, so the aggregate sector data are relatively consistent from year to year. The 13 employment sectors listed in the Woods & Poole database are (a) Farming; (b) Agricultural Services, Forestry, Fisheries, and Other; (c) Mining; (d) Construction; (e) Manufacturing; (f) Transportation, Communication, and Public Utilities (TCU); (g) Wholesale Trade; (h) Retail Trade; (i) Finance, Insurance, and Real Estate (FIRE); (j) Services; (k) Federal Government; (l) Military; and (m) State and Local Government. In this study, (k), (l), and (m) are combined into a single government category.

All earnings, personal income, and retail sales data in the Woods & Poole database are presented in 1992 dollars. These are called "constant" dollars and are used to measure the "real" change in earnings and income when inflation is taken into account. A personal consumption expenditure deflator, revised by the BEA in January 1996, is used to convert dollars between current-year dollars and constant 1992 dollars. Personal consumption expenditure deflators exist for each year from 1969 to 2020. To convert constant 1992-dollar data into other years, one must multiply the constant dollars by the deflator for the appropriate year divided by 100. The same deflator is used for the United States and all counties in the analysis; hence, the rate of inflation (the percent difference year to year in the deflator) is assumed to be constant for all parts of the country.

Econometric Projections

Woods & Poole uses an econometric model of the United States, integrated with a comprehensive and historic county database, to project future growth to

Courtesy of C. Galley

Courtesy of C. Galley

2020. All counties are projected simultaneously so that changes in one county affect the growth or decline of others. The projections are developed within the framework of an overall national projection, acknowledging the complex economic flows of the nation as new industries emerge or relocate in growing areas, and as people migrate in part due to job opportunities found there.

Woods & Poole uses a standard e*xport-base* approach to generate employment, earnings, and income estimates for each U.S. county. Certain industrial sectors at the regional level are considered basic, meaning that these sectors produce "output" that is not consumed locally but is exported out of the region for national or international consumption. This assumption allows these sectors to be linked closely to the national economy and hence to follow national trends in productivity and output growth. The growth of "nonbasic" sectors depends largely on the growth of the basic sectors that are the basis of the region's economy. A modification of the *export-base* approach is used to account for regional variants to normal basic/nonbasic industry definitions. In addition to following an export-base approach, Woods & Poole uses exogenous information about EA economies, as well as some individual EA models, to make projections.

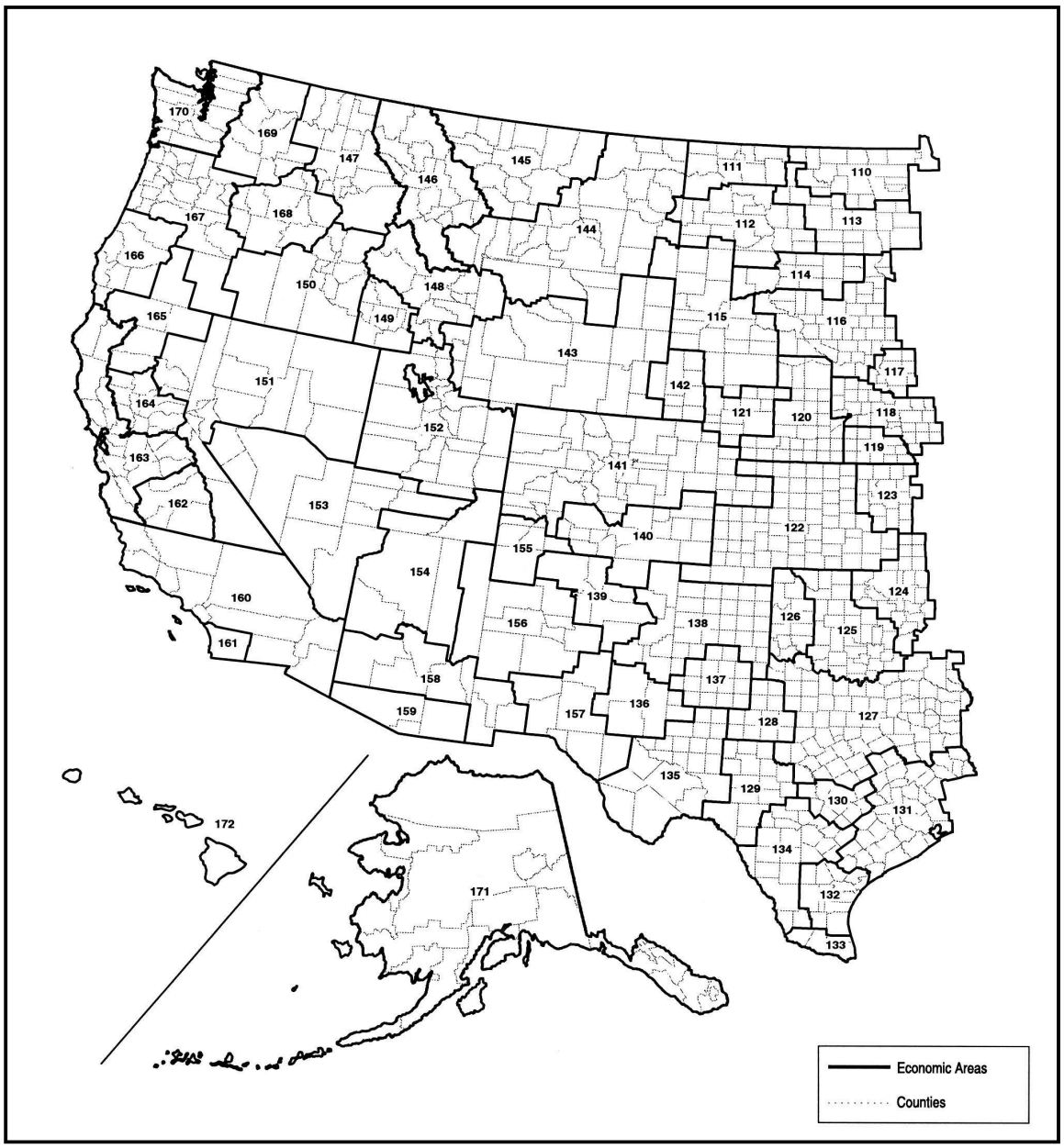
The demographic portion of the regional model follows a traditional cohort-component analysis based on calculated fertility and mortality in each county or EA. The "demand" for total population is estimated from the economic model. Individuals and families are assumed to migrate, at least in part, in response to employment opportunities, with two exceptions: (1) population aged 65 and over, and (2) college- or military-age population. For these two groups, migration patterns over the forecast period are based on historical net migration and not on economic conditions.

The distribution of the population is projected for each year through 2020 based on county or EA-specific mortality, fertility, and migration rates estimated from historical data. The population is categorized by single year of age, sex, and race. In the Woods & Poole model, projected net mortality and migration are based on the historical net change in population by age, race, and sex for a particular county or EA. Similarly, projected net births and migration of age-zero population by race are estimated from the historical change in age-zero population by race, per female population age 15 to 44 by race, for a particular county or EA.

The United States population projections by age, sex, and race, from 1997 to 2020, are based on Bureau of the Census population estimates. Woods & Poole adjusts these figures to reflect current-year population estimates. The forecast U.S. population by age, sex, and race is the control total for the EA projections and indirectly controls the county projections.

Woods & Poole generates individual county projections in an iterative process. The process is accomplished in three phases. In the first phase, the total U.S. personal income, earnings by industry, employment by industry, population, and other variables are forecast to 2020. In the second phase, a projection is made for each EA's employment, which is then used to estimate earnings. The employment and earnings projections then become the principal explanatory variables used to estimate the population and number of households in each EA. The net migration rates projected from the employment opportunities provide the basis for the population projection by age, sex, and race. The total U.S. projection is the control total for the EA projections. The regional projection tech-

Figure 2.2A
Economic Areas (EAs)—Western Half of the United States



Source: U.S. Department of Commerce, BEA.
Note: For EA names referenced by EA numbers, see Appendix B.

nique links the counties together to capture regional flows and to constrain the results to the previously determined U.S. total, allowing internal relationships to be developed within a system of meaningful restraints. In the third and final phase, the model replicates the second phase, except that it is performed at the county level, using the EAs as the control total for the county projections.

The Woods & Poole projections go to 2020. To extend the projections to 2025 for this study, trends in population, households, employment, and income were observed in five-year increments from 2000 to 2020 and extended to 2025. This method was selected because of its simplicity and because it maintains the same complex relationships among the variables. The results are also fit to the published 2025 projections

Figure 2.2B
Economic Areas (EAs)—Eastern Half of the United States

Source: U.S. Department of Commerce, BEA.
Note: For EA names referenced by EA numbers, see Appendix B.

by the U.S. Census (U.S. Department of Commerce 1997).

Projection accuracy is always a critical issue. One way to evaluate the effectiveness of a projection is to compare previous projections to current data. One statistic used to evaluate the projection is the Average Absolute Percent Error (AAPE), which is the average of the absolute values of the percent difference from the projected data to the actual data. The lower the AAPE, the more accurate the projection. At the *county* level, the AAPEs for 10-year employment and population projections are 16.4 percent and 13.9 percent, respectively. A comparison of the Woods & Poole projections with BEA and Bureau of Census projections at the *state* level is shown below. The Woods & Poole data has the lowest of the AAPE ratios.

	AAPEs		
Projection	Woods & Poole	BEA	Census
1-Year State Population	0.7%	N/A	1.58%
8-Year State Population	10.1%	10.7%	N/A
8-Year State Employment	9.5%	10.8%	N/A

CHARACTERIZING LAND-USE DIFFERENCES AMONG COUNTIES

Development Pattern Classifications

If sprawl is to be analyzed at the county level, then a means of delineating a county's growth as either sprawl or nonsprawl must be developed. This is done as follows. First, county development patterns are classified into six categories:

- urban center
- urban
- suburban
- rural center
- rural
- undeveloped

These development patterns reflect a county's existing land use, infrastructure capacity, and regional function. However, the densities for a given land development pattern can vary substantially according to the size and density of the host state, regional economic conditions, and other factors. Thus, the threshold criteria for defining the general development patterns of a county relative to other counties must account for the differences between urban states at one end of the spectrum and states that are largely rural or undeveloped at the other. This subsection describes how the classification criteria were developed.

State Density Pattern Classifications

The initial step in the classification process is to categorize the states by density. Table 2.2 shows 1995 household density for each state, based on Woods & Poole data. As shown in the table, Alaska has the lowest household density, 0.4 households per square mile, while New Jersey has the highest household density, 379 households per square mile. The overall national average of 27.2 households per square mile reflects the large areas of low-density development.

The states fall into four natural density groups: very low, low, moderate, and high. Approximately 20 percent of the states are in each of the very low, moderate, and high categories; the remaining 40 percent are in the low-density category. Altogether, about 60 percent of the states are in the low- and very low density categories. The density ranges defining each of the four groups are summarized in Table 2.3. The map in Figure 2.3 shows the state density designations.

Table 2.4 shows the density classifications of states by region of the United States. Two-thirds of the nine northeastern states are in the high-density classification; the remaining three are classified as moderate (1) or low (2) density. Close to one-half of the 17 southern states are classified as moderate (5) or high (3) density; over half (9) are classified as low density. In the South, as in the Northeast, there are no very low density states. The eleven Midwestern states are characterized by relatively even distribution (3 to 4 states each) between moderate-, low- and very low density states. One-third of the 10 very low density states are found in the Midwest. The Midwest has one high-density state—Ohio. Eleven out of 13 states in the West are low-density or very low density states. The West has the remaining two-thirds of the very low density states (the Midwest has the other one-third.) Only two states in the West are characterized by overall moderate density—California and Hawaii.

County Development Classifications

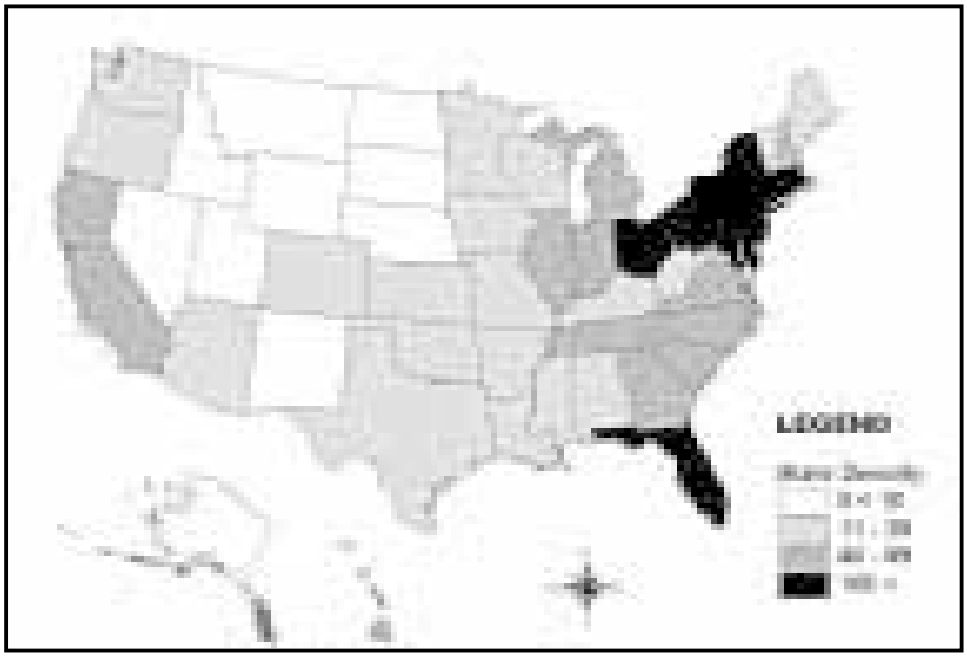
The second step classifies individual counties as urban center, urban, suburban, rural center, rural, or undeveloped based on their densities. However, the classification density thresholds must vary with the density classification of the state. Using Woods & Poole 1998 data, household densities are calculated for each county. The counties in each state density class are then ranked by density. Examination of the listings again reveals distinct groupings of densities as well as separations from other density groupings. Using both obvious breaks in the data and known/familiar counties as references, a series of county density thresholds were defined for each state density class.

Table 2.2
State Density Classifications

State	1995 Households	Area (sq. mi.)	1995 Density: Households /sq. mi.	1995 Density: Category	Rank (1=Lowest, 50=Highest): Density	Households	Area
laska	210,000	573,506	0.4	Very low	1	2	50
yoming	181,127	97,810	1.9	Very low	2	1	42
ontana	334,769	147,022	2.3	Very low	3	6	47
orth Dakota	244,499	70,698	3.5	Very low	4	4	34
outh Dakota	270,438	77,115	3.5	Very low	5	5	35
daho	418,823	83,567	5.0	Very low	6	9	38
ew Mexico	607,133	117,045	5.2	Very low	7	13	46
evada	590,708	110,559	5.3	Very low	8	12	44
tah	620,636	84,896	7.3	Very low	9	14	40
ebraska	623,894	77,352	8.1	Very low	10	15	36
ansas	974,554	82,275	11.8	Low	11	20	37
regon	1,222,761	96,982	12.6	Low	12	22	41
olorado	1,466,181	104,092	14.1	Low	13	27	43
rizona	1,624,241	113,978	14.3	Low	14	30	45
aine	477,190	32,369	14.7	Low	15	11	12
rkansas	938,457	53,178	17.6	Low	16	18	24
klahoma	1,249,999	69,897	17.9	Low	17	24	33
owa	1,093,340	56,271	19.4	Low	18	21	26
ississippi	964,268	47,673	20.2	Low	19	19	20
innesota	1,739,881	84,333	20.6	Low	20	31	39
ermont	223,199	9,613	23.2	Low	21	3	8
exas	6,740,587	264,679	25.5	Low	22	49	49
issouri	2,031,452	69,703	29.1	Low	23	35	32
est Virginia	709,320	24,229	29.3	Low	24	16	10
labama	1,602,869	51,656	31.0	Low	25	29	23
ashington	2,097,179	67,554	31.0	Low	26	36	31
ouisiana	1,559,064	46,806	33.3	Low	27	28	19
isconsin	1,917,122	56,065	34.2	Low	28	33	25
entucky	1,457,492	40,408	36.1	Low	29	26	15
outh Carolina	1,351,552	30,936	43.7	Moderate	30	25	11
eorgia	2,654,052	58,792	45.1	Moderate	31	40	30
ew Hampshire	430,618	9,267	46.5	Moderate	32	10	7
ennessee	2,001,736	42,143	47.5	Moderate	33	34	17
orth Carolina	2,738,027	49,714	55.1	Moderate	34	41	22
awaii	384,259	6,454	59.5	Moderate	35	8	4
ndiana	2,182,395	36,182	60.3	Moderate	36	37	13
ichigan	3,534,216	58,257	60.7	Moderate	37	43	29
irginia	2,476,256	39,480	62.7	Moderate	38	39	14
alifornia	10,940,530	158,081	69.2	Moderate	39	50	48
llinois	4,321,666	56,339	76.7	Moderate	40	45	27
lorida	5,551,391	56,725	100.9	High	41	47	28
ennsylvania	4,574,677	45,300	101.0	High	42	46	18
hio	4,222,580	41,266	102.3	High	43	44	16
ew York	6,709,347	48,653	137.9	High	44	48	21
aryland	1,852,787	9,946	186.3	High	45	32	9
onnecticut	1,225,420	4,966	246.8	High	46	23	3
assachusetts	2,297,330	8,116	283.1	High	47	38	6
hode Island	376,155	1,089	345.3	High	48	7	1
elaware	737,021	2,121	347.5	High	49	17	2
ew Jersey	2,865,727	7,555	379.3	High	50	42	5

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

Figure 2.3
State Density Designations
(in Households per Square Mile)



Source: Center for Urban Policy Research, Rutgers University.

The foregoing method resulted in six unique county land-use patterns for each state density category: undeveloped, rural, rural center, suburban, urban, and urban center. Empirical references helped define functionally realistic categories. For example, the counties containing Salt Lake City, Utah; Dallas, Texas; Chicago, Illinois; and Washington, D.C., are all classified as urban centers because of their regional functions, despite significant differences in their overall densities. Individual counties that fall near the cutoffs are evaluated to ensure they are appropriately classified. If the economic node of an EA is an important node to a rural area, its county is designated as a rural center unless it has already been designated as an urban center, urban, or a suburban county.

Table 2.5 shows the ranges of densities for each county development classification and the extent to which densities vary for each classification. For example, 350 households per square mile represents an urban center in a very low density state, an urban area in a low-density state, and a suburban area in a moderate- or high-density state. The threshold for a given development classification in a high-density state is eight to ten times greater than the threshold in a very low density state. Table 2.6 lists the resulting number of counties by development pattern. The largest classification group, constituting approximately two-thirds of the county equivalents, is undeveloped. The next largest group, with about one-fifth of the counties, is the rural designation. The suburban classification is the third largest group, containing about 9 percent of all counties. The urban center is the smallest group, with only about 1 percent of the 3,091 counties.

The rationale for varying density classifications of land use according to the prevailing density in a state is obvious. There are counties that are clearly suburban in New Jersey, South Carolina, Michigan, and Arizona that have very different densities. There are also urban and rural counties in these states with very different densities. Each of these counties plays a critical role in its respective EA. Lower New York State, western New Jersey, and northern Connecticut rural counties play similar rural roles in the New York-Connecticut-New Jersey EA. The densities of these rural counties differ. They also differ from rural counties in the Atlanta, Georgia, and Greater Denver EAs. As for the urban counties in these respective regions, their differences are similarly obvious. So too are counties in these regions that are designated suburban. Creating a uniform density to categorize the prevailing density in a county could easily ignore regional cultural differences and would employ either an "average" or

Table 2.3
1995 State Density Classification Ranges

Density Classification	Minimum (in Households/Sq. Mi.)	Maximum (in Households/Sq. Mi.)	Number of States	Categories (in Households/Sq. Mi.)
Very Low	0.4	8.1	10	0–10
Low	11.8	36.1	19	11–39
Moderate	43.7	76.7	11	40–99
High	100.9	379.3	10	≥100

Source: Center for Urban Policy Research, Rutgers University.

Table 2.4
State Density Classification by Region

	State Density Classification (Number of States)				
Region	**High**	**Moderate**	**Low**	**Very Low**	**Total**
Northeast	6	1	2	0	9
Midwest	1	3	4	3	11
South	3	5	9	0	17
West	0	2	4	7	13
Total	**10**	**11**	**19**	**10**	**50**

Source: Center for Urban Policy Research, Rutgers University.

Table 2.5
1995 County Density Classification Ranges

	1995 County Density (Households/Sq. Mi.)			
Land-Use Development Pattern	**Very Low Density States**	**Low-Density States**	**Moderate-Density States**	**High-Density States**
Undeveloped	< 5	< 25	< 30	< 45
Rural and Rural Center	< 20	< 75	< 170	< 250
Suburban	< 85	< 250	< 450	< 700
Urban	< 300	< 600	< 1,100	< 3,000
Urban Center	≥ 300	≥ 600	≥ 1,100	≥ 3,000

Source: Center for Urban Policy Research, Rutgers University.

Table 2.6
Number of Counties by Development Pattern Classification

Development Type	Number of Counties
Undeveloped	2,083
Rural	643
Rural Center	46
Suburban	219
Urban	71
Urban Center	29
Total	**3,091**

Source: Center for Urban Policy Research, Rutgers University.

"best practices" development density to classify the land-use pattern of a region in a particular state. The varying density concept allows some standardization or bounds for density groupings, but it also allows western urban counties to continue to exercise their urban roles in EAs and not be classified as suburban, and eastern rural counties to exercise their rural roles in EAs and similarly not be classified as suburban.

CHARACTERIZING SPRAWL AMONG COUNTIES

For those who study sprawl, the dilemma lies in separating sprawl from desirable growth. This is a self-created dilemma because (1) it ignores the fact that virtually all development except urban and inner-suburban redevelopment is sprawl, and (2) the only places where sprawl development can be altered effectively are those locations where it is occurring in relatively undeveloped places. Further, except for development in free-standing organized or planned centers, which is rare in the United States, there is almost no way of characterizing development in rural/undeveloped areas as nonsprawl and at the other extreme almost no way of characterizing development in urban or developed suburban areas as sprawl. Sprawl, for the most part, *is* growth where it would be unproductive; i.e., in locations that are less desirable from resource consumption or capital provision perspectives. These include rural, undeveloped, or developing suburban counties that simultaneously (1) lack the infrastructure to support that growth; and (2) siphon development away from established development areas, effectively diluting the intensity of use for infrastructure that is already in place in these areas.

The locations where sprawl is least desirable are those associated with *significant* growth. Much of the concern with sprawl is voiced by those living in rapidly growing suburban, rural, and undeveloped counties. Therefore, to determine the locations of significant *sprawl* in the United States, the locations of significant *growth* must first be identified. Significant sprawl and growth are then differentiated by two sets of locations: rural and undeveloped locations where *sprawl* is taking place, and urban and developed suburban locations where *growth* is taking place. Even though development in both types of locations is referred to as growth, development in an urban location with mature public-service infrastructure is preferable to development in a rural location with virtually no public-service infrastructure. While this study's definition of sprawl depends heavily on the magnitude of growth in an area, the existing level of development of infrastructure in developing suburban, rural, and undeveloped areas also is key to the definition of sprawl.

Courtesy of R. Ewing

Growth has dimensions that are both relative and absolute. As such, the empirical definition of growth will depend heavily on the *growth rate* of an area. A dimension of *absolute growth* also must be introduced to allow the relative growth rates to encompass an amount of growth that is meaningful.

Definition of Significant Sprawl

At the local level, some sprawl occurs on a micro basis in almost every U.S. county. Sprawl even occurs when there is no net new growth. The focus of this study, however, is on overall county growth that can be termed *significant sprawl*. For this study, significant sprawl is defined according to four criteria. A county must meet either the first three criteria or the fourth criterion to be defined as a county with *significant sprawl*. The four criteria are as follows:

1. a county growth rate in the top quarter of the EA's county annual household and employment growth rates

2. a county growth rate that exceeds the average annual national county growth rate (about 1.0 percent to 1.4 percent for households and 1.3 percent to 2.0 percent for jobs)

3. an absolute level of county growth that exceeds 40 percent of the average annual absolute county growth (about 130 to 145 households and 250 to 300 jobs, annually)

4. an absolute county level of growth that exceeds 160 percent of the average annual absolute county growth regardless of growth rate (about 410 to 525 households and 1,020 to 1,205 jobs)

The first criterion identifies counties with rapid growth rates within an EA, while the third criterion eliminates those counties whose growth rates are due primarily to large increases to an extremely small base. The second criterion ensures that counties with low growth rates do not qualify. The fourth criterion

Courtesy of C. Galley

allows counties with relatively large base populations to be included, even though their relative growth rates may not be as rapid as the rates in average-sized or smaller counties. The first three criteria apply more to rural and undeveloped counties; the fourth criterion applies to suburban and rural center counties where the growth rates would never exceed the thresholds due to their size. This definition of sprawl is further explained in Appendix G.

Significant sprawl occurs when developing suburban, rural, and undeveloped counties experience relatively rapid growth in households, employment, or both. This definition is consistent with the three basic characteristics of sprawl—locations typified by development that is outward bound, low density, and leapfrog. Eliminated from this definition are counties classified as urban and urban centers because they usually do not meet the growth criteria. More important, these urban centers and urban counties no longer exhibit significant outward or leapfrog development and they often do not have relatively low densities. Some developed suburban counties, due to their level of development and slow growth, are also eliminated from the definition of sprawl. Most county development types (rural, undeveloped, developing suburban, and rural center), however, qualify for some type of sprawl designation.[2]

CONCLUSION

The research design enables both a national view of the incidence of sprawl and its potential remediation.

The definition of sprawl comes from an earlier literature search: unlimited outward extension, low density, and leapfrog development. This applies to both residential and nonresidential development and is operationalized by measuring significant development in rural and undeveloped counties. The definition is further operationalized by measuring significant development in suburban and rural center counties. Related to this, significant suburban development sites are not ignored by the definition of sprawl by its concentration solely on locations that are largely development free. This is evident in that the sprawl definition applies to well over 50 percent of all development taking place in the United States.

Does the definition of sprawl miss anything? Does it, for instance, capture significant sprawling locations

[2] In subsequent analyses of land conversion, infrastructure, and other impacts, additional controls enable urban and developed suburban counties to participate in the sprawl solutions.

in the United States? The research team believes that it does. Sprawling locations are areas typified as newly developing, continuing to develop, or slowing in development. The temporal definition of sprawl, which includes start-up sprawl (increasing), continuous sprawl (sustained), and declining sprawl (decreasing), catches each one of the development conditions outlined above.

The fact that sprawl development involves both *significant residential and nonresidential development* also is important. Significant development, both relatively and absolutely, focuses attention on the growth counties of the United States. Numerous counties in the United States are barely growing. These are often locations that are growing slower than 50 households annually. The development taking place there is often a purposeful choice by individual households to seek remote living environments. Such areas often have gravel or dirt roads, and lack city water and sewer services, as well as school transportation services.

Residential and nonresidential development, apart or together, both contribute to the definition of sprawl. Significant development of either type, or both, at the far reaches of the metropolitan area pulls other development with it. Whether sprawl is individually residential, nonresidential, or combined does not matter in terms of the "pull" it can exert. Residential and nonresidential development in these locations is usually characterized by unlimited outward extension, low density, and leapfrog development. In its remote location, due to scale, it certainly will consume infrastructure and may also garner significant amounts of land in the process of development.

Courtesy of T. Delcorso

Courtesy of C. Galley

Nonsprawl is insignificant amounts of development anywhere and significant development in urban, developed suburban, and rural center areas. The former has already been addressed as development "noise"; the latter involves development in established locations, which are usually close in to the center of the metropolitan area, at higher levels of density. In some cases, this development is on infill or redevelopment sites.

This study's definition of sprawl is consistent with other definitions of sprawl. The Sierra Club's definition of sprawl is residential and nonresidential development in remote locations. The Surface Transportation Policy Project (STPP) defines sprawl as low-density, single-use development anywhere. While this study has some basic inconsistencies with the STPP definition, there are also areas of agreement. The *Costs of Sprawl—2000* study would argue that mixed-use strip development in a very rural county is

Courtesy of C. Galley

sprawl. If each individual component of this growth would be considered sprawl, so too must be the combination of components. The reality of chained and unpredictable trips and the lack of a significant job-residence nexus in mixed-use developments detract from the transportation benefits of this type of development. This study would also disagree that lower-density single-use development in an urban or developed suburban area is sprawl. This development is not at the far reaches of the metropolitan area, it is not leapfrog development, and it may not be extremely low density (Sierra Club 1998; STPP 1999).

The areas of agreement between this study's and STPP's definitions are also obvious. Mixed-use development is almost always found closer-in to the center of the metropolitan area, and single-use development is almost always found farther out. The conservative think tanks (e.g., Cato, Pacific, Reason), although reluctant to recognize sprawl as a situation that requires government remedy (growth boundaries, urban service areas, smart growth), do define sprawl as low-density residential and nonresidential development at the periphery of the metropolitan area. Their response to its discovery is to ensure that the right parties pay for this condition by means of congestion pricing and impact fees, or to avoid the creation of this situation at all, through emphasis on a land tax rather than on a real estate tax (Kaplan et al. 1999).

The study team believes that the definition of sprawl and its empirical specification provide for an accurate description of the incidence of this phenomenon nationwide.

Courtesy of R. Ewing

III

U.S. Growth:
Projected Growth in the United States

INTRODUCTION

As a prelude to the chapter on sprawl in the United States, it is necessary to discuss growth in the United States. Twenty-five-year projected growth for the nation as a whole of nearly 60.7 million people, 23.5 million households, and 49.5 million jobs will take place very differently in the various regions and subregions of the United States (U.S. Census divisions). This will influence significantly the locations of sprawl. To the degree that particular regions, subregions, states, and EAs dominate growth, they will also dominate sprawl.

This chapter's main focus is U.S. growth over the period 2000 to 2025—where this growth is taking place, what type of growth it represents, and its potential to be altered. Twenty-five-year growth projections are presented in four subsections: (1) the U.S. and its individual states; (2) the four major U.S. regions and the divisions within those regions; (3) the 172 BEA EAs; and (4) the 3,091 counties that exist nationwide. Growth in the states is based on aggregations of projections for the *counties* in each state; growth in regions and divisions is based on the aggregations of *EAs* within those areas.

The distinction drawn above is an important one. For regional and subregional (divisional) growth, the BEA EAs are summed. This produces a slightly different growth projection for regions and subregions than would be the case if counties, instead of EAs, were chosen as the aggregation unit within these geographic declensions. The reason for choosing EAs for the larger geographic areas is that they are linked to the basic building block of geography when sprawl is discussed in the next chapter. EAs sum well to divisions and regions; they do not sum well to states because they occasionally overlap state boundaries.

GROWTH IN THE U.S. AND THE INDIVIDUAL STATES

The long-term outlook for the United States economy is one of steady and modest growth from the beginning of the century through 2025. Both population and households will grow at similar rates, averaging just under 1 percent per year. Residential population for the United States as a whole will increase by 22 percent, reaching 342.2 million in 2025, up 60.7 million from 2000. The number of households will increase by 23.5 million to 126.7 million over the same period, an increase of nearly 23 percent. Both the new growth and the resulting total growth reflect an overall average of 2.6 persons per household, indicating that the long-term trend of smaller household sizes is slowing somewhat but is never-

Courtesy of G Lowenstein

theless continuing into the future. Total employment is expected to reach 208.8 million, increasing 49.4 million from 2000, an increase of 1.25 percent per year or 31 percent over the period. At this rate, jobs will increase at a rate about one-third faster than that of population and households. By 2025, the United States will have an average of 1.6 jobs per household, an increase over the average of 1.5 jobs per household evident in 2000. Thus, the trend toward multiple wage earners within the same household is more pronounced in future demography than are changes in overall household size. Trends in household size and multiple wage earners are reflected in the growth of total personal income (wages, interest, earnings, dividends, etc.), which will increase twice as fast as employment (2.5 percent per year, or 63 percent in the aggregate). Total personal income will grow by $4.0 trillion from $6.4 trillion, in 2000 to $10.4 trillion in 2025.

Residential and nonresidential growth increments are not distributed evenly across the United States. Instead, as shown in Table 3.1, three states (California, Texas, and Florida) will account for well over one-third (8.1 million households) of the nation's total household growth of 23.5 million. Seven states—three in the West (California, Arizona, and Washington) and four in the South (Texas, Florida, Georgia, and North Carolina)—will comprise over 50 percent (11.8 million households) of the nation's household growth. Twenty states—nine in the South (Virginia, Tennessee, South Carolina, Maryland, and Alabama in addition to the four above), seven in the West (Colorado, Nevada, Oregon, and Utah, in addition to the three above), and four in the Midwest (Ohio, Michigan, Indiana, and Minnesota) will account for close to 80 percent (18.5 million households) of the nation's household growth (see Table 3.2). No state in the Northeast is represented among the 20 states with the most significant household growth increments; Pennsylvania, with a growth increment of 315,000 households, leads northeastern states, but is only the 27th-fastest-growing state in terms of absolute household increase.

With regard to employment, California, Texas, and Florida will account for close to 30 percent (14.4 million) of the nation's future 2000 to 2025 growth of 49.4 million jobs (see Table 3.1). Seven states—three in the South (Texas, Florida, and Georgia), two in the Midwest (Illinois and Ohio), and one each in the West and the Northeast (California and New York)—will account for nearly 43 percent (21.1 million) of the nation's growth in employment. Twenty states—seven in the South (North Carolina, Virginia, Tennessee, and Maryland in addition to the three above), five in the Midwest (Michigan, Indiana, and Minnesota in addition to the two above), four in the West (California, Arizona, Washington, and Colorado), and four in the Northeast (New York, Pennsylvania, New Jersey, and Massachusetts)—will account for close to 75 percent (36.9 million jobs) of the nation's projected employment growth.

The comparison of state growth increments shows relatively high growth in several states that are not generally considered growth centers. One of the most

Courtesy of C. Galley

Table 3.1
U.S. Total and Individual States—Household and Employment Growth: 2000 to 2025

State	Region	Census Division	Households (#, in 000s)		Employment (#, in 000s)	
			Number	2025 Total	Number	2025 Total
Alabama	**South**	**E. South Central**	**431**	**2,135**	**730**	**3,154**
Alaska	West	Pacific	116	350	198	604
Arizona	**West**	**Mountain**	**1,050**	**2,913**	**1,306**	**3,833**
Arkansas	South	W. South Central	159	1,143	420	1,925
California	**West**	**Pacific**	**3,032**	**14,709**	**6,358**	**24,621**
Colorado	**West**	**Mountain**	**663**	**2,282**	**1,194**	**3,858**
Connecticut	Northeast	Middle Atlantic	27	1,271	308	2,329
Delaware	South	South Atlantic	69	357	108	574
D.C.	South	South Atlantic	(18)	213	91	830
Florida	**South**	**South Atlantic**	**2,405**	**8,494**	**3,845**	**12,280**
Georgia	**South**	**South Atlantic**	**1,010**	**3,913**	**1,698**	**6,302**
Hawaii	West	Pacific	163	580	319	1,115
Idaho	West	Mountain	177	638	279	1,022
Illinois	**Midwest**	**E. North Central**	**379**	**4,826**	**1,753**	**8,886**
Indiana	**Midwest**	**E. North Central**	**473**	**2,773**	**1,044**	**4,691**
Iowa	Midwest	W. North Central	108	1,237	512	2,424
Kansas	Midwest	W. North Central	108	1,115	403	2,122
Kentucky	South	E. South Central	273	1,805	656	2,946
Louisiana	South	W. South Central	316	1,949	680	3,032
Maine	Northeast	New England	107	610	208	960
Maryland	**South**	**South Atlantic**	**437**	**2,392**	**972**	**3,894**
Massachusetts	**Northeast**	**New England**	**258**	**2,639**	**907**	**4,737**
Michigan	**Midwest**	**E. North Central**	**478**	**4,155**	**1,413**	**6,916**
Minnesota	**Midwest**	**W. North Central**	**404**	**2,246**	**1,028**	**4,236**
Mississippi	South	E. South Central	188	1,203	398	1,876
Missouri	South	W. North Central	283	2,396	828	4,210
Montana	West	Mountain	90	447	188	732
Nebraska	Midwest	W. North Central	103	756	309	1,462
Nevada	**West**	**Mountain**	**442**	**1,138**	**703**	**1,823**
New Hampshire	Northeast	New England	122	583	235	975
New Jersey	**Northeast**	**Middle Atlantic**	**234**	**3,181**	**943**	**5,482**
New Mexico	West	Mountain	269	936	420	1,422
New York	**Northeast**	**Middle Atlantic**	**248**	**7,076**	**1,678**	**11,633**
No. Carolina	**South**	**South Atlantic**	**884**	**3,844**	**1,586**	**6,308**
North Dakota	Midwest	W. North Central	33	287	139	583
Ohio	**Midwest**	**E. North Central**	**535**	**4,911**	**1,601**	**8,365**
Oklahoma	South	W. South Central	202	1,509	488	2,418
Oregon	**West**	**Pacific**	**427**	**1,754**	**706**	**2,720**
Pennsylvania	**Northeast**	**Middle Atlantic**	**315**	**4,995**	**1,437**	**8,160**
Rhode Island	Northeast	New England	52	440	137	703
So. Carolina	**South**	**South Atlantic**	**546**	**2,017**	**858**	**3,059**
South Dakota	Midwest	W. North Central	56	341	190	698
Tennessee	**South**	**E. South Central**	**640**	**2,798**	**1,134**	**4,540**
Texas	**South**	**W. South Central**	**2,639**	**10,004**	**4,212**	**15,566**
Utah	**West**	**Mountain**	**424**	**1,134**	**692**	**1,998**
Vermont	Northeast	New England	59	296	92	485
Virginia	**South**	**South Atlantic**	**696**	**3,335**	**1,490**	**5,675**
Washington	**West**	**Pacific**	**856**	**3,148**	**1,291**	**4,802**
West Virginia	South	South Atlantic	64	794	279	1,174
Wisconsin	Midwest	E. North Central	369	2,384	862	4,223
Wyoming	West	Mountain	53	246	92	420
Total			**23,454**	**126,699**	**49,418**	**208,807**

Sources: Center for Urban Policy Research, Rutgers University. U.S. Bureau of the Census.

Note: Top 25 household and employment increases highlighted in bold.

Table 3.2
State Growth Ranked by Total Household Growth: 2000 to 2025
(Top 20 States)

State	Rank	Household Growth Increase (# of Households)	Percent of National Household Growth (%)
California	1	3,032,456	12.9
Texas	2	2,638,577	11.2
Florida	3	2,405,432	10.3
Arizona	4	1,049,559	4.5
Georgia	5	1,009,838	4.3
North Carolina	6	883,790	3.8
Washington	7	855,796	3.6
Virginia	8	696,076	3.0
Colorado	9	662,646	2.8
Tennessee	10	639,882	2.7
South Carolina	11	545,564	2.3
Ohio	12	534,892	2.3
Michigan	13	477,693	2.0
Indiana	14	473,235	2.0
Nevada	15	442,453	1.9
Maryland	16	437,233	1.9
Alabama	17	431,386	1.8
Oregon	18	426,957	1.8
Utah	19	424,414	1.8
Minnesota	20	404,439	1.7

Source: Center for Urban Policy Research, Rutgers University.

surprising states, in terms of future growth increments, is Virginia, which ranks eighth in household growth and seventh in employment growth. Another surprise is Ohio, which is 10th overall in household growth and seventh in employment growth. Colorado is ninth in household growth and 14th in employment growth. Nevada, which is growing relatively fast, has somewhat lower absolute increases (it is 15th in household growth and 27th in employment growth).

GROWTH IN U.S. REGIONS

Overview

Table 3.3 shows overall growth in population, households, employment, and income by region. Population and household growth vary between 0.3 percent and 1.4 percent per year, which represent about 7 percent to 34 percent growth in the 25-year period from 2000 to 2025. The lowest relative growth is in the Northeast; the highest is in the West. The nation as a whole is growing at a rate of 0.9 percent annually in population and in households. The largest absolute household growth is found in the South (10.7 million), which represents 46 percent of overall household growth. Projected 25-year household growth in the South is 1.4 times the growth in the West (7.9 million), more than three times the growth in the Midwest (3.5 million), and over six times the growth in the Northeast (1.5 million). The South and West together account for 80 percent of total future household growth.

With regard to employment, the nation will grow at an average rate of 1.25 percent per year, or about 31 percent over the 25-year period 2000 to 2025. Employment growth will vary from a low annual growth rate of 0.8 percent per year in the Northeast to a high

Table 3.3
U.S. Growth by Region: 2000 to 2025
Population, Households, Employment, and Income

Region	2000	2025	2000–2025 Growth	
			Number	Growth Rate
	Population (#, in 000s)			(%)
Northeast	53,594	57,223	3,629	6.8
Midwest	64,393	73,061	8,668	13.5
South	100,237	127,538	27,301	27.2
West	63,198	84,328	21,130	33.4
Total	281,422	342,150	60,728	21.6
	Households (#, in 000s)			(%)
Northeast	19,955	21,431	1,476	7.4
Midwest	24,773	28,223	3,450	13.9
South	35,863	46,526	10,663	29.7
West	22,654	30,519	7,865	34.7
Total	103,245	126,699	23,454	22.7
	Employment (#, in 000s)			(%)
Northeast	29,964	36,013	6,049	20.2
Midwest	39,821	50,278	10,457	26.3
South	54,157	73,179	19,022	35.1
West	35,448	49,338	13,890	39.2
Total	159,390	208,808	49,418	31.0
	Income (Millions of 1992 Dollars)			(%)
Northeast	1,403,731	2,032,287	628,556	44.8
Midwest	1,507,569	2,287,786	780,217	51.8
South	2,012,882	3,490,513	1,477,631	73.4
West	1,426,246	2,541,805	1,115,559	78.2
Total	6,350,428	10,352,391	4,001,963	63.0

Sources: U.S. Census of Population, 2000. Projection data from Woods & Poole (1998). Data interpretation by the Center for Urban Policy Research, Rutgers University.

rate of about 1.6 percent per year in the West. The largest absolute employment increase, 19.0 million, will be in the South. Employment growth in the South will be 1.4 times the growth in the West (13.9 million), 1.8 times the growth in the Midwest (10.5 million), and more than three times the growth in the Northeast (6.0 million). Employment growth in the South and in the West represents two-thirds of the nation's projected employment growth.

Total personal income will increase in the United States (in constant 1992 dollars) by $4.0 trillion over the period 2000 to 2025. Total personal income will increase by an average of 2.5 percent per year, or 63 percent over the 25-year period. Total personal income growth will be slowest in the Northeast, increasing by an average of 1.8 percent per year, or by nearly 45 percent for the period ($0.6 trillion). Total personal income growth will be fastest in the West, increasing by 3.1 percent per year or by 78 percent over the period ($1.1 trillion). The total personal income growth of the South will be the largest absolute increase, $1.5 trillion over the period. That figure is 1.5 times the absolute growth of personal income in the West, more than three times that of the Midwest, and 3.4 times the growth of the Northeast over the period.

Table 3.4
Northeastern United States
Population and Household Growth:
2000 to 2025

Variable	2000–2025 Increment	2025 Totals
Population (#, in 000s)		
New England	1,208	15,131
Middle Atlantic	2,421	42,092
Total	3,629	57,223
Households (#, in 000s)		
New England	603	4,313
Middle Atlantic	873	17,118
Total	1,476	21,431

Source: Woods & Poole (1998).

Table 3.5
Northeastern United States
Employment and Income Growth:
2000 to 2025

Variable	2000–2025 Increment	2025 Totals
Employment (# of Jobs, in 000s)		
New England	1,556	7,476
Middle Atlantic	4,493	28,537
Total	6,049	36,013
Income (Millions of 1992 Dollars)		
New England	128,323	374,884
Middle Atlantic	500,233	1,657,403
Total	628,556	2,032,287

Source: Woods & Poole (1998).

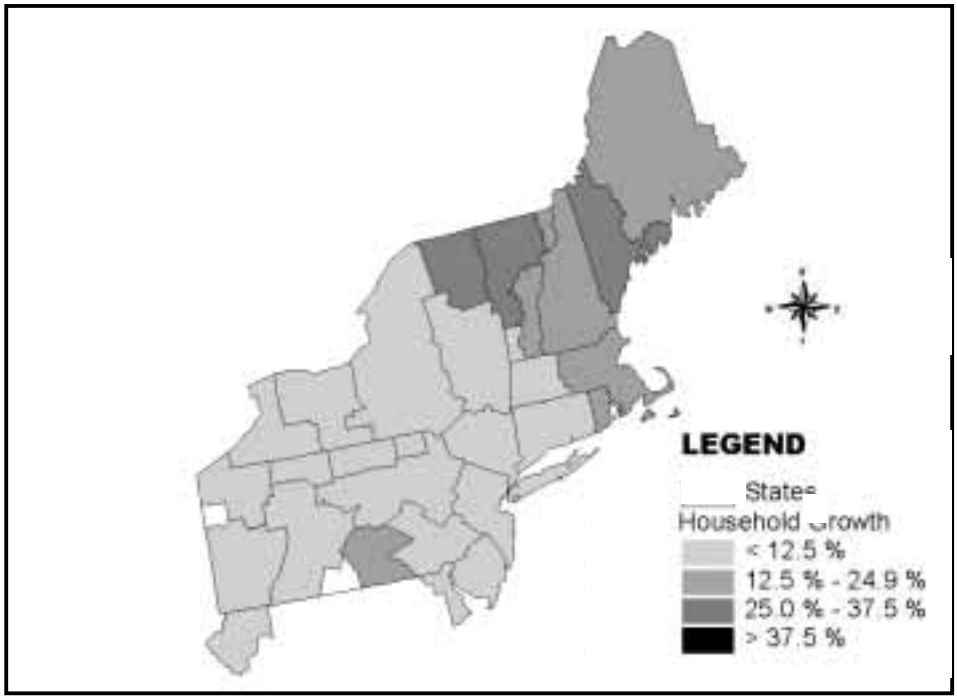
Northeastern United States

As indicated in Table 3.3, the Northeast is growing more slowly than the other regions of the United States due to the out-migration of population and jobs to the South and West. The Northeast is growing at a 25-year average annual growth rate of about 0.3 percent, or 7 percent overall, in both population and households. More rapid growth is projected for employment (0.8 percent annually, 20 percent overall) and income (1.8 percent annually, 45 percent overall). By 2025, the Northeast will have about 17 percent of the nation's population, households, and employment, and about 20 percent of the nation's income. This is about a 10 percent decrease in relative position from 2000.

Population and household growth numbers for the Census divisions in the Northeast Region are summarized in Table 3.4. The Middle Atlantic Division accounts for two-thirds of the region's 3.6 million increase in population, and is growing twice as quickly, in absolute terms, as the New England Division. Household growth is closely related, with 60 percent of the 1.5-million-household increase occurring in the Middle Atlantic Division. The New England Division is growing at two to three times the rate of the Middle Atlantic Division. Figure 3.1, which illustrates the household growth patterns within the Northeast Region, provides additional detail on regional growth patterns. While the regional growth rate of 0.3 percent annually or 7.4 overall is below the national rate of 0.9 percent annually or 22.7 percent overall, specific locations within this region (reflecting single or multiple EA growth) are growing faster. The highest growth rates—in central New England (Vermont, New Hampshire, eastern Massachusetts, and Rhode Island) and around Harrisburg, Pennsylvania—generally equal or exceed the national growth rate. The remainder of the region is growing at a rate well below the national average. Overall, the Northeast Region is typified by slow growth or, in some cases, declining growth in many of its large and established areas, and by relatively fast growth in a few emerging areas. The latter are in central New England and southwestern Pennsylvania. As shown in Table 3.5, the region's total employment is forecast to increase by 6.0 million jobs over the period 2000 to 2025. Again, the Middle Atlantic Division, with three-fourths of the increment, shows significantly greater absolute growth but lower relative growth than the New England Division. Total personal income in the

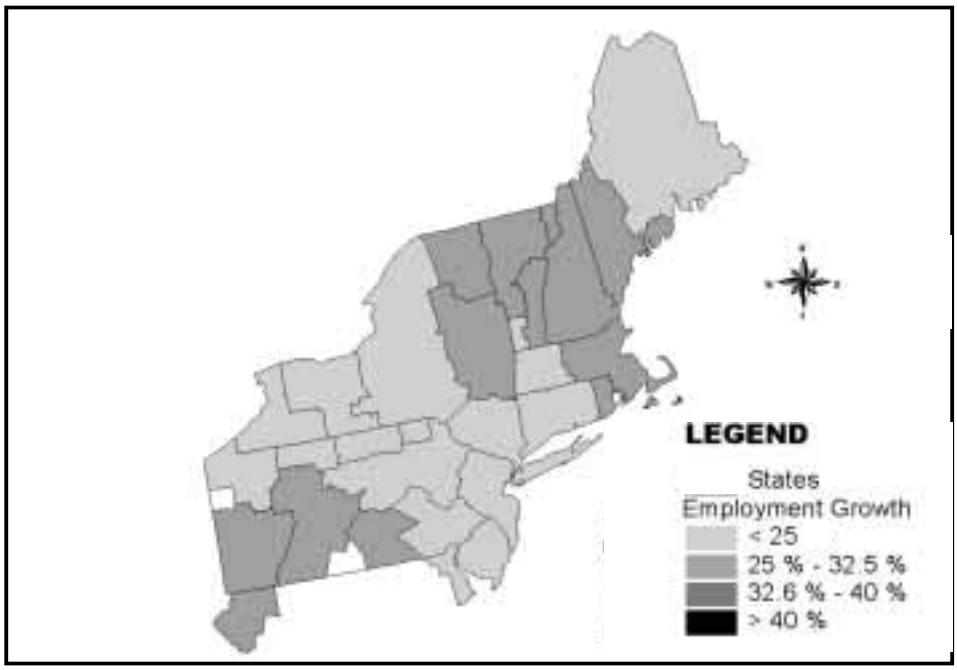
Courtesy of G. Lowenstein

Figure 3.1
2000 to 2025 Household Growth—Northeast Region EAs



Source: Center for Urban Policy Research, Rutgers University.
Note: EAs at the edges of the figure that appear white are counties that belong to an EA in one of the other regions.

Figure 3.2
2000 to 2025 Employment Growth—Northeast Region EAs



Source: Center for Urban Policy Research, Rutgers University.
Note: EAs at the edges of the figure that appear white are counties that belong to an EA in one of the other regions.

Table 3.6
Northeastern United States Employment Growth and Totals by Sector: 2000 to 2025
(in Thousands of Jobs)

	New England		Middle Atlantic		Total Region	
Employment Sector	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**
Farming	-7	26	-30	127	-37	153
Agriculture	12	80	47	248	59	328
Mining	1	6	3	54	4	60
Construction	30	317	60	1,089	90	1,406
Manufacturing	-52	668	-297	2,360	-349	3,028
Transportation	25	250	196	1,412	221	1,662
Wholesale	38	297	190	1,344	228	1,641
Retail	**194**	**1,188**	**447**	**4,173**	**641**	**5,361**
FIRE	**211**	**668**	**619**	**2,978**	**830**	**3,646**
Service	**1,005**	**3,189**	**2,848**	**11,186**	**3,853**	**14,375**
Government	**99**	**786**	**410**	**3,567**	**509**	**4,354**
Total	1,556	7,475	4,493	28,538	6,049	36,014

Source: Woods & Poole (1998).

Note: Entries in boldface are the top four employment sectors.

region is expected to reach $2.0 trillion in 2025 (1992 dollars), an increase of $629 billion from 2000; 80 percent of this income increase is found in the Middle Atlantic Division. Figure 3.2 shows 25-year growth rates in employment for the Northeast Region. Regional locational trends in employment growth rates similar to those evident in population and household growth rates are observed. The most rapid employment growth rates, which would equal or exceed the national employment growth rate of 1.25 percent per year or 31 percent overall, are found in the central New England states and in southwestern Pennsylvania.

A breakdown of employment projections by Standard Industrial Classification shows growth by employment sector (see Table 3.6). The service sector has, by far, the greatest 25-year increase in jobs (3.9 million), accounting for close to two-thirds of the region's employment growth. The service sector increase is nearly five times greater than the second-highest increment—FIRE,[1] evidencing an increase of 0.8 million jobs. Together, the top four economic sectors (service, retail, government, and FIRE) account for 97 percent of the regional employment increment.

Courtesy of G Lowenstein

Southern United States

Table 3.3 shows that the South will experience the second-highest relative growth increases and largest incremental increases of the four U.S. Census regions. This robust growth is due to both a large base and a significant increment of change. When absolute growth is analyzed, population/households and employment in the South are expected to increase more than in any other region over the next two decades. Population and household growth of 1.2 percent per year, or nearly 30 percent in the aggregate, will enable the South to constitute 45 percent of the national growth over the projection period. Similarly, employment growth of 1.4 percent per year, or 35 percent overall, will account for nearly 40 percent of the national increase in employment. Growth in total personal income of 2.9 percent per year, or 73 percent

[1] Finance, Insurance, and Real Estate.

Table 3.7
Southern United States
Population and Household Growth:
2000 to 2025

Variable	2000–2025 Increment	2025 Totals
Population (#, in 000s)		
South Atlantic	15,683	67,452
East South Central	3,195	20,218
West South Central	8,423	39,868
Total	27,301	127,538
Households (#, in 000s)		
South Atlantic	6,101	25,328
East South Central	1,348	6,825
West South Central	3,214	14,373
Total	10,663	46,526

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

Table 3.8
Southern United States
Employment and Income Growth:
2000 to 2025

Variable	2000–2025 Increment	2025 Totals
Employment (# of jobs, in 000s)		
South Atlantic	10,934	40,029
East South Central	2,435	10,558
West South Central	5,653	22,592
Total	19,022	73,179
Income (millions of 1992 dollars)		
South Atlantic	872,412	1,996,349
East South Central	172,887	448,726
West South Central	432,332	1,045,438
Total	1,477,631	3,490,513

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

over the 25-year period, is nearly as high as the personal income growth rates of the West and represents 37 percent of the national growth in income. By 2025, the South will encompass more than one-third of the nation's population, households, employment, and income.

Courtesy of C. Galley

Table 3.7 shows that more than 50 percent of the region's 27.3 million increase in population and 10.7 million increase in households will occur in the South Atlantic Division. This is the fastest-growing Census division in the South and will experience the largest overall population increase. This division includes the six states with the most rapidly increasing number of households. These states are, in order of growth, Florida, Georgia, North Carolina, Virginia, South Carolina, and Maryland. The West South Central Division's increase, led by Texas, is about half that of the South Atlantic Division; the East South Central Division's increase, headed by growth in Tennessee and Alabama, is about one-fifth as great. As illustrated in Figure 3.3, household growth in the South is generally projected to increase fastest in and around the major metropolitan university centers of Florida, Texas, North Carolina, Tennessee, South Carolina, and Alabama. The slowest growth is found in the western part of the region, primarily Oklahoma and western Texas, and further north in West Virginia.

Table 3.9
Southern United States Employment Growth and Totals by Sector: 2000 to 2025
(in Thousands of Jobs)

	South Atlantic		East South Central		West South Central		Total Region	
Employment Sector	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**
Farming	-74	316	-54	203	-66	365	-194	884
Agriculture	128	522	31	119	70	287	229	928
Mining	12	79	6	68	108	528	126	675
Construction	444	2,118	152	616	367	1,367	963	4,100
Manufacturing	198	3,455	175	1,530	273	2,037	646	7,021
Transportation	391	1,743	116	508	234	1,115	741	3,366
Wholesale	377	1,621	90	435	204	970	671	3,027
Retail	**1,838**	**6,872**	**496**	**1,884**	**908**	**3,771**	**3,242**	**12,528**
FIRE	**868**	**2,858**	**138**	**562**	**434**	**1,574**	**1,440**	**4,994**
Service	**5,471**	**14,507**	**1,016**	**3,138**	**2,265**	**7,121**	**8,752**	**24,766**
Government	**1,280**	**4,590**	**270**	**1,495**	**856**	**3,456**	**2,406**	**10,889**
Total	10,933	40,029	2,436	10,558	5,653	22,591	19,022	73,178

Sources: Projection data from Woods & Poole (1998). Data interpretation by the Center for Urban Policy Research, Rutgers University.
Note: Entries in boldface are the top four employment sectors.

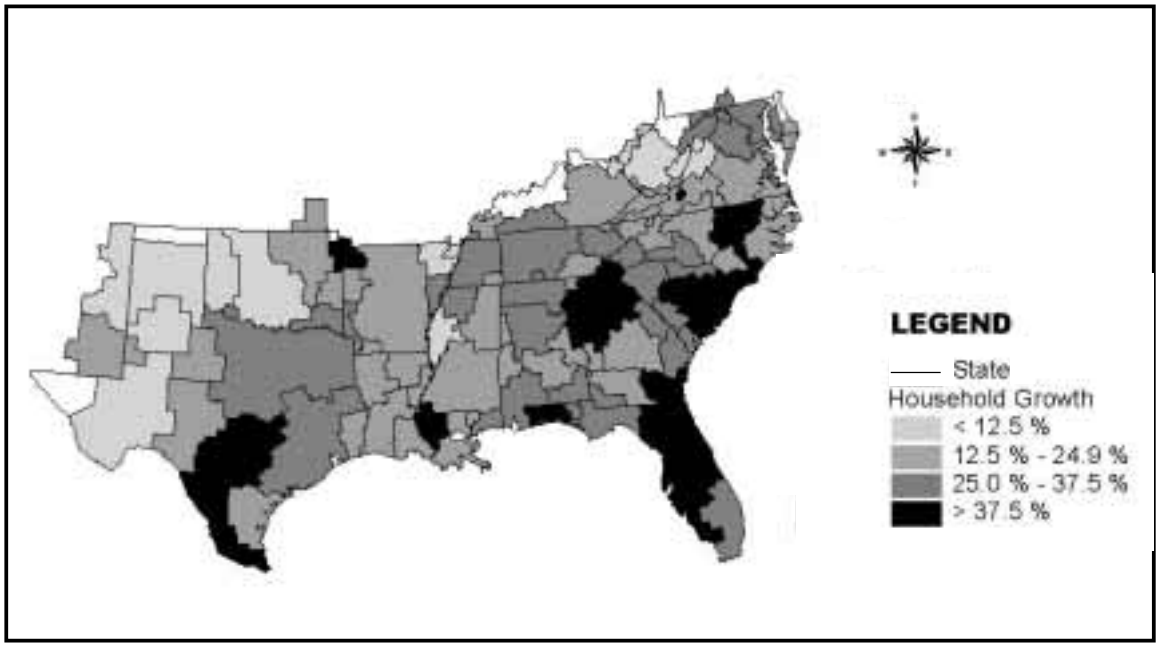
With 19.0 million jobs created during the period from 2000 to 2025 (see Table 3.8), the South's employment growth rate is forecast to exceed the national average employment growth rate by more than 13 percent annually (see Table 3.1). As is the case for population/household growth, the South Atlantic Division has close to 60 percent of the region's total employment increase. The growth increment evident in the West South Central Division is about one-half that of the South Atlantic Division, and the growth increment in the East South Central Division is about one-fourth that of the South Atlantic Division. As shown in Figure 3.4, employment is growing fastest in Texas, Florida, and South Carolina and slowest in Alabama, Missouri, and Arkansas. Table 3.8 also shows the increase in total personal income in the South. The region is projected to increase in total personal income by $1.5 trillion, reaching $3.5 trillion in 2025. The patterns of total personal income growth and its distribution among the Census divisions are basically similar to those for employment.

Courtesy of C. Galley

Employment growth from 2000 to 2025 by employment sector is shown in Table 3.9. The service sector evidences the largest employment growth (8.8 million), with the retail sector (3.2 million) ranking a distant second. The ratio of retail-sector employment growth to service-sector employment growth is not as large as the one evidenced between service employment growth and growth in the next category of employment in the Northeast Region. Government and FIRE also evidence considerable employment increase—2.4 million and 1.4 million, respectively. These four sectors (service, retail, government, and FIRE) represent 83 percent of the region's 25-year employment growth. The service sector alone accounts for more than 50 percent of the region's employment growth.

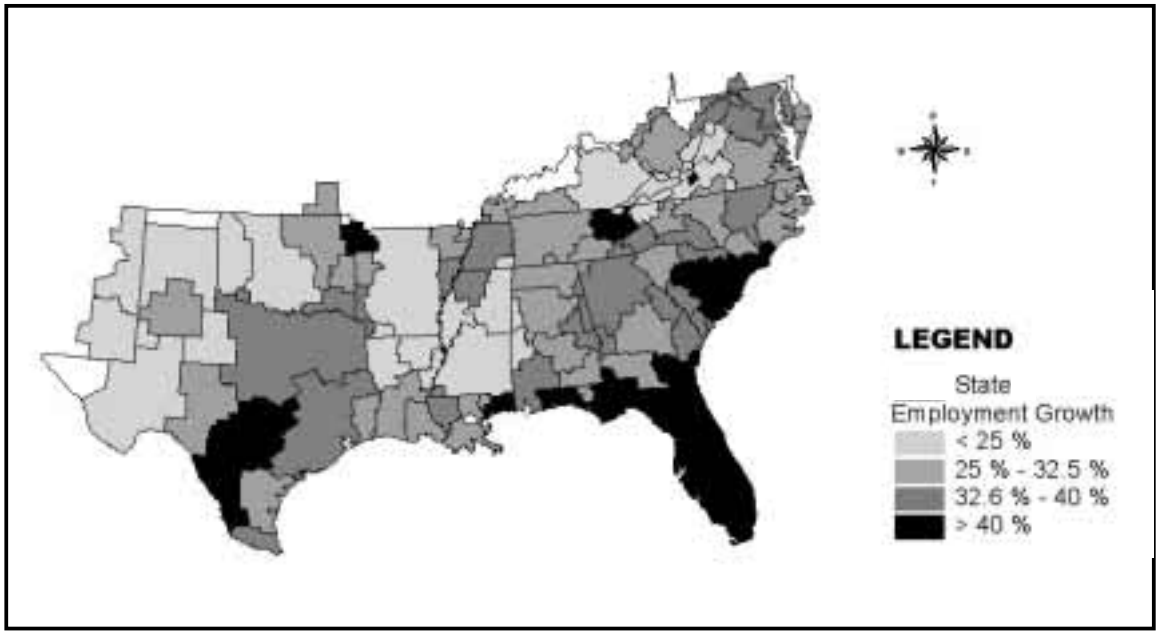
The Southern Region of the United States is a powerhouse of growth. This is a region that contains nine of the 20 states that are growing by the largest absolute increase in population and households. It is also a region that contains seven of the 20 states with the

Figure 3.3
2000 to 2025 Household Growth Rates—Southern Region EAs



Source: Center for Urban Policy Research, Rutgers University.
Note: EAs at the edges of the figure that appear white are counties that belong to an EA in one of the other regions.

Figure 3.4
2000 to 2025 Annual Employment Growth—Southern Region EAs



Source: Center for Urban Policy Research, Rutgers University.
Note: EAs at the edges of the figure that appear white are counties that belong to an EA in one of the other regions.

Table 3.10
Midwestern United States
Population and Household Growth:
2000 to 2025

Variable	2000–2025 Increment	2025 Totals
Population (#, in 000s)		
East North Central	5,506	50,660
West North Central	3,162	22,401
Total	8,668	73,061
Households (#, in 000s)		
East North Central	2,275	18,773
West North Central	1,175	9,450
Total	3,450	28,223

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

Table 3.11
Midwestern United States
Employment and Income Growth:
2000 to 2025

Variable	2000–2025 Increment	2025 Totals
Employment (# of jobs, in 000s)		
East North Central	6,720	32,885
West North Central	3,737	17,393
Total	10,457	50,278
Income (millions of 1992 dollars)		
East North Central	525,469	1,560,474
Northwest Central	254,748	727,312
Total	780,217	2,287,786

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

largest employment growth. By 2025, the South will boast more than one-third of the nation's population and jobs. The increases in the South almost compensate for the relative losses in the Northeast.

Midwestern United States

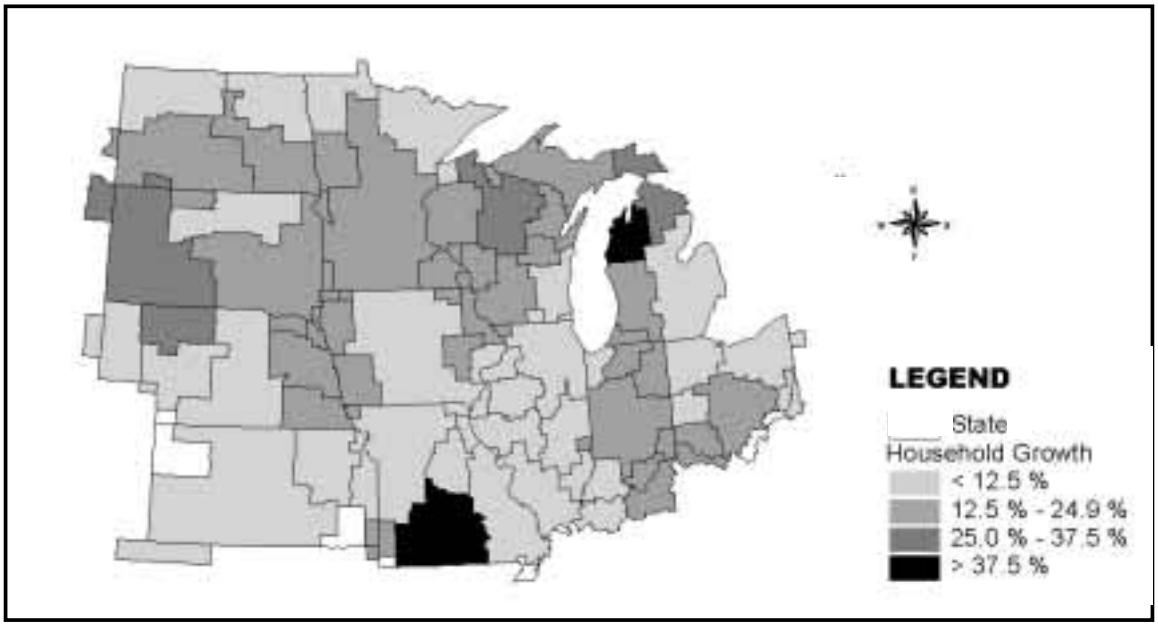
As shown in Table 3.3, the Midwest is expected to experience moderate population growth over the next two and one-half decades. It will grow at a rate two-thirds that of the national average. The 25-year growth in population and households of 0.6 percent annually or 14 percent in the aggregate will lag average population and household growth by one-third. Annual growth of 1.0 percent in employment and 2.0 percent in total personal income also lags national averages by one-third. By 2025, the Midwest will have approximately one-fifth of the nation's population, households, employment, and income. This is about a 15 percent increase of the share that it held in 2000. Table 3.10 indicates that the region will house 73.8 million persons in 28.2 million households by 2025. Of the overall growth (8.7 million people and 3.5 million households), about two-thirds will take place in the East North Central Division and one-third in the West North Central Division. Figure 3.5 shows the projected 25-year household growth rates for various locations (single or multiple EAs) within the Midwest Region. The highest growth rates are found in northern Michigan, Wisconsin, South Dakota, and southern Missouri. Increases in these locations exceed the national rate of growth. Large areas of the Midwest—particularly in Nebraska, Iowa, Kansas, Illinois, and northern Missouri—are growing at about one-half the rate of the United States as a whole.

As shown in Table 3.11, employment in the Midwest is forecast to increase by 10.5 million jobs from 2000 to 2025, which represents a growth rate slightly lower than that of the nation as a whole. The East North Central Division will grow at twice the increment of the West North Central Division. Total personal income in the Midwest Region is expected to reach $2.3 trillion (see Table 3.11) by 2025, an increase of $780 billion from 2000.

Again, the East North Central Division has more than twice the income growth of the West North Central Division. Figure 3.6 depicts employment growth rates within the Midwest Region. South Dakota, southern

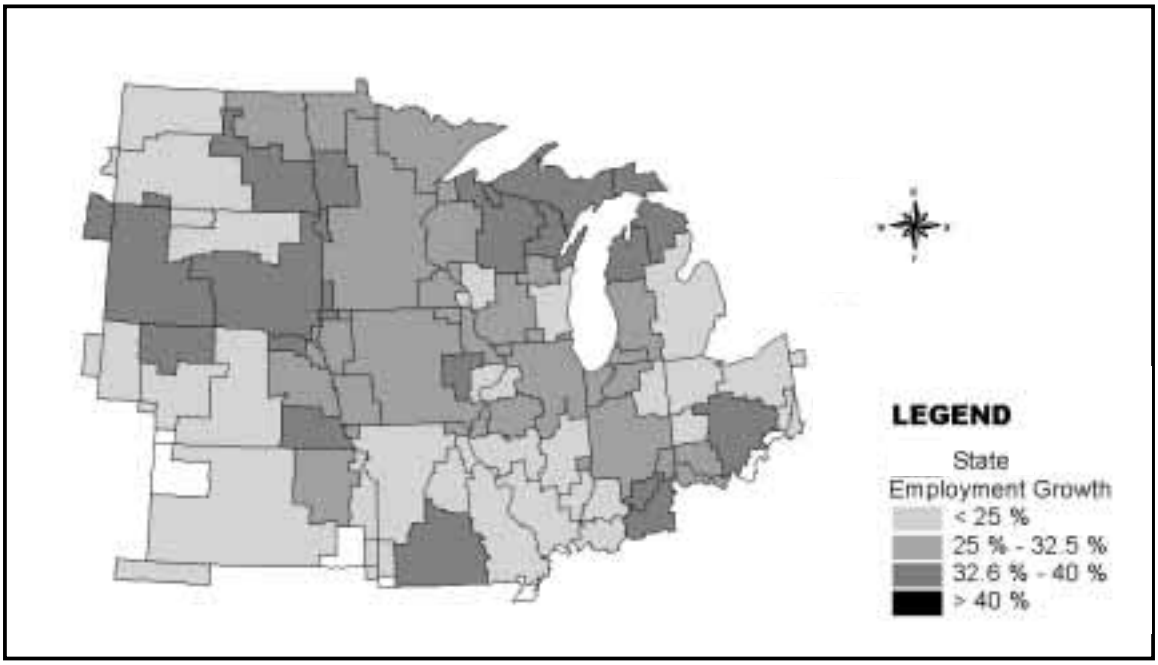
Courtesy of C. Galley

Figure 3.5
2000 to 2025 Household Growth—Midwest Region EAs



Source: Center for Urban Policy Research, Rutgers University.
Note: EAs at the edges of the figure that appear white are counties that belong to an EA in one of the other regions.

Figure 3.6
2000 to 2025 Employment Growth—Midwest Region EAs



Source: Center for Urban Policy Research, Rutgers University.
Note: EAs at the edges of the figure that appear white are counties that belong to an EA in one of the other regions.

Table 3.12
Midwestern United States Employment Growth and Totals by Sector: 2000 to 2025
(in Thousands of Jobs)

	East North Central		West North Central		Total Region	
Employment Sector	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**
Farming	-85	332	-118	483	-203	816
Agriculture	82	318	37	182	119	499
Mining	13	92	11	81	24	173
Construction	288	1,572	198	894	486	2,466
Manufacturing	187	4,678	175	1,896	362	6,573
Transportation	169	1,350	80	747	249	2,097
Wholesale	261	1,490	130	779	391	2,269
Retail	**1,021**	**5,552**	**675**	**3,026**	**1,696**	**8,578**
FIRE	**692**	**2,586**	**314**	**1,268**	**1,006**	**3,854**
Service	**3,486**	**11,195**	**1,855**	**5,772**	**5,341**	**16,967**
Government	**606**	**3,721**	**379**	**2,265**	**985**	**5,986**
Total	6,720	32,886	3,736	17,393	10,456	50,278

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

Note: Entries in boldface are the top four employment sectors.

Missouri, northern Michigan, and central Ohio have growth rates at or exceeding the national employment growth rate of 1.25 percent per year, or 31 percent in the aggregate.

A tabulation of the job growth by employment sector within this region is shown in Table 3.12. The greatest employment gains are in the service sector (5.3 million jobs), accounting for over half the regional employment growth. Retail employment, with a growth of 1.7 million jobs, ranks second; FIRE and government are third and fourth, respectively, each with a growth of approximately 1.0 million jobs. Together, these four sectors represent 86 percent of the Midwest Region's overall employment growth.

Growth in the Midwest is substantially below that of the South but significantly above that in the Northeast for both households and jobs. The Midwest has a slightly larger base of households and employment than does the West, but it is growing at one-half of the household increment and three-quarters of the employment increment of the West. States with notable household and employment growth in the Midwest include Ohio, Michigan, Indiana, Minnesota, and Illinois.

Courtesy of C. Galley

Western United States

The Western Region of the United States, consisting of the Mountain and Pacific Divisions, is the fastest-growing region and exceeds by far the national average growth rate. As shown in Table 3.3, population and households will grow by about 1.3 percent per year, or by more than one-third in the aggregate. Population will increase by 21 million, reaching a total of 83.4 million; household growth will increase by

Table 3.13
Western United States
Population and Household Growth:
2000 to 2025

Variable	2000–2025 Increment	2025 Totals
Population (#, in 000s)		
Mountain	8,415	26,587
Pacific	12,715	57,741
Total	21,130	84,328
Households (#, in 000s)		
Mountain	3,323	10,245
Pacific	4,542	20,274
Total	7,865	30,519

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

Table 3.14
Western United States
Employment and Income Growth:
2000 to 2025

Variable	2000–2025 Increment	2025 Totals
Employment (#, in 000s of jobs)		
Mountain	5,092	15,848
Pacific	8,798	33,490
Total	13,890	49,338
Income (millions of 1992 dollars)		
Mountain	366,588	745,067
Pacific	748,971	1,796738
Total	1,115,559	2,541,805

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

7.9 million, resulting in 30.5 million households by the end of the projection period.

Employment in the West is projected to increase at 1.6 percent annually and 39 percent in the aggregate, 25 percent more than the average national growth. Income is projected to grow even more rapidly, increasing by more than 3 percent annually, or a total of 75 percent between 2000 and 2025. By 2025, the West will have about one-quarter of the nation's population, households, and income, and nearly 40 percent of its jobs. This is about a 10 percent relative increase over similar statistics for 2000.

Although two-thirds of the growth increment occurs in the Pacific Division (see Table 3.13), the Mountain Division is growing at a much more rapid rate—nearly 2 percent annually, or 50 percent overall, compared with 1.2 percent annually, or 30 percent overall, for the Pacific Division. Figure 3.8 illustrates the 25-year household growth rates for areas in the Western Region (single or multiple EAs). Rapid growth is anticipated for areas in Arizona, New Mexico, Nevada, Colorado, and southern Washington. California will have the largest 25-year growth changes of any state. Due to its large base, however, the rates of growth are much higher in the other western states than they are in California. Table 3.14 shows that employment in the West will increase by 13.9 million over the projection period due to a slightly higher growth rate than the national average. Total employment will reach 49.3 million by 2025. The growth rate for the Mountain Division is somewhat higher than the Pacific Division—39 percent versus 26 percent. Personal income is projected to double, growing by $1.1 trillion to a level of $2.5 trillion in 2025.

Courtesy of C. Galley

Table 3.15
Western United States Employment Growth and Totals by Sector: 2000 to 2025
(in Thousands of Jobs)

	Mountain		Pacific		Total Region	
Employment Sector	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**	**2000–2025 Increment**	**2025 Totals**
Farming	-30	141	-13	415	-43	556
Agriculture	60	201	153	686	213	887
Mining	29	147	17	90	46	237
Construction	562	1,324	273	1,437	835	2,761
Manufacturing	176	1,052	43	2,563	219	3,615
Transportation	184	688	271	1,374	455	2,062
Wholesale	188	629	382	1,558	570	2,187
Retail	**886**	**2,787**	**1,475**	**5,518**	**2,361**	**8,304**
FIRE	**327**	**1,126**	**621**	**2,530**	**948**	**3,656**
Service	**2,255**	**5,723**	**4,608**	**12,844**	**6,863**	**18,567**
Government	**453**	**2,029**	**966**	**4,475**	**1,419**	**6,504**
Total	5,090	15,847	8,796	33,490	13,886	49,336

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

Note: Entries in boldface are the top four employment sectors.

More than two-thirds of this income growth will take place in the Pacific Division.

Figure 3.8 presents employment growth rates for the period 2000 to 2025. California, with its large population and job bases, exhibits the largest overall increases but has a relatively low overall growth rate. Arizona, New Mexico, Colorado, and portions of Montana will evidence the most rapid growth rates in the region.

Table 3.15 displays employment growth from 2000 to 2025 by employment sector. As is the case for the other regions, the service sector will experience the greatest job growth—6.9 million jobs, or nearly 50 percent of the region's overall employment increase. The retail sector will follow, but with substantially less employment growth—a 2.4 percent job growth increment over the period. Government (1.4 million jobs) and FIRE (0.9 million jobs) also exhibit relatively large growth changes. Together, these four sectors contribute to 83 percent of the region's employment growth.

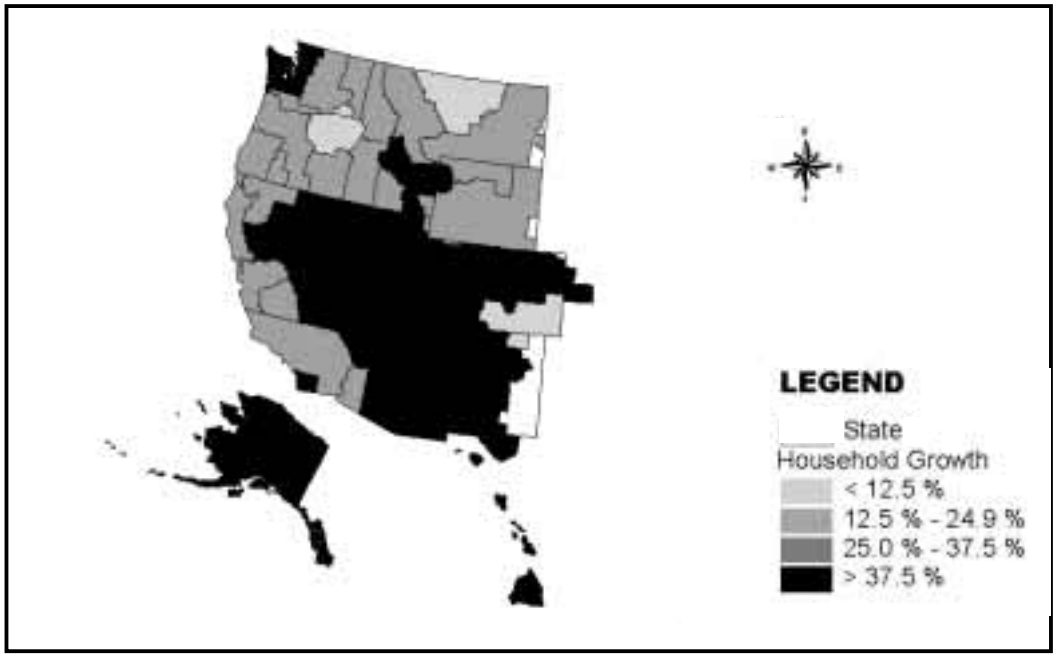
Courtesy of C. Galley

Since the mid-nineteenth century, the West has been a desired destination for American households. California's allure is now being replaced by strong locational "pulls" from Oregon and Washington. Even more than locations in the Pacific Division, areas in the southern Mountain Division are growing rapidly. Arizona and Nevada have high rates of growth. The West contains seven of the 20 states with the largest increments in household growth, and four of the 20 states with the largest increments in employment growth.

GROWTH IN EAs

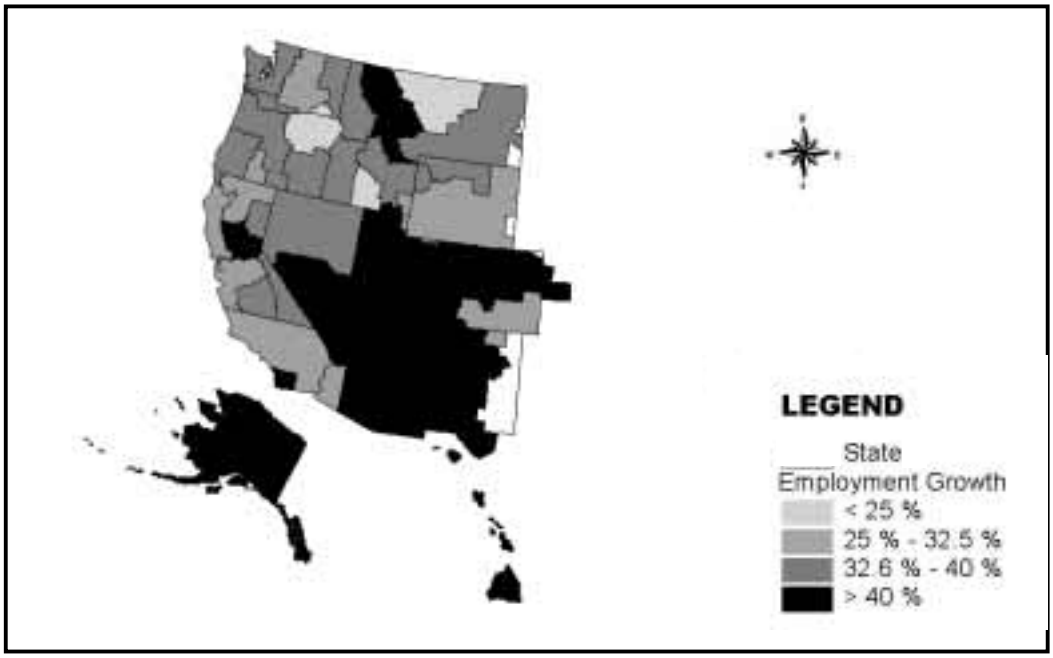
The 172 BEA EAs each represent radically different contributions to the overall growth of the nation and its regions. Table 3.16 shows the rank, amount of household growth, and percentage of national household growth for the top 30 EAs for the projection

Figure 3.7
2000 to 2025 Household Growth—Western Region EAs



Source: Center for Urban Policy Research, Rutgers University.
Note: EAs at the edges of the figure that appear white are counties that belong to an EA in one of the other regions.

Figure 3.8
2000 to 2025 Employment Growth—Western Region EAs



Source: Center for Urban Policy Research, Rutgers University.
Note: EAs at the edges of the figure that appear white are counties that belong to an EA in one of the other regions.

Courtesy of T. Delcorso

period 2000 to 2025. For household growth, absolute increases vary from 1.2 million to 220,000. Contributions to overall national growth vary from about 5 percent down to about 1 percent annually. The following EAs, in descending order of annual growth, contribute to national growth from the approximately 5 percent to the 2.7 percent level:

EA Growth—Top 10

- Los Angeles-Riverside-Orange, CA-AZ
- Dallas-Fort Worth, TX, AR-OK
- San Francisco-Oakland-San Jose, CA
- Atlanta, GA-AL-NC
- Washington-Baltimore, DC-MD-VA-WV-PA
- Phoenix-Mesa, AZ-NM
- Houston-Galveston-Brazoria, TX
- Miami-Fort Lauderdale, FL
- Seattle-Tacoma-Bremerton, WA
- Denver-Boulder-Greeley, CO-KS-NE

Six of these EAs are in the West; four are in the South. The 10 EAs represent about one-third of the projected population and household growth in the United States over the period 2000 to 2025. The top 30 EAs in the United States account for approximatively 64 percent of population and household growth (see Table 3.17). The next 30 EAs account for 18 percent, the next 82 EAs account for 17 percent, and the bottom 30 EAs account for barely 1 percent. The top 60 EAs in the United States represent 82 percent of the nation's projected population and household growth.

With regard to employment growth in EAs, it is much the same picture as with household growth. The top 30 EAs in employment growth account for 63 percent of all growth, the next 30 account for 18 percent, the next 82 account for almost a similar percentage, and the bottom 30 account for 2 percent. Like household growth, the top 60 EAs account for 80 percent of the nation's employment growth.

EAs order themselves somewhat differently in employment growth than in household growth. The fact remains, however, that of the top 30 EAs in household growth, there is almost a perfect match with employment growth. Only the Detroit, Cleveland, and St. Louis EAs are absent from the household growth list. None of these appear in the top 60 household growth locations. Raleigh-Durham, Charlotte, NC, and Austin, TX, are missing from the top 30 employment growth EAs, but they are found in the top 35. The top 10 employment growth EAs are listed below:

Table 3.16
EAs Ranked by Total Household Growth
(Top 30 EAs)

EA Name	Number of Counties in EA	Rank for Total Household Growth	Household Growth Increase (# of Households)	Percentage of National Household Growth (%)
Los Angeles-Riverside-Orange, CA-AZ	10	1	1,160,231	4.9
Dallas-Fort Worth, TX-AR-OK	77	2	925,006	3.9
San Francisco-Oakland-San Jose, CA	22	3	797,268	3.4
Atlanta, GA-AL-NC	67	4	795,581	3.4
Washington-Baltimore, DC-MD-VA-WV-PA	52	5	794,409	3.4
Phoenix-Mesa, AZ-NM	8	6	725,011	3.1
Houston-Galveston-Brazoria, TX	38	7	724,754	3.1
Miami-Fort Lauderdale, FL	10	8	678,757	2.9
Seattle-Tacoma-Bremerton, WA	15	9	644,295	2.7
Denver-Boulder-Greeley, CO-KS-NE	49	10	636,246	2.7
Orlando, FL	13	11	614,319	2.6
San Diego, CA	1	12	564,149	2.4
Boston-Worcester-Lawr.-Low.-Broc., MA-NH-RI-VT	29	13	437,445	1.9
Las Vegas, NV-AZ-UT	11	14	424,361	1.8
Chicago-Gary-Kenosha, IL-IN-WI	30	15	405,854	1.7
Portland-Salem, OR-WA	24	16	401,739	1.7
Minneapolis-St. Paul, MN-WI-IA	70	17	399,604	1.7
San Antonio, TX	22	18	381,815	1.6
Tampa-St. Petersburg-Clearwater, FL	4	19	379,561	1.6
Salt Lake City-Ogden, UT-ID	22	20	375,291	1.6
Sacramento-Yolo, CA	11	21	339,517	1.4
NY-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT	58	22	309,525	1.3
Nashville, TN-KY	54	23	305,503	1.3
Indianapolis, IN-IL	45	24	293,208	1.3
Jacksonville, FL-GA	27	25	281,343	1.2
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD	18	26	264,970	1.1
Raleigh-Durham-Chapel Hill, NC-SC	18	27	257,037	1.1
Charlotte-Gastonia-Rock Hill, NC-SC	16	28	246,273	1.1
Austin-San Marcos, TX	10	29	238,376	1.0
Columbus, OH	25	30	221,778	0.9

Source: Center for Urban Policy Research, Rutgers University.

- Los Angeles-Riverside-Orange, CA-AZ
- New York-Northern NJ-Long Island, NY-NJ-CT-PA-MA-VT
- Washington-Baltimore, DC-MD-VA-WV-PA
- San Francisco-Oakland-San Jose, CA
- Chicago-Gary-Kenosha, IL-IN-WI
- Dallas-Forth Worth, TX-AR-OK
- Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH-RI-VT
- Atlanta, GA-AL-NC
- Miami-Fort Lauderdale, FL
- Houston-Galveston-Brazoria, TX

GROWTH IN COUNTIES

No discussion of growth in the United States is complete without a discussion of growth in counties. While counties are not the focus of the analysis of regional growth, they are an important regional component and must be viewed separately. The top 40 counties account for approximately one-third of national household growth. When considered with the next 110 counties, 150 in total, 60 percent of national household growth is represented. *Thus, 5 percent of the counties in the United States account for 60 percent of the household growth of the United States.*

Table 3.17
Share of National Household and Employment Growth Accounted for by Varying Numbers of EAs

Number of EAs	Share of Households (%)	Household Growth (#, in Millions)	Share of Employment (%)	Employment Growth (#, in Millions)
Top 30 EAs (1–30)	64.0	15.0	62.1	30.7
Next 30 EAs (31–60)	18.3	4.3	17.6	8.7
Next 82 EAs (61–142)	16.9	4.0	18.4	9.1
Bottom 30 EAs (143–172)	0.8	0.2	1.9	0.9
Total 172 EAs	**100.0**	**23.5**	**100.0**	**49.4**

Source: Center for Urban Policy Research, Rutgers University.

Table 3.18
Counties Ranked by Total Growth
(Top 60 Counties)

County	County Type	Rank of Total Growth	Total Household Growth	Percentage of National Household Growth (%)	County	County Type	Rank of Total Growth	Total Household Growth	Percentage of National Household Growth (%)
Maricopa, AZ	S	1	664,552	2.8	Seminole, FL	S	31	124,477	0.5
San Diego, CA	S	2	564,149	2.4	Denton, TX	U	32	117,360	0.5
Harris, TX	UC	3	357,980	1.5	Travis, TX	U	33	116,471	0.5
Clark, NV	S	4	352,899	1.5	Snohomish, WA	S	34	115,406	0.5
Orange, CA	U	5	279,961	1.2	El Paso, TX	U	35	114,737	0.5
Tarrant, TX	UC	6	276,796	1.2	Washington, OR	U	36	113,303	0.5
Bexar, TX	U	7	253,267	1.1	Franklin, OH	U	37	110,591	0.5
Los Angeles, CA	U	8	240,128	1.0	Pasco, FL	R	38	104,059	0.4
Palm Beach, FL	S	9	232,519	1.0	Fort Bend, TX	S	39	103,780	0.4
Riverside, CA	R	10	226,439	1.0	Shelby, TN	U	40	99,957	0.4
Broward, FL	S	11	221,368	0.9	Montgomery, TX	S	41	99,380	0.4
San Bernardino, CA	UND	12	215,330	0.9	Oakland, MI	U	42	98,599	0.4
Hillsborough, FL	S	13	209,754	0.9	Manatee, FL	R	43	91,633	0.4
King, WA	U	14	198,373	0.8	El Paso, CO	S	44	91,112	0.4
Orange, FL	S	15	194,755	0.8	Lake, IL	U	45	86,917	0.4
Pima, AZ	RC	16	184,260	0.8	Alameda, CA	U	46	86,360	0.4
Contra Costa, CA	U	17	173,235	0.7	Utah, UT	S	47	85,397	0.4
Fairfax Cty/Co, VA	U	18	173,211	0.7	Solano, CA	R	48	82,468	0.4
Sacramento, CA	S	19	162,983	0.7	Lexington, SC	S	49	81,987	0.3
Salt Lake, UT	UC	20	161,283	0.7	Hidalgo, TX	S	50	81,287	0.3
Dallas, TX	UC	21	160,477	0.7	Fresno, CA	RC	51	80,833	0.3
Cobb, GA	U	22	155,985	0.7	Du Page, IL	U	52	80,424	0.3
Arapahoe, CO	S	23	149,530	0.6	Lee, FL	S	53	79,629	0.3
Collin, TX	U	24	146,155	0.6	Williamson, TX	R	54	78,253	0.3
Wake, NC	S	25	144,190	0.6	Duval, FL	S	55	75,194	0.3
Mecklenburg, NC	U	26	139,018	0.6	Honolulu, HI	U	56	74,618	0.3
Santa Clara, CA	U	27	133,692	0.6	Clark, WA	S	57	73,492	0.3
Gwinnett, GA	U	28	133,227	0.6	Ventura, CA	R	58	71,490	0.3
Pierce, WA	S	29	130,971	0.6	Bernalillo, NM	U	59	71,306	0.3
Dade, FL	S	30	127,137	0.5	Dakota, MN	U	60	71,220	0.3

Source: Center for Urban Policy Research, Rutgers University.

Note: The six county type categories are: Urban Center (UC), Urban (U), Suburban (S), Rural Center (RC), Rural (R), and Undeveloped (UND).

Courtesy of T. Delcorso

The top 60 counties in household growth are shown in Table 3.18. Household growth varies from nearly 700,000 in Maricopa County, Arizona, to 71,000 in Dakota County, Minnesota. Growth in Maricopa County represents nearly 3 percent of national household growth. Growth in Dakota County represents about 0.3 percent of national household growth.

County Growth—Top 20

• Maricopa, AZ	• Broward, FL
• San Diego, CA	• San Bernardino, CA
• Harris, TX	• Hillsborough, FL
• Clark, NV	• King, WA
• Orange, CA	• Orange, FL
• Tarrant, TX	• Pima, AZ
• Bexar, TX	• Centra Costa, CA
• Los Angeles, CA	• Fairfax, VA
• Palm Beach, FL	• Sacramento, CA
• Riverside, CA	• Salt Lake, UT

The top 20 counties for household growth in the United States are listed below:

Twelve counties on the above list are in the West and eight are in the South. None are in the Midwest or the Northeast. More than one-third are in California (7), 20 percent are in Florida (4), 15 percent are in Texas (3), and 10 percent in Arizona (2). These four states contain three-quarters of the top growth counties in the United States. It is clear that the West and the South dominate as locations of significant county growth nationally.

CONCLUSION

Growth in the United States is taking place primarily in the West and in the South, and in selected locations in each of these two regions. Every list of the fastest-growing states, EAs, and counties is dominated by entries from the Western and Southern Regions. A substantial concentration of the nation's significant growth is found in a relatively small number of geographic areas. *Three of 50 states, 10 of 172 BEA EAs, and 40 of 3,100 counties contain one-third of the nation's growth.* Significant growth in the United States is a concentrated phenomenon. Thus, almost all projections of sprawl and its effects will take place in the Southern and Western regions of the United States.

Courtesy of R. Ewing