Population Division

METROPOLITAN AND NONMETROPOLITAN AREAS: NEW APPROACHES TO GEOGRAPHICAL DEFINITION

Edited by

Donald C. Dahmann and James D. Fitzsimmons

Population Division
U.S. Bureau of the Census
Washington, D.C. 20233

September 1995

WORKING PAPER NO. 12

Working Paper Series

U.S. Department of Commerce
Economics and Statistics Administration
BUREAU OF THE CENSUS

CONTENTS

INTRODUCTION

Geographic patterns of settlement vary dramatically across the United States, ranging from the intense concentrations of people and built structures in large metropolitan areas that serve as centers of decision making, production, and distribution, to regions that are nearly void of human habitation. In some areas, variations in these patterns are stark within short distances, even within miles, while in other areas they occur over hundreds of miles. These fundamental aspects of the geography of human settlement present the core challenge to designing geographic units of analysis that represent individual settlement areas. That challenge is heightened by the need to treat the entire country in a single systematic fashion.

This working paper presents four investigations of new approaches to identifying and presenting elements of the U.S. settlement system. Authors of the reports are John S. Adams (University of Minnesota), Brian J.L. Berry (University of Texas at Dallas), William H. Frey (University of Michigan) and the late Alden Speare, Jr. (Brown University), and Richard L. Morrill (University of Washington). The papers were prepared in conjunction with studies conducted for the Metropolitan Concepts and Statistics Project (MCSP) of the Bureau of the Census. They are part of an effort to establish areas for reporting statistics presented by Federal agencies that has its primary focus, in terms of geographical scale, at the level of metropolitan and complementary nonmetropolitan settlement areas. The studies, however, address issues and the delineation of geographic areas at other scales in support of this overall goal.

History of the Metropolitan Concepts and Statistics Project

The Office of Management and Budget (OMB) and its predecessor agency, the Bureau of the Budget, have defined metropolitan areas for the use of Federal agencies in reporting statistics since standard metropolitan areas (SMAs) were introduced for the 1950 decennial census. Several times in the following years--1958, 1971, 1975,

1980, and 1990--OMB revised the standards for defining metropolitan areas. Along with revisions to the standards, changes in terminology occurred as well--from standard metropolitan area (SMA) in 1949, to standard metropolitan statistical area (SMSA) in 1959, and then to metropolitan statistical area (MSA), consolidated metropolitan statistical area (CMSA), and primary metropolitan statistical area (PMSA) in 1983. Metropolitan areas (MAs) was introduced in 1990 to serve as a collective term for MSAs, CMSAs, and PMSAs.

The widespread production and use of statistics for metropolitan areas indicate that the program has been highly successful. The areas have received broad acceptance as accounting for the geographic domain of individual metropolitan settlements. A wealth of different kinds of Federal government statistics compiled for this set of standard areas is available to data users. A bonus of the program is that other levels of government as well as the private sector also feature metropolitan areas as geographic units in their reporting of data.

In December 1989, as metropolitan area standards were being revised for use in the 1990s, OMB requested that the Census Bureau undertake a longer-term, more fundamental examination of the concepts underlying the identification and definition of metropolitan areas. The goal was to consider and evaluate alternative approaches to conceptualizing metropolitan settlement so that standards could be developed for defining areas with 2000 census data. The Census Bureau's response was the Metropolitan Concepts and Statistics Project, referred to as Metro Areas 2000 by OMB.

Among the first steps taken for MCSP was the formation of two working groups composed of individuals from outside the Federal government. These groups advised the Census Bureau and OMB on an agenda and goals for the project. A key outcome of this initial phase of the project rendered both names for the project obsolete--the simple convention of assigning all territory outside of metropolitan areas to a residual, or nonmetropolitan, status was no longer found to be satisfactory. The primary task became one of devising a system that would explicitly define both metropolitan and

nonmetropolitan areas, a system that would include all of the Nation's territory.

In early 1991, the Census Bureau established joint statistical agreements with four universities to seek development of alternative approaches to defining metropolitan and nonmetropolitan areas. Findings from these investigations were presented to OMB, the Census Bureau, and the Federal Executive Committee on Metropolitan Areas at a one-day meeting in Washington, D.C. in November 1991. The reports in this working paper were derived from presentations at that meeting.

Final submissions of the joint statistical agreements were completed in May 1992. From that point until late 1994, MCSP activity was intermittent, as metropolitan areas based on 1990 standards and 1990 census data were defined and documented. General discussion of the project, however, continued in open forums at the 1991 annual meeting of the Association of American Geographers, the 1991 annual meeting of the Rural Sociological Society, the 1992 and 1993 annual meetings of the Association of Public Data Users, and meetings of the Census Advisory Committee on Population Statistics in 1991 and 1993.

This working paper brings the four reports together and presents them to the public for the first time. It will serve as a centerpiece of discussion at the Conference on New Approaches to Defining Metropolitan and Nonmetropolitan Areas, hosted by the Council of Professional Associations on Federal Statistics. That conference, to be held in November 1995 in Washington, D.C., will initiate the second major round of activity on new approaches to defining metropolitan and nonmetropolitan areas leading up to the year 2000.

The Ten Questions

Each of the four joint statistical agreements required its investigator(s) to address a set of ten questions, which were derived from the discussions of the two working groups:

1. Provide the conceptual basis for a proposed approach for identifying the geographic entities of the

metropolitan/nonmetropolitan settlement system (covering the Nation's territory) and defining statistical areas to represent them. Make clear on what basis and to what extent the approach is founded on (a) morphological and land use characteristics; (b) functional considerations such as movements of people and goods between areas, or the economic or administrative roles of individual entities; and (c) other considerations as appropriate.

2. Present the fundamental geographic unit(s) or "building block(s)" that would be used in identifying the geographic entities of the settlement system. If more than one type of unit would be used, what are the relationships among them? Discuss the advantages and disadvantages of this/these unit(s), especially with reference to their suitability for a statistical standard. For example, are the same units equally applicable in all parts of the settlement system?

3. Discuss the nature of the criteria by which the geographic building blocks would be aggregated to create statistical areas. Would these criteria be based chiefly on functional relationships, or would they be designed to maximize the internal homogeneity of each area observed? Would the criteria vary by region or type of geographic setting?

4. Present any measures of integration that would be used in determining size or extent of statistical areas, such as measures of media markets or journey-to-work patterns. Discuss the advantages and disadvantages of each measure presented.

5. Address the nature of the relationships among the statistical areas that would be delineated. For example, would the proposed approach include a dimension of hierarchy? Would there be more than a single layer of areas so that different ones would be available for different applications?

6. Consider the kinds and quality of data available for delineating statistical areas by the proposed approach. Would the approach require data beyond those available from the decennial census, for example, administrative records data or satellite imagery? What role, if any, might geographic/land management information technologies play in the delineation of statistical areas?

7. Discuss whether the proposed approach to defining areas would be strictly statistical or would incorporate procedures for taking into account local views. If local views are to play a role, under what circumstances and how would those views be ascertained?

8. Consider the appropriate frequency for updating statistical areas in light of the nature and pace of change in the settlement system, the data used to delineate the areas, and the advantages of data continuity in standards.

9. Discuss which entities of the settlement system require official recognition in the proposed approach (for example, "rural areas," "metropolitan areas," or "suburbs") for such purposes as data collection and tabulation.

10. Describe how the proposed approach would generate data to satisfy different uses and users.

These questions are addressed in each of the reports of this volume. The questions did not presume extensive testing, and in fact the agreements did not require or provide funding for empirical testing of the concepts that were developed. By design, then, the reports are explorations, raising issues as much as settling them.

The Reports

Because each of the authors responded to the full set of questions, the reports provide parallel, overall approaches to the definition of metropolitan and nonmetropolitan areas. Each paper took as its starting point the design of a system that would account for all the territory of the Nation.

In the first paper, John Adams initially presents a thorough grounding in the implications of recent societal trends for his subsequent delineation of a system of national settlement areas. Counties serve as the basic units that are individually categorized. Individual counties and aggregations of contiguous counties that fall into the same category form national settlement areas. The basis for categorization is each county's population density as ranked within both the State and the Nation. This combined measure, the rank of counties against others within the State as well as the Nation, enables one to account simultaneously for regional variations in the intensity of settlement and overall national status.

Adams argues that population density alone, as a measure of the intensity of settlement, serves as a satisfactory surrogate for measures of activity patterns and interaction among geographic units, so that the classification produced by his approach will approximate outcomes of function-based approaches. Because the definitions of national settlement areas depend on both national and State-based measures, they may not cross State lines. Preliminary results are presented for the State of Minnesota.

Brian Berry's paper proposes use of the five-digit ZIP Code area as the principal geographic building block in his approach. He observes that ZIP Code areas have the advantage of making it possible to portray settlement patterns with a much finer level of geographic resolution than counties, and also argues for their usage on the basis of data availability and the fact that they are demand-sensitive, with size reflecting need for postal services (and thus intensity of settlement).

Berry would use the ZIP Code areas to define densely settled areas on the basis of housing unit density (he provides comparisons between the effects of using population

and housing unit densities to delineate densely settled areas in the State of Texas). These densely settled areas serve as the cores of larger settlement domains, termed communications regions, which would be defined in terms of television viewership and would exhaust the territory of the Nation. The communications regions would also contain primary metropolitan zones, which would be based on commuting to the densely settled areas and would essentially parallel today's metropolitan areas. Outside the communications region's primary metropolitan zone(s) would lie nonmetropolitan community areas, defined around densely settled cores smaller than densely settled areas, and residual outlying nonmetropolitan districts. All of these areas--both density-based cores and the other, functionally-based larger areas would use five-digit ZIP Code areas as their basic geographic units.

William Frey and Alden Speare propose an approach that would use county subdivisions as the basic geographic unit for defining functional community areas. They would use commuting patterns to define functional community areas, but unlike the Berry approach's dependence on density-based cores, the functional community areas would be defined purely on the basis of commuting ties that would identify clusters of related units. Functional community areas would be aggregated into larger areas, termed metropolitan economic regions, based on commuting ties and subject to minimum population size and other requirements. The metropolitan economic regions would be defined using counties. A comparative analysis between their two new areas and previous delineations is presented for the New York City area. Frey and Speare also suggest that county-based equivalents of functional community areas could be defined for use with data available at only the county level. To capture significant local settlement differences, subcounty portions of functional community areas would be classed into one of six categories: urban centers, primarily residential areas, primarily employment areas, other urban areas, mixed urban-rural areas, and rural areas on the basis of minimum population and population density requirements, employment/population ratios, and measures of commercial and cultural activities.

The final paper, by Richard Morrill, addresses three separate but related topics: a review of the Nation's territory with respect to its subdivision into metropolitan and nonmetropolitan settlement areas; an examination of the internal spatial structure of metropolitan areas; and an approach to delineating small urban agglomerations.

In his section on metropolitan and nonmetropolitan areas, Morrill utilizes the urbanized area as the core area for defining a metropolitan area. The spatial extent of the metropolitan area would be based on commuting to the urbanized area core. Metropolitan areas are subdivided into a set of core, suburban, and exurban zones, and comparative characteristics for these zones in six metropolitan areas are presented. For their wealth of data and geographic consistency across the Nation, Morrill supports using counties as the basic geographic building block for metropolitan areas, although he also recommends consideration of the use of ZIP Code areas.

Morrill divides nonmetropolitan settlement into nonmetropolitan center areas and outer metropolitan areas. The former are aggregations of counties defined on the basis of commuting ties with cores that are smaller in population size than 50,000 persons (these are shown for the State of Washington). Outer metropolitan areas are aggregations of counties defined on the basis of commuting to metropolitan cores, but at levels lower than the 15 percent required for metropolitan area qualification. Morrill also provides maps displaying a preliminary delineation of the country into metropolitan, outer metropolitan, and nonmetropolitan center areas.

In summary, the four reports present a broad range of suggestions for evaluating the many steps involved in creating a new set of geographic units to delineate metropolitan and nonmetropolitan settlement in the United States. These papers serve well the purpose of providing fertile ground for discussion. Elements of any one report, or combinations of elements from different reports, will now require extensive empirical testing, a task that was outside the initial agreements under which the these reports were prepared. The grounding for that work now exists; may the next phase be as fruitful as was this initial one.

CLASSIFYING SETTLED AREAS OF THE UNITED STATES: CONCEPTUAL ISSUES AND PROPOSALS FOR NEW APPROACHES

John S. Adams
Department of Geography and
Humphrey Institute of Public Affairs
University of Minnesota

Preface

This report was prepared in reply to questions raised by the Bureau of the Census, with the support of the Office of Management and Budget (OMB), concerning the conceptual issues involved in identifying the geographic entities that constitute the U.S. metropolitan and nonmetropolitan settlement system. In response to those questions and the discussions that followed, the Census Bureau initiated the Metropolitan Concepts and Statistics Project and commissioned four studies to (1) examine the conceptual issues involved in identifying the geographic entities that constitute U.S. metropolitan/nonmetropolitan settlement today, and (2) propose new approaches to presenting those entities, which range from major agglomerations of population and economic activity to the most sparsely settled locales of the country.

This report responds to the ten questions asked of each study (see this volume's Introduction) in five sections. First is an overview of how we have conceptualized, defined, and measured U.S. settlement, paying special attention to the use of commuting data to define metropolitan areas. Next is a review of the demographic, economic, and governmental trends that currently seem to be stabilizing the map of U.S. settlement. In part, the problem with characterizing the settlement map of the U.S. in the 20th century has been the dramatic rates of change that have occurred, rates that seem to be slowing almost to a halt in many places.

Third is a summary of central conceptual issues that bear on the U.S. settlement process itself, and that challenge the appropriateness of traditional methods used to describe and classify settlement activity and the

settlements that are evolving. These include production, workplace, functions appropriate to the workplace, journey to work, household composition, and fixed residence. This section also presents a review of traditional concepts and practices regarding metropolitan area definition, and how they have been tied to a production-oriented U.S. settlement system.

The fourth section examines a segment of the Upper Midwest region of the U.S. and the changing patterns of daily commuting among the counties of the region between 1960 and 1980.

The last section proposes an approach for identifying geographic entities of the U.S. settlement system and defines national settlement areas (NSAs) to represent them. The approach uses counties as building blocks and is based on metropolitan history, population density, and commuting linkages among counties. This section concludes by considering the proposed approach in light of the ten specific objectives of the Census Bureau in requesting analysis and commentary regarding the official identification of national settlement areas.

National Settlement Areas and U.S. Settlement

A need exists for a set of national settlement areas that would completely blanket the territory of the U.S. at a scale wider than typical counties but narrower than typical states, and that would serve for the indefinite future as an official geographical framework for reporting census and other federal statistical series.

The set of NSAs would number perhaps between 400 and 500 and contain an average of six to eight counties. The NSAs should be defined in anticipation of the spatial patterns toward which the national settlement fabric appears to be evolving. Such a forecast, based on present population density trends, would be self-fulfilling to some extent, but probably no more than present census practice influences the settlement system that it aims to portray.

A useful geographic theory of human settlement considers two main aspects of the settlement process, namely

(1) the structures that are built and arrayed on the land to support or accommodate human activity, and (2) the collective activity itself that is associated with the use of those structures. The former is the stage upon which activity occurs; the latter is the action upon the stage. To be sure, activity on the stage remodels the stage itself, but the stage and the activity upon and within it may be separated conceptually, and it is our objective here to separate them.

Settlement Form Follows and Constrains Function

At least three distinct conceptual issues have a direct bearing on how we think about the structure of contemporary U.S. settlement and the activities distinctively associated with settlement. One is the changing nature of production within our evolving service economy. Present census practice is built upon concepts of work and production, concepts that were relatively easy to define a century ago when most economic activity centered in the agricultural, forestry, fishing, mining, manufacturing, and transportation sectors of the economy. In that earlier economy, measuring the value of outputs and calculating the efficiency of labor and capital were manageable tasks. But for much of our present service economy, these concepts are hard to define and to apply.

A second conceptual issue concerns home and the way in which working conditions and job benefits have blurred the distinction between work places and home space. Not only has paid work moved into the home, but traditional home-based activity (e.g., eating, child care, recreation, social life, etc.) and home-like environments have invaded and transformed the work place.

A third issue surrounds the concept of household and its associated residential location. Households today are increasingly temporary because of non-traditional relationships, and because traditional relationships often turn out to be short-lived, are linked to shared child custody arrangements, and are multi-locational, such as when households maintain two or more residences.

Since the concepts of the workplace, residence, and household appear to need recasting, the settlement system

that knits them together probably needs to be reexamined as well.

Economic Origins of Contemporary Settlements

Our thinking about the role of American cities has been shaped by writers since Adna F. Weber at the end of the 19th century. He and others after him considered cities to be nucleated human settlements built to facilitate specialized production and exchange of monetized goods and services, normally through markets (Weber 1963, Gras 1922, McKenzie 1933). But if the central purpose of the industrial city was an economic one, its social consequences, elaborated by Louis Wirth and others, were many and profound (Wirth 1964, Park 1952, Park and Burgess 1967).

The geographical patterning of the built environment of cities assumed forms that promoted the efficient collection, processing, and distribution of goods and services in the interest of business owners. But the patterning itself has been a reflexive result of economic activity. It has been this understanding that provided a foundation for the major research traditions in urban geography.

Research Traditions in Urban Geography

The understanding of settlement systems can be achieved in part by the careful measurement and classification of their elements. A geographical approach to this effort has been the search for regularities in the organization of systems of urban settlements. The search for regularities took two different forms, laying the groundwork for two different research traditions (Jou 1991).

The first tradition is deductive theory, produced by German geographers. Walter Christaller's Central Place Theory (1966) explained the sizes, locations, and functions of settlements as service centers. August Lösch's more general theory of location was another pillar of this tradition (Lösch 1954). Both of these scholars' works stimulated interest in research on urban systems, especially in the U.S.

The second research tradition grew from the inductively based regionalism of British geography during the period 1920-1950. In urban geography, this line of inquiry

involved the study of spheres of influence within functional regions. Classic studies include those by Dickinson on particular areas (1929, 1934, 1964), by Smailes on the urban hierarchy of England and Wales (1946), and by Green on the identification of hinterlands through the mapping of bus service (1950). Defining functional regions through commuting studies became a standard approach after 1950 (Berry et al. 1968).

Following in the tradition of these theoretical formulations and empirical studies based on them, geographic areas that are defined mainly in terms of home-to-work daily commuting are used as frameworks for presenting federal statistics for labor market areas (Bureau of Labor Statistics), economic areas (Bureau of Economic Analysis), and metropolitan areas (Bureau of the Census and others). Counties have served as the principal building blocks for these areas.

Commuting Linkages and Functional Regions: An Example

A linkage analysis of inter-county commuting in the U.S. used 1970 census commuting flows data to determine whether analysis of commuting data alone could reproduce an accurate profile of metropolitan areas defined by traditional methods (Forstall et al. 1982).

The 1970 population census data file reported counts of 1970 workers by their county of residence and their county of work. The file is a 3000+ by 3000+ flow matrix with county origins as rows and county work destinations as columns. There were only about 107,000 non-zero cell entries in the flow matrix, and most flows were small; four of five flows contained fewer than 50 workers.

For the study, flows were converted to percentages of workers from a county whose county of work was reported. Flows of less than 100, however, were dropped, as were flows of 100 to 500 if they were less than 2 percent of the total flow from the origin county. These thresholds eliminated 95 percent of the cell entries.

The researchers determined the largest outflow percentage (called the "assignment percentage") in each row and then identified the pair of counties linked by that assignment percentage. They combined these two counties to

form a cluster, treating it subsequently as a single county when all flows were recomputed and new assignment percentages were calculated, followed by the county clustering procedure. Counties could be added to existing clusters, and clusters could be combined. The procedure was continued until no assignment percentage exceeding a specified stopping rule (e.g., 20, 10, 5, 2) remained in the matrix.

When this procedure was followed, some small counties failed to cluster even at 2 percent--in part a consequence of limiting attention to flows of 100 or more workers commuting to jobs outside their home counties. The elimination rule meant ignoring genuine linkages, even though they may be small absolutely and small relative to the number of workers in a county for whom destination information was available.

Tests were carried out on 291 counties in all of Louisiana and Mississippi, most of Alabama and Arkansas, plus parts of five other states. Using a 20-percent threshold, 23 clusters formed from 70 counties. The New Orleans, Memphis, and Birmingham areas each comprised 7 counties at this stage of clustering. Other 20-percent clusters involved no large center, the authors noting that "[T]hese smaller clusters serve as a reminder that the network of county boundaries overlies the actual pattern of settlements and worktrips in what is frequently a random fashion" (Forstall et al. 1982, p. 451).

Eight of the 24 standard metropolitan statistical areas (SMSAs) in the study region were found to include only part of a 20-percent cluster. Other cluster counties were excluded from the SMSAs despite high commuting levels because they failed to meet other metropolitan character requirements, such as population density or percentage urban.

At the 5-percent level, much of the study region merges into fairly large areal units, although patches of unmerged counties remained, especially in the Mississippi Delta region. In addition, two clusters that contain separate SMSAs merge at the 5-percent level. In many parts of this 291 county study area in 1970, many local areas (defined in terms of counties) could not "realistically be described as

part of any daily urban system but their own" (Forstall et al. 1982, p. 451). They remained unclustered into larger areas, even at the 2-percent level. Thus, the researchers concluded, there is little support provided by this exercise that much of the U.S. can be assigned to one or another relatively large daily urban system. On the other hand, SMSAs usually were found to nest comfortably within 2-percent clusters (Forstall et al. 1982, p. 452).

We conclude with Berry et al. using 1960 commuting data, and Forstall et al. using 1970 data, that overlapping commutersheds exist, large and small, extensive and confined. If the clustering threshold is raised, boundaries contract and existing linkages go unnoticed. When thresholds are relaxed, boundaries expand and overlap. There is no hierarchical judgment accorded different clusters other than a kind of natural one based on the sizes of workforces, the numbers of counties they contain, or areal sizes.

County boundaries form an arbitrary data template for observing daily commuting flow patterns. A different template would disclose alternate versions of reality as regards commuting-defined clusters of settled territory. Furthermore, the 24-hour day is but one unit of time, as discussed below. The 7-day week is another unit of time, which for most households extends beyond the work-travel link and includes other kinds of travel and other types of linkages.

Census commuting data include only persons in the labor force who actually went to work, but there are no constraints based on days or periods worked. Part-timers are included with full-time workers. The 1990 census question on place of work referred to the place a person worked most in the previous week if they worked at more than one location.

Commuting to jobs is only one type of flow, but it is probably closely correlated with other flows--school, shopping, visiting, and recreation. Using county units to examine daily commuting flows yields one view of linkage. It is a reasonable and useful view, and rather easily reported to the census, but it is a restricted view nonetheless.

Major Demographic, Economic, and Planning Trends Stabilizing the U.S. Settlement Map, 1990-2010

Demographic Trends

Large scale demographic forces will exert major influence on U.S. settlement in general and on metropolitan areas in particular at least until the year 2010 (Sternlieb and Hughes 1988). Rates of natural population increase are likely to be modest. The U.S. population will be maturing. The baby boomers (born 1946-1964) will pass through middle age. Following the baby boomers, the "cohort of contraction" (1965-85) will reach their young adult years.

The demographic slowdown in the U.S. will occur as Latin America and Asia's economically active population expands rapidly during the 1990s and beyond (Table 1).

Table 1. -- Expected Growth in Economically Active Population, 1990-2000

World	+16.5 %
United States	+8.2
Caribbean	+21.1
Latin America	+26.3
Central America	+34.1
Asia	+17.0

(Source: Sternlieb and Hughes 1988, p. 36)

Slow growth inside the U.S., next door to fast growth in neighboring regions, will lead directly to demographic pressure on the states of the East Coast, the Southeast, the South, and the West. Legal and illegal immigration will be heavy and continuous; the coastal regions and their present metropolitan areas will be affected first.

The African-American population grows at about double the overall rates, mainly from natural increase. The Hispanic population grows at approximately double that of the African-American. Growth of Hispanic population occurs both directly from natural increase as well as from the interaction of natural change and immigration change as young workers entering the U.S. in large numbers form

families. Thus, places with large African-American and Hispanic populations are likely to experience continued rapid population increase between 1990 and 2010.

Despite the steady rise in total population, and an expected rapid rise in African-American and Hispanic population, especially in coastal regions close to immigration source areas, the annual number of net new households will continue to drop. In the 1970s, net additional new households totaled 1.7 million per year. In the 1984-95 decade, average growth will be 1.2 million net new households per year; in the 1995-2000 period, 0.9 million net new households. We expect that residential expansion will be fueled by households moving up in the housing market to better quarters, while larger households in some submarkets will mean more people crowded into existing housing units, especially in lower rungs of the metropolitan housing markets of coastal areas.

Female labor force participation rose from about 46 percent in 1975 to almost 60 percent in the mid-1980s, while the male participation rate dropped from 78 percent in 1975, and is expected to reach 75 percent in the mid-1990s. The increased labor force participation by women, who tend to select jobs close to home, and the declining participation by men, who tend to select their housing location based on the location of their jobs, together with the increasing frequency of job changes by both men and women, add to the complexity of household daily and weekly activity orbits.

Coastal areas of the U.S. are likely to flourish economically and demographically, partly due to default by the spatially isolated heartland. But vigorous world population growth trends, set against depletion of surplus food stocks and the temporary collapse of Soviet agriculture, could produce a revitalized agricultural sector in the U.S. heartland even though agriculture is capital intensive (Sternlieb and Hughes 1988, p. 42). As the U.S. continues to export and import raw materials, coastal port areas will continue their processing at break in bulk points, thereby stimulating their local economies and stimulating further intensity of settlement in those areas.

How Economic Trends and Tight Credit Stabilize the Settlement System

No one can say with any certainty what the accumulating U.S. government deficits portend for settlement. Currently in excess of $3 trillion and expanding in the neighborhood of $400 billion or more each year, our $5 trillion economy for years to come will devote much of its savings just to fund and re-fund the debt. Already, the interest component of the federal budget constrains not only other government spending, but capital markets generally as the U.S. Treasury bids against businesses, home builders, and home buyers for America's savings.

Federal borrowing pressure could lead again to economic stagnation plus inflation, or the stagflation we experienced during the 1980-82 recession. If stagflation returns in the 1990s, interest rates would rise, putting a continuing damper on businesses, housing, and consumer spending. Moreover, inflating the currency by excessive expansion of the money supply would stimulate a flight of capital to existing fixed assets, producing further economic hardship and dislocation, but leaving the settlement system largely intact.

Under normal circumstances, cash flows generated by large-scale federal deficit spending would support some expansion of service sectors of the economy (banking, finance, insurance, hospital and medical services, business and producer services, etc.) as well as the infrastructure that the nation builds and uses. But government's ability to sustain such pump priming depends on the economy expanding faster than the debt load (as it did following the celebrated tax cuts engineered by Chairman of the President's Council of Economic Advisers, Walter Heller, in the 1960s); otherwise it causes real shrinkage in the economy--and corresponding landscape stabilization.

To my way of thinking, the major national and international signs point to economic difficulty coupled with landscape stabilization in the decades ahead. The settlement system we have now is essentially the one we will have for the next two or three decades, with some filling in of vacant land within built-up areas, but only limited

expansion outward, and that largely restricted to the coastal regions receiving large waves of immigrants.

Although many business writers and the current administration try to put a positive face on the economic prospects of the nation and the world in the decade ahead, my own reading of the evidence has been pessimistic for some time and remains so (Adams 1990). I agree with political scientist R. M. Christenson that "if there's been a time since the Great Depression when more negative factors converged upon the economy than now, it escapes memory" (Christenson 1991, p. 19A). The implication of this bleak assessment, if correct, is that the U.S. settlement system is unlikely to change much in the years ahead, much as it stabilized in the years between the late 1920s and the middle 1940s.

Trends in Local Development Management that Stabilize Settlement

Dropping down to the local level, significant progress was made between 1970 and 1990 in bringing the real estate development process under control in both traditional urban areas and in traditional rural regions of the U.S.

Developers today often must pay up-front for water supply, sanitary and storm sewage collection and processing facilities, roads, curbs, and gutters, and set aside land for parks, schools sites, and other public uses. These costs are capitalized up front and added to the cost of housing, which raises the cost of new housing and encourages compact development rather than traditional sprawl. The higher cost of new housing and the incentives promoting compact development are reinforced by county and metropolitan governments and planning agencies, with support from environmental groups, restricting new development to areas already served by sewers, water supplies, roads, schools, fire protection, and other local government services.

Since average-cost pricing of services to new development is judged unfair to older settled areas, and marginal-cost pricing for newly extended services is excessive at today's prices, local governments increasingly restrict new development to areas already served so that new

taxes generated are maximized while extra costs to the developers and the local governments are minimized. The result in many parts of the U.S. should be a stabilization of settlement fields as empty spaces within already built-up areas are slowly filled in, and as older built-up areas are cleared and re-used.

To summarize, demographic, economic, and local planning trends point to population expansion in coastal areas, with settlement stabilization and crowding. It is unlikely that resources will be available to build large quantities of expensive, low-density housing. If and when the recession ends, interest rates will rise and create havoc with the federal budget as the Treasury faces a mountain of new and recurring debt to sell. When the Treasury sells more bonds, bills, and notes than money markets can easily absorb, their price drops; that is, interest rates climb sharply, slowing the economic expansion needed to counterbalance the dead weight of debt on the economy. It is hard to imagine an economic or demographic scenario that would lead to a U.S. settlement expansion between 1990 and 2010 that even remotely resembled what occurred between 1970 and 1990. A much more likely outcome, even with significant population increase from immigration and natural change, is significant stability in the overall U.S. settlement system.

Changing Production Landscapes and Stabilized Consumption Landscapes

In the 1970s, the nation experienced an interruption in the auto-cheap oil era, but it also concluded an era of city building based dominantly on the needs of <u>producers</u>. Within the industrial cities of the American manufacturing belt, producers for more than a century had installed their enterprises at locations where they anticipated that they could get the production job done efficiently and profitably. They attracted workers whose neighborhoods clustered near the mills, factories, docks, and central business districts. Work was capital intensive and materials were hard to move.

When we began on a wide geographical scale separating spending power from earning power, we simultaneously began separating production landscapes from consumption landscapes

on our map of modern U.S. settlement. The separation took time. Initially, only high-salaried executives, owners of prosperous businesses, highly paid professionals, and the independently wealthy had the time and money to live at a distance from the unpleasantness of congested cities. But in the decades since World War II, such separation has become the rule rather than the exception, both within the older settled areas and among the diverse recently settled areas of the country.

Sometimes the separation takes place on a daily basis, with residential suburbs remote from job centers in the metropolitan area. Sometimes the separation occurs over longer distances as when people head out of the metropolitan area for weekend recreation. A third separation occurs when wealthy and/or retired persons permanently relocate, taking their pension claims and other resources with them. Retirees' choices have significantly expanded by means of general improvements in retirement incomes in recent decades. For example, private pension plan payments in the U.S. rose from $10 billion in 1972 to $136 billion in 1987 (U.S. Bureau of the Census 1990, Table 574). There were 17 million retired workers and their dependents receiving social security benefits in 1970, then 23 million in 1980, and 27 million in 1987. Meanwhile, the average monthly social security benefit to retired workers increased 189 percent in the 1970s and another 50 percent between 1980 and 1987 (U.S. Bureau of the Census 1990, Table 589). Certainly these people typically are far from wealthy, but most are of independent means because they are not anchored to a place by their jobs. In modern consumption- and leisure-oriented areas of the coasts, mountains, lake districts, and the Sun Belt, many people of independent means seem able to decide first where they wish to live and then watch settlements arise to serve them (Hart 1984a, 1984b, 1986, 1991).

Although it seems easy to make this distinction conceptually, it is harder to see a sharp line between (1) the tendency historically to build cities based on the needs and pulls operating on the commodity producer, as Detroit and Pittsburgh nicely illustrate, and (2) the tendency to create settlements based on the needs and wants of consumers as in a resort or retirement center like Sun City.

It seems that since the 1970s, and with a special flourish in the 1980s, we have been expanding our landscapes of consumption with less and less attention to the requirements of production. Part of this shift is undoubtedly due to the fact that so much of our production and circulation of material is done with capital equipment and little labor input. A result is that consumption variables seem to have become dominant in decisions about where to live even though accessibility to jobs remains important.

The definition of production is elusive today as activity concentrates in fields of endeavor not highly mechanized or automated--engineering, law enforcement, business services, counseling, face-to-face exchange of information and knowledge, entertainment. Furthermore, there is much innovation occurring. But unlike earlier times when a "better mousetrap" was peddled door to door, in willing buyer-willing seller exchanges, today's innovations often involve sectors of the economy engaged in hidden or coercive non-market exchanges (Adams 1990).

Money continues to move through the economy, but goods and services seeming to be of corresponding value increasingly fail to reach the consumer. In the 1950s we bought televisions; in the 1990s home security systems. In the 1950s, a significant share of public money paid for schools, parks, infrastructure, and other positive normal goods. In the 1990s, increasing shares are needed to care for crack babies, expansions of the court system, remedial education, treating victims of chemical dependency, and building prisons.

For many years the country has been consuming increasing volumes of goods it does not care to produce or apparently cannot produce competitively (cars, clothing, certain foods, home electronic equipment, etc.), while it increasingly produces goods and services that it generally prefers not to consume or regrets having to pay for (prescription drugs, surgery, medical care, government, lawsuits, welfare, pre-school and day care, remedial education, law enforcement, prisons, long-term care of the elderly, national defense, casualty insurance, environmental clean-up, etc.). Most of these goods and services must be

consumed where produced or involve face-to-face interaction so they are consumed where persons live. Thus, the expansion of the service industries occurs largely within locales of existing population, while people increasingly live where they choose to and economic activity follows them (Table 2).

The next generation of elderly--those born 1946-1964, who will be retiring in large numbers after 2005--are likely to be far less prosperous in their retirement years than those who retired 1970-1990, and who in their spending during their retirement years triggered a significant expansion of our landscapes of consumption. Moreover, in the next 20 years, monetary deflation remains a continuing possibility. The result of these trends is likely to be a further stabilization of settlement patterns, with local economies increasingly devoted to "taking in their own washing" and relatively less involved in trading their specialized goods and services production for the specialties of other areas. These structural changes have been recent and dramatic, but it will be many years before their full impact is measured and understood.

Production and consumption are separated in space but also in time, as today's elderly spend their savings, pension proceeds, and their capital gains on real estate. Meanwhile, much of today's consumption by government and individuals is paid for with borrowed funds by drawing down national assets of every kind (e.g., environment, public health, educational levels), and by using up infrastructure by neglecting its maintenance or saving for its replacement, thereby passing the bill to a later generation.

To summarize, the core areas of today's metropolitan regions were laid down where they are by the production requirements of industrialization. Next, major increments were added to them, along with some entirely new settlements. These additions were erected as consumption landscapes and were free to locate separate in time and space from older or remote production centers. A third wave seems to be under way in the U.S. today as both previous epochs have lost steam.

The current wave, born in a serious recession, promises a generation of maintenance at best, and possibly a

Table 2. -- Fastest Growing Occupations, 1986-2000.

No. 646. Civilian Employment in Occupations with the Largest Job Growth and in the Fastest Growing and Fastest Declining Occupations: 1988 and 2000

[In thousands, except percent. For occupations employing 100,000 or more in 1988. Includes wage and salary jobs, self-employed and unpaid family members. Estimates based on the 1985 through 1987 Occupational Employment Statistics Surveys. See source for methodological assumptions. Minus sign (–) indicates decrease]

Occupation	Employment				Percent change 1988–2000		
	1988	2000 [1]					
		Low	Moderate	High	Low	Moderate	High
Total [2]	118,104	127,118	136,211	144,146	8	15	22
LARGEST JOB GROWTH [3]							
Salespersons, retail	3,834	4,225	4,564	4,785	10	19	25
Registered nurses	1,577	2,069	2,190	2,258	31	39	43
Janitors and cleaners [4]	2,895	3,240	3,450	3,629	12	19	25
Waiters and waitresses	1,786	2,188	2,337	2,415	22	31	35
General managers and top executives	3,030	3,269	3,509	3,710	8	16	22
General office clerks	2,519	2,787	2,974	3,144	11	18	25
Secretaries, except legal and medical	2,903	3,085	3,288	3,484	6	13	20
Nursing aides, orderlies, and attendants	1,184	1,489	1,562	1,606	24	32	36
Truck drivers, light and heavy	2,399	2,572	2,768	2,973	7	15	24
Receptionists and information clerks	833	1,092	1,164	1,216	31	40	46
Cashiers	2,310	2,429	2,614	2,733	5	13	18
Guards	795	963	1,050	1,129	24	32	42
Computer programmers	519	716	769	831	38	48	60
Food counter, fountain, and related workers	1,626	1,747	1,866	1,927	7	15	19
Food preparation workers	1,027	1,183	1,260	1,305	15	23	27
Licensed practical nurses	626	806	855	881	29	37	41
Teachers, secondary school	1,164	1,328	1,388	1,451	14	19	25
Computer systems analysts	403	575	617	666	43	53	65
Accountants and auditors	963	1,099	1,174	1,250	14	22	30
Teachers, kindergarten and elementary	1,359	1,499	1,567	1,638	10	15	21
Maintenance repairers, general utility	1,080	1,199	1,282	1,358	11	19	26
Child care workers	670	790	856	901	18	28	34
Gardeners and groundskeepers, except farm	760	884	943	1,009	16	24	33
Lawyers	582	712	763	806	22	31	38
Electrical and electronics engineers	439	565	615	676	29	40	54
Carpenters	1,081	1,166	1,257	1,344	8	16	24
Stock clerks, sales floor	1,166	1,241	1,340	1,406	6	15	21
Food service and lodging managers	560	670	721	755	20	29	35
Home health aides	236	373	397	409	58	68	73
Cooks, restaurant	572	680	728	754	19	27	32
Physicians	535	642	684	707	20	28	32
Teachers aides and educational assistants	682	789	827	861	16	21	26
Clerical supervisors and managers	1,183	1,237	1,319	1,394	5	12	18
Blue collar worker supervisors	1,797	1,788	1,930	2,074	–1	7	15
Electrical and electronic engineering technicians	341	434	471	515	27	38	51
Dining room and cafeteria attendants and bar helpers	448	542	578	597	21	29	33
Financial managers	673	750	802	848	12	19	26
Automotive mechanics	771	833	898	947	8	16	23
Medical secretaries	207	307	327	334	49	58	61
Social workers	385	469	495	512	22	28	33
FASTEST GROWING							
Medical assistants	149	238	253	259	60	70	74
Home health aides	236	373	397	409	58	68	73
Radiologic technologists and technicians	132	206	218	224	57	66	70
Medical secretaries	207	307	327	334	49	58	61
Securities and financial services sales workers	200	289	309	325	45	55	63
Travel agents	142	204	219	235	43	54	66
Computer systems analysts	403	575	617	666	43	53	65
Computer programmers	519	716	769	831	38	48	60
Human services workers	118	161	171	176	37	45	49
Correction officers and jailers	186	251	262	276	35	41	48
Electrical and electronics engineers	439	565	615	676	29	40	54
Receptionists and information clerks	833	1,092	1,164	1,216	31	40	46
FASTEST DECLINING							
Electrical and electronic equipment assemblers, precision	161	81	91	99	–50	–44	–39
Electrical and electronic assemblers	237	119	134	144	–50	–44	–39
Farmers	1,141	800	875	932	–30	–23	–18
Stenographers	159	116	122	130	–27	–23	–18
Telephone and cable TV line installers and repairers	127	94	100	106	–25	–21	–16
Sewing machine operators, garment	620	493	531	565	–21	–14	–9
Crushing and mixing machine operators and tenders	136	107	117	126	–21	–14	–7
Textile draw-out and winding machine operators [5]	227	180	197	215	–21	–13	–5
Machine feeders and offbearers	249	199	218	232	–20	–13	–7
Hand packers and packagers	635	516	560	596	–19	–12	–6
Packaging and filling machine operators and tenders	286	232	254	266	–19	–11	–7

[1] Based on low, moderate, or high trend assumptions. [2] Includes other occupations not shown separately. [3] In descending order, based on absolute employment change 1988 to 2000 (moderate growth). [4] Includes maids and housekeepers. [5] Includes tenders.

Source: U.S. Bureau of Labor Statistics, *Monthly Labor Review*, November 1989.

Source: Statistical Abstract of the United States, 1990.

wholesale deterioration of our built environment as available resources diminish. A clear consequence of the third wave is settlement stability. There will be little major construction for the next 20 years, although population growth and pressures for population relocation will continue at every geographical scale, from local to international. As pressures arise for expanded migration and foreign immigration, though, resistance will arise as well. In times of economic distress and uncertainty the haves are less willing to share with the have-nots.

Concepts and Federal Government Practice

Concepts that underlie current metropolitan area definitions are linked to descriptions and conceptualizations of a production-oriented settlement system that was taking shape during the end of the 19th century and has been transforming itself steadily during the 20th century. Concepts and criteria that may have worked satisfactorily in 1910 may have outlived their usefulness because the settlement reality they attempt to portray today is a fundamentally different event compared with that of a century ago.

Production-Oriented Cities of the 19th and Early 20th Centuries

Drastic changes occurred in the map of American metropolitan areas (1) from the end of the iron horse and riverboat eras in 1870 to the end of the steel rail era in 1920; and (2) again from 1920 to the climax of the fifty-year auto-cheap oil era in the 1970s (Borchert 1990). These two half-century time spans, 1870-1920 and 1920-1970, bound two crucial epochs in American city building and settlement evolution.

It was in the midst of the first epoch (1870-1920) when city growth boomed yet outward expansion of industrial cities was severely constrained that the Census Bureau first defined metropolitan districts in 1910. These areas were defined through 1940. In 1950, the metropolitan district was supplanted by the standard metropolitan area, variants

of which have been used since. Thus, a concept developed in one epoch of city building and settlement evolution was carried over for use in the significantly different more recent epoch (1920-1970).

Today, we sense that perhaps the carryover, although a practical solution to a vexing geographic classification problem, may have overlooked important differences in city building between the two epochs.

The concept behind the 20th century definition of the metropolitan district or metropolitan area is one of severely constrained movement by pedestrian or transit mode between peripheral homes and core non-agricultural jobs. Prior to 1890, most American cities functioned mainly as spatially compact production nodes at raw material sources, power sites, local break in bulk ports, or transport intersections. Urban workers were constrained by their work schedules and transport options to live within walking distance of their jobs in business and industry. Turn-of-the-century writings such as Adna F. Weber's The Growth of Cities in the Nineteenth Century documented the abrupt appearance of industrial cities across the world. Astute observers such as Patrick Geddes (1968), Lewis Mumford (1938), and Ebenezer Howard (1965) commented on the rise of the cities, their internal structures, their congestion, all these features reflecting the drive of the capitalist economy to expand production. The flourishing cities were correctly understood as settlements contrived to facilitate the production of goods and services, as "huge machines" with a job to do (Borchert 1990).

The electric streetcar, introduced into all large- and medium-sized cities after 1888, lengthened the convenient distance between work and home, but it was only a modest extension. The streetcar companies were private businesses, so the high cost/benefit ratios for extravagant expansion of systems limited the extension of rails in most cities.

The rapid deployment of streetcar systems between 1890 and 1920 was followed by expanded use of private cars after World War I. But residential extensions of the American industrial city based on streetcar lines and later by the use of cars by the higher-income classes for non-work related trips did little to change the fundamental character

of the production-oriented city, which existed within a confined spatial framework until after World War II.

It was this concept of the spatially confined industrial production city that was captured initially by the 1910 definition of the metropolitan district, and used again by the refined 1950 definition of the metropolitan area. Both of these efforts tried to define and classify a settlement form that had emerged unanticipated and unplanned in the 19th century, and that revealed striking differences from earlier American settlement forms. The Industrial Revolution in America, which started in the 1840s, had introduced new methods of production, and a new settlement form arose to get the production job done.

Settlement Forms and Land Use Law

The law shapes our settlements at the same time that debates over policy issues and official classifications of settlement forms shape our land use law and statistical practice. A three-way cause-effect relationship exists among (1) what is built and used on the land; (2) how we understand, describe, and debate what should be built and used on the land; and (3) the laws and rules adopted to regulate land use patterns.

For example, R. H. Platt wrote that "[A] clear dichotomy exists between rural land uses on the one hand and urban and built-up uses on the other. Rural land, predominantly used for cropland, grazing, or forestry, is abundant in quantity to meet anticipated domestic needs....The overriding goal of public policy toward rural land should be to preserve the productive capacity or 'sustainability' of such resources to meet future domestic and foreign demand. In particular, those lands deemed most or least suitable for specific uses should be identified, designated, and managed accordingly by public and private land managers. Reversible conversion of rural land from one use to another is a normal response to changing economic circumstances. Irreversible transformations of productive rural land, either to a degraded condition (e.g., due to soil erosion, salinization, or inundation) or to urban or built up condition pose important public policy issues" (Platt 1991, p. 15).

The quote from Platt takes for granted a classificatory distinction between urban and rural land. Evidently for legal and planning purposes land is tagged as "rural" depending on the dominant use to which it is put. But the classes potentially available for use, and indeed the classification systems that perhaps ought to be produced to help us think about land parcels can be quite broad. For example, parcels of land may be classified according to:

1. inherent natural features brought to our attention by scientific, engineering, and other investigations (e.g., soil, slope, vegetation, hydrological characteristics, aesthetic quality, etc.);

2. human activity that parcels currently support (e.g., housing, trade, transportation, etc.);

3. structures built upon and within the land, which normally are closely related to the human activity occurring there, but with exceptions (e.g., people living in stores and manufacturing lofts, factories converted to restaurants, barns used as art galleries and antique shops, etc.);

4. linkages that currently exist between and among parcels and aggregates of parcels (e.g., journey to work, movements of goods, travel to purchase services, radio/television, data transmission, etc.);

5. past features, (e.g., historically significant buildings, sites, districts, battlefields, etc.) that recall significant events and evoke memories and sentiments that endow a place with special meaning;

6. intended, forbidden, or hazardous uses as in land zoned by law to support or restrict activities; and

7. degree of permanance of structures, activities, or linkages at a place.

Once the range of considerations broadens, a supposedly sharp distinction between urban and rural land fades quickly despite its legal status. Yet even if the conceptual basis for the urban-rural dichotomy is weak, the conservative force of existing law remains strong.

Platt quotes James E. Vance, Jr. to the effect that law is a morphogenetic agent in the shaping of the human environment (Platt 1991, p. x). For example, the OMB defines metropolitan areas using a combination of morphological and linkage criteria. But morphology and linkages have, in turn, been shaped by law because issues and community goals shape policy, which is codified into land use law. Examples of issues that have led to laws affecting land use include:

1. inefficient use of land due to waste of cropland, loss or pollution of wetlands, overextension of public services, and visual blight;

2. energy waste from lengthy journeys to work, traffic congestion, decline of public transportation, and heating and air conditioning of small structures;

3. natural hazards such as urban flooding, seismic risk, soil and slope instability, or coastal storm hazards;

4. public recreation and open space planning that addresses spatial imbalance between supply and demand, multiple functions and constituencies, and the deterioration of older facilities; and

5. affordable housing as related to exclusionary zoning, inadequate public financing, conversion of rental units into condos, and deterioration of older housing.

The cause-effect relations among issues, laws, and land use run in the opposite direction as well. For instance, present OMB metropolitan area designations affect law making and administrative rule making, although they are not intended to. These metropolitan area classifications or designations affect the law by the way they structure data gathering, the framing of issues, the analysis of issues, lobbying, lawmaking, rule making, and eventual policy implementation (Alonso and Starr 1987).

Some might argue that this sequence of cause and effect is the reverse of what it ideally should be. Policy debate should lead to laws and rules that implement policy. During the policy process, areal classifications should be policy-neutral as far as possible or practicable. Areal classifications should not serve as accidental agents of the policy process, especially if they can be used to subvert, dilute, or reverse policy or thwart the law.

Issues of Spatial Scale, Temporal Cycles, and Spatial Organization of Settlement

Why define metropolitan areas at all? What is distinctive about the spatial scale of metropolitan areas that were defined first for the 1950 census and then entered our classificatory and analytical thinking?

The most important reason is likely the notion of "the spatially confined daily urban system." Our society and culture, like most others, use diurnal patterns of activity as the most obviously natural unit of time. The hour, the minute, and the second were important in the development and smooth operation of our industrial age. The week is a convention, and the month is based on phases of the moon. Both the week and the month traditionally seem to have less relation to societal operation than do the season of the year or the year itself. The day, on the other hand, imposes self-evident routine on life, for the individual and for the society at large.

It is not surprising that the idea of the daily urban system seems conceptually comfortable and reasonable. But the daily urban system, with primary attention in its definition paid to the journey to work, has a production-oriented flavor.

The idea of a "weekly urban system" should be easy to conceptualize, but it is muddied by the explicit mixing of work and play--a mixing that our culture has traditionally found troubling. If we were to speak of a weekly urban system we would have to include the weekend along with the workweek and include major chunks of leisure activity with what we term "work" activity. The fact that we have not done so probably reflects the fact that our thinking about cities and our functional classifications of cities has been rooted in the history of cities as production units. Our economic and geographical studies of cities have emphasized cities as production centers that happened to have people living in them as workers.

If we were to highlight the city as a consumption center rather than a production center our emphasis would shift away from the journey to work and the work day and towards activity at home, consumption, and leisure pursuits at home and elsewhere. With a consumption orientation, instead of the day as the most relevant span of time for defining the "urban system" we would include the weekends, holidays, and vacation time as well.

The concept of "daytime population" is based implicitly on the idea of "people at work." But there are different daytime populations on different days and at different times of the day. On Saturdays, for example, many people who work Monday through Friday are shopping, running errands, playing, and visiting. On Sundays, still other activities besides work can dominate the average household's time and space budgets.

Although traditional working hours have been weekdays during daylight hours, workers in the hospitality and recreational industries are busiest at other times. Shopping centers often are quiet at midday and busy on evenings and weekends. Future censuses might ask which days and which hours were worked in the previous week.

The length of the average American work week diminished steadily through midcentury, but the trend seems to have reversed in the 1970s and 1980s for broad segments of society. For some blue collar, white collar, and professional workers, voluntary and mandatory overtime has lengthened the work day and the work week, while for others

only part-time and temporary work seems to be available. The details of these secular trends need to be better measured down to the neighborhood scale to permit small area analysis.

Present Practice and Settlement Classification Requirements

Defining metropolitan areas has been treated by the OMB over the years as a binary classification exercise. Certain counties (or other building blocks) fall inside metropolitan areas while others fall outside. Another approach to classifying counties according to their metropolitan character would be to array the counties along a continuum of one or more dimensions, assign to each a score according to its position in the classification framework, and cluster the counties according to their similarities. But whether one devises a binary system or a system with several classes along a continuum, the usefulness of the result cannot be judged until the purpose of the classification exercise is clarified. And whatever the purposes expressed or implied in 1910 or 1950 may have been, they are less clear today.

At the close of the 19th century, industrial cities were recognized as strikingly different from earlier settlement forms. The extreme differences in form and character of industrial cities compared with traditional, resource-exploiting settlements and administrative centers set them apart from what was understood as the normal or the familiar of the day.

Today, however, no such obvious distinction between the city and other settled areas can be sharply drawn. On the contrary, when driving outward today from a high-density downtown into what we call the countryside, we never seem completely and decisively to leave behind the economy or the society of the metropolitan core. Land use intensity drops to be sure. But it is a gradual decline, seldom if ever abrupt. One settlement form seems to fade into another, often with no conspicuous boundaries. Moreover, virtually the entire settlement system today is linked by countless flows of information, money, commodities, and people.

In the century since the introduction of the electric streetcar, we extended rails and roads outward radially from

city centers to points in all directions. Next we connected the points and lines to create networks to serve emerging settlement fields. As this process unfolded, former distinctions between rural and urban have faded to insignificance, leaving us to ask: what kind of distinctions regarding size, or form, or density, or linkage, are relevant today from the point of view of policy questions, planning issues, scientific interest, or of forecasting future geographies?

Certainly the settlement fabric of the U.S. will continue evolving, although the rate of change between 1990 and 2010 is likely to be far more muted than what occurred during the 1970s and the 1980s. The question remaining is whether there is merit in carrying forward into the 21st century a conceptual framework and a classification terminology that reflects the late 19th century world. What is familiar is not always necessary. New thinking is needed to guide the description and analysis of emerging settlement, especially as geographic information systems come into play.

The role of classification in geography has been muddled and incomplete. Geographers have devoted little attention to classification based on relative location, focusing instead on the internal attributes of places. They have often borrowed schemes from cognate fields (e.g., geology, soils, economics, psychology, anthropology, etc.) and then refined them for their own sake, without sufficient regard either for their long-term scientific value as tools for promoting basic inquiry, or for their practical value in helping to resolve public policy issues. Classification remains an undernourished and undeveloped part of geography, probably because it is so difficult (Borchert 1991).

Whatever classification scheme is devised for describing selected features of the present and future U.S. settlement system, it should observe in a consistent way:

- basic principles of multivariate clustering of subareas based on selected site and other attributes of the subareas;

- the fact of gradients in physical and socioeconomic landscapes from place to place;

- interaction between and among places; and

- relative location within the settlement system.

Although classes probably cannot easily and directly incorporate historical or genetic dimensions, the classes themselves (as distinct from the members of the classes) should be defined such that they are comparable over time.

The Metropolitan Area Concept and Practice through 1990

The general metropolitan area concept is one of a large, spatially concentrated population nucleus, together with adjacent communities that display a high degree of economic and social integration with that nucleus (U.S. Bureau of the Census 1990, pp. 908-9; Office of Management and Budget 1990). The systematic official recognition of urban entities larger than corporate cities dates from the census of 1910 (Forstall 1990; U.S. Bureau of the Census 1911). The metropolitan districts defined for the 1910 census included minor civil divisions beyond the built-up area if they had high population densities and were within ten miles of the central city boundary. This rule recognized the suburban residence of city workers commuting by rail and streetcar, as well as the city residence of suburban workers.

Metropolitan districts were recognized and defined through the 1940 census, then were supplanted in the 1950 census by standard metropolitan areas (SMAs), which had been first issued in 1949 by the Bureau of the Budget (predecessor of OMB). The SMAs were formed from whole counties, except in New England, where data were available for subcounty cities and towns.

The term for the official metropolitan areas was changed to standard metropolitan statistical area (SMSA) in 1959. Criteria for the establishment and definitions of SMSAs were modified in 1971 and 1975. Standards adopted in 1980 and used during the following decade replaced the term

SMSA with metropolitan statistical area (MSA) and provided that each MSA must include:

(1) a city with at least 50,000 or more inhabitants, or

(2) a Census Bureau-defined urbanized area of at least 50,000 inhabitants and a total MSA population of at least 100,000 (75,000 in the six New England states).

Counties continued to serve as building blocks for MSAs, except in New England where cities and towns were still used as the building blocks. The MSA definitional criteria specified that the MSA would include as central county(ies) the county in which the central city was located, plus any adjacent counties having at least half their population living within the urbanized area. Additional outlying counties were included in the MSA if they met requirements of commuting to the central counties and requirements of metropolitan character such as specified minimum population density and percentage urban.

The 1980 standards also more strongly injected a hierarchical concept into the definition of metropolitan areas than had been the case previously, providing that within metropolitan complexes of one million or more population, separate component metropolitan areas were defined if certain criteria were met. The component metropolitan areas within the million-plus complexes were termed primary metropolitan statistical areas (PMSAs). If an area contained two or more PMSAs it was called a consolidated metropolitan statistical area (CMSA). At the time of the 1990 census, there were 264 MSAs in the U.S., as well as 20 CMSAs that included 71 PMSAs. These were the final areas defined using the 1980 metropolitan area standards.

OMB's revised standards for defining metropolitan areas in the 1990s (issued in 1990) included no major changes from the 1980 standards, retaining the MSAs, CMSAs, and PMSAs. The 1990 standards did, however, introduce a new collective term for all of these areas: metropolitan areas (MAs) (Office of Management and Budget 1990).

Changes in the definitions of metropolitan areas since 1949 have consisted mainly of (1) recognizing new areas as when, for example, cities reached 50,000 population, and (2) the addition of counties (or New England cities and towns)

to existing areas as newly available census data showed them to qualify for inclusion. Some formerly separate areas have merged, and sometimes territory has been transferred from one area to another or from metropolitan to nonmetropolitan territory (U.S. Bureau of the Census 1990).

Another round of metropolitan area definition will occur as OMB applies the 1990 standards to the 1990 census data in 1992 and 1993.

Standards for defining metropolitan areas have changed as the settlement fabric of the nation changed. But as the settlement patterns of 1890 were transformed to those of 1990, some of the basic concepts that seemed relatively easy to set out and to use in 1910 later have proved to be increasingly muddy. Berry et al. (1968) reviewed the major criteria used in defining the SMSA as of 1960 and some of the criticisms that had been lodged against them. These criteria remain at the heart of the criteria specified in 1980 and again in 1990, and the criticisms of them remain valid today.

Definitional criteria used in defining MAs continue to operationalize a "core and periphery" concept of a "large urban-type area" that is essentially different from and on a daily basis relatively unconnected socially and economically with the non-urban hinterland within which the MA is located.

Continuous Threads in Metropolitan Area Definition

Metropolitan area definition has explicitly or implicitly involved three main sets of criteria: population size, metropolitan character, and functional integration of subareas at the local level (Berry et al. 1968).

Population criteria. In 1950, having a city with at least 50,000 population met the requirement to qualify a metropolitan area. Beginning with the 1980 standards, a city of at least 50,000 population or the presence of a Census Bureau-defined urbanized area and a total population of at least 100,000 satisfied the requirement to qualify a metropolitan area. This change, which evolved through two intermediate stages, reflects a recognition of settlement developments over time and the frequently arbitrary

placement of municipal boundaries within a settlement concentration.

Size is interpreted as equivalent to importance. In earlier times, the largest places were most different in their economy and way of life from small places. But as turn-of-the-century movement constraints loosened as improved transportation and communications permitted easier linkage, the largest cities declined in population.

At present, many large cities are losing population, continuing a trend of many years, the cities having reached their peak populations in the 1940s or 1950s, and some even earlier. Meanwhile, many smaller cities that are overbounded or able easily to annex nearby territory are growing larger or increasing in density as empty areas within their borders fill in.

Criteria of metropolitan character. Prior to 1980, metropolitan area definition employed the idea of a large non-agricultural labor force and a large job center with adjacent residential areas. For decades, however, the U.S. labor force has been largely non-agricultural, and those working in agriculture today enjoy ways of life essentially identical with the lives of others. Moreover, a substantial fraction of households living in what are termed farm residences are employed in non-agricultural pursuits off the farm. Consequently, the official criteria dropped any nonagricultural requirement as of the 1980 standards.

The metropolitan concept in the official system hypothesizes substantial separation between workplace and residence within the urban concentration but does not assume the existence of primarily residential areas. Metropolitan area boundaries are defined based on commuting flows, not on relative concentration of jobs, even though job concentrations are used in identifying central cities.

Job centers have been dispersing for years as American business has moved away from the use of railroads and toward the use of highway and air transportation for commodity shipments and to electronic media for communications. Also, residential areas contain purchasing power and labor supply, and business pursues purchasing power and suburban labor pools by locating stores, shops, and services as close as possible to where people live.

At the turn of the 20th century, contiguity was the rule in expansion because all parts of the urban area had to be connected with the center by rail or transit. Official metropolitan definitions, though, have never required built-up continuity, not even in 1910. They have consistently included some communities that were separated by undeveloped area from the main city or agglomeration. (Urbanized areas, on the other hand, are concerned with continuously built-up area.) Since World War II, modern planning practice has evolved to prohibit continuously built-up areas. Open space is now mandated by state, county, and local law. Furthermore, radial patterns of movement have increasingly given way to local and regional fields of trip-making in all directions made possible by modern highway grids.

The traditional metropolitan criteria reflected the typical situation involving a fixed residence on the edge, a fixed job at the core, and a daily journey to work. The contemporary reality is that of workers who change jobs and housing relatively often, and multiple job holders in the typical household who travel in diverse directions to and from their jobs.

According to the current standards, all the jobs could be in the outer counties of the metropolitan area, and all the residents at the center, without affecting the metropolitan area definition. However, commuting to outlying counties does not figure in measuring commuting from additional, more remote counties.

Criteria of integration. The idea here is a set of daily commuter flows that link residences with workplaces. These flows continue, to be sure, and form the glue that connects counties in the traditional aggregation of territory to form metropolitan areas. But the pattern of flows has become increasingly complex as the trips themselves have become multi-purpose. The special priority given to the journey to work can now be called into question as other flow patterns have increased to major significance.

The landscape of trade centers and trade areas has been reorganizing in recent years so that general retailing has steadily consolidated into giant centers while specialized retailing and specialized services have increasingly appeared on the main streets of smaller cities and towns and

neighborhood shopping centers, leading to inter-county shopping for specialties and long-distance shopping trips for general merchandise (Anding et al. 1990).

The priority accorded to daily linkages can also be questioned. We could consider both daily and weekend highway travel flows and the relationship between them. Daytime weekday flows (to work, to shop), weekday evening flows (to work, to shop, to recreate), and weekend flows (for work, shopping, visiting, recreation) all imply different activity orbits and different regional systems. If the criteria of integration were broadened, and attention were paid to a fuller set of flows, the regional systems revealed would differ from the metropolitan areas defined by the narrow notion of journey to work.

National Trends and Local Flux in Job Location and Place of Residence

The national economic picture of the 1970s and 1980s featured changes in production and consumption mixes that have reorganized daily and weekly activity orbits and associated settlement systems. This section recalls those changes and examines recent commuting trends in Minnesota for insight into how census measurements of inter-county commuting reflect changes in the structure and use of a statewide settlement system.

Minnesota is examined not only because it is convenient, but also because it contains both large and small metropolitan areas, some of them relatively isolated and others increasingly intersecting and overlapping. The state has a wide range of local environments, economies, and population densities. It also includes several OMB-defined metropolitan areas that straddle state boundaries.

Work Places and Home Places

The nature and the location of paid employment and the work place have been changing rapidly in recent decades. The fastest growing occupations and the largest job growth in the 1980s and the 1990s has involved employment that is less permanent and more geographically scattered away from

traditional high-density job centers and toward residential areas, especially upper income and newly expanding zones outside of central cities. In response to employment instability and economic pressure, the number of employed persons with more than one job has risen toward 6 percent of all employed persons.

On the residential side of the settlement fabric, other patterns that formerly were considered unusual have become more common. The number of unmarried couples rose by almost five times in the 1970s and 1980s, while such couples with young children quadrupled (Table 3). Husband and wife families are today less typical, while single parent families have become more commonplace (Table 4). Young children living with both parents were relatively less common in 1990 than in 1960 (Table 5). When custody of minor children of divorced or separated parents is shared, the children, in effect, live at more than one address.

Other groups of people in Minnesota who may live at more than one address include some of the 20,000 American Indians living on Minnesota's fourteen reservations who spend time off the reservations, and many of the state's more than 30,000 urban Indians who maintain tribal registration and legal ties with one of the bands in Minnesota and adjacent states. A third group includes households who maintain second homes in the lake, river, and forested regions of the state, or in retirement or recreation areas elsewhere in the U.S.

Changes in County-to-County Commuting in Minnesota, 1960-1980

Local economies, with their different mixes of specialties, expand and contract depending in part on international and national trends. In Minnesota, government, medical, financial, business services, educational, high tech manufacturing, and year-round recreational areas prospered in the 1960s and afterward, while many remote agricultural and mining areas languished, especially in the 1970s. These economic mix effects were squelched or magnified depending on growth initiatives by local leadership and by local enterprises and institutions that outperformed their national counterparts.

Table 3. -- Unmarried Couples with Young Children, 1970-1988.

NO. 54. UNMARRIED COUPLES, BY SELECTED CHARACTERISTICS, 1970 TO 1988, AND BY MARITAL STATUS OF PARTNERS, 1988

[In thousands. As of March, except 1970, as of April. An "unmarried couple" is two unrelated adults of the opposite sex sharing the same household. See headnote, table 55]

PRESENCE OF CHILDREN AND AGE OF HOUSEHOLDER	1970	1980	1985	1988	MARITAL STATUS OF MALE	Total	MARITAL STATUS OF FEMALE			
							Never married	Divorced	Widowed	Married, husband absent
Unmarried couples	**523**	**1,589**	**1,983**	**2,588**	**Total, 1988**	**2,588**	**1,364**	**875**	**177**	**172**
No children under 15 yr	[1] 327	1,159	1,380	1,786	Never married	1,401	968	300	62	71
Some children under 15 yr	[1] 196	431	603	802	Divorced	894	313	469	58	54
Under 25 yr. old	55	411	425	510	Widowed	80	19	21	35	5
25–44 yr. old	103	837	1,203	1,635	Married, wife absent	213	64	85	22	42
45–64 yr. old	186	221	239	325						
65 yr. old and over	178	119	116	118						

[1] Children in unmarried-couple households are under 14 years old.

Source: U.S. Bureau of the Census, *1970 Census of Population*, vol. II, part 4B, and *Current Population Reports*, series P-20, No. 433 and earlier reports.

Source: Statistical Abstract of the United States, 1990.

Table 4. -- Families in the U.S., 1960-1989.
Households, Families, and Subfamilies

NO. 55. HOUSEHOLDS, FAMILIES, SUBFAMILIES, MARRIED COUPLES, AND UNRELATED INDIVIDUALS: 1960 TO 1989

[In thousands, except as indicated. As of March. Based on Current Population Survey; includes members of Armed Forces living off post or with their families on post, but excludes all other members of Armed Forces; see text, section 1 and Appendix III. For definition of terms, see text, section 1. Minus sign (–) indicates decrease. See also *Historical Statistics, Colonial Times to 1970*, series A 288–319]

TYPE OF UNIT	1960	1970	1975	1980	1985	1986	1987	1988	1989	PERCENT CHANGE	
										1970–1980	1980–1989
Households	**52,799**	**63,401**	**71,120**	**80,776**	**86,789**	**88,458**	**89,479**	**91,066**	**92,830**	**27.4**	**14.9**
Average size	3.33	3.14	2.94	2.76	2.69	2.67	2.66	2.64	2.62	(X)	(X)
Family households	44,905	51,456	55,563	59,550	62,706	63,558	64,491	65,133	65,837	15.7	10.6
Married couple	39,254	44,728	46,951	49,112	50,350	50,933	51,537	51,809	52,100	9.8	6.1
Male householder [1]	1,228	1,228	1,485	1,733	2,228	2,414	2,510	2,715	2,847	41.1	64.3
Female householder [1]	4,422	5,500	7,127	8,705	10,129	10,211	10,445	10,608	10,890	58.3	25.1
Nonfamily households	7,895	11,945	15,557	21,226	24,082	24,900	24,988	25,933	26,994	77.7	27.2
Male householder	2,716	4,063	5,912	8,807	10,114	10,648	10,652	11,310	11,874	116.8	34.8
Female householder	5,179	7,882	9,645	12,419	13,968	14,252	14,336	14,624	15,120	57.6	21.7
One person	6,896	10,851	13,939	18,296	20,602	21,178	21,128	21,889	22,708	68.6	24.1
Families	**45,111**	**51,586**	**55,712**	**59,550**	**62,706**	**63,558**	**64,491**	**65,133**	**65,837**	**15.4**	**10.6**
Average size	3.67	3.58	3.42	3.29	3.23	3.21	3.19	3.17	3.16	(X)	(X)
Married couple	39,329	44,755	46,971	49,112	50,350	50,933	51,537	51,809	52,100	9.7	6.1
Male householder [1]	1,275	1,239	1,499	1,733	2,228	2,414	2,510	2,715	2,847	39.9	64.3
Female householder [1]	4,507	5,591	7,242	8,705	10,129	10,211	10,445	10,608	10,890	55.7	25.1
Unrelated subfamilies	207	130	149	360	526	505	566	537	473	176.9	31.4
Married couple	75	27	20	20	46	45	37	38	49	(B)	(B)
Male reference persons [1]	47	11	14	36	85	63	77	46	26	(B)	(B)
Female reference persons [1]	85	91	115	304	395	397	452	452	398	234.1	30.9
Related subfamilies	1,514	1,150	1,349	1,150	2,228	2,256	2,286	2,397	2,278	-	98.1
Married couple	871	617	576	582	719	726	712	765	775	–5.7	33.2
Father-child [1]	115	48	69	54	116	131	123	152	103	(B)	(B)
Mother-child [1]	528	484	705	512	1,392	1,399	1,451	1,480	1,400	5.8	173.4
Married couples	40,200	45,373	47,547	49,714	51,114	51,704	52,286	52,613	52,924	9.6	6.5
With own household	39,254	44,728	46,951	49,112	50,350	50,933	51,537	51,809	52,100	9.8	6.1
Without own household	946	645	596	602	764	771	749	803	824	–6.7	36.9
Percent without	2.4	1.4	1.3	1.2	1.5	1.5	1.4	1.5	1.6	(X)	(X)
Unrelated individuals	11,092	14,988	19,100	26,426	30,518	31,506	31,914	33,124	34,499	76.3	30.5
Nonfamily householders	7,895	11,945	15,557	21,226	24,082	24,900	24,988	25,933	26,994	77.7	27.2
Secondary individuals	3,198	3,043	3,543	5,200	6,436	6,606	6,926	7,191	7,505	70.9	44.3
Male	1,746	1,631	2,087	3,006	3,743	3,764	3,947	4,081	4,241	84.3	41.1
Female	1,451	1,412	1,456	2,194	2,693	2,842	2,978	3,110	3,264	55.4	48.8

– Represents zero. B Not shown; base less than 75,000. X Not applicable. [1] No spouse present.

Source: U.S. Bureau of the Census, *Current Population Reports*, series P-20, No. 441.

Source: Statistical Abstract of the United States, 1990.

Table 5. -- Children Living with Parents, 1970-1988.

NO. 69. CHILDREN UNDER 18 YEARS OLD, BY PRESENCE OF PARENTS: 1970 TO 1988

[As of March. Excludes persons under 18 years old who maintained households or family groups. Based on Current Population Survey; see headnote, table 65]

RACE, HISPANIC ORIGIN, AND YEAR	Number (1,000)	PERCENT LIVING WITH—							
		Both parents	Mother only					Father only	Neither parent
			Total	Divorced	Married, spouse absent	Single [1]	Widowed		
ALL RACES [2]									
1970	69,162	85.2	10.8	3.3	4.7	.8	2.0	1.1	2.9
1980	63,427	76.7	18.0	7.5	5.7	2.8	2.0	1.7	3.6
1985	62,475	73.9	20.9	8.5	5.4	5.6	1.5	2.5	2.7
1987	62,932	73.1	21.3	8.5	5.2	6.0	1.3	2.6	2.9
1988	63,179	72.7	21.4	7.9	5.3	6.8	1.3	2.9	3.0
WHITE									
1970	58,790	89.5	7.8	3.1	2.8	.2	1.7	.9	1.8
1980	52,242	82.7	13.5	7.0	3.9	1.0	1.7	1.6	2.2
1985	50,836	80.0	15.6	8.1	4.1	2.1	1.3	2.4	2.0
1987	51,112	79.1	16.1	8.4	4.0	2.7	1.1	2.6	2.2
1988	51,030	78.9	16.0	8.0	4.0	2.9	1.1	2.9	2.2
BLACK									
1970	9,422	58.5	29.5	4.6	16.3	4.4	4.2	2.3	9.7
1980	9,375	42.2	43.9	10.9	16.2	12.8	4.0	1.9	11.9
1985	9,479	39.5	51.0	11.3	12.4	24.8	2.5	2.9	6.6
1987	9,612	40.1	50.4	9.6	12.0	26.3	2.6	2.5	7.0
1988	9,699	38.6	51.1	8.4	12.1	28.2	2.5	3.0	7.4
HISPANIC [3]									
1970	[4] 4,006	77.7	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
1980	5,459	75.4	19.6	5.9	8.2	4.0	1.5	1.5	3.5
1985	6,057	67.9	26.6	7.3	11.1	6.5	1.7	2.2	3.3
1987	6,647	65.5	27.7	8.0	9.3	8.8	1.6	2.8	4.0
1988	6,786	66.3	27.2	7.9	8.8	8.8	1.6	3.0	3.6

NA Not available. [1] Never married. [2] Includes other races not shown separately. [3] Hispanic persons may be of any race. [4] All persons under 18 years old.

Source: U.S. Bureau of the Census, *Current Population Reports*, series P-20, No. 433 and earlier reports.

Source: Statistical Abstract of the United States, 1990.

The template of county boundaries provides a framework for measuring how the expansion and contractions of local economies are reflected in commuting patterns. Between 1960 and 1980 the share of workers in a county who commuted daily to jobs outside their home county rose in 72 of Minnesota's 87 counties and dropped in only eight (Table 6).

The rise in inter-county commuting can be easily explained by (1) decentralization of employment away from central city congestion to suburban locales, and from large metropolitan areas to small regional centers or outside of nucleated centers entirely; (2) the dispersal of residences from high-density areas to low, along with the sustained increases in population in small and medium sized centers; and (3) the improved ease of highway transportation among counties and apparently increasingly intersecting fields of movement.

Besides the 87 Minnesota counties, in adjacent states (ND, SD, IA, and WI) there are 33 counties that are contiguous to Minnesota. Of these 33 counties, only one of those that sends workers outside the home county to work does not send workers to Minnesota. Between 1960 and 1980, 21 of the 33 border counties increased their share of "out of county" commuters going to jobs in Minnesota, which is yet another index of the geographical spreading out of labor markets.

Counties with 25 percent or more of their resident workers commuting to jobs outside their home county are generally of three types (Table 6):

1. counties in the greater Minneapolis-St. Paul area;

2. essentially agricultural counties adjacent to Minnesota's strong regional centers (Rochester, Mankato, St. Cloud, Bemidji, Duluth) or adjacent to a strong center in an adjacent state (Fargo-Moorhead, LaCrosse); and

3. counties within the corridors linking major centers (Sherburne County between Minneapolis and St. Cloud to the northwest; Kanabec, Pine, Isanti, and Chisago Counties between the Twin Cities and Duluth

Table 6. -- Share of Workers Commuting Out of Home County Daily, Ranked by Share, 1960 and 1980

Share of Workers Commuting Outside Local Area by Rank.

MN County Name	Commuting Wkrs 60	Commuting Wkrs 80
Washington	0.53	0.68
Sherburne	0.46	0.66
Anoka	0.67	0.60
Benton	0.38	0.57
Dakota	0.46	0.55
Carver	0.30	0.54
Scott	0.28	0.50
Wright	0.21	0.49
Chisago	0.29	0.46
Nicollet	0.31	0.45
Isanti	0.19	0.41
Dodge	0.23	0.41
Clay	0.35	0.39
Houston	0.23	0.38
Le Sueur	0.15	0.37
Wilkin	0.15	0.35
Pine	0.13	0.28
Hubbard	0.14	0.28
Ramsey	0.18	0.27
Sibley	0.11	0.27
Carlton	0.11	0.26
Kanabec	0.17	0.25
Wabasha	0.17	0.24
Cass	0.14	0.24
Mille Lacs	0.13	0.23
Lake	0.06	0.23
Polk	0.14	0.22
Red Lake	0.07	0.22
Meeker	0.13	0.21
Goodhue	0.11	0.19
Aitkin	0.14	0.19
Renville	0.07	0.18
Marshall	0.08	0.17
Lake of the Woods	0.03	0.17
Fillmore	0.11	0.17
Mahnomen	0.11	0.17
Todd	0.09	0.17
Rice	0.09	0.16
Jackson	0.09	0.16
Wadena	0.07	0.16
Murray	0.06	0.15
Clearwater	0.10	0.15
Blue Earth	0.08	0.15
Yellow Medicine	0.08	0.15
Chippewa	0.09	0.14
Morrison	0.08	0.14
Pope	0.08	0.14
Becker	0.09	0.14
Grant	0.07	0.14
Mower	0.06	0.14
Lincoln	0.08	0.13

Share of Workers Commuting Outside Local Area by Rank.

MN County Name	Commuting Wkrs 60	Commuting Wkrs 80
Waseca	0.08	0.13
Hennepin	0.12	0.12
Stearns	0.08	0.12
Traverse	0.07	0.12
Kittson	0.04	0.12
Itasca	0.09	0.12
Watonwan	0.06	0.11
Cook	0.10	0.11
Norman	0.07	0.11
Rock	0.06	0.10
Redwood	0.07	0.10
Winona	0.08	0.10
McLeod	0.07	0.10
Big Stone	0.07	0.10
Lac qui Parle	0.06	0.10
Otter Tail	0.07	0.09
Faribault	0.08	0.09
Cottonwood	0.08	0.09
Swift	0.08	0.09
Stevens	0.04	0.09
Steele	0.06	0.08
Crow Wing	0.07	0.08
Beltrami	0.10	0.08
Freeborn	0.06	0.07
Douglas	0.07	0.07
Martin	0.06	0.06
Brown	0.07	0.06
Pipestone	0.08	0.06
St. Louis	0.06	0.06
Kandiyohi	0.09	0.06
Pennington	0.06	0.06
Lyon	0.07	0.04
Nobles	0.06	0.04
Koochiching	0.04	0.04
Olmsted	0.06	0.03
Roseau	0.03	0.03

Source: U. S. Bureau of the Census and calculations by the author.

to the northeast; and LeSueur and Sibley Counties between the Twin Cities and Mankato to the southwest).

Commuter interaction with major centers declines gradually with increasing distance. Generally there is no sharp drop, unless there is some major natural barrier, such as a river with few bridges or a large lake. Instead, percentages decline gradually from highs in the 60 percent range to a low of 3 percent (Table 6).

Evening and weekend travel for shopping produces a different field of movement in which counties that send relatively few of their workers daily out of the county to jobs send a large fraction of travelers out of the county to shop.

County Population Density, Population Changes, and Commuting, 1960-1980

In Minnesota and the Upper Midwest generally, as in much of the U.S., absolute and percentage population changes during a decade are often small. For political and economic reasons public discussion of population change highlights locales experiencing dramatic ups and downs, but most places plod along, neither gaining or losing much population or economic activity over a ten- or twenty-year period.

Even though local changes typically are modest, they do occur in a somewhat predictable fashion. Older, high-density areas disperse their populations and jobs to lower-density areas nearby. Suburban areas that send commuters to a high-density job center are likely to attract consumer oriented jobs to their residential areas. As employment builds in formerly exclusively residential suburban areas, the percentage of workers commuting to jobs outside their home county declines.

When (1) the proportion of Minnesota workers in 1960 who commuted to jobs outside their home county is compared with (2) county population change from 1970 to 1980, R^2 = .39. That is, places sending large shares of workers out were later the ones experiencing population increase.

When (1) the proportion of Minnesota workers in 1960 who commuted to jobs outside their home county is compared with (2) the same measure for 1980, $R^2 = .82$. That is, counties sending high shares of their workers out to jobs elsewhere in 1960 were the same ones as in 1980, and in about the same mix of proportions. In other words, patterns did not change much in twenty years.

A third view of the same linked events is seen when (1) the share of Minnesota workers in 1980 who commuted to jobs outside their home county is compared with (2) county population change 1970 to 1980. In this case, $R^2 = .41$. Places that added population rapidly during the 1970-80 period sent a relatively high fraction of their workers to jobs outside the home county on the average. Counties with stable or declining populations sent only small fractions of workers to jobs outside.

Classifying Geographic Entities of the U.S. Settlement System Using Population Density at the County Level

The Conceptual Basis for a Proposed Approach Based on Population Density

The principal basis for a proposed approach to identifying geographic entities of the settlement system of the national territory is residential population density calculated at the county level. Following such an approach, each county would be characterized according to its national and local percentile rankings in terms of population density. Density classes would be identified. Statistical areas would be delimited by aggregating sets of contiguous counties sharing the same density characteristics.

There is nothing absolutely relevant about settlement form as measured by population density. High or low density at a place takes on meaning only in relation to other places with which it is compared. I propose that comparisons simultaneously be national as well as statewide (Appendix 1).

Comparisons of population density rankings should be national in scope for some purposes. In effect, that is how we began using central cities of at least 50,000 population

as the key criterion for identifying metropolitan areas. A total of 50,000 was large enough to satisfy a variety of statistical tests, and it provided us with enough cities--but not too many. Moreover, it seemed like a reasonable, non-debatable round number. A threshold of 40,000 or 60,000 would have been just as logical, except that in our decimal number system, ten holds a special place and halving ten implies reasonableness in the same way that 46,000 or 55,250 gives the appearance of arbitrariness.

Comparisons of population density should be statewide for other purposes. Constitutionally, states are important, so recognition of important places in each state is desired in a U.S. settlement classification scheme even if such places may not rank as highly significant in national comparisons. In this way, modest-sized cities like Cheyenne, Wyoming achieve recognition even though its county (Laramie) has a low density: 1980 population--68,649; area--2,684 sq. mi.; population density--26 per sq. mi. (Appendix 2).

Building Blocks Used to Identify Geographic Entities

Counties are more suitable than any other areal building block, although even counties are less than ideal. If we recognize the legal significance of states and their boundaries, then counties (and independent cities) as legal subdivisions of states have a special claim on our attention. Four states have fewer than ten counties (CT, DE, HI, RI), the District of Columbia stands alone without legal subdivisions, and four states (MD, MO, NV, VA) have independent cities in addition to counties. For classification and aggregation purposes, independent cities may be treated as counties or can be combined with the counties within which or next to which they are located.

One way to acknowledge and measure the relativity of selected forms of settlement, in both national and statewide contexts, is to array the counties according to their percentile rankings on population density simultaneously in both their respective statewide contexts and their national contexts.

Aggregating County Building Blocks

Every county, independent city, the District of Columbia, and Alaskan borough and census area has a residential population density, calculated simply as residential population divided by area. These quotients may be ranked from highest to lowest. Within this array of 3,141 county-equivalent values, each county enjoys a percentile ranking. The highest value has a percentile rank of 100, and the lowest has a rank of zero. For example, a county with a density ranked 85th from the top of 3,141 counties would enjoy a national percentile of .97.

The same exercise can be repeated with the set of density values of each state. If the county above had a density that ranked 12th from the top of 21, its local percentile ranking would be .43. Special provision would have to be made for the District of Columbia, perhaps by evaluating it with Maryland or Virginia so that it could obtain a local percentile ranking along with its national percentile ranking (See Appendices 1 and 2).

Deciles of the national and local rankings imply a 10-by-10 matrix framework within which every county would fall into one and only one cell. Each decile pair defines a corresponding cell. A county with a national percentile of .97 and a state percentile of .43 can be located within the matrix framework as point C is located in Figure 1.

Every county building block would fit into one of the 100 cells on the basis of its pair of percentile scores and the corresponding deciles into which each score falls. Every building block will have a single density score, the product of its two percentiles (e.g., .97 x .43 = .42 in the example above). The density score can be used to group places according to any appropriate clustering technique. Figure 2 suggests five classes of density scores: 0-19, 20-39, 40-59, 60-79, and 80-100.

The result of this classification-regionalization exercise would be a choropleth map. Regions would be single or multiple-county parcels in the same population density classes. State boundaries would separate parcels of the same density class. The combination of boundaries around density classes, and of state boundaries, would delimit the statistical areas.

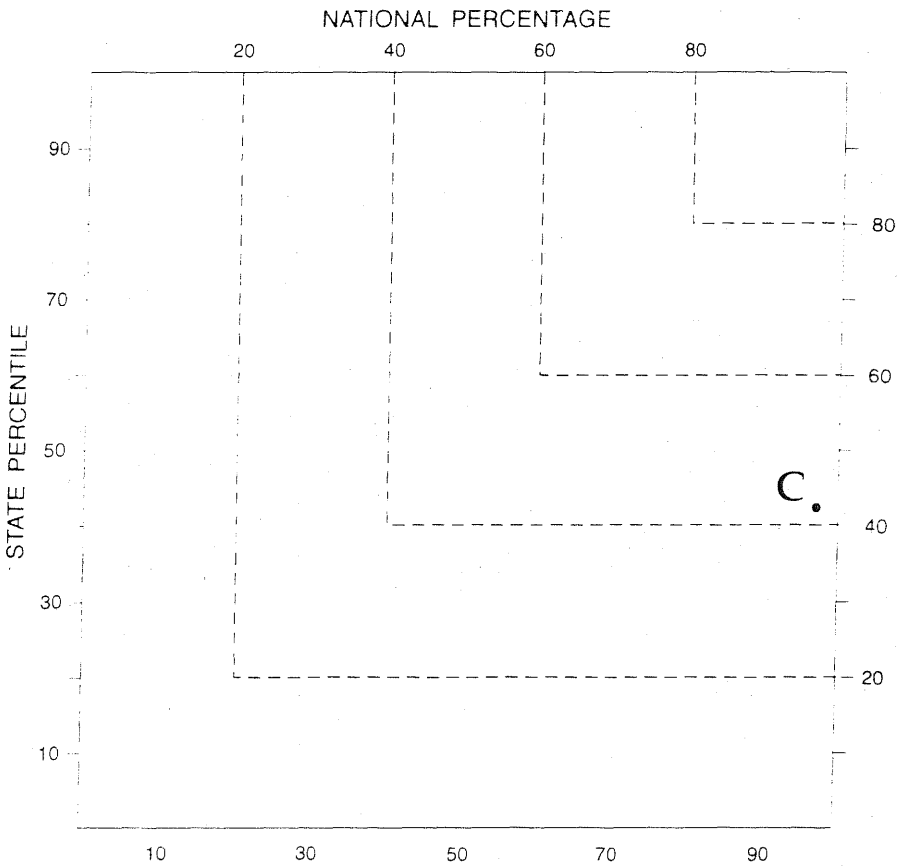


Fig. 1 Defining Population Density Classes : I

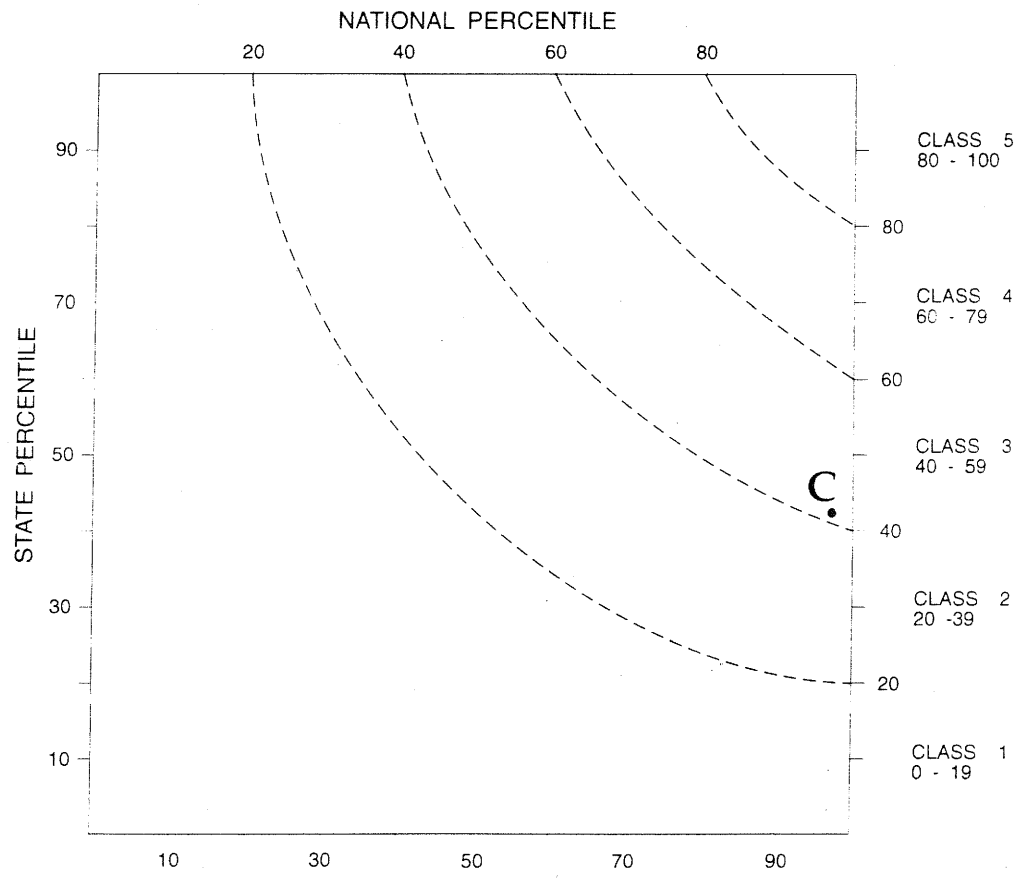


Fig. 2 Defining Population Density Classes : II

Measures of Integration to Determine the Extent of Statistical Areas

If today's settlement patterns are continuously varying on the landscape, and if large daily and weekly urban fields are increasingly unlikely to be monocentric, activity intensity becomes the paramount issue, and linkages become of secondary importance.

It seems that high county population density and proximity accompany inter-county linkages of various kinds--commuting, shopping, migration, and so forth. Thus, it would appear that population density itself can be used as a surrogate for linkage.

To be sure, commuting data can still be used to distinguish the divide between one commuting field and another. Even in high-density Eastern Seaboard metropolitan areas, the MSAs and the CMSAs are defined, like those elsewhere, by commuting data. In cases where commuting across boundaries of formerly separate metropolitan areas is now substantial, they have been combined (e.g., Brockton, Lowell, Lawrence, and Nashua, now all in the Boston CMSA; and New Britain and Bristol in the Hartford CMSA). Also, the 1980 and 1990 metropolitan area standards take into account the overlap of spheres of influence of adjacent metropolitan areas by providing for the definition of PMSAs within large areas, which thereby become CMSAs.

The approach proposed here, however, asks: why try to separate places that are obviously tightly integrated? Why not treat a set of contiguous similarly high density counties within a state as a statistical area? Such a simplified approach recognizes that flows and linkages exist, but it does not try to measure them or to use them in defining statistical areas.

Areas in 1950 were defined as SMA and non-SMA--a binary division that made sense in 1910 but that was becoming harder to defend in many parts of the country by 1950 as metropolitan areas, especially in the East and Midwest, were sprawling into one another. What was the reason for the binary division? It was partly simplicity; partly local field experience when the "edge of town" was still visible; and partly the intellectual climate of the day, based on conceptual frameworks in social thought of the early 1900s

that made an important theoretical distinction between urban and rural, a distinction that is still possible to make but that sheds little light on interpreting the settlement reality that we must measure and describe.

Within the SMA vs. non-SMA distinction of 1950, and in subsequent refinements, the concept of "central city" and "suburb" persist, and have substantial historical, morphological, and legal legitimacy. But these labels were less than precise when they were introduced. At the end of World War II, some "overbounded" central cities still contained large tracts of undeveloped land inside their borders (e.g., St. Paul, Los Angeles, Houston), while "underbounded" central cities had little or none (e.g., Boston, Baltimore, Philadelphia).

What has evolved since 1950 is a new species of integrated "urban field," the dim outlines of which were perceptively described by Friedmann and Miller (1965) a generation ago and discussed at about the same time in the Berry et al. critique of metropolitan area definition (1968). Within the urban field, the central city-suburban relationship that once existed and gave spatial structure and operational form to daily urban systems of 1900 or 1940 had long since begun to evolve into something quite different. The production and distribution of goods and an emphasis on radial movement to and from the urban core was giving way to the rise of the service economy, communications substituting for movement, and a field of movement in all directions at all times of the day and week.

In recent decades there has been increased attention to the building, maintenance, and improvement of environments, with a shift of emphasis away from issues of relative location. As previous spatial monopolies were broken, downtown was no longer the easiest place to do many kinds of business, and New York City was no longer the ideal place for many Fortune 500 headquarters.

The morphological profile of the original city centers --creatures as they were of high-capacity fixed rail transit systems--belie their contemporary functions or their economic importance despite their visual prominence. Truly competitive enterprises seldom squander hard-won profits on extravagant highrise buildings at the center of downtown.

In the 1990s, linkage or integration within a settlement system carries abstract meanings that go well beyond traditional activities such as the delivery of a newspaper or a journey to work. It seems to me that to ignore today's linkages is to deny the realities of what our society and its settlements are becoming. Yet to try to incorporate them in clear, uncontentious ways into a definition of settlement forms is a practical impossibility. Thus, I conclude that a relatively unambiguous measure like residential population density can serve as an effective and defensible surrogate for what we need to know, without getting into some of the problems that present MA criteria create. Our science at present is not developed enough even to defend present practice, and our political life would be better served by greater simplicity in settlement definitions.

Hierarchical Relations among Statistical Areas

An implicit hierarchy of sorts is recognized when counties and groups of counties are stratified according to population density. High-density zones in the U.S. are also the important places. High-density counties and independent cities within a state are locally the most important ones. Political representation is based on population, and when population clusters, political significance develops proportionately, both in national and in statewide contexts.

Places of high residential population density are important economically, not only in terms of the local money flows that reflect the movement of goods and services, but also in terms of the value of land, sunk capital, accumulated savings, and available physical and institutional infrastructure. All these values--of flows and of stocks--diminish as population density diminishes.

If there were five density levels identified in the classification system, then there would be five levels in a type of "density hierarchy," which we would expect would represent hierarchies of importance, influence, or prominence.

Data Availability Using Counties and Independent Cities as Building Blocks

If counties (and independent cities) are used as the building blocks in establishing a set of NSAs, a wide array of federal and state statistical systems can be tapped to produce statistical summaries for NSAs with minimum difficulty. There is no other areal unit that blankets the settled parts of the nation as effectively as counties.

Counties vary in population size from millions of residents (e.g., Kings County, NY; Los Angeles County, CA; Cook County, IL; Wayne County, MI; etc.) to just a few hundred. Most counties have large enough populations to qualify them for separate treatment when the Census Bureau publishes sample data from the decennial census of population and housing. Yet counties are small enough in area to provide relatively detailed geographical resolution when the entire nation is mapped using them as units of analysis.

For many purposes, the state as a data unit is too large an area for revealing important aspects of settlement structure on a choropleth map, while towns, townships, cities, or census tracts provide a degree of detail that is unneeded in most national-scale comparative analyses. For purposes of studying, analyzing, and portraying national settlement structure and change, counties offer unmatched advantages.

Statistical Definitions and Local Opinion

In geography, we distinguish between "generic regions" and "specific regions." Generic regions are parcels of land scattered across all or part of the globe but sharing a common attribute or set of attributes. Examples would be "French speaking lands," or "areas of Mediterranean climate," or "high crime areas." Specific regions are "one of a kind" regions such as "Russia," or the "Salinas Valley," or "Capitol Hill."

When we group counties according to their national and statewide density rank percentiles, we define classes of density that imply generic regions. Since most places are like their neighbors, the generic regions thereby created could be extensive in states having large numbers of

counties and significant stretches of relatively open space such as Texas (254 counties), Iowa (99 counties), or Kansas (105 counties). Nevertheless, since the proposed classification system is strictly statistical, there is no need for local opinion for deciding where a class boundary would be drawn. There would, however, be a need for additional analysis or local opinion if some large aggregations of counties of the same density class were to be subdivided to form additional NSAs.

If high-density "islands" emerge in a sea of low population density, as we know they would, some local opinion would be needed for deciding what to name the islands--the same procedure that has been used by the U.S. Board on Geographic Names in recognizing and officially confirming (or rejecting, or adjudicating disputes over) names for local places and physical features in official national mapping programs.

If twin peaks or multiple peaks emerge in high-density corridors, such as along the Eastern Seaboard or around the Great Lakes from Milwaukee to Pittsburgh, along the Florida Coast, or in northern and southern California, it may become necessary to partition high-density areas to recognize counties of the historic core regions.

Updating Statistical Areas

Empirical evaluations will have to be carried out on maps of different parts of the U.S. to assess the full implications of using density classes for defining statistical areas. Over a ten- or twenty-year period, some of the nation's counties and independent cities will change their density percentile rankings on the national and statewide scales. Most places, though, will stay where they are in the density matrix.

If counties and independent cities are the building blocks for statistical areas, then specialized sets of statistical areas can be defined by users themselves and the nature of events within (population, housing, employment, environment, etc.) can be mapped. The day is fast passing when the Census Bureau was obliged to supply mapped data because, with the exception of geographers, cartographers and planners, few people knew how to make effective maps.

Today is different. Data on a county basis come in machine-readable form. Cartographic software is available to make maps on demand. Map purpose guides the way maps are designed and executed. Therefore, updating of statistical areas can occur depending on what the statistical areas are to be used for.

Entities Requiring Official Recognition

When counties and independent cities are arrayed in a two-dimensional coordinate space defined by national percentile density ranking and by statewide percentile density ranking, it is an easy matter to specify thresholds to define areas requiring official recognition (Figure 3). Specifying thresholds of high national rank (A), and of high statewide rank (B), creates a space (C) within which are located all counties recognized as ranking high on both criteria simultaneously.

It would be equally easy mathematically and operationally to define a single line (D) that would delimit a zone within the coordinate space, but it might be harder to explain and justify to a lay audience.

A similar procedure could be used to define one or more low-density zones in the coordinate space, such as (E) in Figure 3. Whether these places deserve names like "urban" or "rural" I cannot say. I personally believe that conventional terms such as these are too imprecise for describing population distribution and settlement forms in the U.S. today (Figures 4-8).

On the other hand, data could be collected and tabulated easily for NSAs of Density Class 5, or Density Class 4, etc. The fact is that the settlement fabric of the U.S. forms a continuum, and defining a series of density classes to reflect the fact of a continuum makes theoretical as well as common sense (Figure 9).

How the Proposed Approach Would Generate Data

At the present time, metropolitan planning agencies, metropolitan councils of governments, and metropolitan governments themselves frequently have jurisdictions that differ from conventional MA definitions. As a result, these organizations draw on census and other sources to create

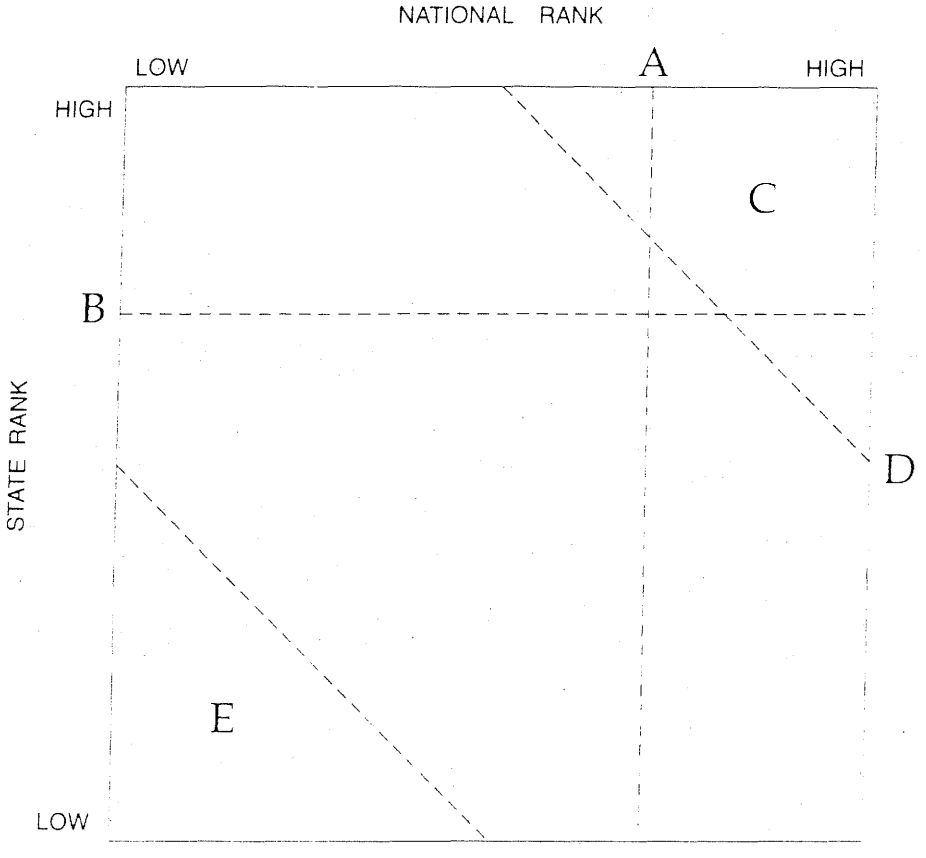


Fig. 3 Defining Population Density Classes : III

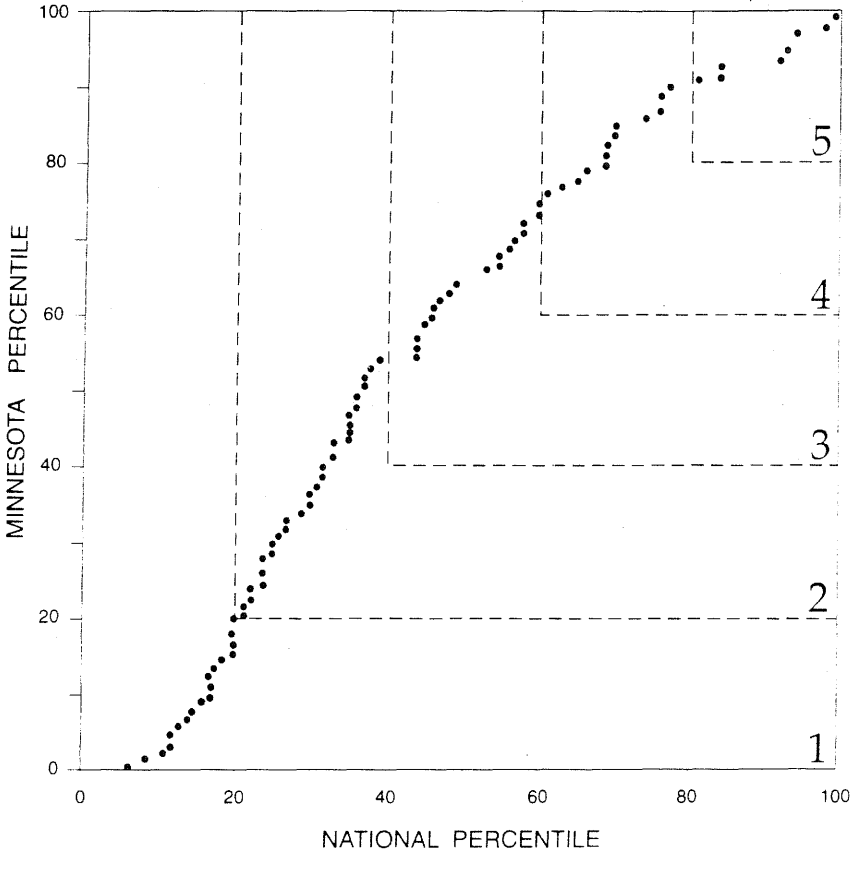


Fig.4 Minnesota Counties, by National and Statewide Density Percentiles, 1990

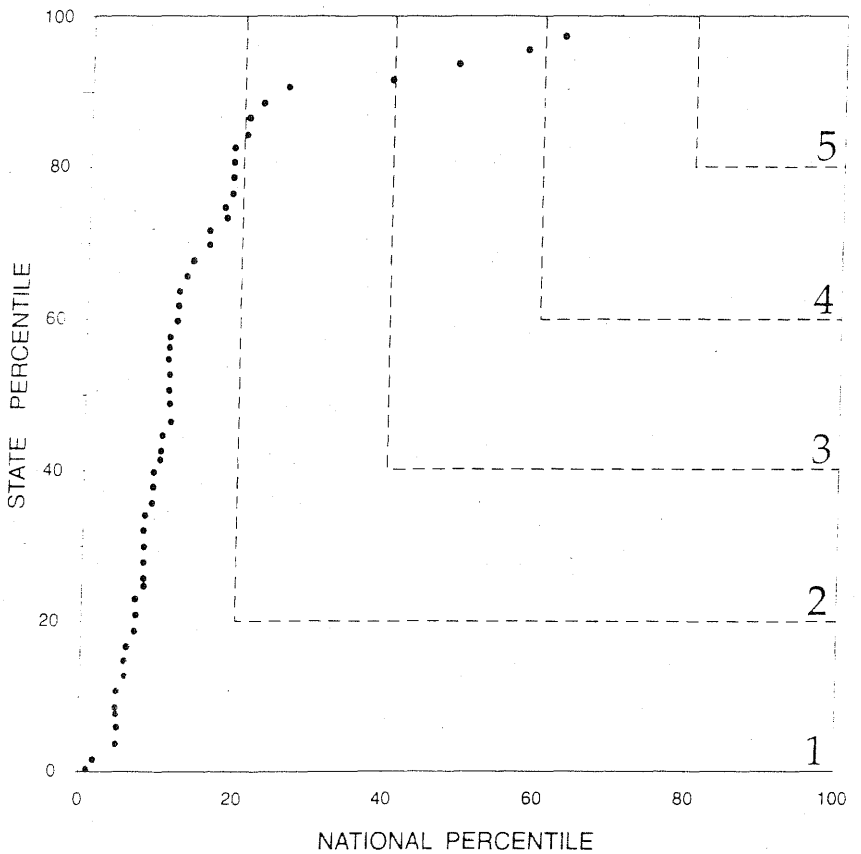


Fig.5 North Dakota Counties, by National and Statewide Density Percentiles, 1990

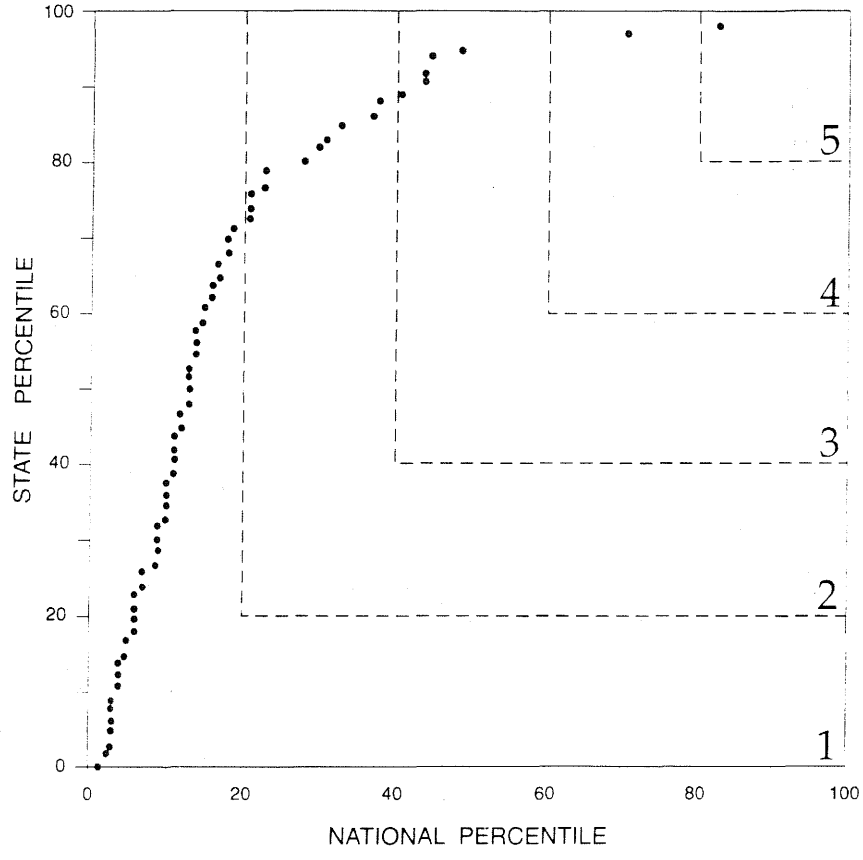


Fig.6 South Dakota Counties, by National and Statewide Density Percentiles, 1990

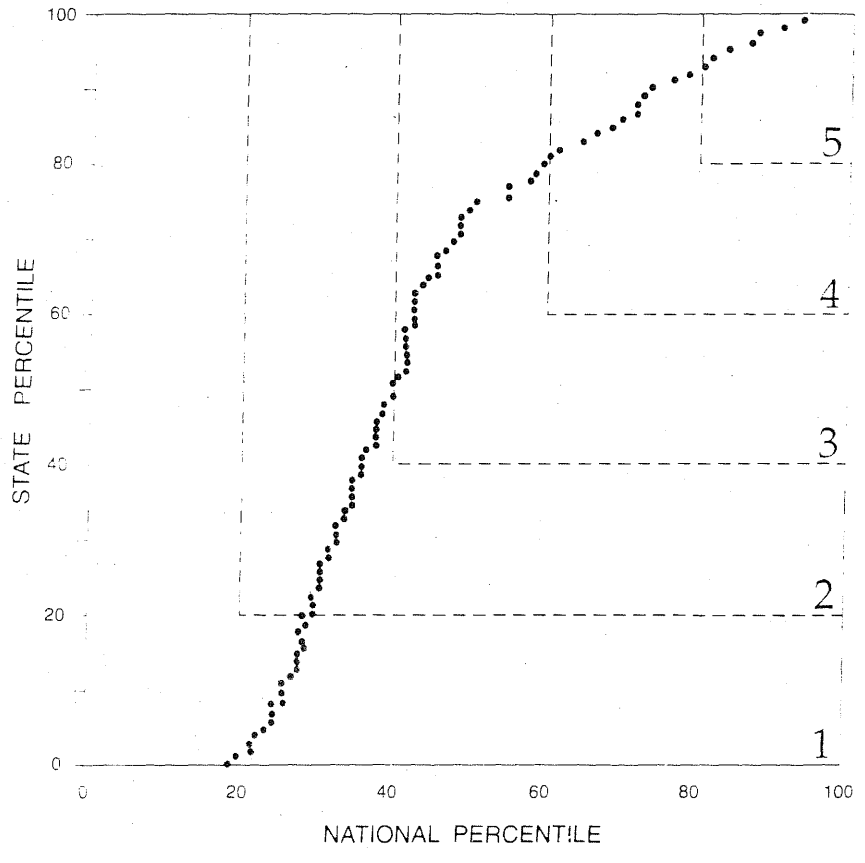


Fig.7 Iowa Counties, by National and Statewide Density Percentiles, 1990

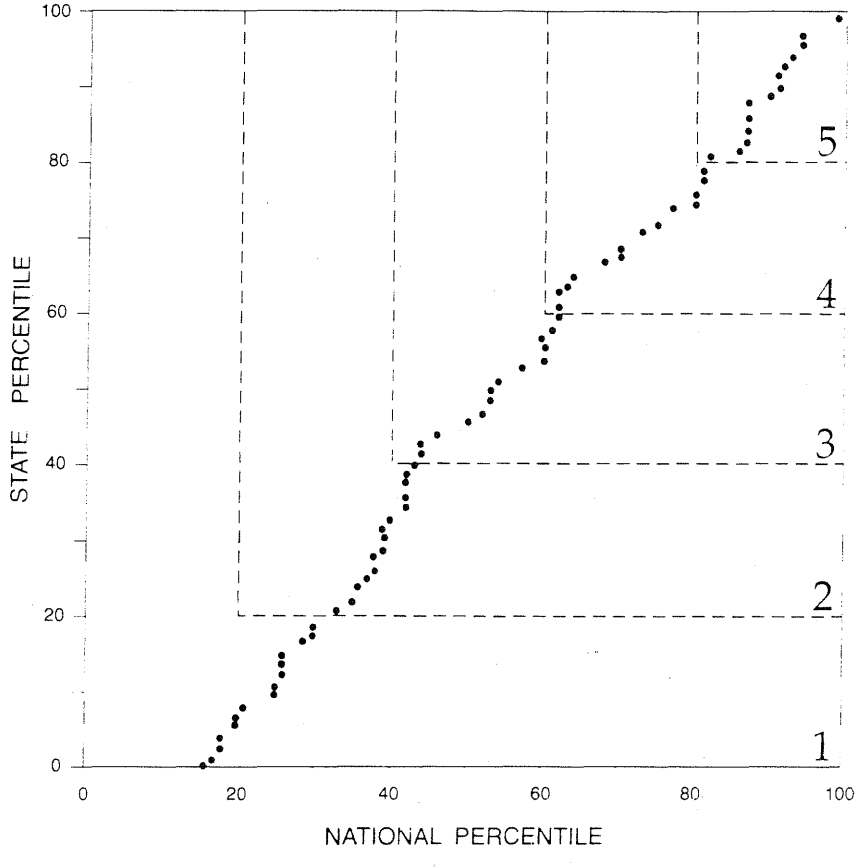


Fig.8 Wisconsin Counties, by National and Statewide Density Percentiles, 1990

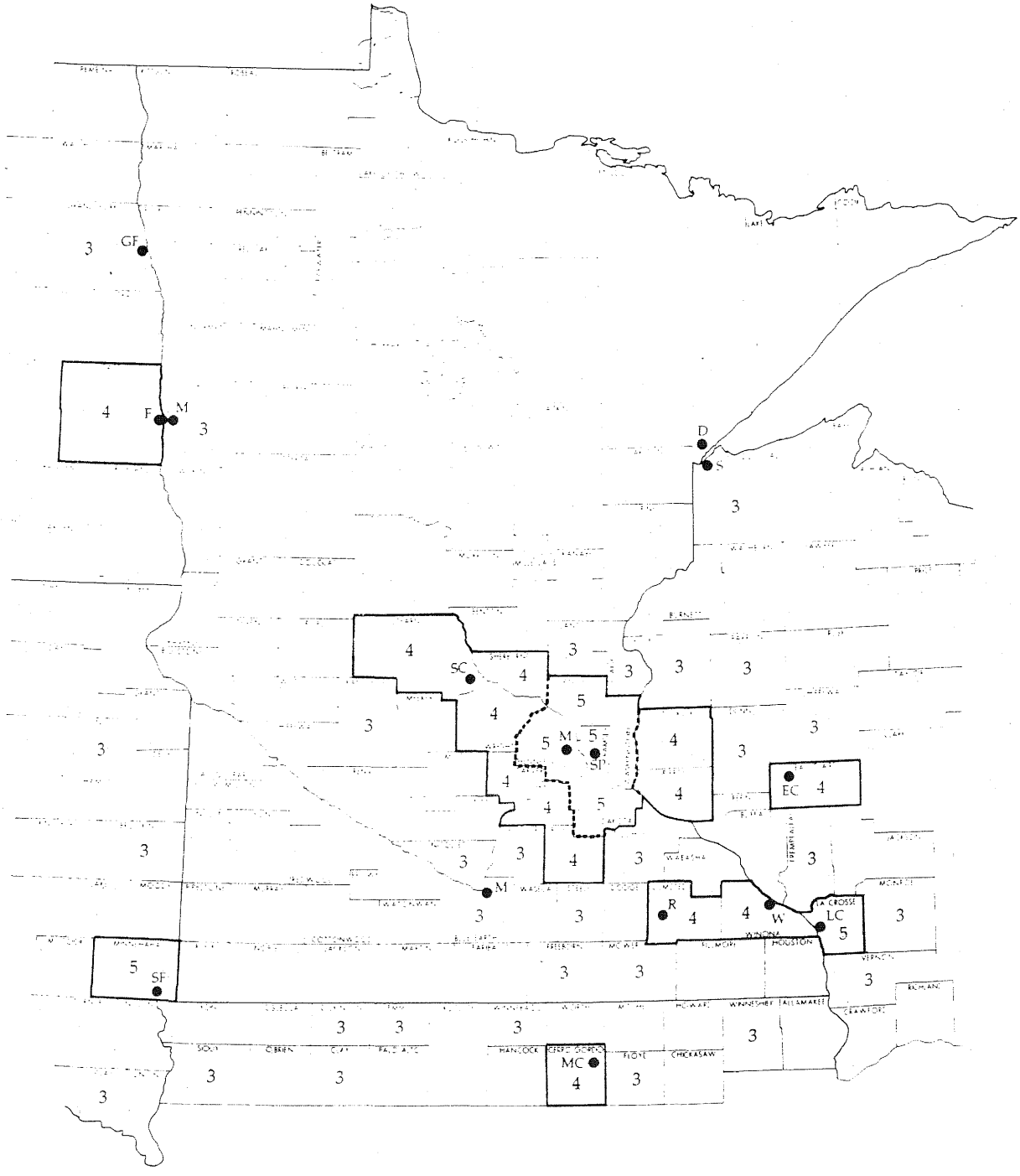


Fig. 9 Counties in Minnesota and Selected Counties in Adjacent States, in Density Classes 5 (highest), 4, and 3, 1990. Classes 2 and 1 (lowest) Unmarked.

their own statistical profiles of the areas for which they have responsibilities. Usually these organizations deal with assemblages of counties and independent cities. Thus, as long as public and private sources continue to tabulate data on a county basis, these organizations will continue to function as they have in the past.

Business users differ in how they request and use data on places. The direct mail advertising industry and market researchers use U.S. Postal Service ZIP Code areas as a framework for their activity, and Census Bureau data are available in ZIP Code formats to meet their needs. The NSA approach proposed here would have no direct impact on these data user groups because their needs are already being met.

The scholarly community would benefit from ready access to density information because so many aspects of economy and society seem to be related to density and to changes in density. There have been suggestions in the scholarly literature that population density at the local area level is an important variable, and that over time high-density regions tend to lose population while sparsely settled areas tend to gain (Rees 1970).

State departments of transportation, law enforcement organizations, and agencies responsible for environmental protection would have a new tool for examining patterns of settlement structure and settlement change that relate to their areas of responsibility and concern. Every type of settlement, from low density to high, needs a better sense of how it compares with others like itself, and how it differs. At present, MA identification criteria are complex, but once applied it is hard to distinguish one type of MA from another except by their population size, a measure that may not provide as much contextual information as density class.

Acknowledgements

Helpful comments, suggestions, and assistance from the following persons are gratefully acknowledged: Brian J. L. Berry, John R. Borchert, Donald C. Dahmann, James D. Fitzsimmons, Richard L. Forstall, William H. Frey, Thomas Gilaspy, R. Craig Ham, John Fraser Hart, Jae-heon Choi, Jian-yi Liu, John F. Long, Linda McCarthy, Richard L. Morrill, Alden Speare, and Barbara J. VanDrasek.

Works Consulted and Cited

Adams, John S. 1990. "The Regional Service Economy: A Contemporary Mirage?" Journal of Applied Manufacturing Systems 3: 3-10.

Alonso, William and Starr, Paul. eds. 1987. The Politics of Numbers. New York: Russell Sage Foundation.

Anding, Thomas L.; Adams, John S.; Casey, William; de Montille, Sandra; and Goldfein, Miriam. 1990. Trade Centers of the Upper Midwest: Changes from 1960 to 1989. Minneapolis, MN: Center for Urban and Regional Affairs, University of Minnesota.

"Area Economic Projections 1990" 1974. Supplement to Survey of Current Business 54: 10-13.

Berry, Brian J. L. 1973. The Human Consequences of Urbanization. London: Methuen.

Berry, Brian J. L. and Gillard, Quentin. 1977. The Changing Shape of Metropolitan America. Cambridge, MA: Ballinger.

Berry, Brian J. L.; Goheen, Peter G.; and Goldstein, Harold. 1968. Metropolitan Area Definition: A Re-Evaluation of Concept and Statistical Practice. U.S. Bureau of the Census Working Paper No. 28 (Washington, DC: Government Printing Office).

Borchert, John R. 1990. "GIS: Science, Application, Coherence." Keynote Address. GIS/LIS Conference, Anaheim, CA.

Borchert, John R. 1991. Personal communication. 21 March.

Bradburn, Norman M. 1982. "Discrepancies Between Concepts and Their Measurements: The Urban-Rural Example." In The Social Sciences: Their Nature and Uses, edited by William H. Kruskal. Chicago: University of Chicago Press. Pp. 137-148.

Bureau of Economic Analysis. 1977. BEA Economic Areas: Component SMSAs, Counties, and Independent Cities. Washington, DC: U.S. Department of Commerce.

Bureau of Economic Analysis. 1991. "A User's Guide to BEA Information" Survey of Current Business 71: 44-56.

Butler, Margaret A. 1990. Rural-Urban Continuum Codes for Metro and Nonmetro Counties. Economic Research

Service, Staff Report No. 9028. Washington, DC: U.S. Government Printing Office.

Christaller, Walter. 1966 (1933). Central Places in Southern Germany. Translated by Carlisle W. Baskin. Englewood Cliffs, NJ: Prentice-Hall.

Christenson, Reo M. 1991. "Depressing Array of Factors Mean Economic Trouble." StarTribune 25 September, P. 19A.

Dahmann, Donald C. 1990. "Geographic Units of Analysis for Social Science Research." Unpublished report. Washington, DC: Population Division, U.S. Bureau of the Census.

Dickinson, Robert E. 1929. "The Commercial Functions of the Nuclei of the English Conurbations" Sociological Review 21: 38-49.

Dickinson, Robert E. 1934. "The Metropolitan Regions of the United States" Geographical Review 24: 278-291.

Dickinson, Robert E. 1964. City and Region. London: Routledge and Kegan Paul.

Doxiadis, Constantinos A. 1968. Ekistics: An Introduction to the Science of Human Settlements. London: Hutchinson.

Feldt, Allan G. 1965. "The Metropolitan Area Concept: An Evaluation of the 1950 SMA's" Journal of the American Statistical Association 60: 617-636.

Forstall, Richard L. 1990. "Metropolitan Definition: A Canadian-U.S. Comparison." Unpublished report. Washington, DC: Population Division, U.S. Bureau of the Census.

Forstall, Richard L. 1991. "Regional and Metropolitan/ Nonmetropolitan Population Trends in the United States, 1980-90." Paper presented at the annual meetings of the Association of American Geographers, Miami, FL.

Forstall, Richard; Rives, N.; and Cossette, F. 1982. "Defining Commuting Clusters of Counties for Demographic Research" Proceedings, Social Statistics Section, American Statistical Association. Pp. 450-455.

Frey, William H. and Speare, Jr., Alden. 1988. Regional and Metropolitan Growth and Decline in the United States. New York: Russell Sage Foundation.

Friedmann, John and Miller, John. 1965. "The Urban Field" Journal of the American Institute of Planners 31: 312-319.

Garnick, Daniel H. 1984. "Shifting Balances in U.S. Metropolitan and Nonmetropolitan Area Growth" International Regional Science Review 9: 257-273.

Geddes, Patrick. 1968 (1915). Cities in Evolution. New York: Harper & Row.

Goldfein, Miriam and Casey, William. 1991. "Trade Centers of the Upper Midwest" CURA Reporter (Center for Urban and Regional Affairs, University of Minnesota) 21: 1-5.

Gras, Norman S.B. 1922. An Introduction to Economic History. New York: Harper & Brothers.

Green, F. H. W. 1950. "Urban Hinterlands in England and Wales: An Analysis of Bus Services" Geographical Journal 66: 64-88.

Guest, Avery M. 1975. "Journey to Work, 1960-70" Social Forces 54: 220-225.

Guest, Avery M. 1976. "Nighttime and Daytime Populations of Large American Suburbs" Urban Affairs Quarterly 12: 57-82.

Guest, Avery M. 1977. "The Functional Reorganization of the Metropolis" Pacific Sociological Review 20: 553-567.

Guest, Avery M.; Hodge, David C.; and Staeheli, Lynn. 1988. "Industrial Affiliation and Community Culture: Voting in Seattle" Political Geography Quarterly 7: 49-73.

Hanson, Susan and Pratt, Geraldine. 1988. "Reconceptualizing the Links Between Home and Work in Urban Geography" Economic Geography 64: 299-321.

Hardy, Thomas F. and Ross, Peggy J. 1990. The Diverse Social and Economic Structure of Nonmetropolitasn America: An Update. Economic Research Service, Staff Report No. AGES 9036. Washington, DC: U.S. Government Printing Office.

Hart, John Fraser. 1984a. "Population Change in the Upper Lake States" Annals of the Association of American Geographers 74: 221-243.

Hart, John Fraser. 1984b. "Resort Areas in Wisconsin" Geographical Review 74: 192-217.

Hart, John Fraser. 1986. "Facets of the Geography of Population in the Upper Midwest" Journal of Geography 85: 201-211.

Hart, John Fraser. 1991. "Population and the Labor Force." In The Great Lakes Economy: Looking North and South. Chicago, IL: Federal Reserve Bank of Chicago. Pp. 28-37.

Hodge, David C. and Staeheli, Lynn A. 1990. "Social Transformation and Changing Urban Electoral Behavior." In Developments in Electoral Geography, by R.J. Johnston et al. London: Routledge. Pp. 176-190.

Howard, Ebenezer. 1965 (1902). Garden Cities of To-Morrow. Cambridge, MA: MIT Press.

Johnson, Kenneth P.; Friedenberg, Howard L.; and Renshaw, Vernon. 1988. "Tracking the BEA Regional Projections" Survey of Current Business 68: 23-27.

Jou, Sue-Ching. 1991. Determinants of Spatial Variations in Housing Prices and House Price Changes: The Case of Minneapolis and Suburbs, 1970-1980. Unpublished Ph.D. dissertation. Minneapolis, MN: Department of Geography, University of Minnesota.

Killian, Molly Sizer and Tolbert, II, Charles M. 1991. "A Commuting-Based Definition of Metropolitan and Nonmetropolitan Local Labor Markets in the United States." Paper presented at the annual meetings of the American Statistical Association, Atlanta, GA.

Lampard, Eric E. 1955. "The History of Cities in the Economically Advanced Areas" Economic Development and Cultural Change 3: 81-136.

Lawson, Victoria and Staeheli, Lynn A. 1990. "Realism and the Practice of Geography" Professional Geographer 42: 13-20.

LeClere, Felicia and Dahmann, Donald C. 1990. Residents of Farms and Rural Areas: 1989. U.S. Bureau of the

Census, Current Population Reports, Series P-20, No. 446. Washington, DC: U.S. Government Printing Office.

Lösch, August. 1954 (1941). The Economics of Location. Translated by William H. Woglom. New Haven, CT: Yale University Press.

Lukermann, Barbara; Goldfein, Miriam; and de Montille, Sandra. 1991. Trade Centers of the Upper Midwest: Three Case Studies Examining Changes from 1960 to 1989. Minneapolis, MN: Center for Urban and Regional Affairs, University of Minnesota.

Marsh, C.; Arber, S.; Wrigley, N.; Rhind, D.; and Bulmer, M. 1988. "The View of Academic Social Scientists on the 1991 UK Census of Population: A Report of the Economic and Social Research Council Working Group" Environment and Planning A 20: 851-889.

McKenzie, Roderick D. 1933. The Metropolitan Community. New York: McGraw-Hill.

Migration Statistics in the United States. 1988. A Report of the Subcommittee on Migration Statistics. Washington, DC: Population Association of America.

Millman, Marcia and Kanter, Rosabeth Moss. 1975. Another Voice: Feminist Perspectives on Social Life and Social Science. New York: Anchor/Doubleday.

Moriarty, Barry M. 1983. "Hierarchies of Cities and the Spatial Filtering of Industrial Development" Papers of the Regional Science Association 53: 59-82.

"New Urbanized Areas List Released." Census and You Bureau of the Census. 26: 4-6.

Norton, Rob. 1991. "The Changing System of Housing Finance." NBER Digest National Bureau of Economic Research. Pp. 2-3.

Office of Management and Budget. 1990. "Revised Standards for Defining Metropolitan Areas in the 1990s: Notice." Federal Register 55: 12154-12160.

Park, Robert E. 1952. Human Communities: the City and Human Ecology. New York: Free Press.

_____ and Burgess, Ernest W. 1967 (1952). The City. Chicago, IL: University of Chicago Press.

Platt, Rutherford H. 1991. Land Use Control: Geography, Law, and Public Policy. Englewood Cliffs, NJ: Prentice-Hall.

Rees, Philip H. 1970. "The Urban Envelope: Patterns and Dynamics of Population Density." In Brian J.L. Berry and Frank E. Horton, Geographic Perspectives on Urban Systems. Englewood Cliffs, NJ: Prentice-Hall.

Schaefer, Gordon P. 1977. "The Urban Hierarchy and Urban Area Production Function: A Synthesis" Urban Studies 14: 315-326.

Schneider, Paula J. and Fulton, Philip N. 1988. "Plans for Data and Products from the 1990 Census" Paper presented at the annual meeting of the Association of American Geographers, New Orleans.

Sheppard, Eric. 1982. "City Size Distributions and Spatial Economic Change" International Regional Science Review 7: 127-151.

Shryock Jr., Henry S. 1957-8. "The Natural History of Standard Metropolitan Areas" American Journal of Sociology 63: 163-170.

Smailes, Arthur E. 1946. "The Urban Mesh of England and Wales." Transactions of the Institute of British Geographers 11: 85-101.

Sommer, Judith E. and Hines, Fred K. 1991. Diversity in U.S. Agriculture: A New Delineation by Farming Characteristics. Economic Research Service, Agricultural Economic Report No. 646. Washington, DC: U.S. Government Printing Office.

South, Scott J. and Posten, Jr., Dudley L. 1982. "The U.S. Metropolitan System: Regional Change, 1950-1970" Urban Affairs Quarterly 18: 187-206.

Starsinic, Donald E. and Forstall, Richard L. 1989. Patterns of Metropolitan Area and County Population Growth: 1980 to 1987. U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 1039. Washington, DC: U.S. Government Printing Office.

Sternlieb, George and Hughes, James W. eds. 1988. America's New Market Geography: Nation, Region and Metropolis. New Brunswick, NJ: Center for Urban Policy Research, Rutgers University.

"The BEA Economic Areas: Structural Changes and Growth, 1950-73." 1975. Survey of Current Business 55: 14-21.

"Thirty-three New Urbanized Areas Reflect Rise of Population Clusters in South, West." Commerce News (Bureau of the Census, 16 August 1991. 1-8.

Tolbert II, Charles M. and Killian, Molly Sizer. 1987. Labor Market Areas for the United States. Economic Research Service, Staff Report No. AGES 870721. Washington, DC: U.S. Government Printing Office.

U.S. Bureau of the Census. 1911. Thirteenth Census of the United States, 1910. Vol. 1. Washington, DC: U.S. Government Printing Office. P. 73.

U.S. Bureau of the Census. 1984. Proceedings of the National Geographic Areas Conference: Putting it Together for 1990. Washington, DC: U.S. Government Printing Office.

U.S. Bureau of the Census. 1990. "Metropolitan Area Concepts and Components and Population of Metropolitan Statistical Areas." Statistical Abstract of the United States: 1990. Washington, DC: U.S. Government Printing Office. Pp. 908-909.

Weber, Adna F. 1963 (1899). The Growth of Cities in the Nineteen Century: A Study in Statistics. Ithaca, NY: Cornell University Press.

Wirth, Louis. 1964. On Cities and Social Life, selected papers edited by Albert J. Reiss, Jr. Chicago, IL: University of Chicago Press.

Appendix 1. -- Population Density of U.S. Counties *

1990 Population Density of U.S. Counties, by Rank.

Rank	St.	CNTY	County Name	Pop.Den.
1	36	061	New York County	2023.91
2	36	047	Kings County	1259.42
3	36	005	Bronx County	1105.82
4	36	081	Queens County	688.77
5	06	075	San Francisco County	598.54
6	34	017	Hudson County	457.73
7	42	101	Philadelphia County	453.04
8	25	025	Suffolk County	438.04
9	11	001	District of Columbia	381.57
10	24	510	Baltimore city	351.66
11	51	510	Alexandria city	281.11
12	51	013	Arlington County	255.01
13	36	085	Richmond County	249.67
14	29	510	St. Louis city	247.32
15	34	013	Essex County	237.91
16	17	031	Cook County	208.43
17	51	710	Norfolk city	187.62
18	51	610	Falls Church city	185.33
19	34	039	Union County	184.59
20	36	059	Nassau County	173.33
21	55	079	Milwaukee County	153.32
22	51	540	Charlottesville city	151.81
23	51	685	Manassas Park city	141.95
24	34	003	Bergen County	136.07
25	26	163	Wayne County	132.76
26	51	760	Richmond city	130.39
27	51	600	Fairfax city	122.91
28	51	740	Portsmouth city	121.04
29	27	123	Ramsey County	120.37
30	39	035	Cuyahoga County	118.97
31	06	059	Orange County	117.86
32	08	031	Denver County	117.79
33	12	103	Pinellas County	117.37
34	42	045	Delaware County	114.78
35	51	683	Manassas city	107.83
36	51	678	Lexington city	107.74
37	22	071	Orleans Parish	106.21
38	51	650	Hampton city	99.69
39	51	700	Newport News city	96.07
40	34	031	Passaic County	94.53
41	51	840	Winchester city	90.80
42	17	043	DuPage County	90.24
43	34	007	Camden County	87.32
44	51	670	Hopewell city	87.04
45	51	770	Roanoke city	86.75
46	06	037	Los Angeles County	84.29
47	34	023	Middlesex County	83.50
48	51	570	Colonial Heights city	83.12
49	39	061	Hamilton County	82.10
50	48	113	Dallas County	81.30
51	51	059	Fairfax County	79.90
52	13	089	DeKalb County	78.55
53	36	119	Westchester County	78.03
54	18	097	Marion County	77.64

* Sample page of complete record of all U.S. counties and independent cities, 1990. Source: U. S. Bureau of the Census and calculations by the author.

Appendix 2. -- Counties of Minnesota and Contiguous States, National and Statewide Percentile Rankings based on Population Density, 1990

Population Density of Minnesota Counties,
National and Statewide Percentile Rankings, 1990

County	U.S.Rank	U.S.%ile	MN Rank	MN %ile
Ramsey County	29	99	1	99
Hennepin County	57	98	2	98
Anoka County	184	94	3	97
Dakota County	207	93	4	95
Washington County	256	92	5	94
Olmsted County	496	84	6	93
Scott County	500	84	7	92
Carver County	587	81	8	91
Wright County	720	77	9	90
Rice County	747	76	10	89
Sherburne County	768	76	11	87
Stearns County	831	74	12	86
Winona County	932	70	13	85
Benton County	956	70	14	84
Chisago County	963	69	15	83
Blue Earth County	979	69	16	82
Steele County	988	69	17	80
McLeod County	1065	66	18	79
Nicollet County	1109	65	19	78
Isanti County	1154	63	20	77
Goodhue County	1224	61	21	76
Mower County	1250	60	22	75
Le Sueur County	1264	60	23	74
Kandiyohi County	1325	58	24	72
Clay County	1331	58	25	71
Freeborn County	1365	57	26	70
Douglas County	1394	56	27	69
Crow Wing County	1415	55	28	68
Brown County	1423	55	29	67
Waseca County	1461	53	30	66
Wabasha County	1593	49	31	64
Dodge County	1640	48	32	63
Lyon County	1679	47	33	62
Meeker County	1694	46	34	61
Carlton County	1702	46	35	60
Houston County	1731	45	36	59
Mille Lacs County	1750	44	37	57
Martin County	1756	44	38	56
St. Louis County	1766	44	39	55
Nobles County	1906	39	40	54
Watonwan County	1949	38	41	53
Morrison County	1965	37	42	52
Otter Tail County	1988	37	43	51
Todd County	2012	36	44	49
Wadena County	2024	36	45	48
Sibley County	2030	35	46	47
Kanabec County	2033	35	47	46
Fillmore County	2045	35	48	45
Faribault County	2054	35	49	44
Chippewa County	2093	33	50	43
Pipestone County	2098	33	51	41
Pennington County	2139	32	52	40

Population Density of Minnesota Counties,
National and Statewide Percentile Rankings, 1990

County	U.S.Rank	U.S.%ile	MN Rank	MN %ile
Becker County	2149	32	53	39
Rock County	2182	31	54	38
Cottonwood County	2201	30	55	37
Redwood County	2210	30	56	36
Stevens County	2243	29	57	34
Renville County	2280	27	58	33
Jackson County	2320	26	59	32
Polk County	2331	26	60	31
Hubbard County	2344	25	61	30
Pope County	2349	25	62	29
Yellow Medicine County	2372	24	63	28
Itasca County	2374	24	64	26
Pine County	2388	24	65	25
Swift County	2411	23	66	24
Beltrami County	2434	23	67	23
Murray County	2436	22	68	22
Lincoln County	2464	22	69	21
Big Stone County	2469	21	70	20
Lac qui Parle County	2500	20	71	18
Grant County	2510	20	72	17
Cass County	2528	20	73	16
Red Lake County	2537	19	74	15
Wilkin County	2561	18	75	14
Norman County	2601	17	76	13
Mahnomen County	2604	17	77	11
Roseau County	2606	17	78	10
Clearwater County	2633	16	79	9
Traverse County	2655	15	80	8
Aitkin County	2697	14	81	7
Marshall County	2723	13	82	6
Kittson County	2764	12	83	5
Koochiching County	2765	12	84	3
Lake County	2786	11	85	2
Lake of the Woods County	2902	8	86	1
Cook County	2945	6	87	0

Population Density of North Dakota Counties,
National and Statewide Percentile Rankings, 1990

County	U.S. Rank	U.S. %ile	ND Rank	ND %ile
Cass County	1163	63	1	98
Grand Forks County	1316	58	2	96
Burleigh County	1610	49	3	94
Ward County	1882	40	4	92
Stark County	2311	26	5	91
Rolette County	2419	23	6	89
Richland County	2470	21	7	87
Morton County	2485	21	8	85
Walsh County	2530	19	9	83
Ramsey County	2532	19	10	81
Williams County	2549	19	11	79
Traill County	2552	19	12	77
Stutsman County	2560	18	13	75
Mercer County	2586	18	14	74
Barnes County	2630	16	15	72
Pembina County	2637	16	16	70
Ransom County	2695	14	17	68
Foster County	2720	13	18	66
Dickey County	2755	12	19	64
Sargent County	2759	12	20	62
Benson County	2771	12	21	60
Pierce County	2785	11	22	58
McLean County	2788	11	23	57
Bottineau County	2792	11	24	55
LaMoure County	2800	11	25	53
Eddy County	2803	11	26	51
Griggs County	2804	11	27	49
Wells County	2808	11	28	47
Nelson County	2813	10	29	45
McIntosh County	2825	10	30	43
Cavalier County	2828	10	31	42
Mountrail County	2843	9	32	40
Renville County	2870	9	33	38
Towner County	2872	9	34	36
McHenry County	2875	8	35	34
Sioux County	2880	8	36	32
Steele County	2882	8	37	30
Oliver County	2892	8	38	28
Adams County	2895	8	39	26
Emmons County	2896	8	40	25
Bowman County	2907	7	41	23
Hettinger County	2914	7	42	21
Logan County	2923	7	43	19
Burke County	2939	6	44	17
Kidder County	2959	6	45	15
McKenzie County	2968	6	46	13
Divide County	2970	5	47	11
Sheridan County	2978	5	48	9
Grant County	2985	5	49	8
Golden Valley County	2987	5	50	6
Dunn County	2992	5	51	4
Billings County	3084	2	52	2
Slope County	3104	1	53	0

Population Density of South Dakota Counties,
National and Statewide Percentile Rankings, 1990.

County	U.S.Rank	U.S.%ile	SD Rank	SD %ile
Minnehaha County	522	83	1	98
Davison County	1524	51	2	97
Yankton County	1607	49	3	95
Codington County	1734	45	4	94
Clay County	1759	44	5	92
Brookings County	1770	44	6	91
Pennington County	1854	41	7	89
Lincoln County	1955	38	8	88
Lawrence County	1983	37	9	86
Union County	2117	33	10	85
Brown County	2167	31	11	83
Hughes County	2192	30	12	82
Lake County	2250	28	13	80
Beadle County	2408	23	14	79
Turner County	2425	23	15	77
Bon Homme County	2472	21	16	76
Moody County	2473	21	17	74
Grant County	2486	21	18	73
Hutchinson County	2551	19	19	71
McCook County	2563	18	20	70
Hamlin County	2571	18	21	68
Roberts County	2609	17	22	67
Douglas County	2622	17	23	65
Walworth County	2624	16	24	64
Charles Mix County	2634	16	25	62
Deuel County	2675	15	26	61
Kingsbury County	2680	15	27	59
Hanson County	2692	14	28	58
Day County	2700	14	29	56
Brule County	2705	14	30	55
Meade County	2718	13	31	53
Todd County	2731	13	32	52
Marshall County	2740	13	33	50
Miner County	2742	13	34	48
Spink County	2758	12	35	47
Gregory County	2763	12	36	45
Sanborn County	2784	11	37	44
Shannon County	2798	11	38	42
Clark County	2809	11	39	41
Jerauld County	2810	11	40	39
Aurora County	2814	10	41	38
Tripp County	2820	10	42	36
Fall River County	2822	10	43	35
Custer County	2832	10	44	33
Edmunds County	2851	9	45	32
Buffalo County	2859	9	46	30
Potter County	2861	9	47	29
Butte County	2874	9	48	27
Hand County	2918	7	49	26
McPherson County	2929	7	50	24
Faulk County	2938	6	51	23
Bennett County	2943	6	52	21
Campbell County	2944	6	53	20

Population Density of South Dakota Counties,
National and Statewide Percentile Rankings, 1990.

County	U.S.Rank	U.S.%ile	SD Rank	SD %ile
Dewey County	2962	6	54	18
Lyman County	2976	5	55	17
Hyde County	2994	5	56	15
Stanley County	3016	4	57	14
Corson County	3017	4	58	12
Mellette County	3024	4	59	11
Sully County	3033	3	60	9
Jackson County	3042	3	61	8
Haakon County	3047	3	62	6
Perkins County	3054	3	63	5
Jones County	3055	3	64	3
Ziebach County	3068	2	65	2
Harding County	3114	1	66	0

Population Density of Iowa Counties,
National and Statewide Percentile Rankings, 1990

County	U.S. Rank	U.S. %ile	IA Rank	IA %ile
Polk County	185	94	1	99
Scott County	280	91	2	98
Linn County	376	88	3	97
Black Hawk County	399	87	4	96
Johnson County	516	84	5	95
Dubuque County	559	82	6	94
Story County	612	81	7	93
Woodbury County	674	79	8	92
Des Moines County	726	77	9	91
Muscatine County	807	74	10	90
Pottawattamie County	845	73	11	89
Wapello County	872	72	12	88
Cerro Gordo County	877	72	13	87
Lee County	946	70	14	86
Clinton County	959	69	15	85
Marshall County	1042	67	16	84
Warren County	1097	65	17	83
Webster County	1190	62	18	82
Marion County	1221	61	19	81
Bremer County	1258	60	20	80
Dallas County	1286	59	21	79
Jasper County	1343	57	22	78
Henry County	1422	55	23	77
Boone County	1426	55	24	76
Dickinson County	1549	51	25	75
Sioux County	1555	50	26	74
Mahaska County	1589	49	27	73
Carroll County	1592	49	28	72
Jefferson County	1597	49	29	71
Buchanan County	1620	48	30	70
Buena Vista County	1677	47	31	69
Washington County	1688	46	32	68
Floyd County	1699	46	33	67
Jones County	1706	46	34	66
Hardin County	1714	45	35	65
Poweshiek County	1748	44	36	64
Page County	1775	43	37	63
Jackson County	1783	43	38	62
Benton County	1787	43	39	61
Delaware County	1791	43	40	60
Clay County	1797	43	41	59
Winnebago County	1821	42	42	58
Mills County	1822	42	43	57
Winneshiek County	1823	42	44	56
Union County	1827	42	45	55
Cedar County	1829	42	46	54
Fayette County	1836	42	47	53
Emmet County	1856	41	48	52
Louisa County	1879	40	49	51
Montgomery County	1894	40	50	49
Hamilton County	1911	39	51	48
Appanoose County	1919	39	52	47

Population Density of Iowa Counties,
National and Statewide Percentile Rankings, 1990

County	U.S. Rank	U.S.%ile	IA Rank	IA %ile
Butler County	1940	38	53	46
Plymouth County	1941	38	54	45
O'Brien County	1946	38	55	44
Cass County	1952	38	56	43
Chickasaw County	1964	37	57	42
Iowa County	2007	36	58	41
Humboldt County	2017	36	59	40
Wright County	2023	36	60	39
Clayton County	2027	35	61	38
Cherokee County	2029	35	62	37
Tama County	2043	35	63	36
Grundy County	2051	35	64	35
Crawford County	2065	34	65	34
Mitchell County	2072	34	66	33
Shelby County	2103	33	67	32
Madison County	2111	33	68	31
Hancock County	2118	33	69	30
Allamakee County	2137	32	70	29
Sac County	2143	32	71	28
Harrison County	2155	31	72	27
Lucas County	2158	31	73	26
Howard County	2170	31	74	25
Lyon County	2181	31	75	24
Calhoun County	2187	30	76	23
Keokuk County	2190	30	77	22
Worth County	2193	30	78	21
Franklin County	2217	29	79	20
Ida County	2224	29	80	19
Clarke County	2230	29	81	18
Kossuth County	2232	29	82	17
Palo Alto County	2242	29	83	16
Monroe County	2251	28	84	15
Guthrie County	2257	28	85	14
Osceola County	2268	28	86	13
Greene County	2296	27	87	12
Audubon County	2325	26	88	11
Davis County	2329	26	89	10
Pocahontas County	2332	26	90	9
Fremont County	2348	25	91	8
Van Buren County	2359	25	92	7
Decatur County	2364	25	93	6
Adair County	2397	24	94	5
Monona County	2409	23	95	4
Wayne County	2445	22	96	3
Taylor County	2449	22	97	2
Adams County	2508	20	98	1
Ringgold County	2554	19	99	0

Population Density of Wisconsin Counties,
National and Statewide Percentile Rankings, 1990

County	U.S.Rank	U.S.%ile	WI Rank	WI %ile
Milwaukee County	21	99	1	99
Waukesha County	190	94	2	97
Racine County	195	94	3	96
Kenosha County	212	93	4	94
Brown County	260	92	5	93
Winnebago County	285	91	6	92
Ozaukee County	290	91	7	90
Dane County	299	90	8	89
Washington County	396	87	9	88
Outagamie County	397	87	10	86
La Crosse County	401	87	11	85
Sheboygan County	420	87	12	83
Rock County	438	86	13	82
Manitowoc County	581	82	14	81
Walworth County	585	81	15	79
Eau Claire County	592	81	16	78
Fond du Lac County	624	80	17	76
Jefferson County	637	80	18	75
Calumet County	707	77	19	74
Wood County	789	75	20	72
Dodge County	843	73	21	71
Portage County	935	70	22	69
Marathon County	948	70	23	68
St. Croix County	1011	68	24	67
Waupaca County	1118	64	25	65
Columbia County	1162	63	26	64
Pierce County	1185	62	27	63
Sauk County	1195	62	28	61
Kewaunee County	1208	62	29	60
Door County	1234	61	30	58
Green Lake County	1246	60	31	57
Green County	1259	60	32	56
Chippewa County	1261	60	33	54
Barron County	1354	57	34	53
Grant County	1456	54	35	51
Dunn County	1474	53	36	50
Shawano County	1488	53	37	49
Monroe County	1513	52	38	47
Polk County	1582	50	39	46
Trempealeau County	1692	46	40	44
Vernon County	1758	44	41	43
Douglas County	1764	44	42	42
Waushara County	1795	43	43	40
Pepin County	1808	42	44	39
Lincoln County	1809	42	45	38
Oconto County	1819	42	46	36
Richland County	1835	42	47	35
Marinette County	1876	40	48	33
Juneau County	1902	39	49	32
Oneida County	1904	39	50	31
Crawford County	1913	39	51	29
Marquette County	1944	38	52	28

Population Density of Wisconsin Counties,
National and Statewide Percentile Rankings, 1990

County	U.S.Rank	U.S.%ile	WI Rank	WI %ile
Iowa County	1961	38	53	26
Clark County	1977	37	54	25
Lafayette County	1996	36	55	24
Adams County	2036	35	56	22
Langlade County	2108	33	57	21
Vilas County	2183	30	58	19
Buffalo County	2200	30	59	18
Taylor County	2222	29	60	17
Washburn County	2312	26	61	15
Jackson County	2315	26	62	14
Rusk County	2330	26	63	13
Burnett County	2354	25	64	11
Ashland County	2365	25	65	10
Price County	2477	21	66	8
Sawyer County	2515	20	67	7
Menominee County	2526	20	68	6
Bayfield County	2583	18	69	4
Florence County	2584	18	70	3
Forest County	2621	17	71	1
Iron County	2643	16	72	0

Source: U. S. Bureau of the Census, and calculations by the author.

CAPTURING EVOLVING REALITIES: STATISTICAL AREAS FOR THE AMERICAN FUTURE

Brian J.L. Berry
The University of Texas at Dallas

Introduction and Overview

Reacting to changes in the nation's settlement system, during the twentieth century the Bureau of the Census has developed and modified two concepts designed to capture "the greater urban reality." In 1910, metropolitan districts were added to the system of area classification, defining for every city with more than 200,000 residents a larger entity including contiguous suburbs that met criteria designed to differentiate them from surrounding rural territory.

The definition was changed in 1930 and 1940, creating metropolitan districts for cities having 50,000 or more inhabitants, adding to them contiguous incorporated places and minor civil divisions having gross population densities of more than 150 persons per square mile. By this time, a diversity of other area classifications had emerged to meet specific needs, however. The Census Bureau had defined industrial districts for the 1905 Census of Manufactures, and the Bureau of Employment Security offered alternative labor market areas to capture the nation's principal laborsheds.

Dissatisfaction emerged both with this multiplicity of classifications and with the inability to continue to capture the changing nature of the greater urban reality. As a result, in 1950, an attempt was made both to standardize and to capture the extent of suburbanization by offering two different classifications. The Census Bureau's new urbanized areas were somewhat akin to metropolitan districts, attempting to capture the extent of urban land use. Each urbanized area was defined around a population nucleus of more than 50,000 people, and included adjacent areas that satisfied certain population density criteria. As a corollary, the definition of rural areas was modified to permit unincorporated but urbanized territory to be

classified as urban rather than rural. Standard metropolitan areas, established by the Bureau of the Budget with the assistance of the Census Bureau, were designed "so that a wide variety of statistical data might be presented on a uniform basis" by the various agencies of government. The standard metropolitan area was defined a cluster of counties surrounding an incorporated city of at least 50,000 population that satisfied specified criteria of metropolitan character and of social and economic integration with the central city. This area, it was hoped, would delineate laborsheds and capture the extent of the metropolitan field of influence.

By 1960 it was once again evident that both of these new area classifications, and particularly the renamed standard metropolitan statistical areas, were failing to capture fast-paced restructuring of the nation's settlement system. During the 1960s the Office of Business Economics (now Bureau of Economic Analysis) found it necessary to define a system of multicounty economic areas that both exhausted the territory of the 48 conterminous United States and captured the increasingly farflung relationships between metropolitan housing and labor markets. The Office of Business Economics wanted an area classification in which the regions were "closed" in the short run in that incomes earned (as reported in place-of-work surveys) could be equated with expenditures plus savings in a system of accounts in which the regional products summed to the national product. The journey-to-work criterion was the most logical to identify such economic areas. The Office of Management and Budget, on the other hand, advised by Census Bureau staff, temporized by modifying inclusion/exclusion criteria for counties in 1970, 1980 and 1990, ultimately defining a complex system of metropolitan areas featuring metropolitan statistical areas (MSAs) centered on cities or urbanized areas of at least 50,000 people, combinable into larger MSAs if adjacent areas met certain criteria, separated by size into A-B-C-D levels, subdividable if level A into primary metropolitan statistical areas (PMSAs), and if so subdivided and composed of more than one PMSA, to be termed consolidated metropolitan statistical areas (CMSAs). The result by 1990 was a system so arcane, so needlessly

complex, so lacking in underlying principle, and so afflicted by "ad hoc-ism" in the selection and modification of criteria for inclusion/exclusion of counties in statistical areas as to be ludicrous.

In response, the Office of Management and Budget requested the Census Bureau to enter into a metropolitan areas research project, which subsequently resulted in establishment of four joint statistical agreements in early 1991. Each of these agreements called for

> "research on the conceptual issues involved in identifying the geographic entities that constitute the U.S. settlement system, and on an approach to presenting those entities--ranging from major agglomerations of population and economic activity to the least densely settled areas of the country--in a standard fashion that would be suitable for Federal statistics. This research is useful to the Census Bureau as it faces the continuing necessity to identify and delineate efficiently useful statistical areas in a changing settlement system. Both operational and tabulation requirements demand statistical areas."

Ten questions asked in each agreement constituted a request for a proposed alternative approach to defining metropolitan and nonmetropolitan areas, raising such issues as the basic geographic unit to be used, how the units would be aggregated, and the frequency with which areas would be updated. (See this volume's Introduction for the complete list of questions.) Follow-on questions included the request that the possibility of updating metropolitan/nonmetropolitan statistical area definitions every five years be evaluated, and that consideration be given to the possibility of defining "rural population concentration areas" within nonmetropolitan America.

These are the issues addressed in what follows. The concluding recommendations are these:

- The 5-digit ZIP Code area should be used as a uniform basis for area classification.

  ZIP Code units, central to intercensal reporting and analysis in both private organizations and public agencies, will produce statistical areas of maximum value to user groups, and will both permit and encourage regular intercensal statistical updates.

- A set of densely settled areas composed of one or more 5-digit ZIP Code areas should be defined using housing unit density criteria.

  These areas, analogous to the present system of urbanized areas, address the question of morphological differences in the nation's settlement pattern.

- The U.S. should be subdivided into an exhaustive set of communications regions composed of one or more densely settled areas, together with surrounding 5-digit ZIP Code areas, linked by their use of the same communications media.

  These information-age regions--media markets--should reflect the interdependence of Americans who receive common messages from common sources, such as television stations and cable networks, should meet the need for an exhaustive regionalization based upon daily interdependence of the population, and should provide a logical basis for consolidating densely settled areas that are, in fact, interdependent.

- Within each communications region, each densely settled area that satisfies a minimum population-size criterion should have defined around it a primary metropolitan zone composed of all of these 5-digit ZIP Code areas either sending more than a specified percentage of their labor force to work in the designated densely settled area, or receiving from that area more than a certain percentage of their local employees.

These primary metropolitan zones should serve the same function as today's metropolitan areas, identifying areas tied together by daily interactions and thus with a higher degree of interdependence than the larger communications regions within which they are located.

- Contiguous 5-digit ZIP Code areas lying outside the primary metropolitan zones should be grouped into nonmetropolitan community areas if they meet certain criteria; e.g. composed of a densely settled area or a municipality that meets minimum size requirements, plus surrounding areas that satisfy specified criteria of interdependence, each nonmetropolitan community area not to have less than a specified total population.

  These regions should meet the felt need for smaller-scale statistical areas lying outside primary metropolitan zones that nonetheless have substantial degrees of daily interdependence, functioning as tightly knit communities.

The Changing Nature of the Settlement System

Metropolitan area classifications remain rooted in the concepts that led to the initial definition of metropolitan districts in 1910. These concepts emerged from an urban form that, already by 1920, was reaching its zenith: the concentrated core-oriented metropolis that emerged to solve the problem of slow and expensive transportation by agglomerating industry and employment in a single center and packing the population around that center and along radiating transport networks.

The concepts were adjusted to respond to suburbanization after World War II, but have continued to reflect their ancestry, for example, in the separate reporting of statistics for "central cities" and "suburbs" within metropolitan areas, and by focussing upon core-oriented measures of interdependence. The result is that

today they fail to capture the essential qualities of what historian Robert Fishman calls America's "new city" that, during the 1970s, "successfully challenged the old downtowns in the last area of their supremacy, office employment....By the 1980s, even social scientists could not ignore the fact that the whole terminology of 'suburb' and 'central city,' deriving from the era of the industrial metropolis, had become obsolete" (Fishman 1990, p. 37).

To Fishman the new cities are the sprawling regions in which the "basic unit...is not the street measured in blocks but the 'growth corridor' stretching 50 to 100 miles" (ibid., p. 28), regions that lack "what gave shape and meaning to every urban form of the past: a dominant single core and definable boundaries" (ibid.). The new urban regions are multicentered, with third-, fourth-, and fifth-generation cores (Leinberger 1990) located in and beyond "edge cities," "high-tech corridors," and large scale private master-planned communities (Knox 1991).

Every urban landscape says Knox (ibid., p. 181), quoting Meinig (1979), is "mold and mirror of our economy, culture, and society." Fishman's new cities are no exception. Today's urban regions, Knox says, reflect the continuing eclipse of the era of mass production and mass consumption in the economic sphere, with accompanying flexibility of production and location to deal with increasingly segmented markets and time-space compression, and the philosophical, cultural, and attitudinal shift away from modernism towards postmodernism. "Whereas modernism is paradigmatic, universalistic, purposive, hierarchical, synthetic, selective, and concerned with master codes and metanarratives, postmodernism is syntagmatic, playful, anarchical, antithetical, combinatorial, ideolectal, localistic, and anti-narrative" (ibid., p. 183). Fishman concludes (op.cit., pp. 38-9) that "in the new city...there is no single center. Instead, ...each family home has become the central point for its members. Families create their own 'cities' out of the destinations they can reach....The pattern formed by these destinations represents 'the city' for that particular family or individual. The more varied one's destinations, the richer and more diverse is one's personal 'city.' The new city is a city à la

carte. It [is] composed of three overlapping networks.... The household network is composed of places that are part of family and personal life....The network of consumption... comprises...the shopping centers and malls....recreational facilities, and perhaps a second home....The network of production....includes the place of employment of one or both spouses (and) the suppliers...which these enterprises rely upon....Each of these networks has its own spatial logic."

"We can see," says Castells (1989, p. 348) "a major social trend standing out from all our observations: the historical emergence of the space of flows, superseding the meaning of the space of places....The new industrial space and the new service economy organize their operations around the dynamics of their information-generating units, while connecting their different functions to disparate spaces...; the overall process is then reintegrated through communication systems." "The supersession of places by a network of information flows is a fundamental goal of the restructuring process...." (ibid., p. 349).

The consequences are captured by Barras (1987, pp. 24-26):

> "...The adoption of new microelectronics-based technologies...appears to improve the economic viability of smaller scale production, moving away from the standard production line towards more flexible and customised manufacturing processes, while at the same time increasing the demand for ancillary services such as research and development and software production. These two trends are already creating a further decentralisation of manufacturing activity, based on the establishment of smaller production units in rural areas and small towns....The expansion of electronic, network-based service industries, will inevitably further strengthen the impetus towards de-urbanisation....The new interactive services carried on the network will also shift the locus of service delivery from the point of production (e.g., the bank), to the point of consumption

(e.g., the home or business), both weakening the need for spatial proximity between producers and consumers, and further shifting the balance towards the preferences of households, rather than businesses, as the key determinants of the location of economic activity....The capability of the network to transfer information between any set of business and domestic locations will both create more mobile job opportunities for the most qualified social groups, and allow more flexible patterns of working with a greater home-based component."

Schrage (1991) adds that emergent computer "groupware" can go even further in eliminating geography by linking dispersed researchers not only in collaborative technologies, but in "virtual realities" demanding radically different modes of integration. This may be the shape of things to come.

We conclude that:

- The new and emergent pattern of settlement is composed of increasingly dispersed and decentralized activity centers and residential zones.

- The activity centers and residential zones are linked by networks of flows that have rendered the older urban/rural, metropolitan/ nonmetropolitan, and center/suburb distinctions obsolete.

- The new networks are home-based, not work-based, and are organized to meet family, consumption, and production needs.

- Each individual home-based network is unique, depending upon characteristics of the household, location relative to activity centers, and the information available to the household.

- What provides common structure to the household networks is the information households receive from the communications media. Common "messages" are what bind together larger informational communities.

- Within these informational communities, family-defined "cities" overlap, to create in the larger settlement systems distinctions between more and less densely settled areas. The more densely settled areas correspond to contemporary morphological notions of what territory is "urban."

- Area classifications that attempt to capture this new and evolving reality must: (1) be constructed using building blocks that are finely textured enough to capture some of the home-based variance; (2) reflect the informational milieu within which the household makes choices; (3) yet also capture the expression of revealed preferences in the shape and the extent of the new dispersed settlements.

The Question of Building Blocks

What geographic unit is:

- Finely textured enough to capture the new shape of the nation's settlement system more precisely than 3,000 counties and more than 500 "central cities" or their equivalents?

- Consistently defined across the country?

- Readily amenable to collection of statistics by a variety of procedures and to easy manipulation using a modern geographic information system?

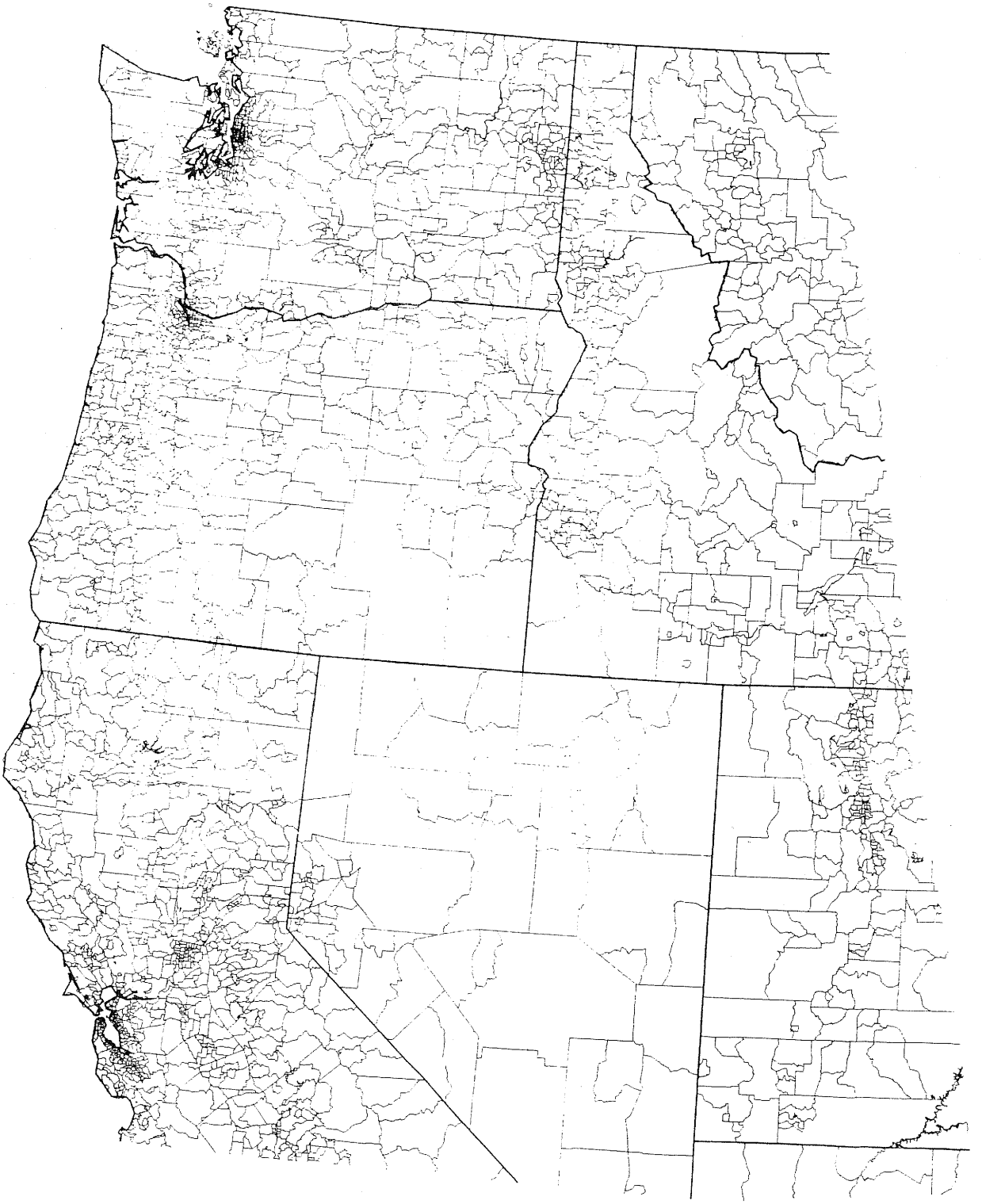
- Structured so as to build in the potential for regular intercensal updates of important demographic and social indicators and of the new area classifications?

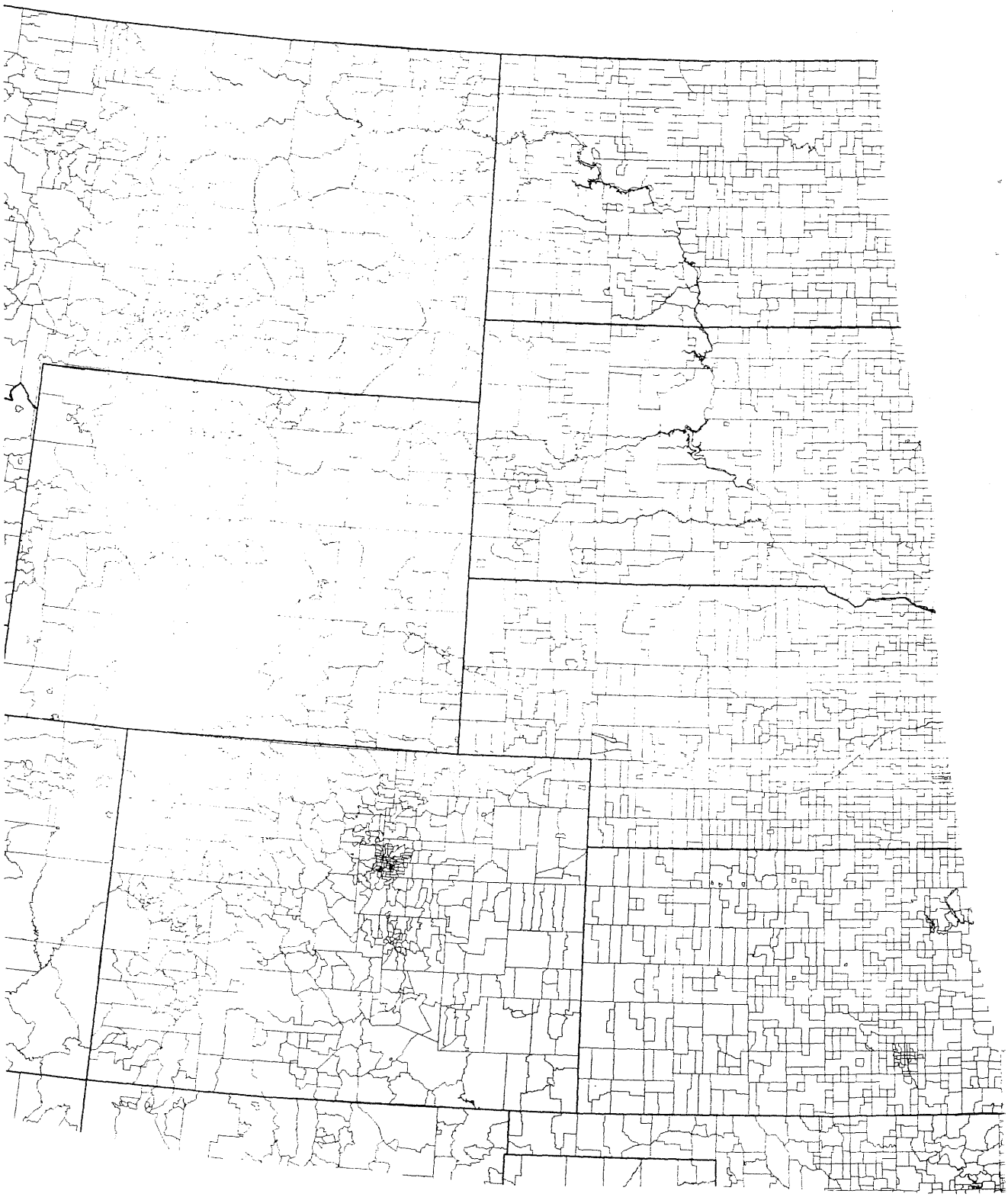
- Likely to maximize utility to both private and public user groups?

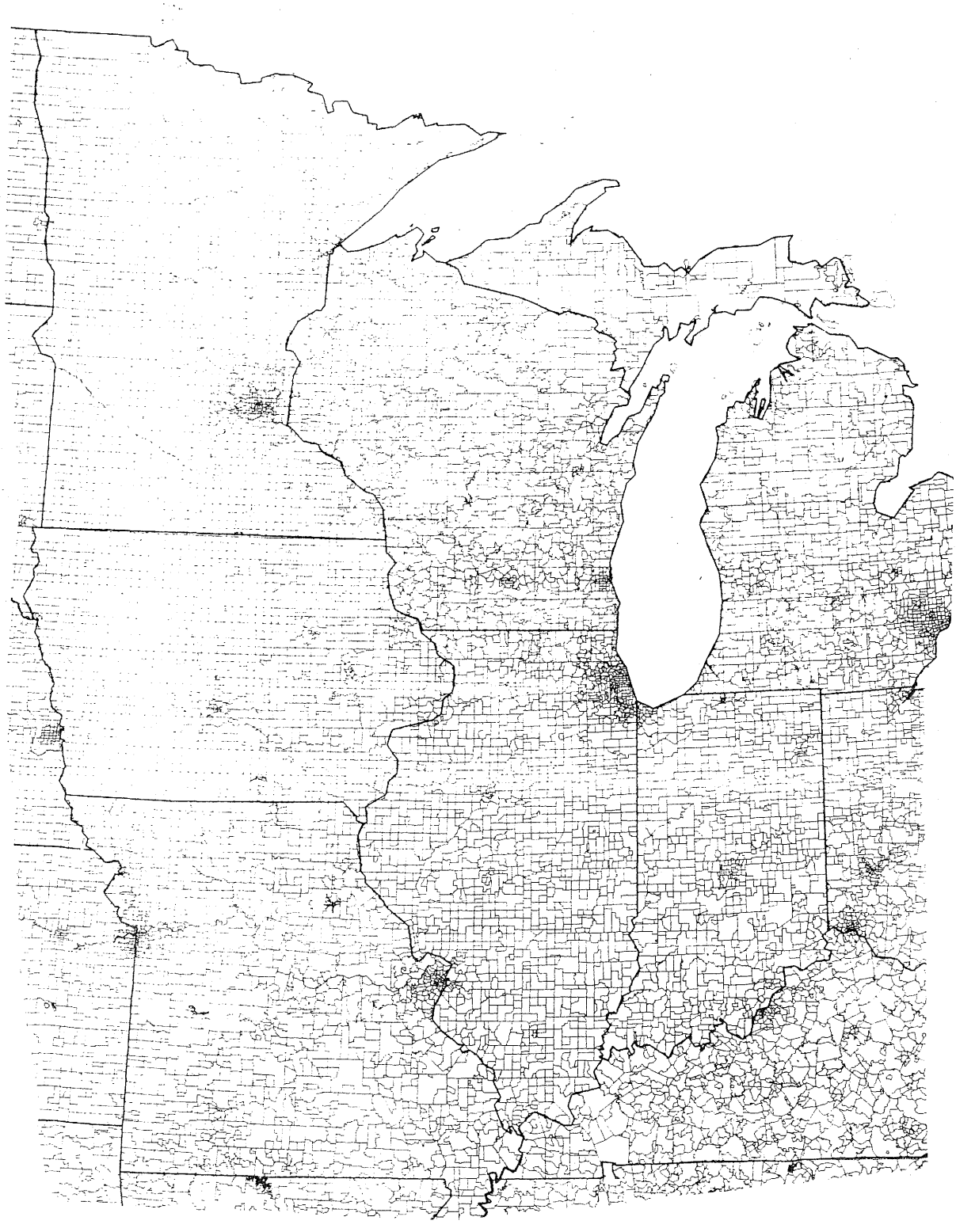
Such a unit is the 5-digit ZIP Code area, which now appears in every address record accompanying the majority of transactions that occur each day in the U.S. ZIP Codes define areas established by the U.S. Postal Service (USPS) to speed mail delivery as the organization has attempted to computerize its operations. They provide excellent building blocks for an area classification system because they are consistent in dividing the nation into some 36,000 geographic units, the size of which reflects variations in the density of demand for postal services, as Figure 1 reveals. The map excerpted for Figure 1 was prepared at The Bruton Center for Development Studies at the University of Texas at Dallas using its geographic information system and is based upon a 1990 ZIP Code boundary file obtained from Geographic Data Technology Inc. of Lyme, New Hampshire. Such a boundary file should become part of the Census Bureau's TIGER system; it is part of GDT's street-and-address range file for the nation. The boundary map alone reveals much about variations in density of settlement across the U.S., because as noted, ZIP Code areas are demand-sensitive.

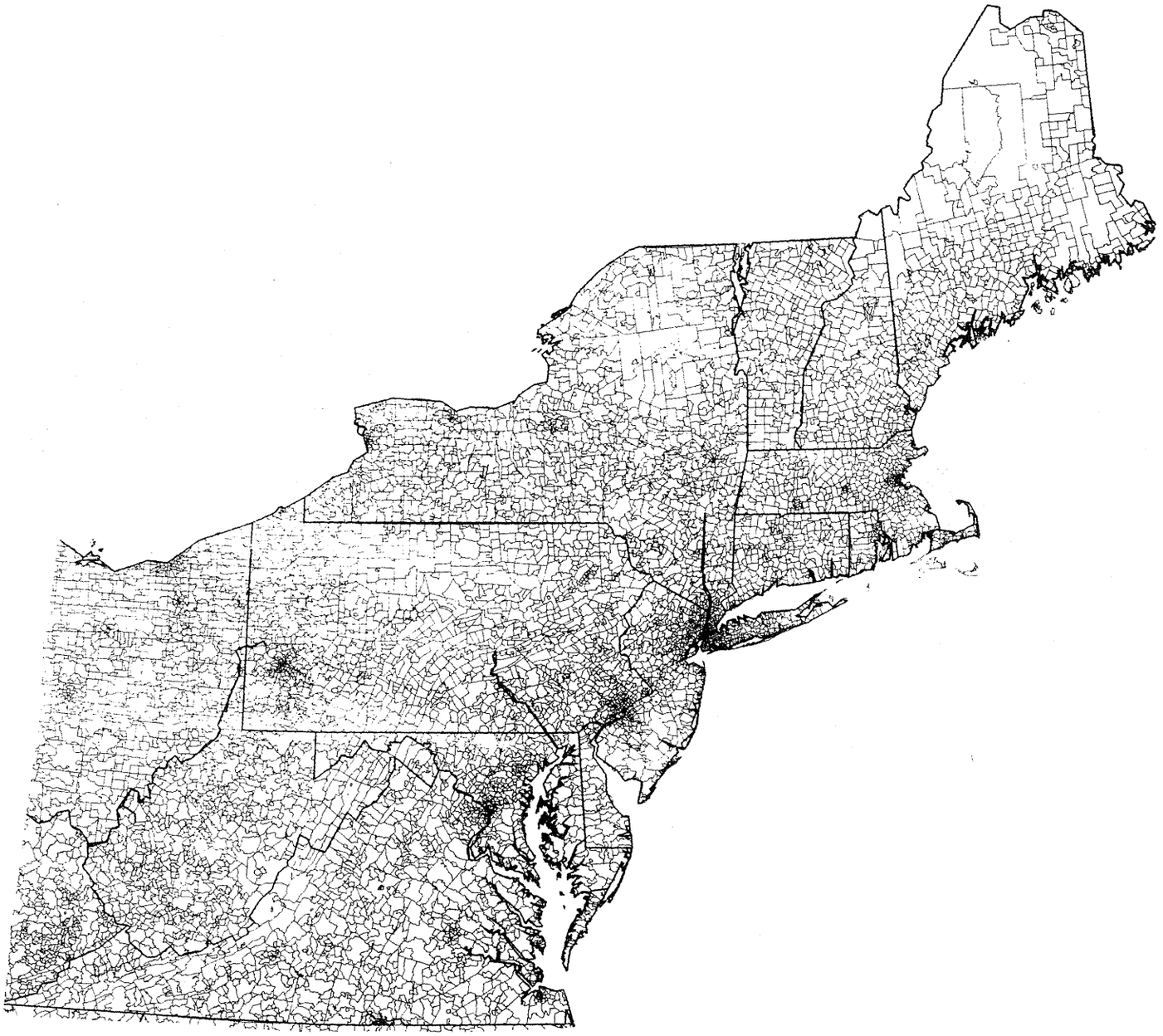
USPS reviews its 5-digit area classification on a regular basis, subdividing existing 5-digit units into new 5-digit areas when growth of demand warrants it. The Census Bureau and USPS recently have entered into discussions regarding the accuracy and availability of ZIP Code data in the future. As important, businesses and banks use ZIP Code areas for sales, market definition, and site evaluation studies; insurance companies analyze claim and risk data by ZIP Code; multiple listing services report housing statistics by ZIP Code; and governments already present and analyze health, crime, economic and many other kinds of data using those units. The Social Security Administration, for example, produces its compilation Social Security Beneficiaries by ZIP Code Area every two years, making the data available on diskette. The 5-digit ZIP Code areas provide more than 10 times the level of geographic detail as the county network--a level of detail that is greater, the greater the density of settlement and activities and level of postal demand.

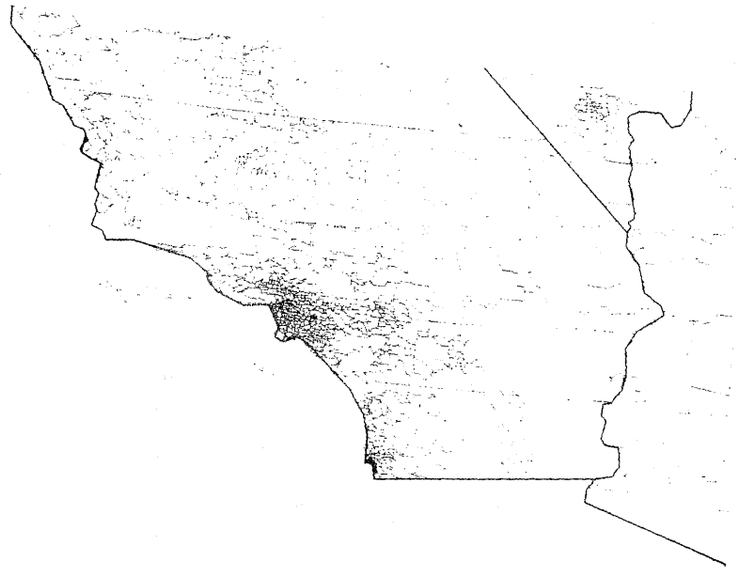
Figure 1: National map of 5-digit ZIP Code areas (8 pages)

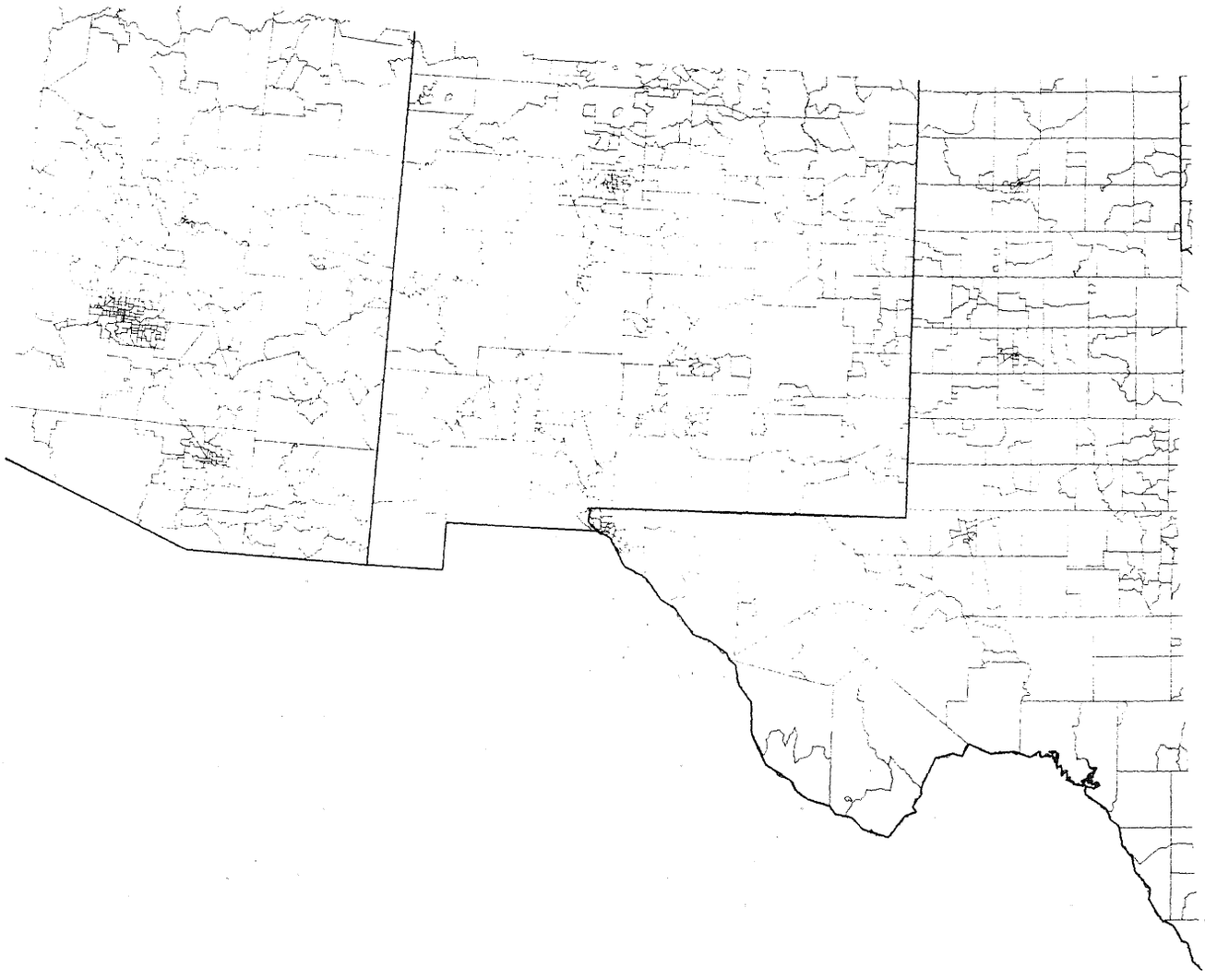


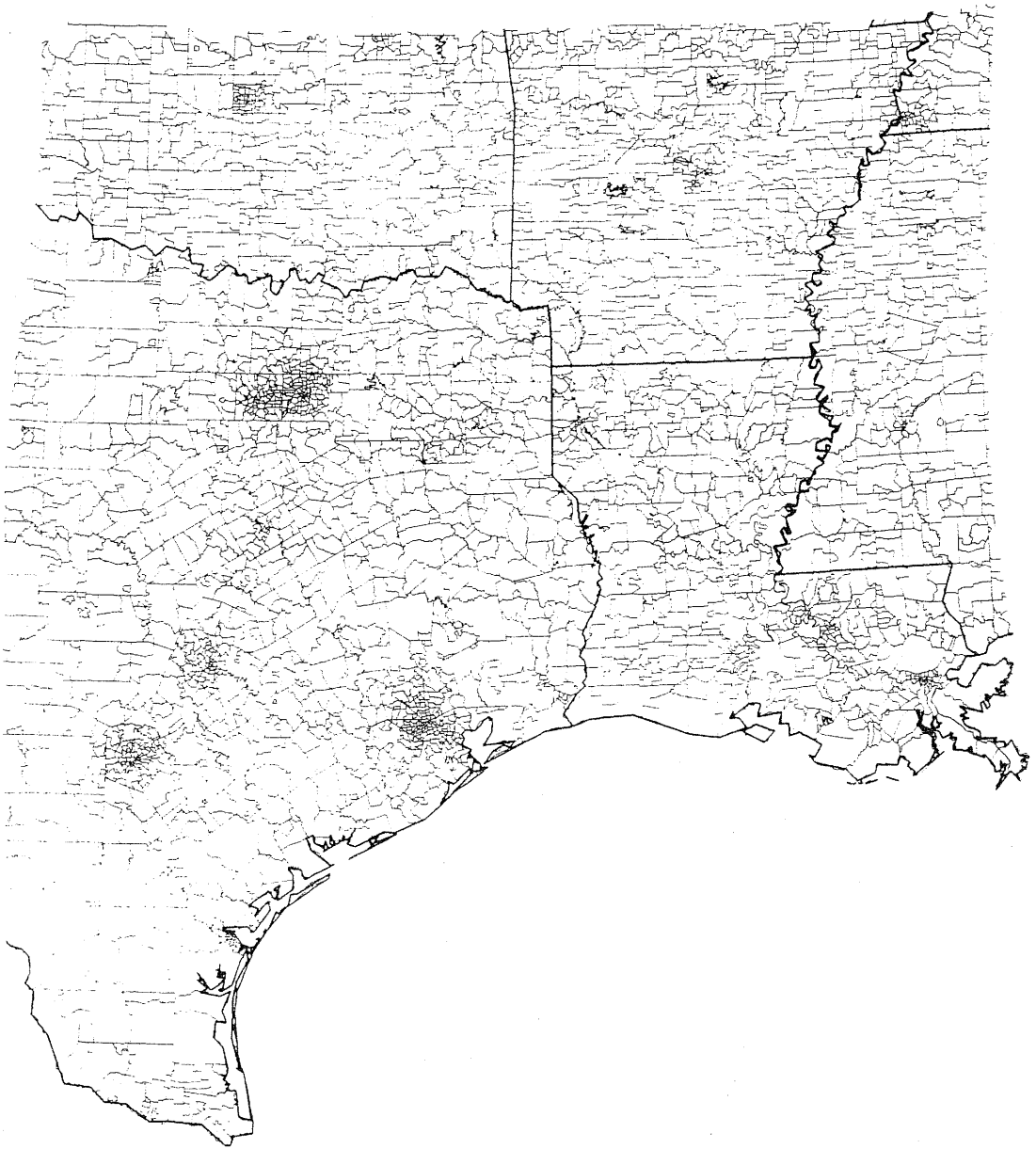


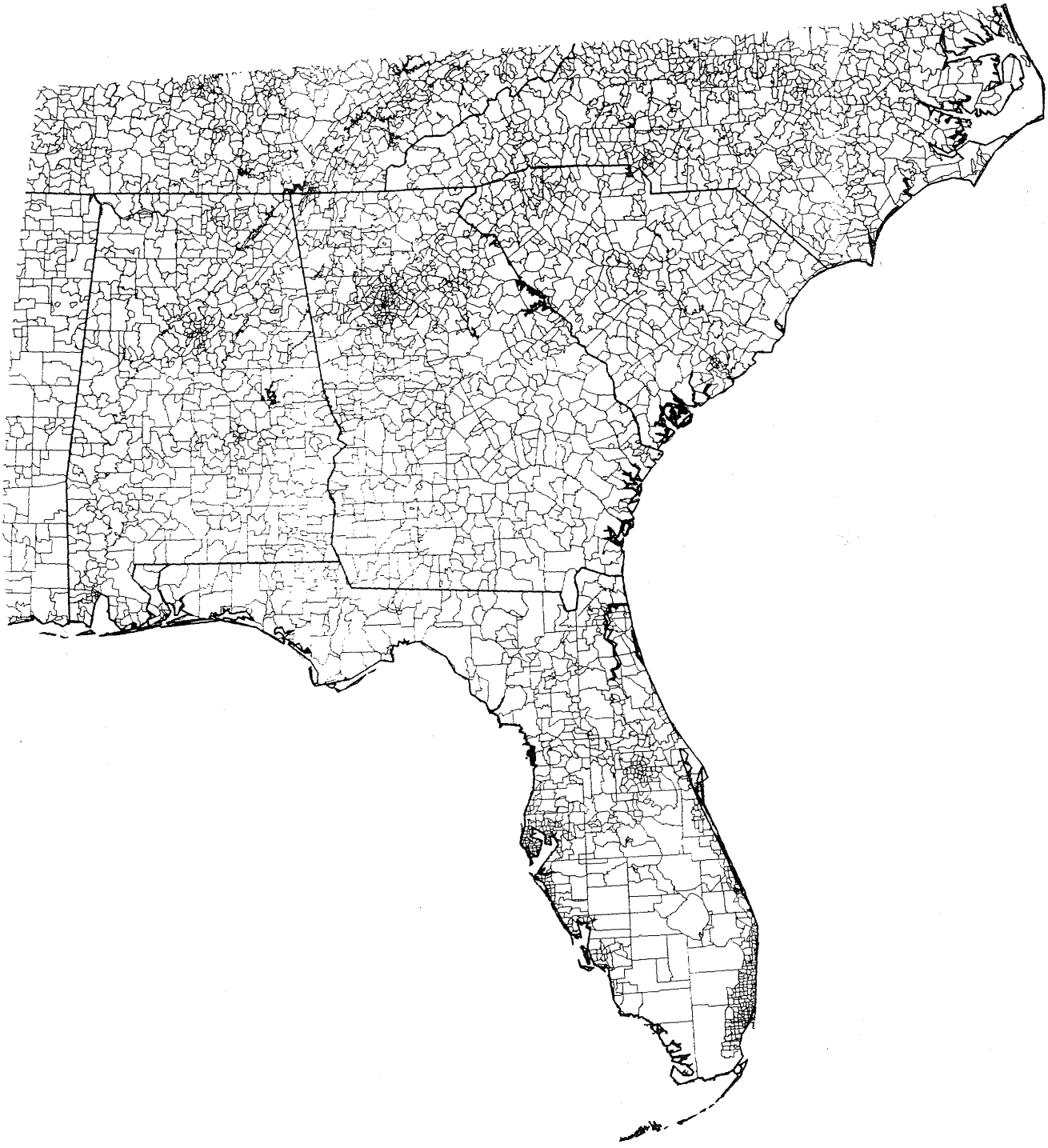












Among the private companies that now prepare and market 5-digit ZIP Code data to a widening array of users are CACI of Fairfax, Virginia, Donnelley Marketing Information Services of Stamford, Connecticut, and National Planning Data Corp. of Ithaca, New York. Donnelley's file is built from its database of more than 83 million households with listed telephones in the U.S.--90 percent of America's households--and is used for such things as targeted advertising and marketing, delineation of sales territories, and estimating trade area patronage, based upon the socioeconomic characteristics of the households residing within the ZIP Code. Claritas Corp. of Reston, Virginia has classified the ZIP Code areas into a limited number of socioeconomic types to permit this kind of marketing (Weiss 1988). Similar to the Claritas PRIZM system are Donnelley's "Cluster Plus" (Donnelley 1988), CACI Inc.'s ACORN and National Decision Systems' VISION.

The marketers' files are becoming increasingly rich repositories of information not simply on demographics and socioeconomics, but on the preferences and purchasing patterns of each area's inhabitants, and most important, they are kept as up-to-date as possible. No other geographic unit has achieved such widespread use or provides the basis both for the geographic analysis needed to produce area classifications and for speedy intercensal updates using either private or public data services. There is no effective alternative.

We recommend that future area classifications be developed using the 5-digit ZIP Code area as the building block, and that every effort be made to use combinations of public and private data to maintain, to the maximum extent possible, intercensal currency at this 36,000 unit-area level of detail.

The Densely Settled Areas

Central to all metropolitan area classifications has been the notion of a large, densely settled population nucleus. According to the metropolitan area standards introduced in 1990, this should be an urbanized area,

provided that the component counties of the resulting metropolitan area have at least 100,000 people (75,000 in New England). The urbanized area on which this definition rests is composed of densely settled territory comprising contiguous census blocks having at least 1,000 persons per square mile, provided that the total population is 50,000 or greater. The 100,000/75,000 metropolitan area population requirement is waived if the region contains a city (municipality) of more than 50,000 people.

This mixed definition lacks consistency, but it is possible to define densely settled areas consistently across the nation using the 5-digit ZIP Code areas in a manner that reflects the broad morphological differences between more and less densely settled territory. To illustrate, combining ZIP Code data obtained from CACI Inc. with the GDT Inc. ZIP Code boundary file, the Bruton Center's geographic information system was used to produce a series of maps of the densely settled areas of Texas first by using the gross population density criterion built into current urbanized area definition, and second by using a housing density criterion.

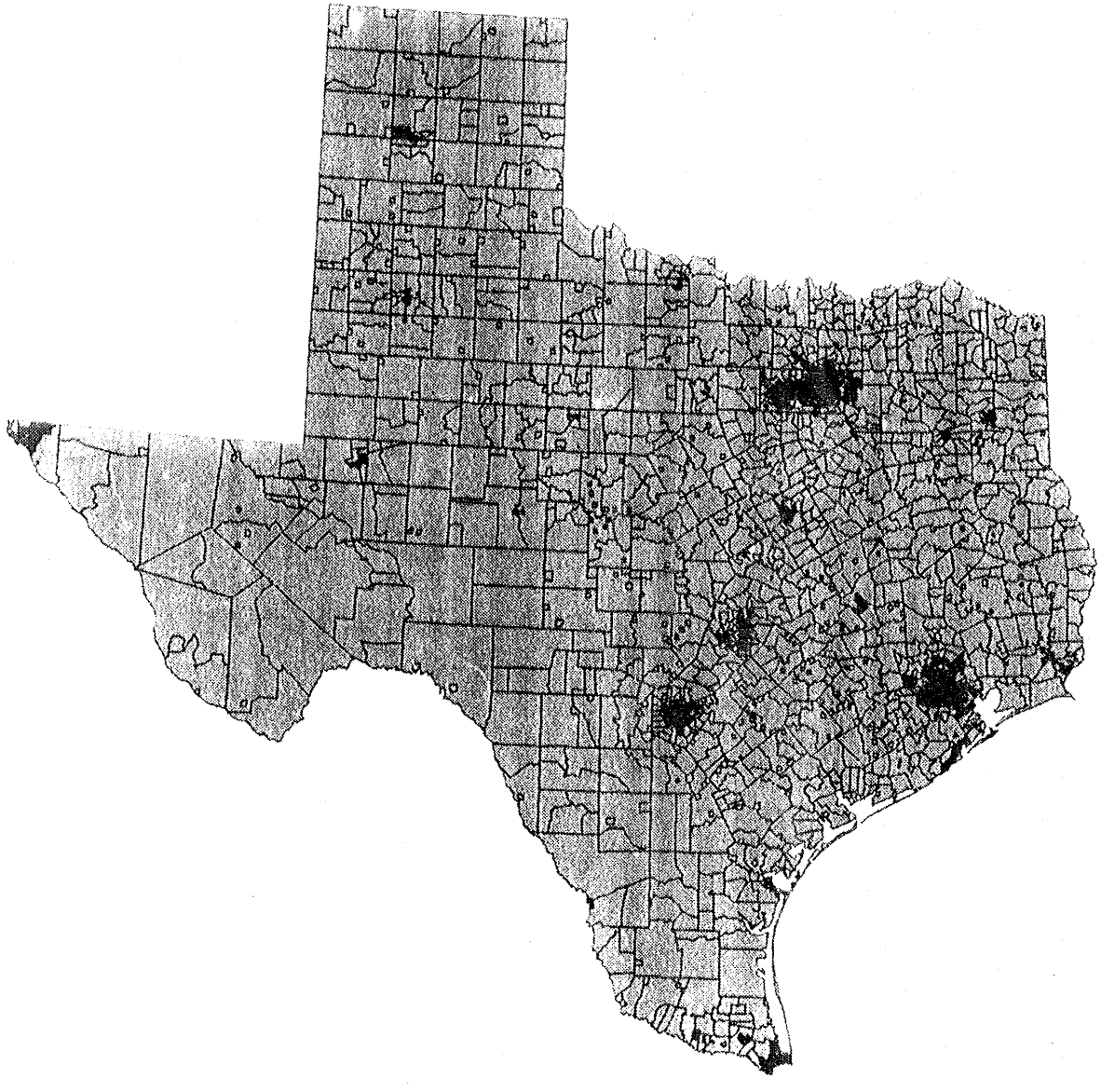
Shaded in red on the first of these maps, Figure 2, are all ZIP Coded polygons with at least 1,000 persons per square mile in 1989. Some large densely settled zones are evident, as are a number of urban areas that only have a single ZIP Code area satisfying this criterion.

Figures 3, 4 and 5 reduce the population density criterion, following the urban density gradient outwards to provide progressively broader views of the notion of a densely settled area. Figure 6 shows the ZIP Code areas added to the first map's definition by this successive relaxation of the gross population density criterion from at least 1,000 persons per square mile to at least 250 persons per square mile. The areas that are added include suburbs and exurbs of the densely settled cores that appear in the first map, a few smaller urban areas, plus zones of colonias in the lower Rio Grande Valley.

What Figures 2-6 show clearly enough is that if population densities are used to identify densely settled zones, the number and extent of the zones that result are critically dependent upon the density criteria selected.

1989 Population Density

By Zip Code ; unit of measurement=square miles



Legend

Less than 999.9

Over 1,000

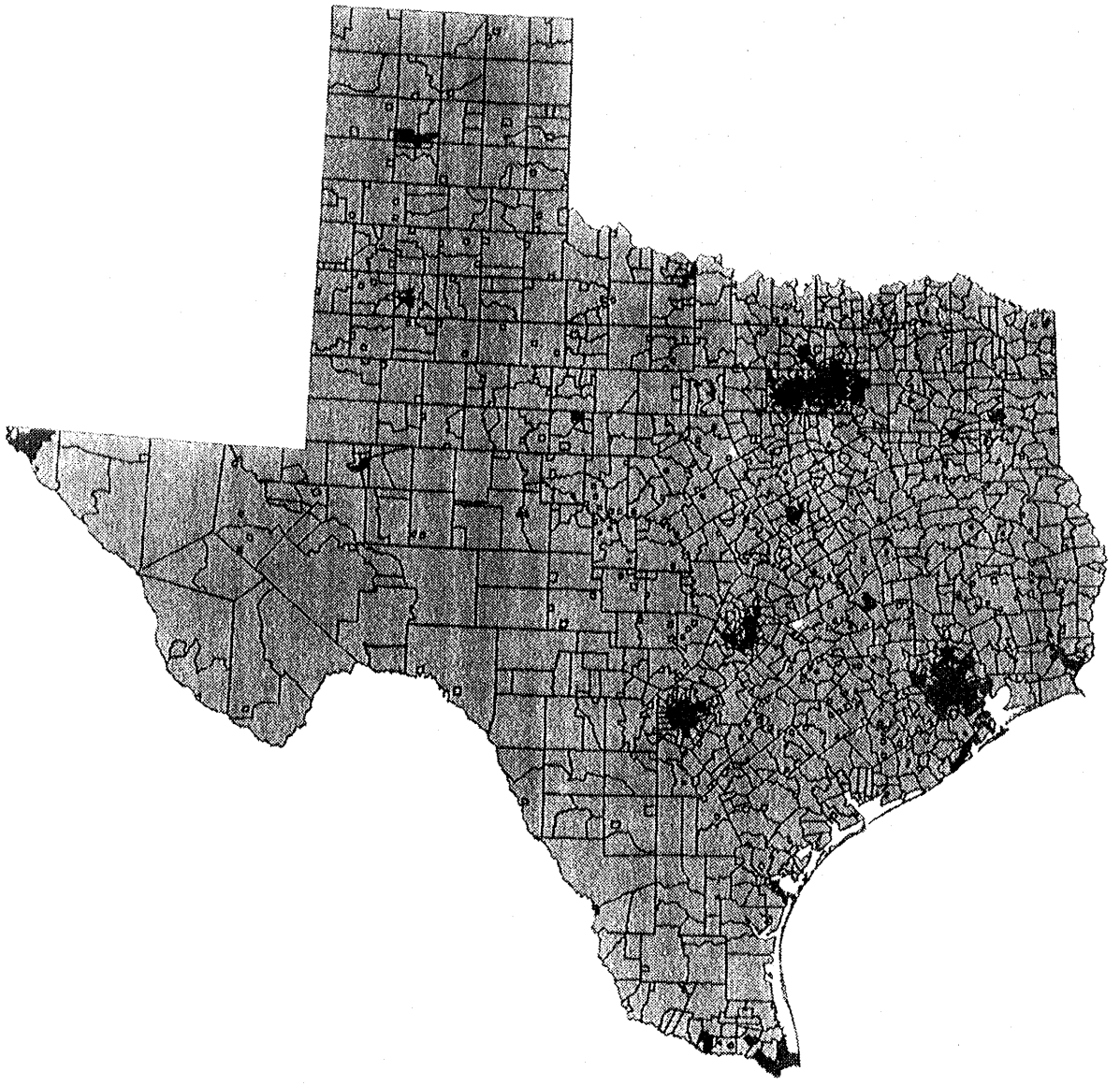
Figure 2

Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas
July 19, 1991

1989 Population Density

By Zip Code ; unit of measurement=square miles



Legend

Less than 749.9

Over 750

Figure 3

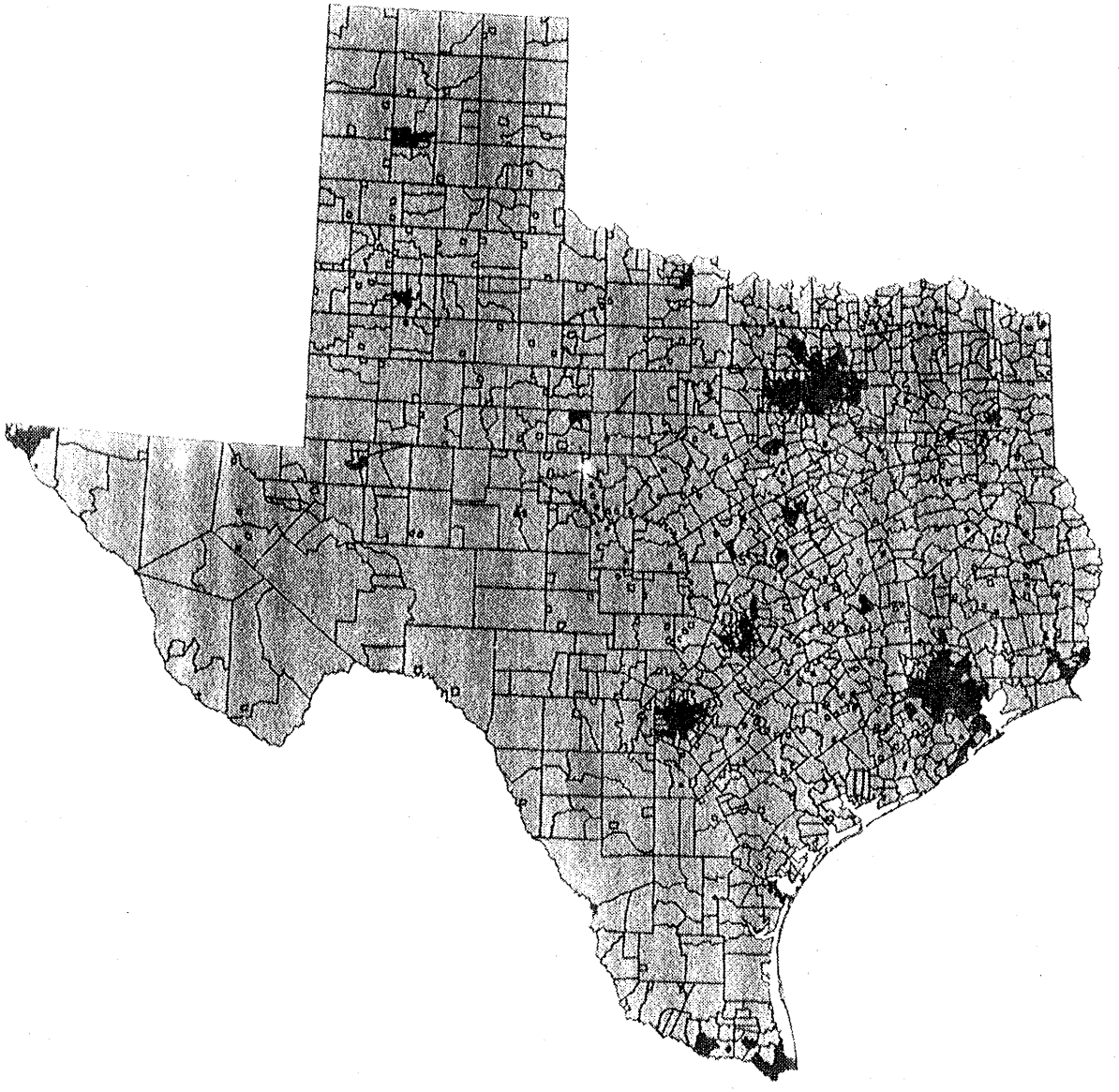
Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

July 19, 1991

1989 Population Density

By Zip Code ; unit of measurement=square miles



Legend

Less than 499.9

Over 500

Figure 4

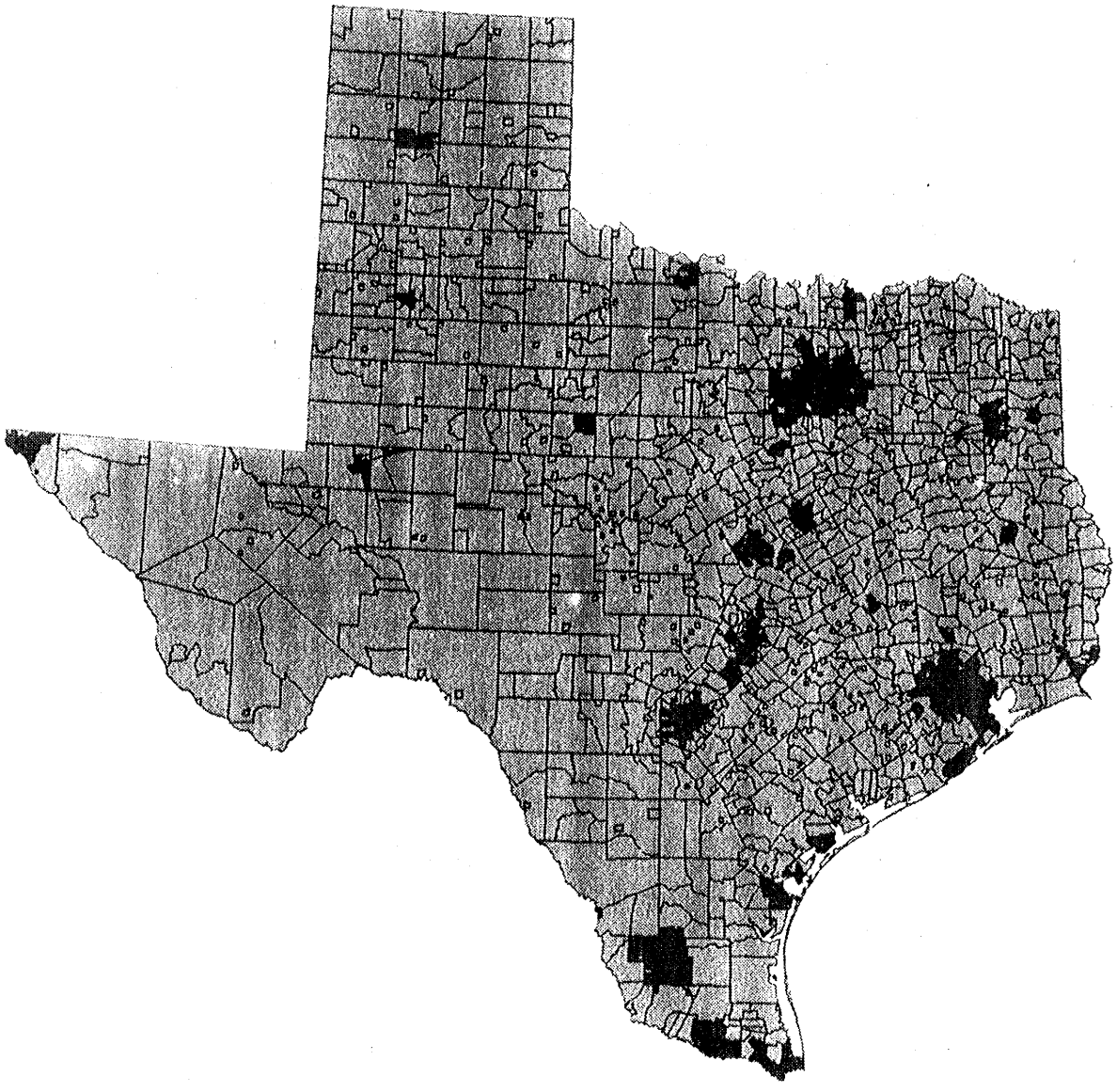
Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

July 19, 1991

1989 Population Density

By Zip Code ; unit of measurement=square miles



Legend

Less than 249.9

Over 250

Figure 5

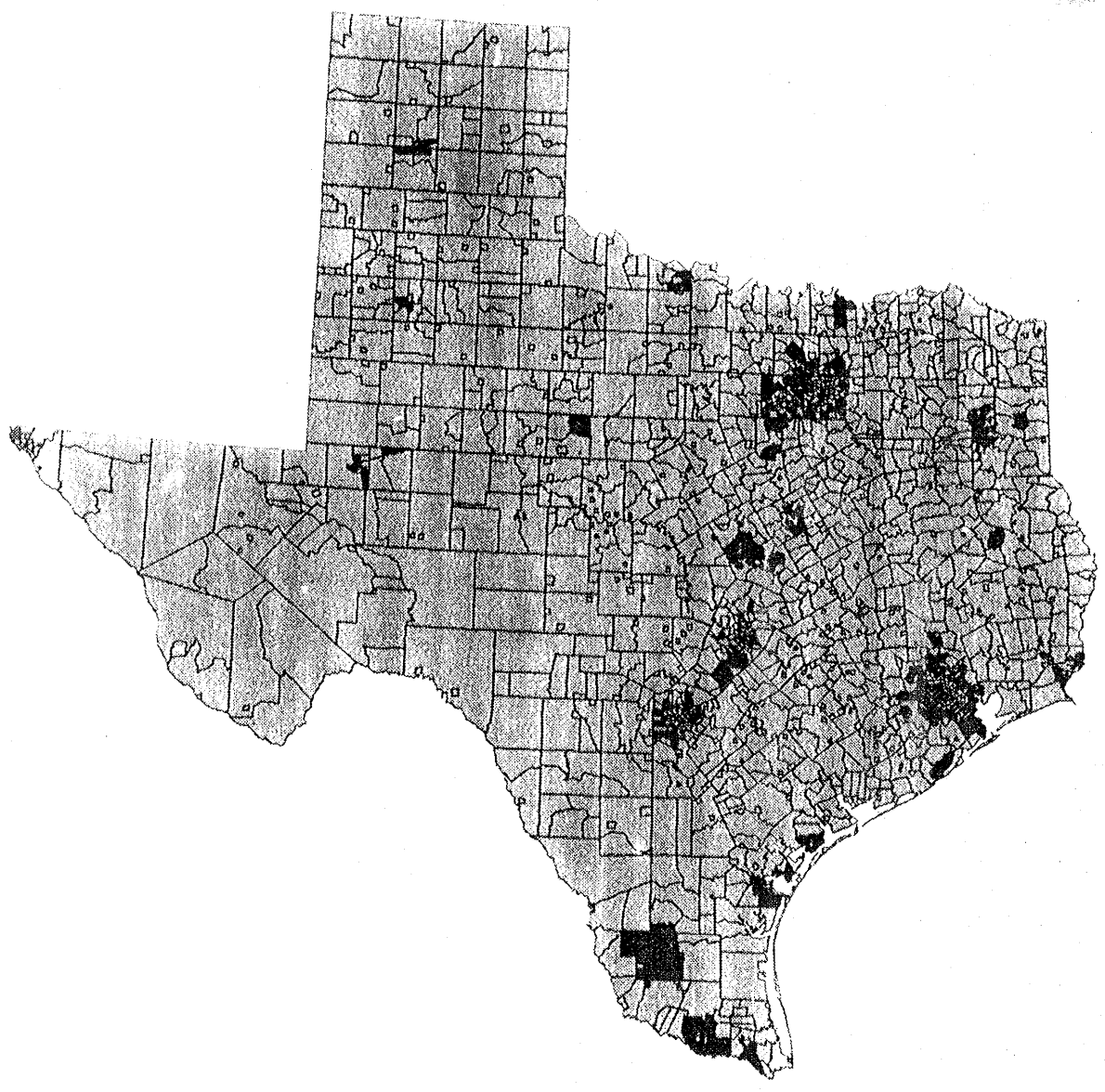
Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

July 19, 1991

1989 Population Density

By Zip Code ; unit of measurement=square miles



Below 250 or over 1,000

Between 250 and 1,000

Figure 6

Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

August 30, 1991

Figure 5, which sets the cutoff criterion at one 2.5-person household per 6.4 gross acres does correspond to many Texans' views of the extent to which their state is becoming "developed," although Figure 2 or 3 probably corresponds with their image of "urbanization."

"Density" is, however, a compound concept. Define, for example, the following variables:

P = Population

FS = Floor space

R = Rooms

HU = Housing Units

S = Structures

RA = Residential land area

TA = Total land area

A number of useful density ratios may be derived from pairs of those variables, among them:

$\frac{P}{FS}$ = **Population per unit of floor space**

$\frac{FS}{R}$ = **Floor space per room**

$\frac{R}{HU}$ = **Rooms per housing unit**

$\frac{HU}{S}$ = **Housing units per structure**

$\frac{S}{RA}$ = **Structures per unit of residential land area**

$\frac{RA}{TA}$ = **Residential land area per unit of total land area**

By combining these ratios, we can derive the following compound ratios of density:

$$\text{Gross population density} \quad \frac{P}{TA} = \frac{P}{FS} \cdot \frac{FS}{R} \cdot \frac{R}{HU} \cdot \frac{HU}{S} \cdot \frac{S}{RA} \cdot \frac{RA}{TA}$$

$$\text{Net population density} \quad \frac{P}{RA} = \frac{P}{FS} \cdot \frac{FS}{R} \cdot \frac{R}{HU} \cdot \frac{HU}{S} \cdot \frac{S}{RA}$$

$$\text{Structure density} \quad \frac{P}{S} = \frac{P}{FS} \cdot \frac{FS}{R} \cdot \frac{R}{HU} \cdot \frac{HU}{S}$$

$$\text{Housing unit density} \quad \frac{P}{HU} = \frac{P}{FS} \cdot \frac{FS}{R} \cdot \frac{R}{HU}$$

$$\text{Room density} \quad \frac{P}{R} = \frac{P}{FS} \cdot \frac{FS}{R}$$

$$\text{Floor space density} \quad \frac{P}{FS} = \frac{P}{FS}$$

Alternatively, we might write:

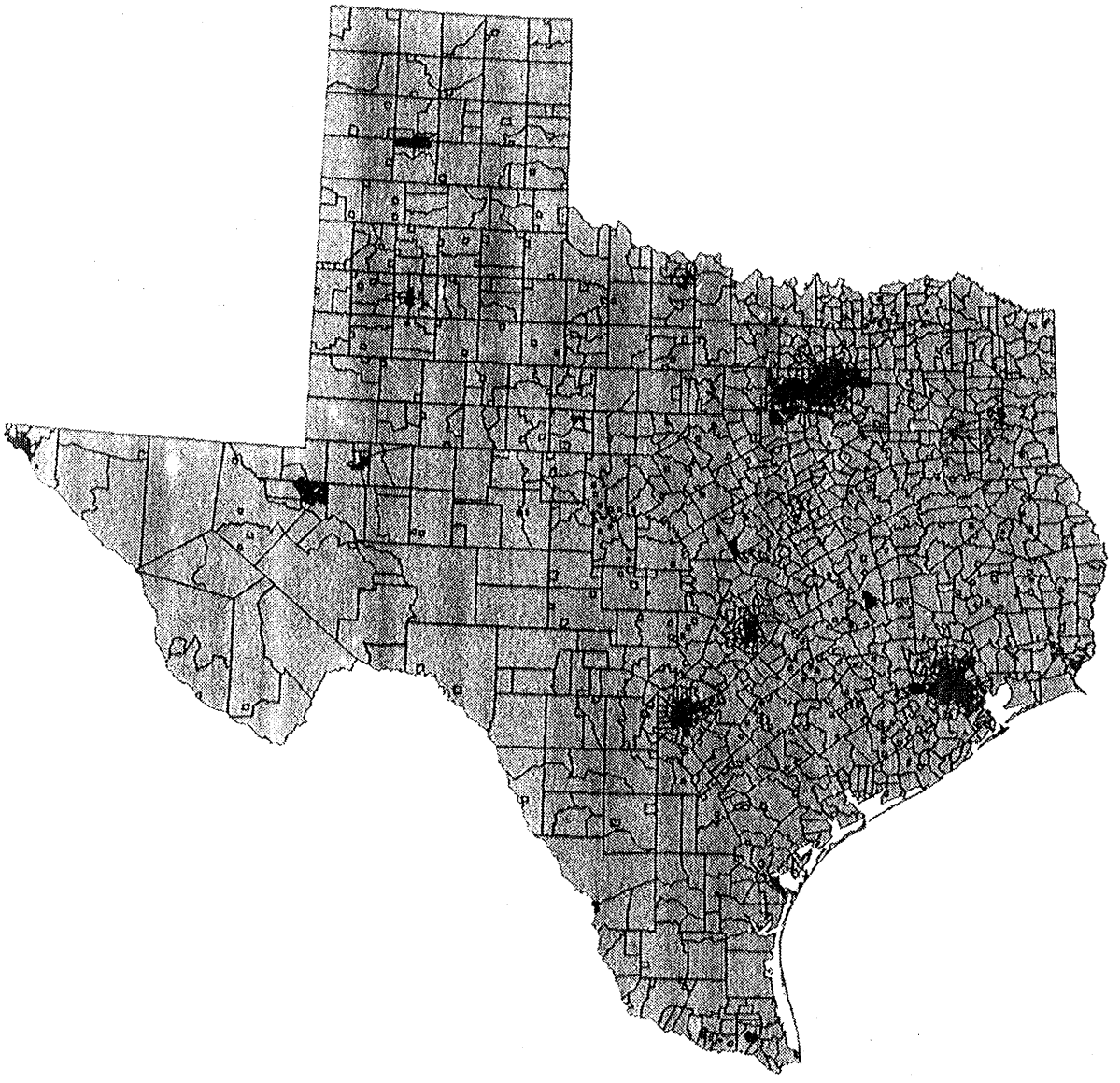
$$\frac{P}{TA} = \frac{P}{HU} \cdot \frac{HU}{TA}$$

This suggests that the gross population density used to define urbanized areas and depicted in Figures 2-6 is a compound of population per housing unit (a product of household sizes and types) and of housing units per total area (a land use concept). The former may change rapidly, up or down. The latter is far more stable, reflects observable changes on the ground, and is far more amenable to annual monitoring and updates either via reports from local and state governments, or by remote sensing.

To give some sense of the difference, Figures 7-11 repeat the sequence of population density maps for Texas, this time using housing units per gross acreage in each 5-digit ZIP Code area as the density criterion. To create

1980 Housing Unit Density

By Zip Code; # of housing unit /sqmi



Legend

- Less than 369
- Over 369

Figure 7

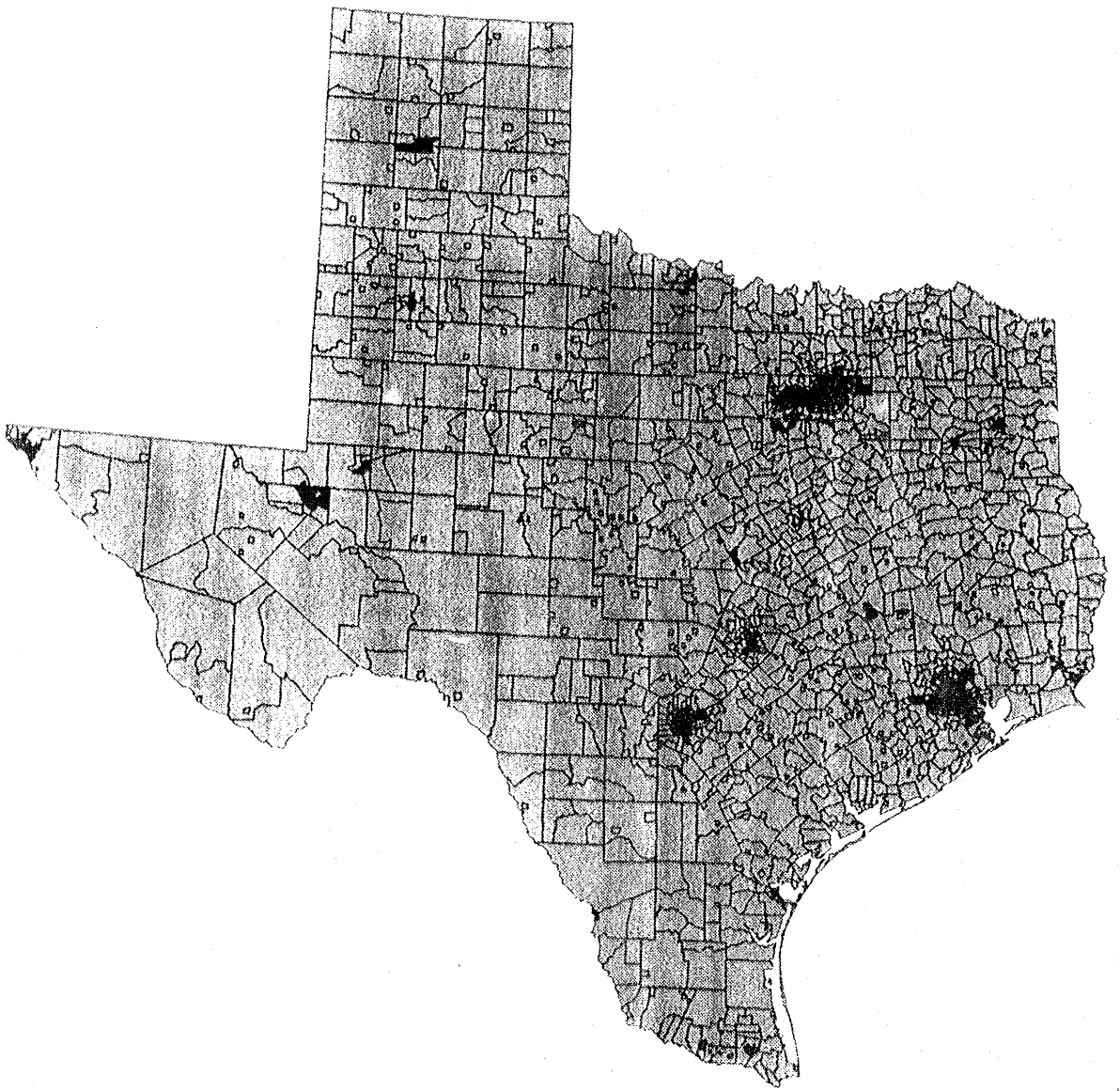
Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

August 30, 1991

1980 Housing Unit Density

By Zip Code; # of housing unit /sqmi



Legend

Less than 330

Over 330

Figure 8

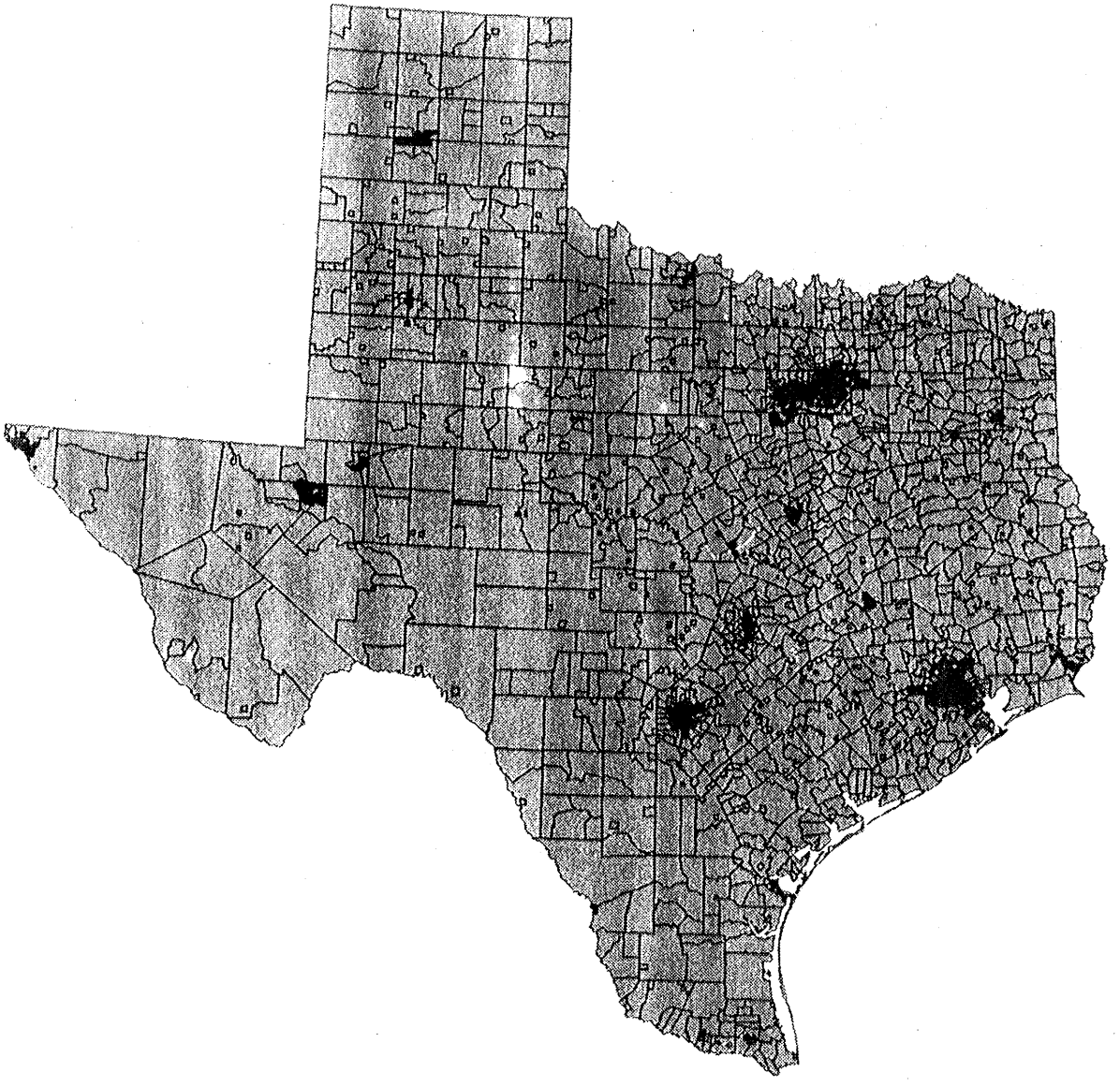
Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

August 30, 1991

1980 Housing Unit Density

By Zip Code; # of housing unit /sqmi



Legend

Less than 290

Over 290

Figure 9

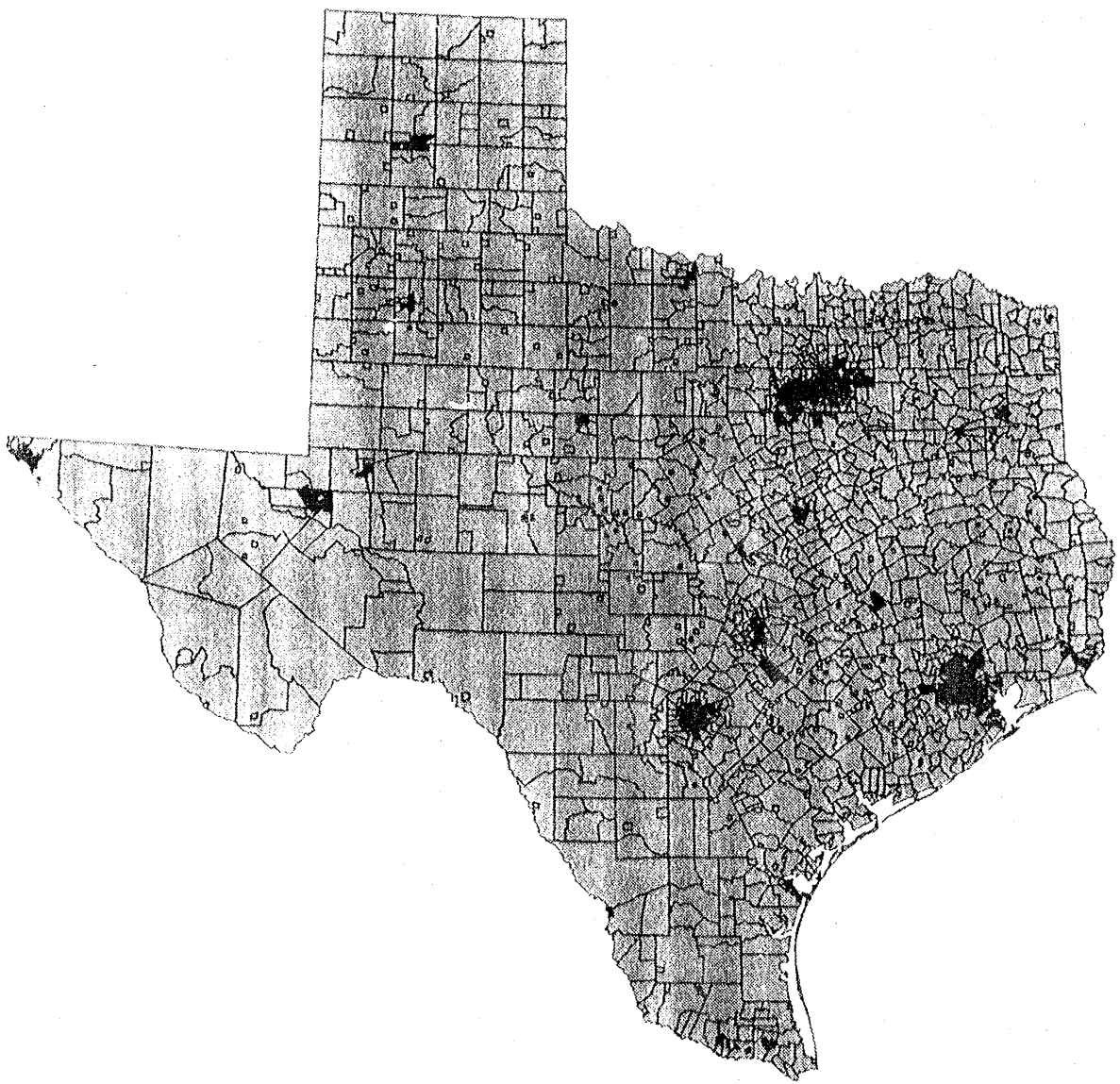
Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

August 30, 1991

1980 Housing Unit Density

By Zip Code; # of housing unit /sqmi



Legend

- Less than 251
- Over 251

Figure 10

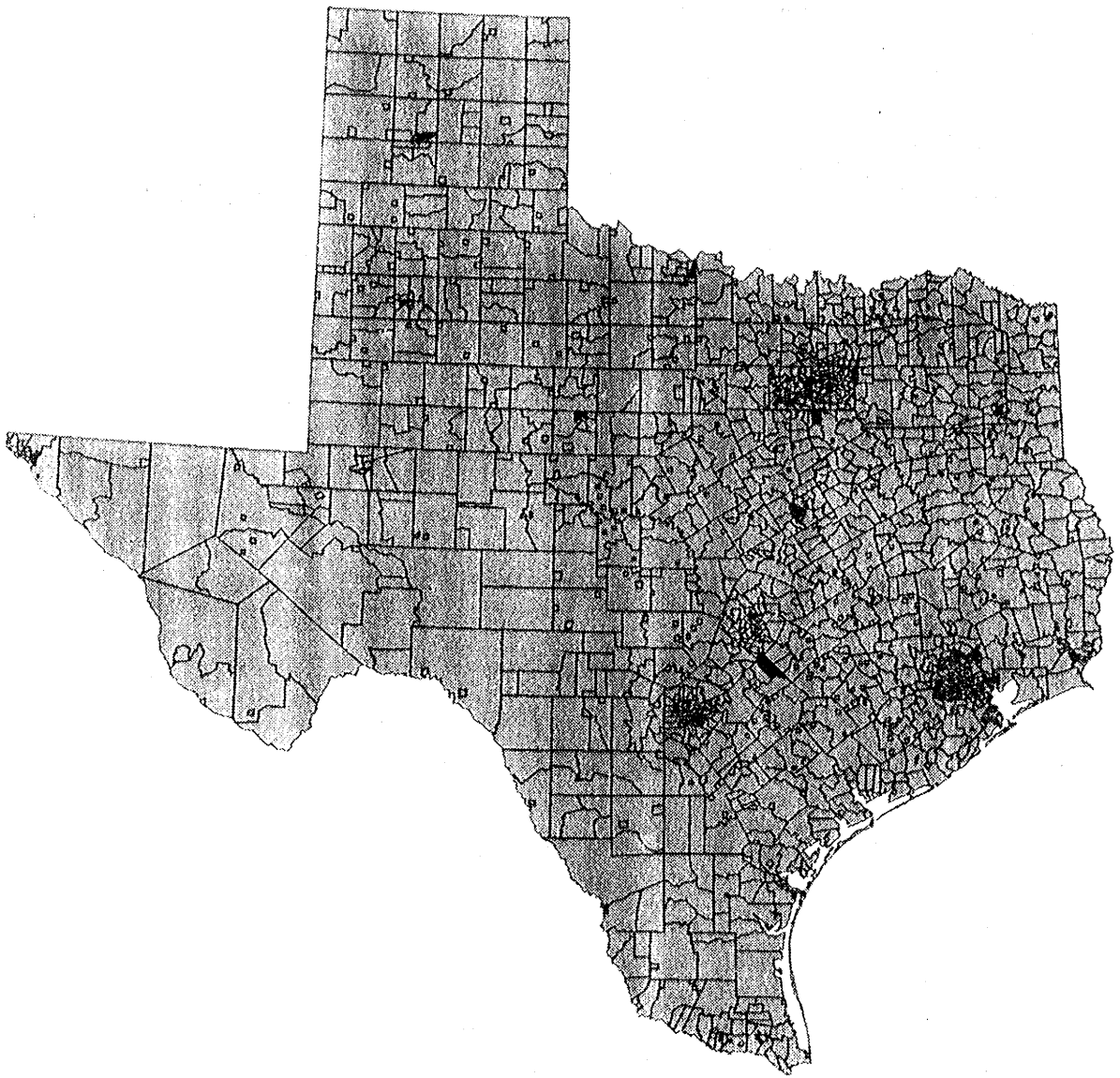
Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

August 30, 1991

1980 Housing Unit Density

By Zip Code; # of housing unit /sqmi



Below 251 or over 369

Between 251 and 369

Figure 11

Source: CACI Demographics

Bruton Center for Development Studies
University of Texas at Dallas

August 30, 1991

identical class intervals to those in Figures 2-6, housing unit density was regressed on population density, and the equation solved for the class intervals to produce the following:

Population Density P/TA	Housing Density HU/TA
1,000	369
750	330
500	290
250	251

The right hand column contains the class intervals used in the housing density maps.

The principal difference between the geographic patterns displayed in Figures 2-6 and those in 7-11 is that the housing unit density criterion--the land use rather than the demographic concept--provides a much stabler definition of the densely settled areas of Texas. What are deleted by use of the land use criterion are exurbs and colonias, the intervening variable being their larger household sizes:

$$\frac{P}{TA} = \frac{P}{HU} \cdot \frac{HU}{TA}$$

This suggests that whether a population or a housing unit density criterion is used to delineate densely settled areas depends upon whether a demographic or a morphological concept of density is preferred. Because of the greater stability over a range of class intervals revealed by Figure 11, its permanence on the ground, and the greater ability to monitor housing unit change on an annual basis between censuses to determine whether or not the boundaries of the densely settled area should change, **we recommend adoption of the land use criterion (housing units per total land area) for densely settled area delineation.**

The Nation's Communications Regions (Media Markets)

Both the more and the less densely settled portions of the United States are embedded within a system of communications media--newspapers, radio, and television--that provides news, information, and entertainment. Among these media, the most potent is television. Two private research organizations, A.C. Nielsen and Arbitron, conduct ongoing surveys of households' television usage: which stations they tune in to and when, and which programs they watch. Each year, based upon these surveys, these firms measure each television station's market penetration, providing the basis for each station to prepare its own "coverage map." The market penetration data are summarized by county to correspond to current Office of Management and Budget practice (although we were assured by company executives that it would be a lot easier to use the 5-digit ZIP Codes because of the ways in which their mail-back surveys are taken), and the counties are allocated to designated market areas (DMAs) in the case of Nielsen or areas of dominant influence (ADIs) by Arbitron on the basis of the market penetration data. Every county in the U.S. is allocated to one of the DMAs/ADIs.

Nielsen (Arbitron's procedure is similar) begins its allocation process with a list of MSAs and PMSAs. The MSAs/PMSAs are put into the same DMA if they are served by the same television stations, one of which may be located in one MSA/PMSA, another in a second, and others in intervening or adjacent locations, yet all broadcasting to the whole. Outlying counties are assigned to the MSA/PMSA group served by the television stations to which they give their largest audience share.

Figures 12 and 13 reproduce the Nielsen and Arbitron DMA/ADI maps, and Table 1 tabulates the concordance of the DMAs/ADIs and the MSAs/PMSAs. The DMAs and ADIs differ only marginally, but in numerous instances the media markets embrace several adjacent MSAs/PMSAs. For example, in Texas, a single Waco/Temple/Bryan DMA/ADI links the Waco, Killeen/Temple, and Bryan/College Station MSAs, plus adjacent nonmetropolitan area, into a single media market. Likewise

Figure 12

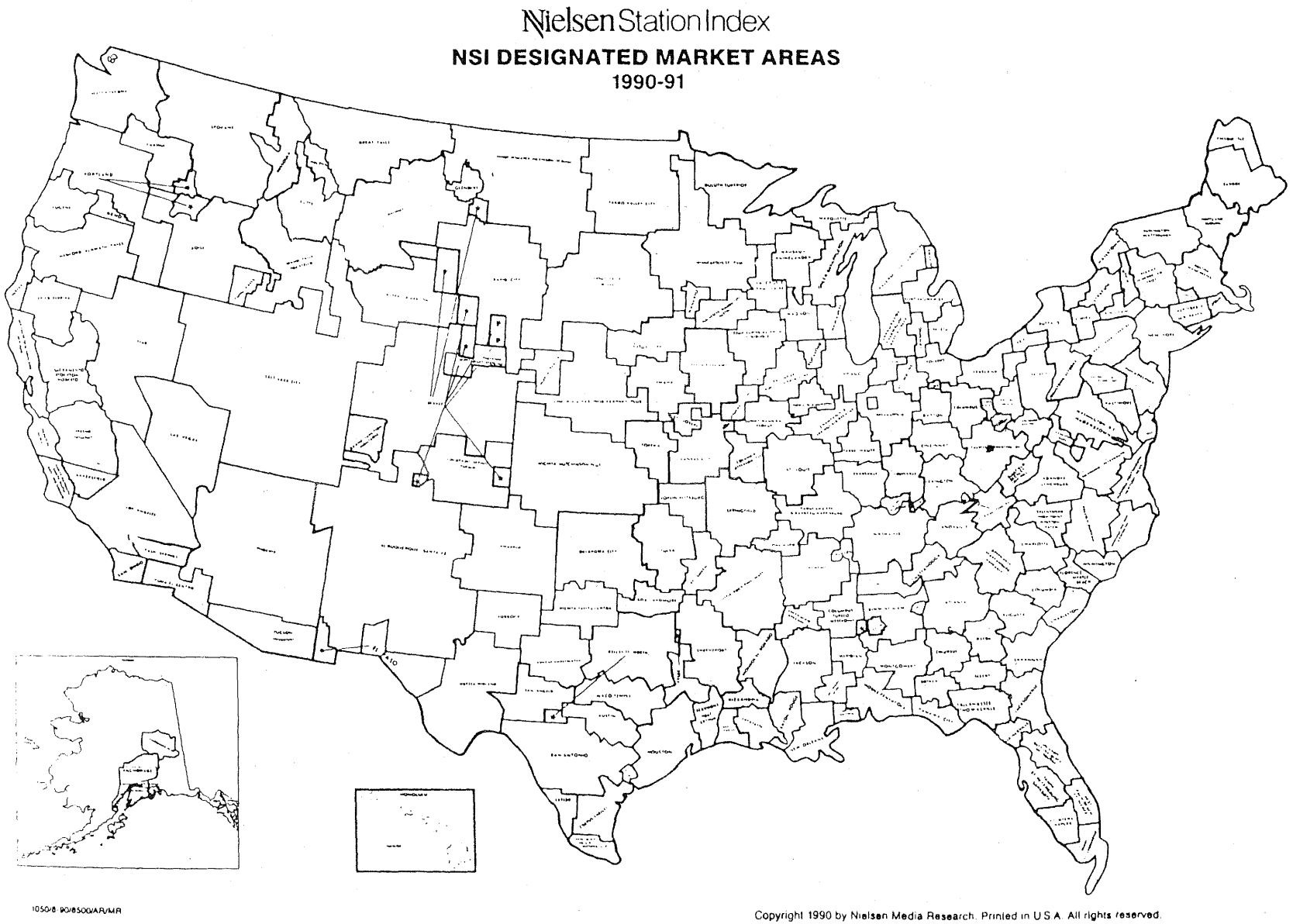

Nielsen Station Index
NSI DESIGNATED MARKET AREAS
1990-91
1050/8 90/8500/AR/MR
Copyright 1990 by Nielsen Media Research. Printed in U.S.A. All rights reserved.

Figure 13

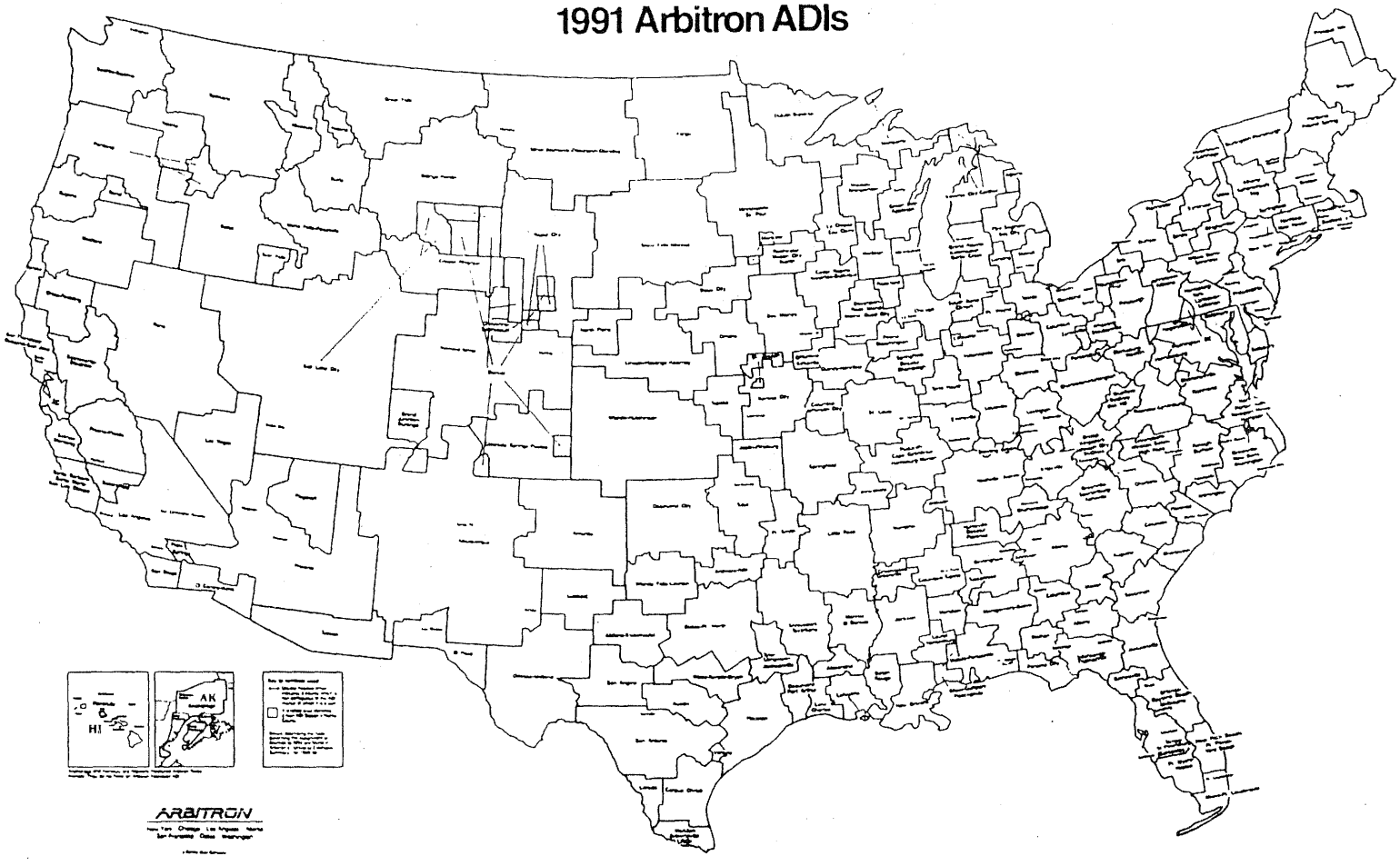


Table 1

Concordance: DMAs, ADIs, MSAs, and PMSAs.

NIELSEN'S DESIGNATED MARKET AREA	ARBITRON'S AREA OF DOMINANT INFLUENCE	U.S.OFFICE OF MGMT & BUDGET's MSAs & PMSAs
	ALABAMA	
Huntsville/Decatur/ Florence	Same	Huntsville Decatur Florence
Birmingham	Same	Same Gadsden
Anniston	Same	Same
Tuscaloosa	Same	Same
Dothan	Same	Same
Mobile/Pensacola	Same	Mobile
Montgomery	Montgomery/Selma	Montgomery
	ARIZONA	
Phoenix	Same Flagstaff	Same
Tucson (Nogales)	Tucson	Tucson
Yuma/El Centro	El Centro/Yuma	Yuma
	ARKANSAS	
Shreveport	Shreveport/Texarkana	Texarkana-Texarkana
Ft. Smith	Same	Same Fayetteville/Springdale
Little Rock/ Pine Bluff	Little Rock	Little Rock/N.L.R. Pine Bluff
Jonesboro	Same	-
	CALIFORNIA	
Eureka	Same	-
Chico/Redding	Same	Chico Redding
Sacramento/ Stockton/Modesto	Sacramento/ Stockton	Sacramento Stockton Modesto Yuba City
San Francisco/ Oakland/San Jose	Same	San Francisco Oakland San Jose Santa Rosa/Petaluma Vallejo/Fairfield/Napa
Monterey/Salinas	Salinas/Monterey	Salinas/Seaside/ Monterey Santa Cruz
Fresno (Visalia)	Fresno/Visalia	Fresno Visalia/Tulare/ Porterville Merced
Bakersfield	Same	Same
Santa Barbara/Santa Maria/San Luis Obispo	Same	Sta. Barbara/Sta. Maria/ Lompoc
Los Angeles	Same	Los Angeles/Long Beach Oxnard/Ventura Riverside/San Bernardino Anaheim/Santa Ana
Palm Springs	Same	-
Yuma/El Centro	El Centro/Yuma	-
San Diego	Same	Same

	COLORADO	
Denver	Same	Denver Boulder/Longmont Greeley Ft. Collins/Loveland
Colorado Springs/ Pueblo	Same	Colorado Springs Pueblo
Grand Junction/ Montrose	Grand Junction/ Durango	-
	CONNECTICUT	
Hartford/New Haven	Same	Hartford New Haven/Meriden New London/Norwich Bristol Waterbury Middletown New Britain
	DELAWARE	
Salisbury	Same	Wilmington
	FLORIDA	
Mobile/Pensacola	Same	Pensacola Ft. Walton Beach
Panama City	Same	Same
Tallahassee/ Thomasville	Same	Tallahassee
Gainesville	Same	Same
Jacksonville	Same	Same
Orlando/Daytona Beach/Melbourne	Same	Orlando Daytona Beach Melbourne/Titusville Palm Bay Ocala
Tampa/St. Petersburg	Tampa/St. Petersburg	Tampa/St. Petersburg/ Clearwater
Sarasota	Sarasota	Bradenton Sarasota Lakeland/Winter Haven
West Palm Beach/ Ft. Pierce	W. Palm/Ft. Pierce/ Vero Beach	West Palm Beach/Boca Raton Delray Beach Ft. Pierce
Ft. Myers/Naples	Same	Ft. Myers/Cape Coral Naples
Miami/Ft. Lauderdale	Same	Miami/Hialeah Ft.Lauderdale/Hollywood/ Pompano Beach
	GEORGIA	
Atlanta	Same	Atlanta Athens
Augusta	Same	Same
Columbus	Same	Same
Macon	Same	Macon/Warner Robins
Savannah	Same	Same
Albany	Same	Same
	IDAHO	
Boise	Same	Boise City
Idaho Falls/Pocatello	Same	-
Twin Falls	Same	-

ILLINOIS

Chicago	Same	Chicago Lake County Aurora/Elgin Joliet Kankakee
Rockford	Same	Same
Peoria/Bloorington	Same	Peoria Bloomington/Normal
Champaign/Springfield/ Decatur	Springfield/Decatur/ Champaign	Springfield Decatur Champaign/Urbana/ Rantoul

INDIANA

Chicago, IL	Same	Gary/Hammond
South Bend/Elkhart	Same	South Bend/Mishawaka Elkhart/Goshen Benton Harbor, MI
Lafayette	Same	Lafayette/West Lafayette
Ft. Wayne	Same	Same
Indianapolis	Same	Same Kokomo Anderson Muncie Bloomington
Terre Haute	Same	Same
Evansville	Same	Same

IOWA

Cedar Rapids/Waterloo Dubuque	Same	Cedar Rapids Waterloo/Cedar Falls Dubuque Iowa City
Des Moines/Ames	Des Moines	Des Moines
Davenport/Rock Island/ Moline	Davenport/Rock Island/ Moline: Quad City	Davenport/Rock Island/ Moline
Ottumwa/Kirksville	Same	-

KANSAS

Topeka	Same	Same
Kansas City	Same	Same Lawrence
Wichita/Hutchinson	Wichita/Hutchinson	Wichita

KENTUCKY

Evansville, IN	Same	Owensboro
Louisville	Same	Same
Charleston/Huntington	Same	Huntington/Ashland
Lexington	Same	Lexington/Fayette
Bowling Green	Same	-

LOUISIANA

Shreveport	Shreveport/Texarkana	Shreveport
Monroe/El Dorado	Same	Monroe
Alexandria	Same	Same
Lake Charles	Same	Same
Lafayette	Same	Same
Baton Rouge	Same	Same
New Orleans	Same	New Orleans Houma-Thibodaux

	MAINE	
Bangor	Same	Same
Portland/Auburn	Portland/Poland Spring	Lewiston/Auburn Portland Portsmouth/Dover Rochester
Presque Isle	Same	-
	MARYLAND	
Baltimore	Same	Same
Salisbury	Same	-
	MASSACHUSETTS	
Providence/New Bedford	Same	New Bedford
Boston/Manchester	Boston	Boston Worcester Salem/Gloucester Fitchburg/Leominster Brockton Lawrence/Haverhill Lowell Nashua
Springfield	Same	Same
	MICHIGAN	
Marquette	Same	-
Alpena	Same	-
Traverse City/Cadillac	Same	-
Grand Rapids/Kalamazoo/ Battle Creek	Same	Grand Rapids Kalamazoo Battle Creek Muskegon
Flint/Saginaw/Bay City	Same	Flint Saginaw/Bay City/ Midland
Lansing	Same	Lansing/East Lansing Jackson
Detroit	Same	Same Ann Arbor
	MINNESOTA	
Mankato	Same	-
Duluth/Superior	Same	Duluth
Minneapolis/St. Paul	Same	Same St. Cloud
Rochester/Mason City/ Austin	Same	Rochester
	MISSISSIPPI	
Greenwood/Greenville	Same	-
Jackson	Same	Same
Meridian	Same	-
Hattiesburg/Laurel	Laurel/Hattiesburg	-
Biloxi/Gulfport	Biloxi/Gulfport/ Pascagoula	Biloxi/Gulfport Pascagoula
Columbus/Tupelo/ West Point	Columbus/Tupelo	-

	MISSOURI	
St. Joseph	Same	Same
Kansas City	Same	Same
Quincy/Hannibal/Keokuk	Quincy/Hannibal	-
Joplin/Pittsburg	Same	Joplin
Springfield	Same	Same
Columbia/Jefferson City	Same	Columbia
St. Louis	Same	Same
Ottumwa/Kirksville	Same	-
	MONTANA	
Great Falls	Same	Same
Helena	Same	-
Missoula	Same	-
Butte	Same	-
Billings	Billings/Hardin	Billings
	NEBRASKA	
Sioux City	Same	Same
Omaha	Same	Same
North Platte	Same	-
Lincoln/Hastings/Kearney	Same	Lincoln
	NEVADA	
Reno	Same	Same
Las Vegas	Same	Same
	NEW HAMPSHIRE	
Boston/Manchester	Boston	Manchester Lawrence/Haverhill Nashua
	NEW MEXICO	
Albuquerque/Santa Fe	Albuquerque	Albuquerque Santa Fe
	NEW YORK	
Watertown	Watertown/Carthage	-
Utica	Same	Utica/Rome
Syracuse	Same	Same
Buffalo	Same	Buffalo Niagara Falls Jamestown/Dunkirk
Rochester	Same	Same
Elmira	Same	Same
Albany/Schenectady/ Troy	Same	Albany/Schenectady/Troy Glens Falls Pittsfield, MA
Binghamton	Same	Same
New York	Same	New York Orange County Nassau/Suffolk Poughkeepsie Bergen/Passaic, NJ Jersey City, NJ Newark, NJ Middlesex/Somerset/ Hunterdon, NJ Monmouth/Ocean NJ Trenton, NJ Bridgeport/Milford, CT Danbury, CT Stamford, CT Norwalk, CT

NORTH CAROLINA

Raleigh/Durham	Same	Same
		Fayetteville
Greensboro/High Point/ Winston-Salem	Greensboro/Win-Sal/ High Point	Greensboro/Win-Sal/ High Point
		Burlington
Greenville/New Bern/ Washington	Same	Jacksonville
Wilmington	Same	Same
Charlotte	Same	Charlotte/Gastonia/ Rock Hill
		Hickory/Morganton
Greenville/Spartanburg/ Asheville	Same	Asheville

NORTH DAKOTA

Fargo/Valley City	Fargo	Fargo/Moorhead
		Grand Forks
Glendive	-	-
Minot/Bismarck/ Dickinson	Minot/Bismarck/ Dickinson/Glendive	Bismarck

OHIO

Youngstown	Same	Youngstown/Warren
		Sharon, PA
Cleveland	Same	Cleveland
		Lorain/Elyria
		Mansfield
		Akron
		Canton
Toledo	Same	Same
Lima	Same	Same
Wheeling/Steubenville	Same	Wheeling
		Steubenville/Weirton
Columbus	Same	Same
Dayton	Same	Dayton/Springfield
Cincinnati	Same	Cincinnati
		Hamilton/Middletown
Zanesville	Same	-

OKLAHOMA

Oklahoma City	Same	Oklahoma City
		Enid
Tulsa	Same	Same
Ada/Ardmore	Ardmore/Ada	-
Wichita Falls/Lawton	Same	Lawton

OREGON

Portland	Same	Same
		Salem
Bend	Same	-
Medford/Klamath Falls	Medford	Medford
Eugene	Same	Eugene/Springfield

	PENNSYLVANIA	
Wilkes-Barre/Scranton	Same	Scranton/Wilkes-Barre Williamsport
Johnstown/Altoona	Same	Johnstown Altoona State College
Erie	Same	Same
Pittsburgh	Same	Pittsburgh Beaver County
Harrisburg/Lancaster/ Lebanon/York	Harrisburg/York/ Lancaster/Lebanon	Harrisburg/Lebanon/ Carlisle Lancaster York
Philadelphia	Same	Philadelphia Allentown/Bethlehem/ Easton Reading Atlantic City, NJ Vineland/Milville/ Bridgeton, NJ Trenton, NJ Wilmington, DE-MD-NJ
Youngstown, OH	Same	Sharon
	RHODE ISLAND	
Providence/New Bedford	Same	Providence Fall River Pawtucket/Woonsocket/ Attleboro
	SOUTH CAROLINA	
Florence/Myrtle Beach	Same	Florence
Columbia	Same	Same
Charleston	Same	Same
Greenville/Spartanburg/ Asheville	Same	Greenville/Spartanburg/ Anderson
	SOUTH DAKOTA	
Rapid City	Same	Same
Sioux Falls (Mitchell)	Sioux Falls/Mitchell	Sioux Falls
	TENNESSEE	
Nashville	Same	Same Clarksville/ Hopkinsville
Knoxville	Same	Same
Chattanooga	Same	Same
Tri-Cities, VA & TN	Bristol/Kingsport/Johnson City/Tri-Cities	Johnson City/Kingsport/ Bristol
Jackson	Same	Same
Memphis	Same	Same
Paducah/Cape Girardeau/ Harrisburg	Paducah/Cape Girardeau/ Harrisburg/Marion	-

	TEXAS	
Amarillo	Same	Same
Lubbock	Same	Same
Odessa/Midland	Same	Odessa Midland
El Paso	Same	El Paso Las Cruces, NM
Wichita Falls/Lawton	Same	Wichita Falls
Dallas/Ft. Worth	Same	Dallas Ft. Worth/Arlington Sherman/Denison
Abilene/Sweetwater	Same	Abilene
San Angelo	Same	Same
Waco/Temple	Waco/Temple/Bryan	Waco Killeen/Temple Bryan/College Station
Austin	Same	Same
San Antonio	San Antonio/Victoria	San Antonio
Laredo	Same	Same
Tyler	Tyler/Longview/ Jacksonville	Tyler Longview/Marshall
Beaumont/Port Arthur	Same	Same
Houston	Same	Houston Galveston/Texas City Brazoria
Victoria	San Antonio/Victoria	Victoria
Corpus Christi	Same	Same
Harlingen/Weslaco/ Brownsville	Mc Allen/Brownsville/ LRGV	Mc Allen/Edinburg/ Mission Brownsville/ Harlingen
	UTAH	
Salt Lake City	Same	Salt Lake City/Ogden Provo/Orem
	VERMONT	
Burlington/Plattsburgh	Same	Burlington
	VIRGINIA	
Harrisonburg	Same	-
Washington D.C./ Hagerstown	Washington D.C. Hagerstown	Washington D.C. Hagerstown Cumberland
Charlottesville	Same	Same
Richmond/Petersburg	Richmond	Richmond/Petersburg
Roanoke/Lynchburg	Same	Roanoke Lynchburg Danville
Norfolk/Portsmouth/ Newport News	Norfolk/Portsmouth/Newport News/Hampton	Norfolk/VA Beach/ Newport News
Tri Cities, VA & TN	Bristol/Kingsport/Johnson City/Tri-Cities	Johnson City/Kingsport/ Bristol

WASHINGTON

Spokane	Same	Same
Seattle/Tacoma	Same	Seattle Tacoma Bellingham Bremerton Olympia
Yakima	Yakima/Pasco/ Richland/Kennewick	Yakima Richland/Kennewick/ Pasco
Portland, OR	Same	Vancouver

WEST VIRGINIA

Bluefield/Beckley/ Oak Hill	Same	-
Parkersburg	Same	Parkersburg/Marietta
Charleston/Huntington	Same	Charleston Huntington/Ashland
Clarksburg/Weston	Same	-

WISCONSIN

La Crosse/Eau Claire	Same	La Crosse Eau Claire
Wausau/Rhinelander	Same	Wausau
Green Bay/Appleton	Same	Green Bay Appleton/Oshkosh/ Neenah
Madison	Same	Madison Janesville/Beloit
Milwaukee	Same	Milwaukee Sheboygan Muskegan Racine Kenosha

WYOMING

Casper/Riverton	Same	Casper
Cheyenne/Scottsbluff/ Sterling	Cheyenne/Scottsbluff	Cheyenne

the Houston communications region incorporates the Galveston/Texas City and Brazoria PMSAs.

The reality is that, from a communications-interdependence/media market perspective, current metropolitan area standards lead to the definition of too many MSAs/PMSAs: no less than 73 media markets contain within them two or more MSAs/PMSAs that share the same information sources, including news broadcasts, special programming, and regional/local advertising. From a media information point of view it is the media markets that are the nation's essential communications regions today, exhausting the national territory, and not beset by arcane metropolitan/ nonmetropolitan distinctions. Far preferable to the current practice of identifying CMSAs with component PMSAs would be to **establish an Office of Management and Budget/Media Task Force to develop common criteria for communications region/media market definition that the Census Bureau would use for reporting statistics on a regional basis,** and which the media would evaluate annually on the basis of their ongoing audience surveys. To facilitate data processing and better definition of market area boundaries, as well as to standardize across definitions, the 5-digit ZIP Code should be used as the building block.

Primary Metropolitan Zones (Labor Markets)

Each communications region will contain one or more densely settled areas; it is not unreasonable to require that each communications region contain at least one densely settled area that satisfies a certain minimum size criterion--say 50,000 people. But, because many media markets are large, it may be useful to add another classificatory layer between the morphological concept (the densely settled area) and the information age reality (the media market) that reflects the daily movements that are central to home-based interaction networks. A commuting criterion remains the best indicator of such networks (Berry

et al. 1969). **For each densely settled area that meets the minimum size criterion, a primary metropolitan zone should be defined using two-way commuting criteria.** The zone should include all less densely settled 5-digit ZIP Code areas that either send more than a specified percentage of their resident workers to places of work within the densely settled area, or which have more than a specified percentage of their jobs filled by workers resident in that densely settled area. For those who want a new set of metropolitan areas, the primary metropolitan zones should provide such a collection. They will be as wide or as narrow as the specified commuting percentages that are selected dictate.

Nonmetropolitan Community Areas

Beyond the primary metropolitan zones, each communications region will contain an array of 5-digit ZIP Code areas, some of which may be densely settled but which are of insufficient size to qualify as the core of a primary metropolitan zone, and the majority of which will be less densely settled. These areas are, however, no longer "rural" in the traditional sense that their residents are dependent upon agricultural production or other extractive industries for their livelihood (Bealer et al. 1965, Uzzell 1979, Lang 1986, Morrison 1990). Following the earlier suggestions of Karl Fox, Tweeten and Brinkman, for example, pointed out as early as 1976 that many of the nation's nonmetropolitan regions contained towns with populations of less than 50,000 that served as viable centers of "micropolitan" development (Tweeten and Brinkman 1976). Lessinger (1987) argues that "penturbia"--"small cities and towns, new subdivisions, homesteads, industrial and commercial districts interspersed with farms, forests, rivers and lakes" lying beyond the commuting range of central cities--constitutes the upcoming focus of new-style American development (see also Berry 1970, 1973). There now are increasing calls among development specialists and in the U.S. Congress for outlying communities-of-interest to be systematically identified and to have statistical series reported for them on the same basis as metropolitan areas.

We concur: **there is need to identify nonmetropolitan community areas in those portions of the communications regions lying outside the primary metropolitan zones.**

A reasonable procedure would appear to include the following elements:

(a) Composed of a densely settled area or a municipality of at least a certain minimum population but less than the population threshold for the densely settled areas around which primary metropolitan zones are formed.

(b) Plus surrounding 5-digit ZIP Code areas in which local television station(s) or cable networks receive more than a specified market share or which meet the same commuting standards as the primary metropolitan zones.

(c) The combination of (a) and (b) to exceed a specified size threshold.

There will, of course, be sections of the country that lie outside the primary metropolitan zones and the nonmetropolitan community areas. A term will be needed to describe them, for example outlying nonmetropolitan districts, statistics for which, within each communications region will complement those for the primary metropolitan zones and the nonmetropolitan community areas.

Conclusions

This report addresses a series of questions raised by the Census Bureau. How have they been answered?

1. What is the conceptual basis for identifying entities of the settlement system?

This basis resides in information age distinctions between tightly overlapping household and consumption networks, more extensive networks of production, and yet

more extensive networks of communications. Functional criteria are recommended to delineate the last two networks (in reverse order, media market penetration and the journey to work). A morphological criterion, housing unit density, is recommended to capture the tighter household and consumption network configuration.

2. What building blocks should be used for identifying the entities of the systems?

The use of 5-digit ZIP Code areas is recommended. They are consistent across the system, provide a reliable basis for a statistical standard, are readily usable within a geographic information system for purposes of area classification, and provide the basis for regular intercensal updates of key demographic and socioeconomic indicators.

3. What is the nature of the criteria by which the building blocks would be aggregated?

For densely settled areas, it is the contiguity of 5-digit ZIP Code areas that meet a morphological/land use standard; i.e. that exceed a specified housing unit density. For primary metropolitan zones, it is a functional criterion of degree of interdependence via commuting flows. For communication regions/media markets it again is a functional criterion, media shares of the local television market.

4. What are the measures of integration?

See above. Two criteria are recommended: (a) journey-to-work for primary metropolitan zones; (b) media market share for communications regions.

5. What are the relationships among the delineated areas?

The relationship is a nested one. Each communications region/media market will contain one or more densely settled areas, at least one of which will satisfy a minimum population size criterion, plus outlying areas that together

are served by the same set of television stations. Each densely settled area that satisfies the population size threshold will have defined around it a primary metropolitan zone, using the journey-to-work criterion. Beyond the primary metropolitan zones there may be one or more nonmetropolitan community areas, plus a residual set of outlying nonmetropolitan districts. Statistics for each communications region can be separately identified for each qualifying densely settled area, the balance of its primary metropolitan zone, each nonmetropolitan community area, and for the outlying nonmetropolitan districts.

6. What kinds and quality of data will be needed to delineate those areas?

The definition of communications regions will require private sector participation, since it will be based upon industry survey data. The advantage is that the process is part of routine media market analysis, and that the continuing survey activity of the two principal media research companies provides an annual basis for verification/reassessment of the regions.

Densely settled areas can be defined decennially using census data, but also can be reevaluated regularly using the housing start/completion data that are compiled on a continuing basis by the Census Bureau for other purposes, and if need be by remote sensing, by calibrating the sensors to the specific housing unit density signature.

7. Would the proposed approach be purely statistical, or would it take into account local views?

The approach is designed to be statistical.

8. What is the appropriate frequency for updating statistical areas in light of the nature and pace of change in the settlement system and the advantages of data continuity in standards?

Data continuity can always be assured by consistent reporting for every 5-digit ZIP Code area, provided that

agreement can be reached with USPS about stabilizing boundaries in established areas. Anyone equipped with a basic geographic information system capability can combine/disaggregate/recombine those areas at will. In light of this, reassessment should be as frequent as each data element permits: annual in the case of communications regions and densely settled areas; hopefully less than decennial in the case of journey-to-work.

9. Which entities will require official recognition for purposes of data collection and tabulation?

For data collection: the 5-digit ZIP Code areas, with up-to-date digitized boundaries maintained as part of the Census Bureau's TIGER files.

For data tabulation: communications regions, densely settled areas, primary metropolitan zones, nonmetropolitan community areas, and outlying nonmetropolitan districts.

10. How would the proposed approach generate data to satisfy different uses and users?

First, the system of densely settled areas and primary metropolitan zones should satisfy the needs of those users who have looked to urbanized area and metropolitan area summaries in the past.

Second, the system of communications regions will integrate Office of Management and Budget practice with the very important media market research activities of the private sector.

Third, identification of nonmetropolitan community areas will satisfy the stated need for information about smaller-scale interdependent communities lying outside the fabric of metropolitan America.

Finally, and most importantly, basing everything on the 5-digit ZIP Code unifies the census base with everyday practice in much of private and a growing array of public America, permitting a broader scale and more effective integration of data streams on an ongoing basis. The availability of a common framework for data collection and analysis and the opportunity to integrate traditional

tabulations with the power of modern geographic information systems will help bring the Census Bureau into the contemporary information age.

11. Should statistical area definition be evaluated every five years?

The defined areas should be reevaluated as frequently as data systems permit, annually if possible. The definitional criteria should be reexamined at least once every five years, to determine whether or not they continue to be useful indicators of various elements of the nation's settlement system.

12. Should a set of "rural population concentration areas" be defined within nonmetropolitan America?

Yes: a framework for identifying nonmetropolitan community areas is given.

Next Steps

It will be easier to evaluate those suggestions if a project is funded to implement them on a national basis, using the results of the 1990 census. The nationwide system of 5-digit ZIP Code areas is already operational within the Bruton Center's geographic information system. Implementation would be straightforward and speedy, once the requisite 1990 data have been provided.

Acknowledgements

This report was prepared with the assistance of Kyoun-sup Chung, Andrew I. Ewoh, Woldaz T. Gebremicael, Sheila Kelly, Hak-Min Kim, and Heja Kim.

References

Arbitron. 1990. Description of Methodology: The Arbitron Company Television Market Reports. A corporate report.

Barras, Richard. 1987. "Technical Change and the Urban Development Cycle" Urban Studies 24: 5-30.

Bealer, Robert C., Willis, Fern K., and Kuvlevsky, William P. 1965. "The Meaning of 'Rurality' in American Society: Some Implications of Alternative Definitions" Rural Sociology 30: 255-266.

Berry, Brian J.L. with Goheen, Peter G., and Goldstein, Harold. 1969. Metropolitan Area Definition: A Re-Evaluation of Concept and Statistical Practice. Bureau of the Census Working Paper No. 28 (rev.). Washington, D.C.: U.S. Government Printing Office.

Berry, Brian J.L. 1970. "The Geography of the U.S. in the Year 2000" Transactions of the Institute of British Geographers 51: 21-53.

Berry, Brian J.L. 1973. The Human Consequences of Urbanisation. London and Basingstoke: Macmillan.

Castells, Manuel. 1989. The Informational City. Oxford: Basil Blackwell.

Donnelley Marketing Information Services. 1989. CLUSTER PLUS Fact Book. A corporate report.

Fishman, Robert. 1990. "America's New City" The Wilson Quarterly 14: 24-48.

Knox, Paul L. 1991. "The Restless Urban Landscape" Annals of the Association of American Geographers 81: 181-209.

Lang, Marvel. 1986. "Redefining Urban and Rural for the U.S. Census of Population: Assessing The Need and Alternatives" Urban Geography 7: 118-143.

Leinberger, Christopher B. 1990. "Urban Cores" Urban Land Pp. 4-9.

Meinig, Donald W. 1979. "Symbolic Landscapes." In D.W. Meinig et al. eds. The Interpretation of Ordinary Landscapes. New York: Oxford University Press. Pp. 164-192.

Morrison, Peter A. ed. 1990. A Taste of the Country: A Collection of Calvin Beale's Writings. University Park, PA: Pennsylvania State University Press.

Nielsen Media Research. 1990. Nielsen Station Index Reference Supplement 1990-91: Methodology, Techniques and Data Interpretation. A corporate report.

Schrage, Michael. 1991. "Computer Tools for Thinking in Tandem" Science 253: 505-507.

Tweeten, Luther and Brinkman, George L. 1976. Micropolitan Development: Theory and Practice of Greater Rural Economic Development. Ames, IA: Iowa State University Press.

Uzzell, Douglas. 1979. "Conceptual Fallacies in the Rural-Urban Dictionary" Urban Anthropology 8: 333-335.

Weiss, Michael J. 1988. The Clustering of America. New York: Harper & Row.

METROPOLITAN AREAS AS FUNCTIONAL COMMUNITIES

William H. Frey
Population Studies Center
The University of Michigan

Alden Speare, Jr.
Department of Sociology
Brown University

Summary

We propose defining the metropolitan area as a functional community area (FCA), as distinct from a physically-defined entity or a broader economic region. When the original standard metropolitan area (SMA) concept was formulated, there was a high degree of correspondence among labor market area, housing market area, and local activity space. This area also tended to take on a common physical form where a highly dense core served both integrative and distributive functions for a less dense, largely residential hinterland.

Changes in transportation, communication, and production technologies, in the organization of production, as well as nationwide industrial and demographic shifts, have led to a decoupling of these functional and physical spaces. Regional economic areas are now much broader than local labor market areas and local activity spaces. Over the years, the expansion of existing areas and creation of new areas in a low-density mode have led to a diversity of physical configurations for the daily activity space of community residents--including areas that have no discernible cores. Since the original SMAs were defined, the country's nonmetropolitan territory has become more strongly integrated into the national economy. Some portions of this nonmetropolitan space have become closely tied to specific metropolitan areas, while others stand relatively isolated from metropolitan influence.

We propose a new system that views the metropolitan area in a fashion consistent with Amos Hawley's concept of an "enlarged area of local life." The FCAs will be defined on the basis of high commuting density, as an indicator of the community's activity space. They will employ building blocks that consist of incorporated places, minor civil divisions, and census designated places, and may or may not

contain a single highly dense place or employment node. Where adjacent FCAs are closely linked, they will be combined to form a broader metropolitan economic region (MER). The criteria used to define these regions will include both commuting and non-commuting considerations. However, MERs will be defined on the basis of a "bottom-up" aggregation of FCAs. The building blocks for MERs will be larger units such as counties and New England towns.

Territory within FCAs and MERs will be classed according to place or minor civil division attributes. Urban centers, primarily residential areas, and primarily employment areas will be among the several categories used to classify territory within FCAs. These categories can be cross-classified with the traditional rural-urban concept. However, the proposed classification will be developed solely to distinguish analytically meaningful types of territory. It will not form the basis for defining the boundaries of the FCAs or MERs.

Because the FCAs are defined on the basis of commuting clusters, rather than linkages to a large or highly dense central place, FCAs will cover most of the nation's territory--both urban and rural. As with all metropolitan areas under the present system, some FCAs will comprise mixed urban and rural territory. Other FCAs will be totally urban or totally rural. Some portions of the country with weak commuting links to other areas will lie outside any FCA. Such areas will be grouped by proximity and given a different name to indicate that they are not included in an FCA. We have not adopted any a priori criteria with respect to minimum population densities, or population sizes, for FCAs.

Because our definitions of FCAs and MERs are heavily dependent on commuting data, we do not advocate updating the system between census enumerations unless reliable commuting data can be obtained elsewhere. We also recommend the development of a county-counterpart system of FCAs to facilitate analyses with data that are available only at the county level. Finally, we end our proposal with several research questions that we believe need to be answered to further refine the FCA concept and facilitate its implementation.

I. Background

This proposal offers a new approach toward representing the geography of the U.S. settlement system that is consistent with the changing nature of this system and the kinds of statistical comparisons users will want to make. Our recommendations are based on a review of the original SMA concept that has formed the basis for metropolitan-scale settlement statistics since 1950, and on our assessment of changes in the settlement pattern that render some aspects of the old concept obsolete. Yet, consistent with the original concept, our proposed system of FCAs purports to delineate "enlarged areas of local life" that represent socially and economically integrated communities that exist within our highly interdependent regional and national economic systems.

This proposal is divided into three separate parts. Section I reviews some of the underpinnings of the current metropolitan concept and reassesses their relevance in light of the changing U.S. settlement patterns of the past four decades. It concludes by discussing some of the limitations of the present metropolitan area concept. In Section II, we present the basic principles of the FCA system we propose as a successor to the system currently in use. Lastly, in Section III, we enumerate questions for further research that will help to refine the FCA concept and facilitate its implementation.

A. Original SMA Concept

The metropolitan area concept, set out during the 1940s, was an appropriate one to represent the national geographic settlement system as it had evolved to that point. Four aspects of this concept that are relevant to our reassessment of its use are as follows:

- The metropolitan area was seen to be an economic unit where a cluster of activities in a core location dominated export, import, and service functions which sustained the population of a surrounding hinterland, which was economically and socially integrated with the core area.[1]

- Historically, this functional definition coincided with physical properties that were common to most metropolitan areas at the time.[2]

- Socio-demographic, industrial, and land-use characteristics also patterned themselves in common ways as distance from the core increased.[3]

- Because of the correspondence between functional and physical space, the metropolitan area could be operationalized by identifying core areas with population size and density criteria and hinterland areas by measures of integration with the core.

Operationalization of original concept. The original SMAs, which were defined for use in tabulating the 1950 census, were based on the concept of a large population nucleus together with adjacent communities that had a high degree of integration with the nucleus. Integration was defined mainly by commuting trips. For all of the United States except New England, SMAs were defined in terms of counties or county equivalents. There are two advantages to defining metropolitan areas in terms of counties. First, the county is the smallest geographical unit for which many types of data are tabulated. Second, there have been very few changes in county boundaries over time, so that using counties to define SMAs made it relatively easy to study metropolitan change over time. An obvious disadvantage of counties, however, is their variability in size.

In 1959 the term was changed to standard metropolitan statistical areas (SMSAs), and in 1983 it was changed to metropolitan statistical areas (MSAs). Metropolitan areas (MAs) became the official collective term in 1990. While there have been some changes in the rules for defining these areas over time, the basic concept has remained the same. For all of the censuses between 1950 and 1990, metropolitan areas have been defined as including a densely settled urban core with a population of at least 50,000, the rest of the county (or counties) in which this core was located, and any contiguous counties which met both the criteria of

metropolitan character and the criteria of integration with the core.

When metropolitan areas were initially defined in 1949, these areas had to have a central city with at least 50,000 population. In 1958, the criteria were revised so that two contiguous cities with a combined population of 50,000 could qualify as the nucleus of a metropolitan area, providing that the smaller had at least 15,000. In 1971, the concept was further modified to allow a city of 25,000 to qualify an area if the total population of the city and surrounding places with density of 1,000 or more persons per square mile was at least 50,000. In 1980, the concept of urban core was again changed to require either a city of at least 50,000 or a Census Bureau-defined urbanized area. When the core consists of an urbanized area without a central city of at least 50,000, the entire metropolitan area must have 100,000 population (except in New England, where this minimum was set at 75,000).

From the start, adjacent counties have been added to metropolitan areas if they meet the criteria of metropolitan character and social and economic integration. For the 1950 census, a county met the criteria of metropolitan character if at least one-half of its population lived in minor civil divisions with a density of 150 or more persons per square mile and less than one-third of its workers were engaged in agriculture. It met the criteria of integration if at least 15 percent of its resident workers worked in the central city's county or 25 percent of the people working in the county commuted from the central county. In consideration of the declining proportion of the labor force in agriculture, the criteria of metropolitan character were modified in 1958 to require that at least 75 percent of the population of a contiguous county be employed in non-agricultural activity before the county could qualify for addition to a metropolitan area. In 1980 the requirement that contiguous areas have a minimum proportion employed in non-agriculture was dropped. By that time, only about seven percent of the nonmetropolitan labor force was engaged in agriculture, so that there were few counties in the United States that did not meet the non-agricultural requirement.

In 1980, the criteria of metropolitan character were combined with the criteria of integration to provide a sliding scale whereby a county could qualify for inclusion either because it had a high population density or a high level of commuting to the core.[4] For example, an adjacent county in which 50 percent of the workers commuted to the core was to be added with a density as low as 25 persons per square mile, while a county with only 15 percent commuters needed a density of 50 persons per square mile, and other evidence of metropolitan character. These criteria were applied to new metropolitan areas defined in 1981 and used in the tabulation of 1980 census data, but they were not applied to existing metropolitan areas until 1983.

From the beginning, slightly different criteria have been used to define metropolitan areas in New England. Because the cities and towns in New England have more political significance than the counties, have had relatively stable boundaries since 1950, and data are available for these units, they were used as the building blocks for SMAs and their successors. The result is that most New England MAs are smaller in land area than those in the rest of the United States, and some New England counties contain two or more metropolitan areas.

Consolidated metropolitan areas. In several parts of the country, the urbanized areas surrounding major cities have grown together so that it is hard to determine where one metropolitan area begins and another ends. The area between Boston and Washington has long been described as "an almost continuous stretch of urban and suburban areas" (Gottmann 1961, p. 3). In all parts of the country, improvements in highways have made it easier for people to commute longer distances, and metropolitan areas that were once quite separate have become more closely tied to one another.

In 1959, the standard consolidated area (SCA) was introduced to provide an alternative aggregate unit that included two or more adjacent, closely integrated. Originally, this merely recombined parts of the New York and Chicago areas of 1950, which recently had been split. In 1975, definite criteria of size and integration were established for consolidated areas, and the name was changed

to standard consolidated statistical areas (SCSAs). This permitted the recognition of the growing integration of previously separate metropolitan areas. For the 1980 census, there were 16 SCSAs consisting of 48 SMSAs. All of these SCSAs had at least one million people in 1980.

Under the 1980 metropolitan standards (first applied in 1983, metropolitan areas with over one million population and comprising two or more counties were divided into two or more primary metropolitan statistical areas (PMSAs) if specified statistical criteria were satisfied and if local opinion supported such a division. The original, subdivided metropolitan area was known as a consolidated metropolitan statistical area (CMSA). Application of the 1980 standards to 1980 census data and later population estimates and special census data had resulted in definitions of 264 MSAs plus 20 CMSAs (which contained a total of 71 PMSAs) in the U.S. as of 1990.

The establishment of SCAs, SCSAs, and the more recent CMSAs gives the analyst a choice of units to use. In ranking metropolitan areas by size, the CMSA seems more accurately to represent the total size of metropolitan areas such as New York than does the more restricted PMSA. However, the PMSAs are better units for studying processes of change such as suburbanization because they are more likely to contain only a single central city and its suburbs. Also, since local governments play an important role in determining the directions of change of an area, two nearby cities, which logically fit within a single consolidated area, may experience different patterns of growth or decline.

Criticisms. From the beginning, both the criteria for defining metropolitan areas and the application of these criteria to specific cases have been sharply criticized. On one side, those who feel that a metropolitan area should be a relatively autonomous economic area have pointed out that most officially defined metropolitan areas are underbounded in terms of including all of the population which depends upon the area for certain services such as public utilities, retail shopping, medicine, education, and other personal services.[5] Alternative areas such as Berry's "urban fields"

tend to be considerably larger on the average, although there is much variability (Berry 1973).

On the other side are those who associate metropolitan character with size, density, and the performance of certain "metropolitan" functions. These critics feel that the concept has been stretched to allow more and more marginal areas to qualify for federal programs targeted for metropolitan areas. Most notable among these critics is Calvin Beale, who has pointed out that the metropolitan areas newly designated in the 1970s lack many of the facilities that might be expected of a "metropolitan area," such as a television station, a Sunday newspaper, local bus service, a four year college, and specialized hospital services (Beale 1984).[6] Forty-six out of the 58 areas added during this period lacked central cities of 50,000, and nine did not even have a central city of 25,000 (ibid., p. 31).

While Beale's criticism applies to many of the newer areas that he cites, some of the new MAs represent a recent form of metropolitan settlement, one based more on suburbs than central cities. An example of this recent form of settlement is Bradenton, Florida which had a central city of only 30,170 (using 1980 census data), but a total population of 148,442, which was 89 percent urban.

The various attempts to accommodate consolidated metropolitan areas and the kinds of criticism just discussed suggest that the nation's settlement areas evolved in ways not anticipated by the original concept. That concept was consistent with the settlement pattern that existed at mid-century and was probably relevant for the two decades that followed World War II. Under this settlement system, the following generalizations held:

- Functional settlement areas could be approximated by areas with common physical attributes.

- Areas generally contained one central, highly dense, populated core area with a hinterland that spread out with declining density, along with a predictable patterning of population and land-use attributes.

- Because of limited and relatively undifferentiated hinterlands, there was little need to consider a nesting of metropolitan areas, or subareas, into a wider regional hierarchy. The metropolitan community represented, at once, a regional economic area, a local labor market area, and a community's overall activity space.

Each of these characterizations of the nation's settlement areas at mid-century are less generally applicable to today's settlement patterns.

B. Changes in Settlement Patterns, 1950-1990

Since the current metropolitan area concept was put into use with the 1950 census, there have been massive shifts in the patterns of settlement in the United States that have called into question the applicability of this concept for future decades. These changes include:

- Extensive suburbanization within metropolitan areas giving rise to multinucleated suburbs, suburbs with highly diversified economies, suburban commercial and employment nodes, residential suburbs, and mixed urban-rural territory.

- Metropolitan expansion and development in previously undeveloped parts of the country in a low-density mode, following a different model than that offered by the single core-hinterland development experiences around older cities.

- The increased spread and expansion of all economic activities that has led to different-sized radii for the broader regional economic unit and the smaller labor market or daily activity areas nested within the larger unit.

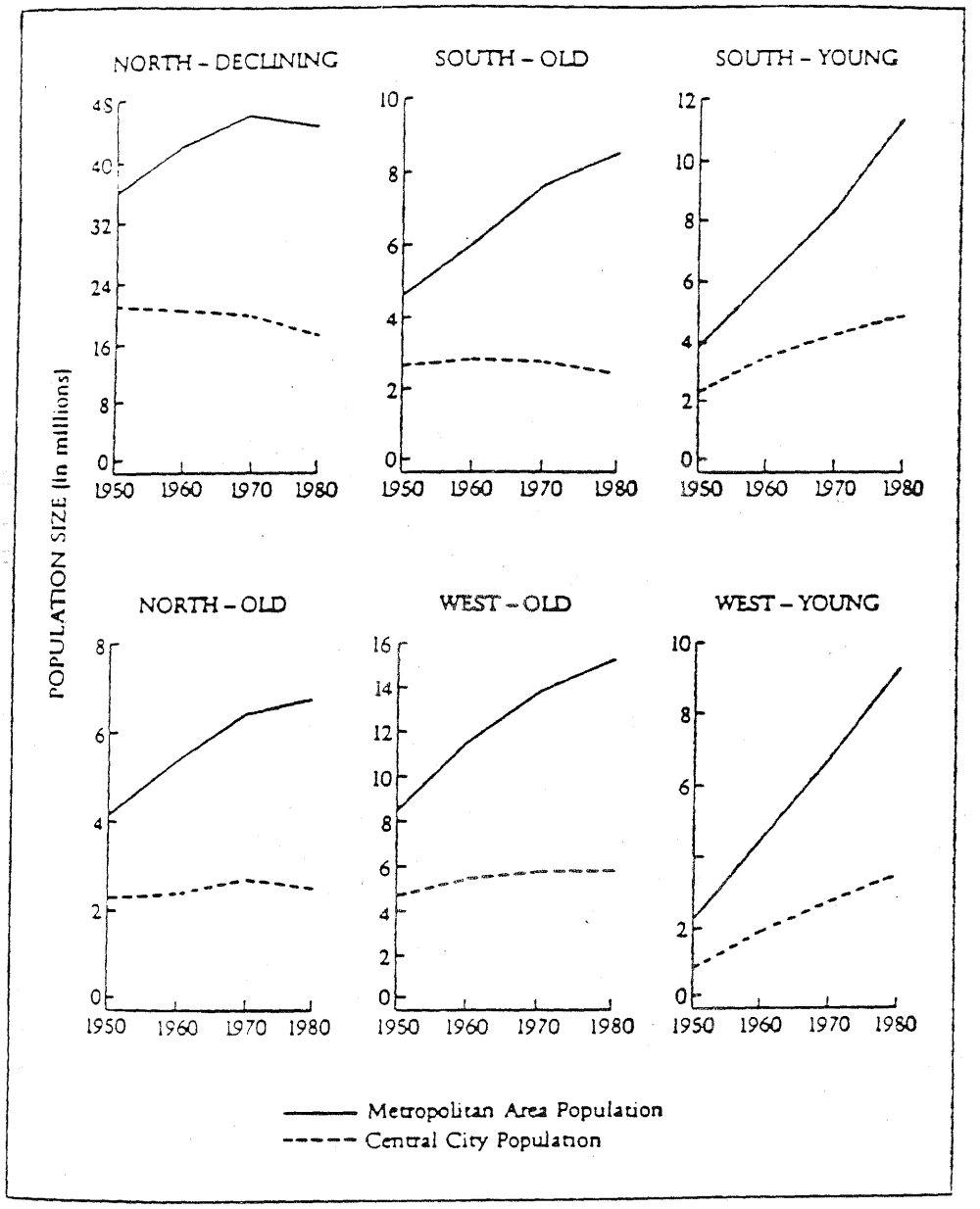
- The development of nonmetropolitan systems based less on farms and extractive activities and more on new production, service, and recreation activities.

These changes have occurred as a result of improved transportation and communication technologies, as well as massive federal subsidies, that led to the continued spread of residential, retail, and manufacturing activities away from core central cities (Long 1981, Zimmer 1975). In established areas, this decentralization began much earlier in the century (Hawley 1971) but became accentuated in the immediate postwar decades. This is apparent from the population trends, shown in Figure 1, for large metropolitan areas classed as: North-Declining, North-Old, South-Old, and West-Old.[7] In less urbanized portions of the South and West, newer metropolitan areas also experienced peripheral growth--though often in concert with their less dense, territorially extensive core areas. (See patterns for South-Young and West-Young metropolitan areas in Figure 1).

Spread of metropolitan population since 1970. Over the past two decades, in particular, the expansion of metropolitan population was the result of the continued spread of population into new territory around existing metropolitan areas --territory that subsequently was added to metropolitan areas--and the establishment of new metropolitan areas in less densely populated parts of the country (Long and DeAre 1988). During the 1970s, 45 percent of the nation's metropolitan population increase was attributed to the reclassification of residents into metropolitan territory (through added counties or the creation of new metropolitan areas). The comparable percentage for the 1950s was 16 percent (Frey and Speare 1988, p. 45). In that decade the vast majority of metropolitan population growth occurred within the boundaries of existing metropolitan areas. It was also in the last two decades that most larger, older central cities lost significant percentages of their resident populations (see Table 1), leading to a continued redistribution of the metropolitan population to low-density suburban communities and newer settlement areas that do not conform to earlier morphological stereotypes.

The new shifts render the original central city-hinterland model less useful for distinguishing socio-economic and demographic settlement patterns--except, perhaps, for residence patterns by race. The 1950s

Figure 1: Metropolitan Area and Central City Populations, 1950-1980 for Large Metropolitan Areas,* classed by Frey-Speare Groupings.**



*1980 metropolitan areas with populations greater than 1 million defined as 1980 SMSAs and NECMAs (in New England).

**These metropolitan area groupings are based on three categories of region (North, South, West), two categories of age (Old, Young), and two categories of metropolitan growth (Declining, Nondeclining). Thirteen Declining areas are also Old and located in the North, and are placed in the single North-Declining grouping. The remaining 26 areas are all Nondeclining and are sorted into the groupings: North-Old, South-Old, West-Old, South-Young, and West-Young.

Source: William H. Frey and Alden Speare, Jr. 1988. Regional and Metropolitan Growth and Decline in the U.S. A 1980 Census Monograph, New York: Russell Sage. Chapter 7.

Table 1: Percent Change in Primary Central City(s) and Surrounding Areas of the 25 Largest Metroppolitan Areas in North, South and West Regions, 1960-1990

Region and Metropolitan Area[b]	Age of Area[c]	1990 Size (1000s)		Primary Central City Percent 10-yr Change			Surrounding Area Percent 10-yr Change		
		Metro-politan Area	Primary Central City(s)	1960 -70	1970 -80	1980 -90	1960 -70	1970 -80	1980 -90
NORTH									
New York CMSA	1800	18087	7323	1.5	-10.4	3.5	21.1	1.7	2.8
Chicago CMSA	1860	8066	2784	-5.1	-10.8	-7.4	30.3	11.8	7.1
Philadelphia CMSA	1810	5899	1586	-2.6	-13.4	-6.1	21.5	5.1	8.0
Detroit CMSA	1870	4665	1028	-9.3	-20.5	-14.6	28.2	8.4	2.5
Boston CMSA	1830	4172	574	-8.0	-12.2	2.0	17.8	3.4	5.5
Cleveland CMSA	1870	2760	506	-14.3	-23.6	-11.9	21.1	0.5	-0.3
Minneapolis-St. Paul MSA	1890	2464	641	-6.5	-13.8	-0.1	51.8	20.8	21.9
St. Louis MSA	1850	2444	397	-17.1	-27.2	-12.4	28.1	6.5	6.4
Pittsburgh CMSA	1870	2243	370	-13.9	-18.5	-12.8	3.3	-1.8	-6.3
Cincinnati CMSA	1850	1744	364	-9.7	-15.1	-5.5	20.2	10.0	8.3
Milwaukee CMSA	1870	1607	628	-3.2	-11.3	-1.3	26.2	8.9	4.8
Kansas City MSA	1880	1566	435	6.5	-11.6	-2.9	19.3	13.8	14.8
SOUTH									
Washington MSA	1860	3924	607	-0.9	-15.7	-4.9	57.5	14.4	27.0
Dallas-Fort Worth CMSA	1910	3885	1454	19.5	4.2	12.8	63.9	47.3	48.2
Houston CMSA	1910	3711	1631	31.6	29.3	2.2	47.8	61.1	38.1
Miami CMSA	1930	3193	359	14.7	3.5	3.4	58.9	47.9	23.4
Atlanta MSA	1890	2834	394	1.6	-14.1	-7.3	56.3	44.1	42.4
Baltimore MSA·	1820	2382	736	-3.5	-13.2	-6.4	34.3	19.4	16.5
Tampa-St. Petersburg MSA	1920	2086	519	8.3	3.3	1.7	67.8	80.4	40.4
WEST									
Los Angeles CMSA	1890	14532	3485	13.6	5.4	17.4	35.9	19.0	29.5
San Francisco-Oakland CMSA	1860	6253	1096	-2.8	-5.4	7.6	40.6	18.3	18.6
Seattle CMSA	1900	2559	516	-4.7	-7.0	4.5	49.8	22.4	27.7
San Diego MSA	1920	2498	1111	21.6	25.6	26.8	43.7	49.2	40.7
Phoenix MSA	1940	2122	983	33.0	35.2	24.5	72.5	85.8	58.3
Denver CMSA	1890	1848	468	4.2	-4.3	-5.1	64.3	55.6	22.6

[a] Metropolitan Areas are CMSAs and MSAs, defined by OMB as of June 30, 1990, with 1990 populations exceeding 1.5 million. Primary Central City(s) consist of the one or two historically dominant cities of the area, and the Surrounding Area consists of the remainder of the Metropolitan Area.

[b] Abbreviated CMSA or MSA name (according to primary central city(s)).

[c] Census year when metropolitan areas's primary central city first achieved a population of 50,000.

Source: Compiled at University of Michigan Population Studies Center from the 1960, 1970, 1980, and 1990 U.S. Censuses.

distinction between a suburban population oriented toward "familism" and a more heterogeneous central city population has broken down, as suburban populations have taken on much more of an "urban" character. Migration and redistribution patterns, particularly in the last two decades, have led to heterogeneous suburban populations when classed by social status, household type, and age structure--if one considers the non-central city portion of the metropolitan area to constitute the suburbs (Frey and Speare 1988).

Of course, within this broad category, one finds the usual clustering of population characteristics across smaller communities (Muller 1981). Yet even these configurations do not conform to the kinds of distance-based or sectoral models that urban sociologists and geographers showed, in earlier times, to be consistent with core-hinterland development (Johnston 1971). Detailed examinations of tract cluster variations on a range of 1980 population and housing characteristics, in selected metropolitan areas, indicate that neither the central city-ring nor the urbanized area-ring dichotomies are ideal categories for distinguishing intra-metropolitan attribute differences (Treadway 1990, 1991).

Indeed, the social geography in many settlement areas has now evolved to a situation where it is the central city population rather than its suburbs that is unique in its socio-demographic makeup. This characterization is most applicable to large, older industrial central cities that have served, historically, as destinations for immigrants from abroad or the black rural-to-urban migrants. These central cities, whose physical configurations most closely approximate the classic model, have been sustaining race- and class-based population declines for decades. (The 1980-90 white-minority changes for these areas are shown in Table 2.) As a consequence, these cities' social and demographic compositions are decidedly unrepresentative of the broader metropolitan area. This argues for a classification scheme that recognizes analytically meaningful categories within the broad expanse of territory classed simply as "balance of MA" under the present statistical system. The new classification should be just as applicable to smaller and recently developed settlement

Table 2: 1990 Percent Minorities, and 1980-90 Percent Change for Non-Hispanic Whites and Minorities in Primary Central City(s) and Surrounding Suburbs of the 25 Largeest Metropolitan Areas in North, South and West Regions

Region and Metropolitan Area[b]	1990 Percent Minorities			% Change N-H Whites			% Change Minorities			City-Suburb Dissimilarity Index[c]		
	Central City	Suburbs	Diff.	Central City	Suburbs	Diff.	Central City	Suburbs	Diff.	1990	1980	Diff.
NORTH												
New York CMSA	56.8	23.4	-33.4	-13.8	-4.1	+9.7	+22.2	+34.7	+12.5	31	30	+3
Chicago CMSA	62.1	18.2	-43.9	-18.7	+1.2	+19.9	+1.3	+44.8	+43.5	44	43	+1
Philadelphia CMSA	47.9	15.8	-32.1	-14.3	+4.7	+19.0	+4.8	+30.2	+25.4	32	30	+2
Detroit CMSA	79.4	9.2	-70.2	-47.2	+0.5	+47.7	+1.8	+27.2	+25.4	70	59	+11
Boston CMSA*	41.0	8.8	-32.2	-11.4	+0.1	+11.5	+30.2	+114.1	+83.9	32	28	+4
Cleveland CMSA	52.2	11.6	-40.6	-19.4	-2.4	+17.0	-3.6	+19.8	+23.4	41	38	+3
Minn.-St. Paul MSA	21.3	4.3	-17.0	-10.1	+19.8	+29.9	+69.8	+101.9	+32.1	17	10	+7
St. Louis MSA	49.9	13.6	-36.3	-16.9	+4.6	+21.5	-7.5	+19.1	+26.8	36	35	+1
Pittsburgh CMSA	28.4	5.6	-22.8	-15.9	-7.0	+8.9	-3.6	+5.8	+9.4	23	21	+2
Cincinnati CMSA	39.9	6.2	-33.7	-12.3	+7.4	+19.7	+6.8	+23.2	+16.4	34	30	+4
Milwaukee CMSA	39.2	5.5	-33.7	-15.8	+3.5	+19.4	+34.9	+33.1	-1.8	34	24	+10
Kansas City MSA	35.0	10.3	-24.7	-7.4	+13.0	+20.4	+6.6	+33.8	+27.2	25	23	+2
SOUTH												
Washington DC MSA	72.6	30.9	-41.7	+1.2	+13.6	+12.4	-7.0	+72.1	+79.8	42	52	-10
Dallas FT. Worth CMSA	49.6	18.7	-30.9	-3.5	+35.1	+38.6	+36.1	+154.5	+118.4	31	30	+1
Houston CMSA	59.4	28.6	-30.8	-20.6	+25.1	+45.7	+27.2	+87.0	+59.8	31	27	+4
Miami CMSA	87.8	47.7	-40.1	-34.9	-4.1	+30.8	+12.6	+79.9	+67.3	40	48	-8
Atlanta MSA	69.7	23.4	-46.3	-11.9	+29.9	+41.8	-5.1	+107.9	+113.0	46	52	-6
Baltimore MSA	61.4	14.5	-46.9	-16.8	+12.7	+29.5	+1.5	+45.8	+44.3	47	45	+2
Tampa ST. Pete MSA	33.1	11.4	-21.7	-4.1	+35.5	+39.6	+15.6	+95.0	+79.4	22	21	+4
WEST												
Los Angeles CMSA	62.7	46.3	-16.4	-8.4	+6.5	+14.9	+41.3	+72.9	+31.6	16	17	-1
S.F.-Oakland CMSA	59.7	34.3	-25.4	-6.5	+4.0	+10.5	+20.0	+62.1	+42.1	25	28	-3
Seattle CMSA	26.3	12.3	-14.0	-1.7	+22.7	+24.4	+27.2	+81.3	+54.1	14	13	+1
San Diego MSA	41.3	29.3	-12.0	+8.3	+27.0	+18.7	+67.7	+90.0	+22.3	12	10	+2
Phoenix MSA	28.2	18.2	-10.0	+14.5	+53.2	+38.7	+60.3	+86.3	+26.0	10	6	+4
Denver CMSA	38.6	14.0	-24.6	-12.1	+18.3	+30.4	+8.8	+58.3	+49.5	25	23	+2

[a] Metropolitan Areas are CMSAs and MSAs, defined by OMB as of June 30, 1990, with 1990 populations exceeding 1.5 million (*NECMA counterparts are used for Boston CMSA). Primary Central City(s) consist of the one or two historically dominant cities of the area, and the Surrounding Area consists of the remainder of the Metropolitan Area.

[b] Abbreviated CMSA or MSA name (according to primary central city(s)).

[c] Index represents the percentage of minorities that would need to change (city or suburb) residence to achieve the same city-suburb residence distribution as Non-Hispanic Whites (100 = maximum segregation, 0 = absence of segregation).

Source: Compiled at University of Michigan Population Studies Center from the 1980 and 1990 U.S. Censuses.

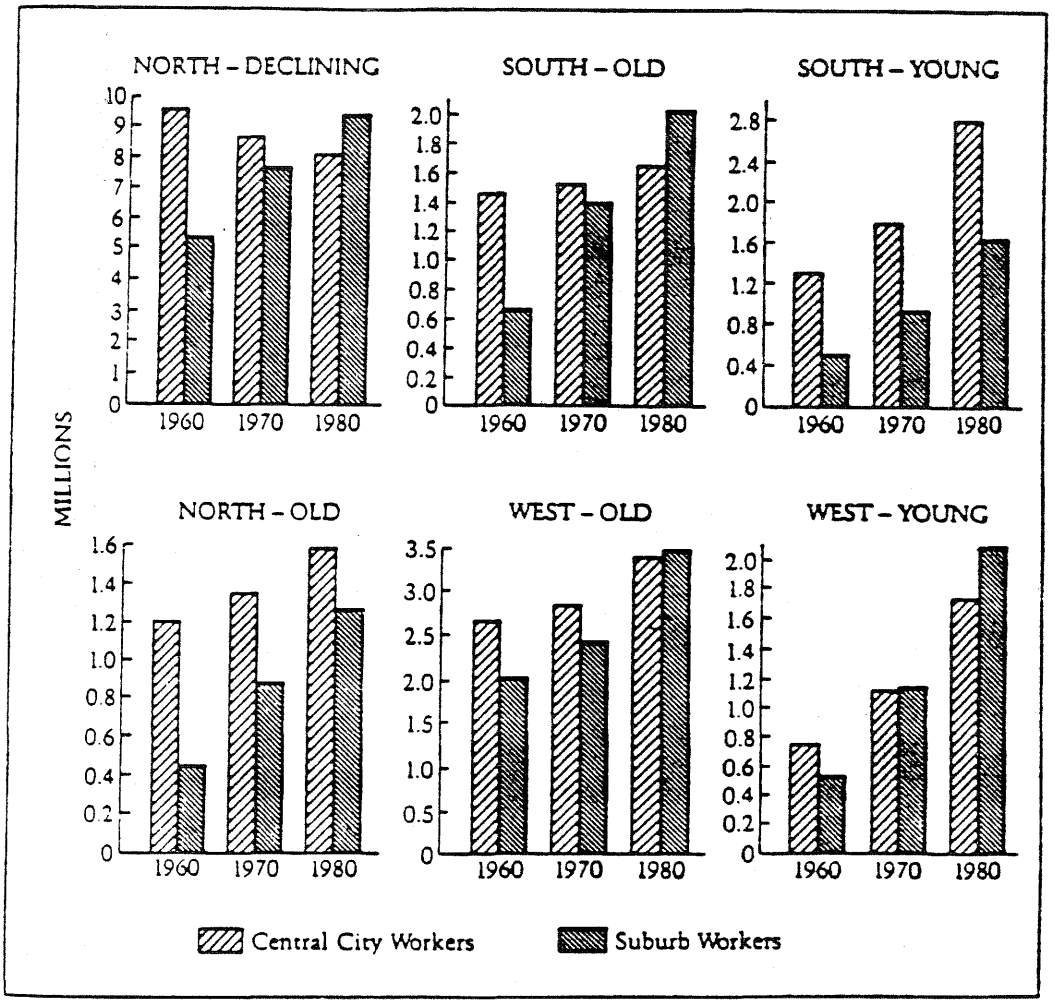
areas as to older areas with growth histories that conform more closely with the core-hinterland model.

Spread of employment since 1970. The strong deconcentration of the metropolitan resident population since mid-century is closely linked to the outward spread of employment. Already in the 1940s, manufacturing and retail employment followed residential redistribution outward from the central city (Hawley 1971, Schnore 1965). The suburbanization of manufacturing and consumer services continued in the 1950s and 1960s. Yet, as with the suburbanization of residences, it was in the post-1970 period when employment deconcentration accelerated in both scope and character. It was during the 1970s that the balance of metropolitan jobs shifted from the central city to the suburbs in many older metropolitan areas (Figure 2). It was also during this decade that the suburbanization of nonmanufacturing jobs outpaced those for manufacturing jobs in these older areas (Frey and Speare 1988). This included many white collar office and service industry jobs that heralded the beginning of the "suburban office boom" (Cervero 1986).

Hartshorn and Muller (1986) characterized the 1970-80 decade as a period of "catalytic growth" for suburban downtowns (following the pre-1960 "bedroom community" and 1960-70 "independence" stages).[8] During this stage, suburban employment clustered in various types of places classed as: suburban freeway corridors, retail strip corridors, high-technology corridors, regional mall centers, diversified office centers, large-scale mixed use centers, old town centers, and suburban specialty centers. Although there was some development of regional shopping centers, industrial parks, and office parks in the 1960s, the widespread growth of these suburban employment sites accelerated during the 1970s.

Stanback (1991) contends that these suburban employment changes are associated with a new era of metropolitan economic development wherein suburban employment centers have begun to compete with historical central cities, becoming more economically independent and taking on more of the area's export functions. In a detailed study of counties within 14 large metropolitan areas, he finds that

Figure 2: Workers' Employment Location, * Central Cities and Suburbs, 1960-1980, for Large Metropolitan Areas, classed by Frey-Speare Groupings.



*Includes employed workers, at work during census week, for metropolitan area residents who reported workplace (ages 14+ in 1960, ages 16+ in 1970 and 1980).

Source: William H. Frey and Alden Speare, Jr. 1988. Regional and Metropolitan Growth and Decline in the U.S. A 1980 Census Monograph, New York: Russell Sage. Chapter 11.

suburban counties have become more diverse and central counties more specialized in their industrial structures since 1970. Much of this Stanback attributes to the post-1970 rise in advanced business and producer services. These, as well as social and public services, comprise an increasing share of the nation's industrial structure, and are attracted to certain suburban locations. (See also Noyelle and Stanback 1984, for a discussion of the spatial implications of the new service economy.)

While the employment in many suburban communities still revolves around residential service activities, other communities have taken on service activities such as wholesaling and business-related services that were previously concentrated in the central city. Still other suburbs, which Stanback labels as "suburban magnet" areas, have achieved certain agglomeration economies and stand in competition with the historic city with respect to key export services. These suburban areas often house high-tech and office complexes, divisional offices, sales centers, and, sometimes, headquarters for large corporations. They are surrounded by a complement of hotels, retail, and entertainment complexes that are located within ready highway access to other parts of the metropolitan area. Stanback identifies counties in 11 selected metropolitan areas that house such suburban magnets (Table 3). Many of these counties rival the metropolitan area's central county in total employment, and all show high and increasing employment/population ratios. These counties have also shown precipitous declines in the percent of net out-commuting to the central county, over time.

Stanback's (1991) analysis of these counties' industrial structures confirms that they have taken on many advanced service functions previously held by the central county. Yet, employment in the most specialized FIRE (finance, insurance, and real estate) and legal services industries continues to be centralized in the central counties for these study areas. This suggests that there is both a symbiotic and competitive relationship between the central city and its magnet suburban areas.

Nevertheless, Stanback's analysis shows that there has been a dramatic deconcentration of almost all types of

Table 3: 1987 Employment and Employment/Population (E/P) Ratios, 1969 and 1987, for Suburban Magnet Counties[a] in Selected Metropolitan Areas.

Metro Area/ Magnet Counties	1987 Employment	Percentage of Central City County	E/P Ratio 1969	E/P Ratio 1987
New York	2,679,977	100.0		
Westchester	507,162	18.9	.42	.59
Nassau	784,494	29.3	.38	.60
Bergen	558,580	20.8	.41	.67
Chicago	1,330,029	100.0		
Du Page	430,318	32.4	.31	.58
Philadelphia	869,654	100.0		
Montgomery	492,299	56.6	.51	.73
Camden	245,482	28.2		.50
Atlanta	685,290	100.0		
De Kalb	346,638	50.6	.35	.64
Cobb	224,083	32.7	.40	.55
Clayton	94,144	13.7	.26	.56
Boston	656,311	100.0		
Middlesex	962,718	146.7	.45	.70
Norfolk	373,374	56.9	.37	.61
Cincinnati	595,293	100.0		
Boone	34,558	5.8	.32	.66
Columbus	625,175	100.0		
Union	15,993	2.6	.45	.55
Detroit	1,021,050	100.0		
Oakland	648,638	63.5	.37	.62
Minneapolis	856,530	100.0		
Ramsey	341,464	39.9	.58	.72
St. Louis	330,240	100.0		
St. Louis	662,852	200.7	.39	.66
Washington	740,671	100.0		
Arlington	204,175	27.6	.80	1.28
Montgomery	460,593	62.2	.43	.67
Alexandria	112,915	15.2	.53	1.05
Fairfax	474,983	64.1	.30	.54

[a]Source: Thomas M. Stanback, Jr. 1991. The New Suburbanization: Challenge to the Central City. Boulder, CO: Westview Press. Chapter 4. (Data compiled by Bureau of Economic Analysis)

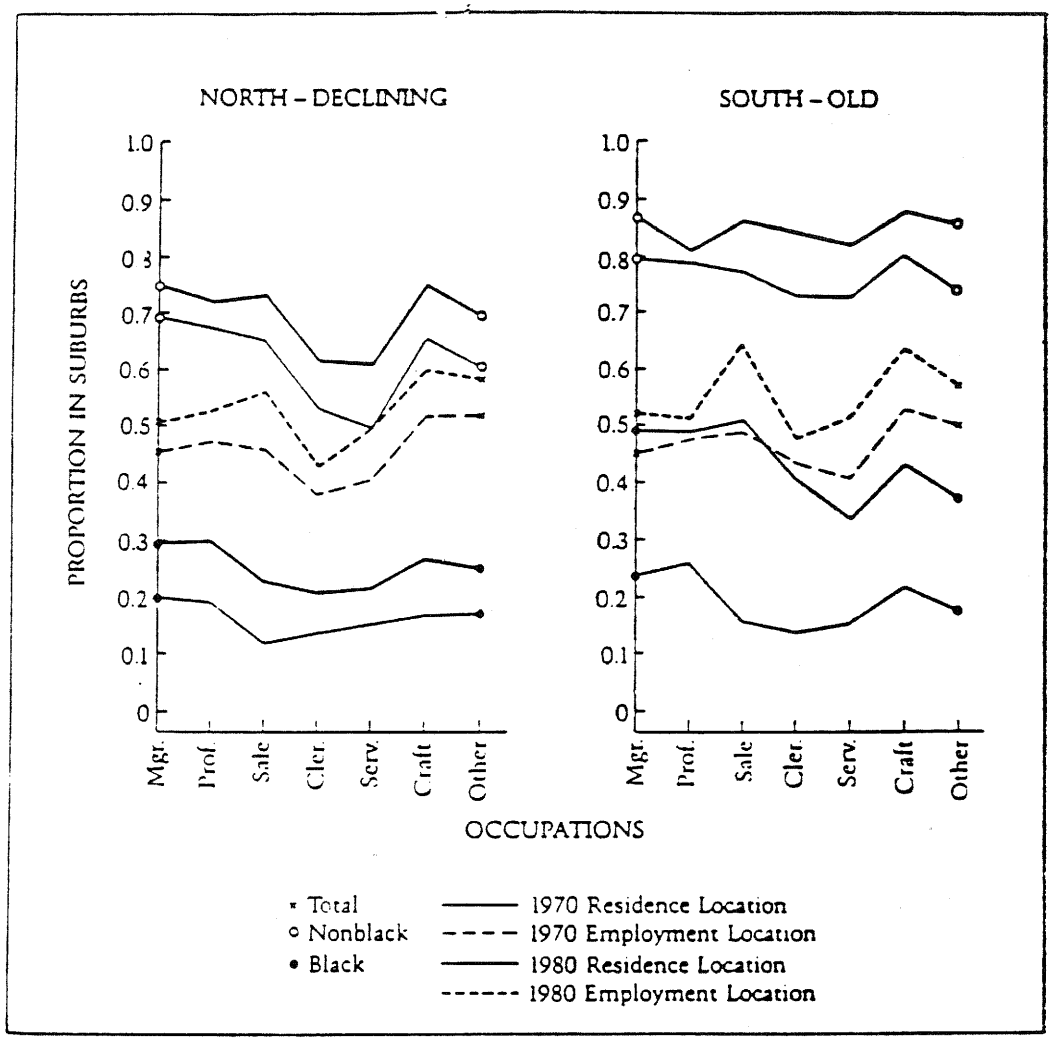
employment into suburban counties. Central cities, more than ever before, are dependent on suburban in-commuters to fill jobs that require higher eduction and skills. At the same time there has been a significant increase in metropolitan resident-workers who both live and work outside the central city (Pisarski 1987, Frey and Speare 1988). In many large older metropolitan areas, suburban resident-workers comprise a plurality of the metropolitan work force.

Stanback's work and related evidence from other studies suggest the existence of "suburb-only" activity spaces and labor markets associated with the post-1970 spread of residences and work places. Yet the phenomenon is so new that comprehensive empirical studies (prior to the 1990 census) could not be undertaken to establish their geographic limits. Stanback (1991, p. 65) observes that his county-level analysis is too crude to serve this purpose.

The identification of local activity or labor market spaces is fraught with two kinds of complexities: (1) these spaces do not necessarily conform to single incorporated places or minor civil divisions but can comprise combinations of these depending on the nature of the activity space and (2) there may be overlapping local labor market or activity spaces. The dramatic rise in women's labor force participation since 1970 (Bianchi and Spain 1986) has increased the number of workers and, in particular, the number of part-time workers in the labor force. This has given rise to more multiple-worker and multiple-work place households. Commuting studies have suggested that local labor markets might also differ by population subgroup characteristics such as education, race, and gender (Frey and Speare 1988, Kasarda 1988, Stanback 1991, McLafferty and Preston 1991). This is implied by the distinctly different city-suburb residential distributions for white and black resident-workers, shown in Figure 3.

Two recent investigations of suburban employment patterns suggest that local labor markets within the broad expanse of suburbia should be defined in terms of geographic units below the county level. In a careful empirical study of post-1980 materials Cervero (1989) identified 57 suburban employment centers in representative metropolitan areas and regions of the country. Each of these areas had more than

Figure 3: Worker Employment Locations by Occupations and Worker Residence Locations by Race and Occupations, 1970 and 1980: North-Declining and South-Old Groupings.*



*Based on metropolitan resident-workers, who were employed at work during census week.

Source: William H. Frey and Alden Speare, Jr. 1988. Regional and Metropolitan Growth and Decline in the U.S. A 1980 Census Monograph, New York: Russell Sage. Chapter 11.

1 million square feet of office floor space, 2,000 or more workers, and were located more than 5 miles from the area's central city's central business district. Areas with the greatest concentrations of jobs were classed as office growth corridors, subcities, and large mixed-use developments (with average employment concentrations of 234,000; 33,500; and 27,500 jobs, respectively).

The second investigation is a carefully researched journalistic account by Garreau (1991), who labeled his suburban centers edge cities. He identified 203 such areas within the boundaries of 36 major metropolitan areas, primarily on criteria of: more than 5 million square feet of leasable office space; more than 600,000 square feet of retail space; a high employment/population ratio; local perception of the area as a single destination for mixed uses (jobs, shopping, entertainment); and the transformation from residential or rural to mixed use over the past 30 years. Neither Cervero's empirical study nor Garreau's journalistic account intended to define local activity spaces or labor market areas within the suburbs. Yet their discussions of land use patterns and industrial and demographic characteristics associated with these emergent suburban employment centers provide useful background for the more in-depth study which should be a prerequisite to any new classification of local labor market or community areas.

Outside metropolitan areas. One final aspect of the national settlement system that has changed since mid-century is the nature of those areas that lie outside of metropolitan areas, as currently defined. In the 1940s, the territory outside of metropolitan areas was more predominantly rural and less integrated into the national economy than has been the case for the last two decades. While the territory now classed as nonmetropolitan still differs in population and economic characteristics from that in metropolitan areas, improvements in transportation, communication, and the organization of production have served to integrate economic activities in nonmetropolitan areas with those in the rest of the country (Fuguitt, Brown, and Beale 1989). Also, around 1970, residential and employment activities began to deconcentrate around many

small and moderate-sized places, following a pattern that previously had been observed in metropolitan areas. This has continued according to recent analyses of nonmetropolitan commuting patterns (Fuguitt 1991b) and some of the 1980s population growth analyses (Fuguitt 1991a).[9]

In light of these patterns and for more analytic reasons, it would make sense to define local labor market areas for that part of the country now defined as nonmetropolitan. Earlier attempts to define the nation's nonmetropolitan territory into homogeneous or other analytically useful regions (Bogue and Beale 1961, Berry 1973, Beale and Fuguitt 1978, Morrison 1990, chapter 7, or see Dahmann 1990) should, at a minimum, be revised to reflect the significant demographic and economic shifts of the past two decades. However, a more promising approach might be to update Tolbert and Killian's (1987) labor market areas that group counties on the basis of 1980 commuting clusters. The latter approach serves to diminish the distinction between metropolitan and nonmetropolitan areas, allowing users to decide how they want to classify each area on the basis of statistics readily available for these county-based units.

To summarize, the U.S. settlement pattern has undergone significant change since 1950, particularly during the last two decades. Metropolitan growth has deconcentrated markedly within the older parts of the country, and has spread to new territory (through reclassification) into less developed, less dense areas and regions. The outward, suburban spread of more diverse population groups and economic activities has created the need for more useful settlement categories pertaining to new activity spaces and local labor market areas. Finally, the increased economic integration of the territory now classed as nonmetropolitan has created the need for a system of settlement areas that classifies this territory with procedures similar to those used to classify territory now labeled as metropolitan.

These shifts in the nation's settlement patterns over the past 40 years call into question the three assumptions we associated with the current statistical system:

- functional settlement areas can no longer be approximated by areas with common physical attributes.

- the highly dense central core-hinterland model of settlement now characterizes only a portion of the nation's settlement system.

- as population and economic activities have increasingly spread outward from metropolitan centers, there is a need to consider a nesting of local activity spaces or labor market areas that are connected to the broader metropolitan region.

C. Limitations of the Current Metropolitan Concept

Although the concept of a functionally defined community is an important one to preserve, we believe that the changed settlement patterns over the past four decades have rendered some aspects of the current metropolitan area formulation obsolete. We identify, below, five limitations of the present formulation for representing the evolving U.S. settlement system.

First, the definition of current MAs is too wedded to the central core-hinterland concept of settlement area.[10] The need for high central densities no longer exists, and there is no reason why a modern, post-industrial settlement could not be developed around a set of dispersed labor market areas that could be entirely "suburban" in character while providing employment, shopping, and recreation for its inhabitants.

Second, current MA definitions are limited by their restriction to county building blocks. While the use of counties has well-known practical advantages, they are too large in many parts of the country to adequately define functional or activity space.

Third, while the current concept recognizes that some areas (PMSAs) can be defined within larger, consolidated areas (CMSAs), the division of the latter areas is often done in a nonsystematic fashion with great discretion given to local opinion for identification. Moreover, the PMSAs are often crudely identified because: (a) the procedure

gives first priority to identifying the larger CMSA, following a top-down approach toward specifying PMSAs; and (b) PMSAs are created to fit an often inappropriate core-hinterland model, on the basis of crude county building blocks.

Fourth, statistics available for intra-metropolitan analysis are generally produced for only two components--the central city (or combined multiple central cities) and the suburban ring. Hence, the expansive residual territory that includes primarily residential suburbs, primarily employment suburbs, mixed-use urban centers, and still undeveloped territory remains undifferentiated in the statistics available for analytical use.

A fifth limitation with the present MA system is that much of the country is left out. The vast territory now classified as nonmetropolitan has become more integrated both with the metropolitan economy and, internally, on the basis of local labor market areas. Moreover, to the extent that government agencies and private sector analysts find MAs useful in their planning, they may ignore the population living in nonmetropolitan territory simply because a manageable classification scheme is not available.

II. Basic Principles of the New System

In light of the above considerations, we propose here a new classification of geographic settlement areas designed to accommodate continuing changes in the nation's distribution patterns. At the same time, we wish to retain the general notion of a functional community area that served as an underlying tenet of the metropolitan community concept upon which the current statistical system was designed.

In the paragraphs below, we discuss the ways our proposed system addresses the various items that are of interest to the Census Bureau's Metropolitan Concepts and Statistics Project (see the Introduction to this volume). The items will appear in the following sequence: (A) conceptual basis (Item 1); (B) aggregation criteria and integration measures (Items 3 and 4); (C) building blocks

(Item 2); (D) relationships among areas (Item 5); (E) entities of the settlement system (Item 9); (F) data for delineating areas (Item 6); (G) local views (Item 7); (H) frequency for updating statistical areas (Item 8); and (I) data for users (Item 10).

A. Conceptual Basis

We propose FCAs to form the basic areas of a new approach to portraying the settlement system. The FCAs are intended to delineate functional areas that represent, to the extent possible, self-contained local activity or local labor market areas. In this regard, the approach is consistent with the functional community premise underlying Hawley's conception of an "enlarged area of local life." In discussing the metropolitan community, as it was originally formulated, he states:

> The concept of the metropolitan area lends itself to various definitions....It may apply to an enlarged area of local life, i.e., with a radius of twenty-five to thirty miles, or it may refer to a much broader area in which the scattered activities have come under the administrative supervision of a metropolis. The former is what is usually denoted when the term <u>metropolitan area</u> or <u>metropolitan community</u> is used; <u>metropolitan region</u> is ordinarily reserved for the latter.
>
> The principle of the metropolitan community, as well as the metropolitan region, is delineated by the frequency with which outlying residents and institutions transact their affairs in the metropolis, whether through direct visitation or through indirect means of communication. These frequencies...decline in gradient fashion with distance from the center. Thus figuratively speaking, one might rotate a gradient on its center and sweep out a zone in which the residents routinely engage in a given frequency of communication with the center. The zone of daily

> frequencies comprises the metropolitan community; zones of lesser frequencies fall in new regions. Theoretically sound as this mode of definition appears to be, it presents certain difficulties. To the observer, for example, the boundaries located in the manner described are ephemeral. They correspond to no political demarcation or, unless there happens to be a seacoast or mountain range nearby, to no physical impediments. A boundary is visible only through the application of rather refined means of observation. A functional boundary of that kind is also somewhat fluid; it shifts from time to time as the influence of the metropolis is extended or retracted. (Hawley 1971, pp. 149-150).

As has been discussed earlier, certain aspects of the original metropolitan community formulation are no longer valid for today's settlement patterns. One of these is its earlier strong linkage to the central core-hinterland physical model of settlement. Another would be the assignment of a specific distance to the community's radius. Yet the basic notion of a common area with heightened frequencies of daily interaction lay at the root of this functional conception of the metropolitan community.

Another aspect of the original formulation seems applicable in some parts of the country today. That is the distinction between the local community or activity space and a broader metropolitan region. Again, the nature of the functional relationships between these two kinds of spaces differs markedly from what existed at mid-century, when this concept was originally formulated. However, the recent work of Stanback (1991) and others reviewed earlier suggests that a strong symbiosis exists between communities in some parts of the country and these related communities can be thought of as metropolitan regions.

The FCAs we propose are not tied to any requirements of physical configuration, such as population size and density criteria, or location of urbanized areas. They will be specified solely on the basis of measures of interaction (although some size considerations will be used in

designating the larger MERs). Because the same kind of interaction measures will be used to designate FCAs in the more and less densely settled parts of the country, they will not be formally distinguished on the basis of "metropolitan" and "nonmetropolitan" status. As such, they will encompass a much larger portion of the national territory than the current system.

The procedures discussed below reflect our preliminary thinking in the formulation and operationalization of the FCA concept. As the next section reveals, we place heavy reliance on commuting data as an indicator of interaction. Nevertheless, we are open to wide experimentation, which might employ various types of commuting measures or noncommuting measures in designating these settlement areas. There maybe are even larger questions of face validity associated with designated areas of this type. In the final part of this report (III), we call for broader research efforts along these lines.

B. Aggregation Criteria and Integration Measures

The measures of integration we propose to designate FCAs are those traditionally used to define local labor markets. A labor market is an area within which a worker can commute to work, and our procedure assumes that we can identify spatially distinct labor markets on the basis of commuting data. As indicated above, the FCA concept does not presume to identify homogeneous areas on physical characteristics. Neither does it presume to identify homogeneous areas on population or housing attributes. The main criteria for identifying these areas are high levels of interaction. For the remainder of this section we will discuss specific techniques employed by others to determine commuting flow-based labor market areas. Although the specific objectives and areal building blocks for these investigations differ from ours, they provide a methodological basis for the procedures we wish to adopt.

Killian and Tolbert (1991) have developed a commuting-based procedure which maps the areas of the U.S. into an "exhaustive and mutually exclusive set" of local labor markets. Unlike other sets of areas, such as those of the Bureau of Economic Analysis, these local labor market areas

are not necessarily formed around a large urban core and do not therefore carry an "urban bias." Their procedure starts with a county-by-county matrix of place of work by place of residence. Unlike the procedure for defining current MSAs/CMSAs, their procedure uses flows in both directions between pairs of counties. There is no attempt to define one county as "central."

They used a two-step procedure in which a computer algorithm was first used to group counties into commuting clusters, and these clusters were then aggregated into labor market areas. After the first step, they identified 763 commuting zones (excluding Alaska), some of which were single counties that did not have sufficient commuting to cluster with any other counties. Recognizing the need for a minimum size for labor market areas either to provide reliable estimates for some measures based on samples or to protect confidentiality on public use samples of individual data, they aggregated adjacent commuting clusters to provide labor market areas with at least 100,000 population. This aggregation was based primarily on commuting flows between clusters and secondarily upon pure proximity when flows were too weak to link clusters with less than 100,000. This resulted in 382 labor market areas, with all of Alaska treated as one area.

Any clustering procedure, such as that used by Killian and Tolbert, requires setting an arbitrary cut-off level for termination. Otherwise, the computer program will run until it has linked all of the counties into a single cluster. In setting a cut-off level, Killian and Tolbert were particularly concerned with getting nonmetropolitan counties with relatively small commuting flows to cluster together. This meant that around major cities, counties that were not part of the official MSAs were often added to these areas to form labor market areas that were much larger than the MSAs. Using a higher level of commuting as the cut-off level would have resulted in smaller clusters around metropolitan areas, but also would have left a larger number of isolated counties. (Killian and Tolbert had about 80 isolated counties using their cut-off rule.)

Another aspect of Killian and Tolbert's work that might benefit from further research is the measure of strength

they used to define the closeness of two areas. They calculated the sum of the number of commuters in both directions between two counties divided by the labor force of the smaller county. They claim that this measure reduces the tendency for smaller counties to be drawn together with larger ones and is more likely to produce clusters of counties that are independent of large cities. The actual clustering was done with the SAS CLUSTER procedure and required converting the measure of strength of interaction into distance, which they did by subtracting it from 1.0 (Tolbert and Killian 1987). This conversion may further distort the measure and lead to poor groupings in some cases. However, this can only be determined by experimenting with alternative measures and by doing sensitivity analysis to see what effect sampling error may have on the results.

Forstall, Rives, and Gossette (1982) experimented with different clustering rules using 291 counties in nine contiguous states in the South. They considered all flows of 100 or more workers that constituted at least 2 percent of a county's work force. Alternative clustering termination rules that ranged from requiring flows of 20 percent of the county's work force for assignment to a cluster down to 2 percent were used. At the 20 percent level, less than one-quarter of the counties were included in clusters, while at the 2 percent level, only seven of the counties were not included in any cluster. However, using the lower cutoff percentage resulted in considerably fewer clusters. While this paper does not recommend an optimal "cut-off" level, it does demonstrate the overall feasibility of the approach.

British geographers have developed a more sophisticated computer algorithm for dividing the country into labor market areas (Coombes, Green, and Openshaw 1986). This algorithm considers only those commuting flows between pairs of areas that satisfied minimum criteria for the proportion of workers commuting between these pairs and the proportion of all workers involved in commuting. The measure of strength that they used to decide between alternative pairings of areas was based on a formula that included the number of commuters in each direction between the areas and

the number of workers who were working and residing in both areas.

A test of the method for different subgroups of the population revealed that the labor market areas were not the same for different types of workers (Coombes, Green, and Owen 1988). In general, the more affluent workers such as managers and professionals tended to commute longer distances and therefore had larger labor market areas than less affluent workers. However, the smaller areas of unskilled workers were not always nested within the larger areas of the more affluent workers. This suggests that any similar method of clustering of areas based on commuting data needs to be tested with different subgroups of the population.

C. Building Blocks

While counties are convenient units to use because their boundaries rarely change and because a great deal of statistical data are available at the county level, they are generally far too large to aggregate into the local labor market areas we wish to identify. A more precise definition could be obtained by using smaller building blocks such as minor civil divisions and places. Census tracts and block numbering areas also would be logical units to use. However, to facilitate widespread use, there should be a county-counterpart system of FCAs.

How small should local labor market areas be? If an area had a square shape and residences and work places were randomly distributed throughout the area, it can be shown that the average commuting distance would be about .6 times the length of one side of the square. Assuming an average commuting distance one way of six miles (based on the 1985 panel of the Census Bureau's Survey of Income and Program Participation), an area of 10 miles by 10 miles or 100 square miles, would be large enough to be a single labor market area. In reality, workers will tend to live closer to work than the random location assumed here, which would allow for somewhat larger areas. However, it seems reasonable that the building blocks be smaller than 100 square miles, when possible. Since the average county in

the United States (excluding Alaska) has about 965 square miles, counties are too large by this criterion.

There should also be a minimum size for building blocks, based on population size. If commuting is to be used as the basis for grouping building blocks, then the commuting data should pass some minimum standard of reliability. Given that commuting data are based on a sample of about one in six workers, if a minimum stream of 100 workers is used (as Forstall, Rives, and Gossette did in their analysis) in the clustering, then this is actually based on a sample of only about 16 workers and has a sampling error of about 25 percent. If 10 percent is the minimum proportion of workers commuting to define a stream worthy of consideration for clustering, then the area must have at least 1,000 workers or about 2,500 population to satisfy this minimum.

In many parts of the United States, it will not be possible to find building blocks that both contain at least 2,500 people and have 100 square miles or less of area. In these regions, the county may be the smallest feasible building block. However, the fact that there are many low-density areas in some parts of the United States should not be used to argue for using the county in higher-density areas where the land area of counties far exceeds average commuting fields.

The use of smaller building blocks should help in setting the dividing line between adjacent FCAs. At present there are many MSAs/CMSAs that are adjacent to other MSAs/CMSAs and where there may be commuting in both directions from counties on the boundary. While the MAs are adjacent, however, the urbanized areas are often clearly separated, and the use of subcounty areas should help to divide parts of the county which are oriented towards one area from parts oriented towards the other.

An obvious alternative to the use of counties as building blocks would be to use county subdivisions. There were 35,158 such units in 1980, excluding Alaska. The average size of these areas was about 84 square miles, which fits the first criterion well, while the average population was about 6,400, which satisfies the second criterion. However, the type of county subdivision varied widely among

regions and states. In 24 states, towns or townships were the basic subcounty units, although these varied greatly in function ranging from the basic governmental units below the state in southern New England to mere historical units with little present-day functions in parts of the Midwest. Twenty states had only census county divisions, and six states had other types of divisions.

Of even greater consequence than the variation in type and function of county subdivisions is the considerable variation in size and population from one state to another. For example, California has 386 county subdivisions with an average area of about 405 square miles and an average population of about 61,300, while North Dakota has 1,811 county subdivisions with an average area of 38 square miles and an average population of 360. In Minnesota there are 2,729 units with an average area of only 29 square miles. In Alaska, the 37 divisions have an average area of 15,428 square miles.

The variation could be reduced considerably by combining adjacent small areas in states such as North Dakota and Minnesota and by dividing overly large areas in states such as Alaska, Montana, and California. While this is possible, there would still be the problem of changes in boundaries of county subdivisions between censuses, which would make comparison difficult.

Another possibility would be to use census tracts and block numbering areas (BNAs). These relatively permanent areas are defined by the Census Bureau in cooperation with local and state bodies. Changes in boundaries often are accomplished through splitting tracts or combining tracts, making longitudinal comparisons possible. Since tracts have an average population around 4,000, they meet the criteria discussed above.

Whether tracts/BNAs or county subdivisions were used, the goal would be to obtain labor market areas that more closely reflected actual commuting areas than is possible using counties as units. It is expected that some of the linkages among counties are due to workers at one end of a county commuting in one direction while those at the other end of the county go in the opposite direction. For example if there are three counties, A, B, and C, in a line, workers

at one end of county B may go to county A, while those at the other end of county B will go to county C. Using a clustering method, all three counties may be grouped together when, in fact, there are two distinct commuting zones.

A comparison of the areas and distances along one side of an area shows that both the labor market areas of Killian and Tolbert and their smaller commuting zones are quite large compared to the average commuting distance of American workers:

Type of Area	Number	Ave. Pop. (1980)	Ave. Area (sq. mi.)	Ave. Width (miles)
Labor Market	381	594,000	7,791	88
Commuting Zone	763	296,400	3,891	62
County	3,075	73,500	965	31
County Subdivision	35,158	6,400	84	9
Tract/BNA	61,041	3,705	49	7

Notes: Width calculation assumes square area. Number of counties excludes most of the independent cities in Virginia. Alaska has been excluded from all calculations.

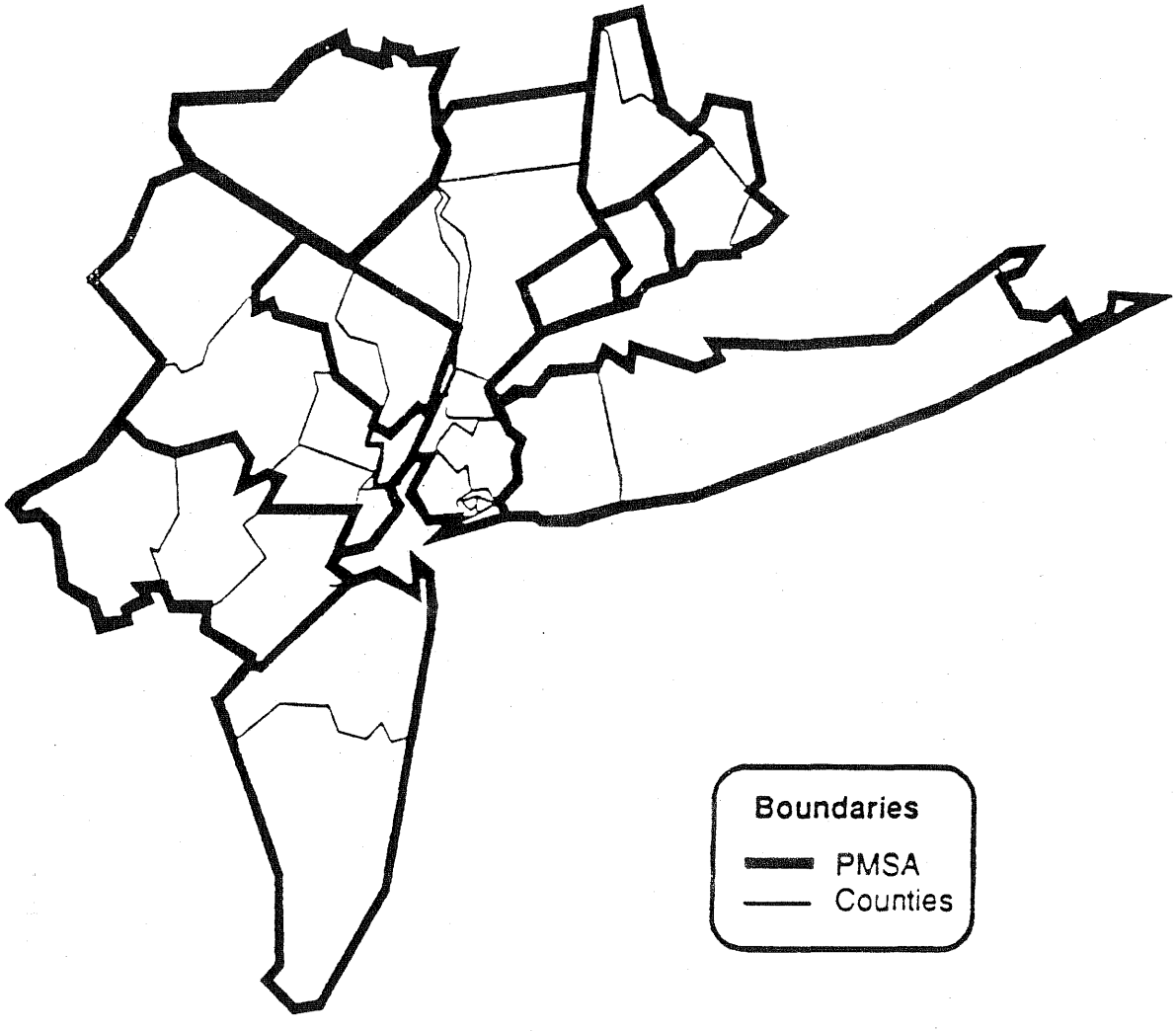
In sum, we recommend that FCAs be delineated on the basis of subcounty building blocks with appropriate adjustments in states where these are unusually large or small. Such a system of FCAs will not necessarily exhaust the entirety of U.S. territory, because some areas will not display strong commuting ties with adjacent territory. Nevertheless, such areas will account for a much smaller part of the population than that which lies outside of the current MAs. (As a crude indication, 502 of the 763 county-based commuting zones identified by Killian and Tolbert, discussed above, lie totally outside of MAs under present definitions.) Finally, to assist analyses based on data available only at the county level, we advocate designing a county-counterpart system to the more finely grained FCA system. The county-counterparts would be determined in much the same manner that the current New England County Metropolitan Areas (NECMAs) are determined from the present city and town-based MSAs and CMSAs in the New England states.

D. Relationships among Areas

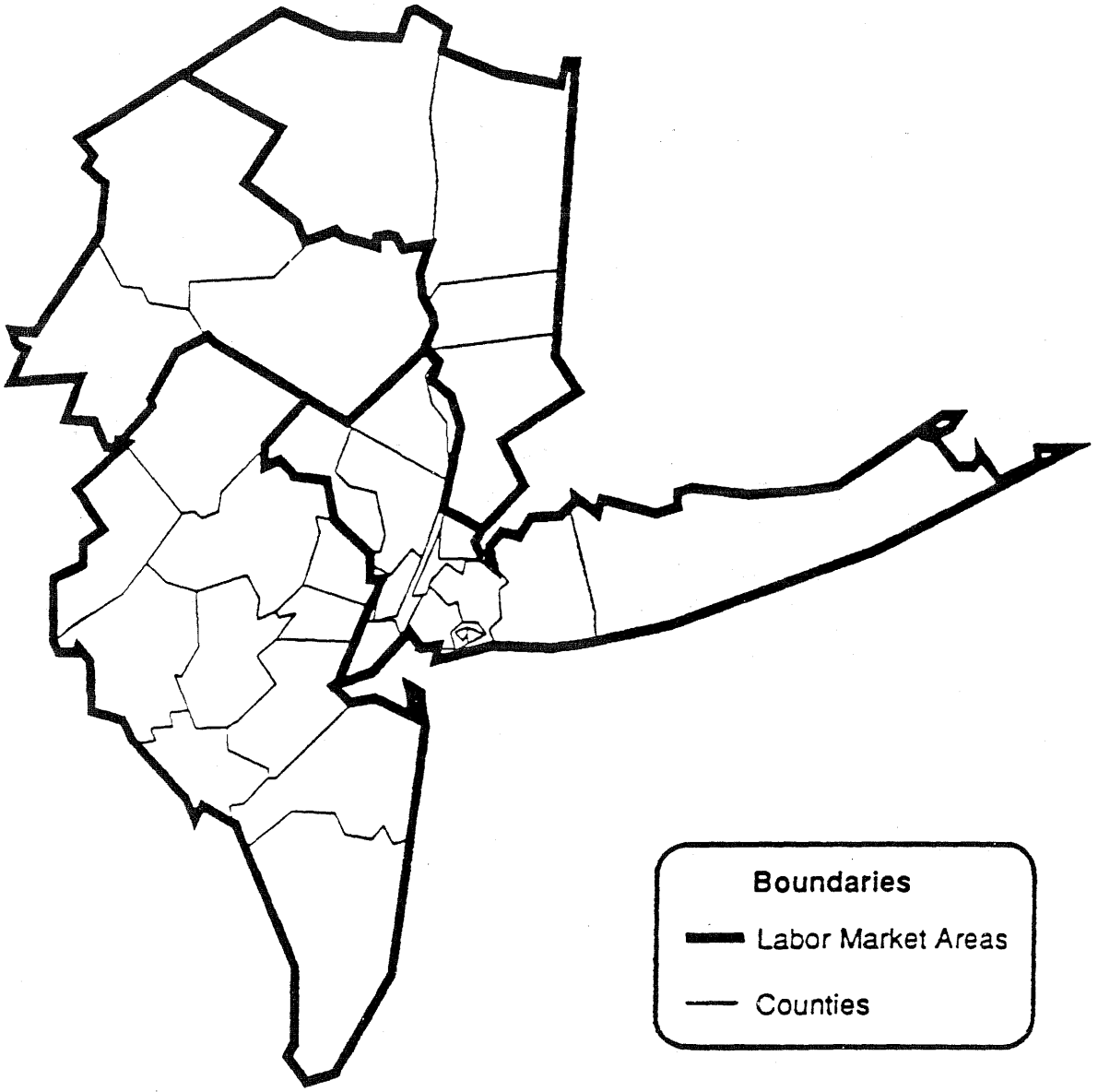
The primary geographic areas for representing the settlement system under our approach will be the FCAs, defined solely on the basis of interaction (commuting) clusters, without taking into consideration physical form, population homogeneity, proximity to other areas, or hierarchical considerations. As indicated above, some portion of the national territory will lie outside of these areas, but this will include a very small percentage of the population. Yet, the system should also reflect the existence of broader metropolitan economic regions to which the economies and the wider activity spaces (those involving less frequent interactions) of residents in the MERs' component FCAs are linked. These MERs would be somewhat analogous to the current CMSAs, though they will be determined in a very different manner.

Unlike the identification of current CMSAs, the MERs would be identified using a "bottom-up" approach beginning with already-defined FCAs. Also, the aggregation of FCAs into MERs would be based on a cluster analysis of inter-FCA commuting flows, rather than flows with a specific core area. While core areas would be identified for MERs, they would not become the starting point for defining these areas' commuting regions. Finally, because FCAs are generally smaller in both territory and population size than PMSAs (the components of CMSAs), MERs will be composed of a greater number of component areas than CMSAs.

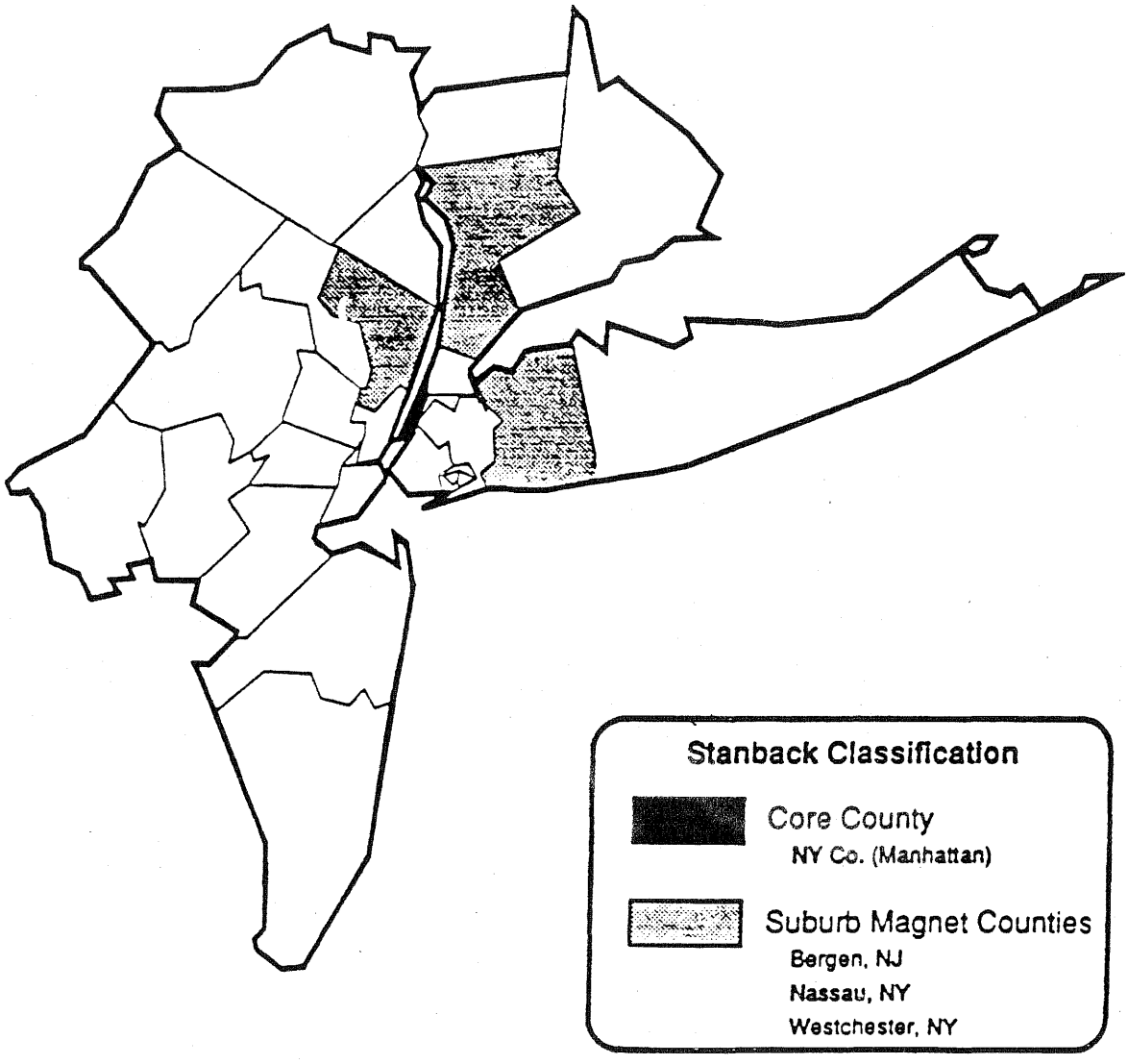
Different aggregation techniques and component area sizes can lead to a variety of outcomes in identifying larger metropolitan regions. This is crudely illustrated with Maps 1 through 4 for the greater New York metropolitan area. Map 1 shows the 12 PMSAs that are carved out of the current (1980) New York CMSA using the "top-down" procedure described earlier. The Tolbert-Killian labor market areas, based on the commuting cluster algorithm yields the four areas shown in Map 2. (Fairfield County, Connecticut, included in the New York CMSA, is included with a large part of Connecticut in the Tolbert-Killian scheme.) Map 3 depicts the three suburban magnet counties identified in Stanback's (1991) analysis of employment/population ratios, and Map 4 depicts the 23 edge cities and suburban downtowns



Map 1. Component PMSAs of New York CMSA

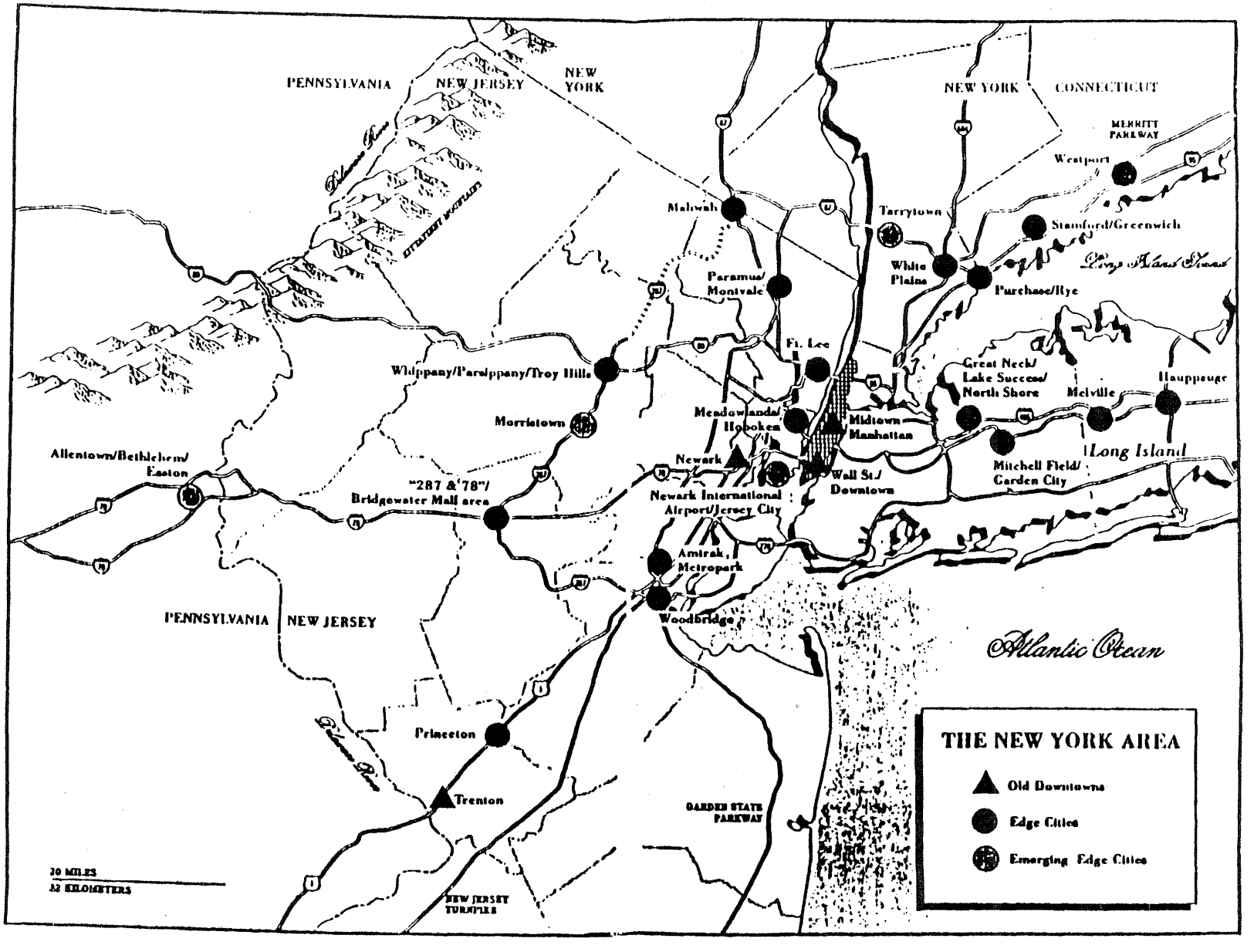


Map 2. Tolbert-Killian Labor Market Areas



Map 3. Component Counties of New York CMSA

MAP 4: "EDGE CITIES" IDENTIFIED BY GARREAU.



Source: Joel Garreau. 1991. Edge City: Life on the New Frontier. New York: Doubleday.

that Garreau (1991) identifies in the greater New York region.

If one considers Stanback's suburban magnet counties as areas most strongly integrated with the greater region's economy, it is noteworthy to see that each is located in a different PMSA in Map 1, while two are located in the same Tolbert-Killian labor market area. Clearly the Stanback magnet counties do not constitute a surrogate for the commuting cluster relationships our procedure would identify. Both PMSAs and labor market areas are constructed from larger (county) units than the ones we propose be used. While identified in a much less systematic fashion, Garreau's edge cities and suburban downtowns may come closer to the kinds of areas that would be linked to the New York area after the more finely-grained FCAs, for this region, are identified. (Note that only eight of the edge cities/suburban downtowns are located in Stanback's magnet counties.)

Two additional considerations toward defining MER regions involve: (1) identifying the region's core cities, and (2) establishing minimum population size and density criteria. In this system, core cities should not be used to establish the MER's commuting area but should simply be identified as the primary urban centers in the region. A MER's core cities, then, would include all of those cities or areas that qualify for "urban center" status according to the classification presented under section E (below).

Minimum population size and density criteria for the entire MER would also need to be established, after some experimentation. As an exercise, we classified the Tolbert-Killian county-based commuting zones by arbitrary metropolitan size and density categories, and cross-classified them by metropolitan status according to the current MA classification (Table 4). The results show that 163 of the 763 commuting zones are classified as metropolitan (either "large metro" or "other metro") according to these arbitrary criteria. An additional 159 commuting zones are classed as "mixed." These size and density criteria tend to class more areas into the metropolitan category than the current MA classification. However, this exercise should not be taken necessarily to

Table 4: Correspondence between Tolbert-Killian commuting zones, classed by Population Size and Density, with OMB MSAs defined as of June 30 1990.

Tolbert-Killian Commuting Zone Size-Density Category (a)	OMB MSA Category		
	Mostly MA (b)	Part MA	Non-MA
Large Metro	47	0	0
Other Metro	65	47	4
Mixed	31	50	78
Nonmetro	7	14	420

(a) The commuting zones of Tolbert and Killian were classified by size and density to create 4 levels of metropolitan/nonmetropolitan areas. These included: Large Metro (Size>1 million); Other Metro (Size>250,000 and Density>50); Mixed (Size>100,000 and Density>25); and Nonmetro (Size<100,000).

(b) "Mostly MA" pertains to commuting zones with greater than 75 percent of the population located in OMB-defined MSAs.

reflect the outcomes of the MER scheme proposed here. As indicated earlier, MERs will comprise groupings of FCAs, which will be defined on the basis of sub-county rather than county building blocks.

Another consideration in identifying MERs involves the desire to make them inclusive of all segments of the region's population. This should include residentially segregated racial, ethnic, or class subgroups whose commuting flows do not contribute greatly to the aggregate flows that determine the MERs' component FCAs. Much has been written about the spatial isolation of inner-city minorities from expanding employment opportunities in the suburbs (Kasarda 1988, McLafferty and Preston 1991). Moreover, the examination of the social, economic, and demographic characteristics of the counties and PMSAs that make up the New York CMSA reveal a great deal of diversity <u>across</u> PMSAs (Tables 5 and 6). It is likely that the smaller FCA components, used in our system, would show even greater inter-area diversity. For this reason, procedures should be devised to ensure that the MERs will include the broad diversity of population subgroups residing in the region. This may involve some experimentation with subgroup-specific commuting clusters before arriving at the final formula.

In sum, we recommend the designation of MERs in appropriate parts of the country, by aggregating FCAs with strong commuting ties and where the entire MER unit satisfies minimum population size and density requirements. Additional experimentation should develop the means of including the broad diversity of the region's population subgroups into the MER. This could involve examining subgroup-specific commuting clusters by race, ethnicity, gender, and other attributes. Finally, we believe that MERs should be defined on the basis of entire counties. In cases where component FCAs cut across county boundaries, the entire county should be included in the MER.

E. Entities of the Settlement System

For reasons outlined above, we believe it is useful to replace the current central city-suburb categorization of

Table 5. Population Size, Minority Composition and 1980-90 Change in New York CMSA*.

PMSA/ County	1990 Population Size (1000s)	Percent of Population		1980-90 Percent Change		
		Non-Hsp. White	Minority	Total	Non-Hsp. White	Minority
New York, NY PMSA	8,546	47.9	52.1	+3.3	-12.2	+23.4
Bronx Co.	1,203	22.6	77.4	+3.0	-31.3	+20.6
Kings Co.	2,300	40.1	59.9	+3.1	-14.9	+20.2
New York Co.	1,487	48.9	51.1	+4.1	+1.8	+6.5
Queens Co.	1,951	48.0	52.0	+3.2	-20.0	+41.1
Richmond Co.	378	80.0	20.0	+7.6	+0.9	+47.1
Westchester Co.	874	73.2	26.8	+1.0	-8.3	+39.4
Rockland Co.	265	79.9	20.1	+2.3	-5.6	+52.6
Putnam Co.	88	95.3	4.7	+8.7	+6.7	+80.1
Nassau-Suffolk, NY PMSA	2,609	84.1	15.9	+0.1	-5.1	+41.3
Nassau Co.	1,287	82.6	17.4	-2.6	-9.2	+48.7
Suffolk Co.	1,322	85.5	14.5	+2.9	-0.9	+33.5
Bridgeport-Stamford-Norwalk-Danbury-CT NECMA (Fairfield Co.)	827	79.8	20.2	+2.5	-3.9	+39.5
Orange Co., NY PMSA (Orange Co.)	307	84.8	15.2	+18.5	+13.4	+58.2
Bergen-Passaic, NJ PMSA	1,278	75.6	24.4	-1.1	-10.7	+47.9
Bergen Co.	825	82.7	17.3	-2.4	-10.4	+70.7
Passaic Co.	453	62.7	37.3	+1.2	-11.3	+32.8
Jersey City, NJ PMSA (Hudson Co.)	553	47.4	52.6	-0.7	-19.5	+25.8
Newark, NJ PMSA	1,824	64.2	35.8	-2.9	-10.7	+15.1
Essex Co.	778	45.1	54.9	-8.6	-21.0	+32.9
Union Co.	493	65.3	34.7	-2.0	-14.1	+5.0
Morris Co.	421	88.4	11.6	+3.4	-1.7	+70.1
Sussex Co.	130	95.8	4.2	+12.1	+11.1	+72.5
Middlesex-Somerset-Hunterdon, NJ PMSA	1,019	80.8	19.2	+15.1	+5.4	+88.0
Middlesex Co.	671	77.0	23.0	+12.7	+0.9	+85.0
Somerset Co.	240	85.2	14.8	+18.3	+10.5	+100.0
Hunterdon Co.	108	95.0	5.0	+23.4	+20.9	+100.7
Monmouth-Ocean, NJ PMSA	986	88.5	11.5	+16.1	+13.8	+38.0
Monmouth Co.	553	84.8	15.2	+9.9	+6.4	+34.6
Ocean Co.	443	93.1	6.9	+25.2	+23.8	+48.4
Total New York CMSA	17,953	63.0	37.0	+3.1	-7.0	+26.6

*The New England portion consists of the Bridgeport-Stamford-Norwalk-Danbury CT NECMA rather than four separate PMSAs in the official definition.

Source: Compiled at University of Michigan Population Studies Center from 1980 and 1990 U.S. Censuses.

Table 6. Population and Housing Characteristics for PMSAs within New York CMSA and surrounding MSAs.

CMSA/PMSA MSA	1990 Pop. (1000s)	1980-90 Percent Change	Percent of Pop Min-ority[a]	Age 0-17	Age 65+	Percent Married Couples[b]	Percent Nonfam HHs	Persons Per HH	Percent Owner Occ HHs	Median Home Value[c]
New York CMSA	18,087	+3.1	37.0	23.0	13.1	50.6	31.2	2.67	51.0	191.1
New York, NY PMSA	8,546	+3.3	52.1	23.0	13.0	41.6	36.9	2.56	33.3	59.4
Nassau-Suffolk, NY PMSA	2,609	+0.1	15.9	23.3	12.4	66.4	20.0	2.99	80.3	187.0
Stamford CT PMSA	202	+1.9	19.9	20.8	14.1	56.3	30.2	2.60	64.8	394.0
Norwalk CT PMSA	127	+0.5	18.1	21.1	12.3	58.4	28.2	2.60	70.6	315.8
Bridgeport-Milford CT PMSA	443	+1.2	22.1	23.2	14.2	55.3	28.0	2.67	67.6	190.1
Danbury CT PMSA	187	+10.3	9.2	24.4	9.9	63.5	25.3	2.75	74.9	221.2
Orange Co NY PMSA	307	+18.5	15.2	27.6	10.4	62.3	24.0	2.89	67.5	141.7
Bergen Passaic NJ PMSA	1,278	-1.1	24.4	21.7	14.5	58.4	26.7	2.71	63.9	214.4
Jersey City NJ PMSA	553	-0.7	52.6	22.1	12.7	43.4	34.8	2.62	32.5	157.0
Newark NJ PMSA	1,824	-2.9	35.8	23.5	12.5	54.2	27.7	2.74	59.1	191.4
Middlesex-Somerset-Hunterdon NJ PMSA	1,019	+15.1	19.2	21.9	11.3	61.6	26.0	2.71	70.7	173.5
Monmouth Ocean NJ PMSA	986	+16.1	11.5	23.6	17.3	60.9	27.1	2.65	77.4	150.6
New Haven-Meriden CT MSA	530	+5.9	20.1	22.6	14.1	52.6	31.7	2.55	62.4	171.9
Waterbury CT MSA	221	+8.1	15.3	23.4	15.6	54.9	29.7	2.58	63.3	148.0
Poughkeepsie NY MSA	259	+5.9	14.1	23.9	11.4	59.9	27.7	2.69	69.1	149.2
Allentown-Bethlehem PA NJ MSA	686	+8.1	7.2	23.9	15.2	59.7	27.9	2.57	71.6	102.4

[a] Persons who are not classed as Non-Hispanic Whites.

[b] Percent of all families that are married couple families.

[c] Value in 1000s of dollars.

Source: Compiled at University of Michigan Population Studies Center from 1980 and 1990 U.S. Censuses.

intra-area metropolitan territory with a classification scheme that more accurately reflects current land use and activity categories. We advocate an approach that classifies each FCA's subcounty building blocks into six categories.

Urban centers would identify places or county subdivisions that satisfy minimum population and density requirements, have high employment/population ratios, and, using criteria yet to be determined, are local centers of commercial and cultural activities.

Primarily residential areas are places or county subdivisions that are classed as urban, have low employment/population ratios, and, using criteria yet to be determined, are primarily residential in character.

Primarily employment areas are places and subcounty areas that are classified as urban, and have high employment/population ratios but do not qualify as urban centers on the basis of population size, density, or other criteria.

Other urban areas, mixed urban-rural areas, and rural areas are used to class the remaining places or subcounty areas on the basis of traditional rural-urban criteria.

This classification scheme represents a minimum set of categories that could be elaborated upon, even further, pending additional investigation. These categories could be reaggregated into the traditional rural-urban classification as well as into size-of-place categories for purposes of statistical tabulations. As indicated under D (above) urban centers that are located within MERs would be included in the list of "core cities" for those MERs. Further investigation into land use patterns, economic activity, and, perhaps, local opinion, should be undertaken to develop additional criteria for identifying urban centers and primarily residential areas.

F. Data for Delineating Areas

The data required for specifying the FCAs and MERs are commuting and population data provided by the decennial Census of Population. Additional land use and economic census data may be required for classifying local areas as urban centers or primarily residential areas (under E

above). However, the latter data will not be required for identifying the basic FCA or MER units, or for delineating their boundaries.

G. Local Views

We advocate instituting procedures for identifying FCAs and MERs that rely on commuting cluster measures of spatial interaction rather than placing an emphasis on local views. While local views can offer guidance, a strong reliance on them in the definition of areas leaves open the possibilities for political pressure and arbitrary decisions.

Local views may have some influence on our designation of urban centers and primarily residential areas as categories of land use for the statistical presentation of data (under E above). However, these considerations are not relevant for the identification of FCAs or MERs or the delineation of their boundaries.

H. Frequency for Updating Statistical Areas

Because our definition of FCAs and MERs is dependent upon the availability of commuting data, we do not advocate updating the system between census enumerations unless reliable commuting data can be obtained elsewhere.

I. Data for Users

All of the statistical areas and geographic entities for statistical presentation proposed above are based on standard geographic units: county subdivisions, places, and counties. Hence, the wide range of data that are available for the latter units can be presented and disseminated for the various elements in the system we propose. Moreover, we also advocate developing a county-counterpart system of FCAs to facilitate comparisons of statistical measures that are only conveniently available at the county level.

III. Questions to Be Investigated

This proposal advocates defining settlement areas on a purely functional basis in light of the decoupling of resident-workers' activity spaces and local labor market areas from older physical configurations. These activity spaces can now occur totally within the "suburbs" or "nonmetropolitan territory" as they are classed under the present system. The proposed functional areas are not tied to any particular density criteria, linkage to core cities, or population homogeneity criteria. They are based simply on the assumption that community and local labor market activities cluster within spatially delimited areas.

Our formulation and operationalization of these local activity spaces, or FCAs, are based on certain assumptions about the overlap of activity spaces with local labor market areas, and the use of commuting data to delimit the boundaries of these spaces. However, we propose these ideas very much in the abstract. There is much need for investigations in the field of the measures and assumptions underlying our proposals. This involves examining larger questions such as: how closely do the FCAs, as delimited by commuting data, coincide with local perceptions of a common activity space? Also involved are smaller issues such as: do the commuting clusters, as measured on the basis of all employed workers, differ from those that are based on the commuting of only full-time workers?

We believe these kinds of issues can only be resolved from extensive on-site research activities conducted in selected parts of the country that have different patterns of settlement and county subdivisions (and, hence, different implications for commuting data). The kinds of questions that should be addressed in these investigations are:

- Questions of face validity. Do the commuting clusters, as measured with census commuting data, actually reflect daily activity spaces as indicated by other measures of interaction? Are the commuting cluster areas less valid in particular kinds of locations (for example, where large numbers of persons are out of the work force)? To what degree

are local activity spaces or labor markets spatially distinct from each other? To what degree is there a fair amount of overlap? What is an appropriate territorial size for the local activity space as manifested in different kinds of contexts (e.g., highly urbanized, suburban, and rural)?

- Questions of measurement specification. Are FCAs, as measured by all commuters, different from the ones approximated from full-time worker commuters? How greatly do they differ for population subgroups (e.g., men vs. women, minorities, or workers in different occupations)? If there are differences, which best approximates the local labor market area?

- Alternative indicators. To what degree can alternative indicators be used to identify FCAs? Experiments with alternative local measures of activity can be undertaken as can an assessment of indirect measures of some of our concepts. This might facilitate lesser dependence on census data, and a more frequent updating of the system.

These are only representative of the issues that need to be investigated in a thorough manner before adopting and implementing this (or any other) fundamental change to the existing system representing settlement areas. They involve both broad questions of concept formulation and more technical questions of measurement calibration. Appropriate states for conducting these investigations would include: California, Minnesota, New Jersey, North Carolina, and Massachusetts. These states differ from each other in their county subdivisions and also represent different types of urban and rural settlement patterns.

Footnotes

1. The basic underpinnings of this concept are put forth in McKenzie (1933) and Hawley (1950). However, as described later in this paper, the actual operationalization of metropolitan areas was in terms of high-density clusters linked by commuting without consideration of export, import, and service functions to the surrounding community.
2. See Hawley (1971).
3. See Duncan and Reiss (1956) for U.S. evidence through 1950, and Johnston (1971) for a review of research on this topic.
4. A less elaborate sliding scale had been introduced in 1971 for counties with between 15 and 30 percent commuting.
5. The metropolitan areas and their predecessor metropolitan districts, as officially designated, were never intended to include all the territory dependent on the area for specified services.
6. See Forstall (1991) for a comment on Beale's criticism.
7. Frey and Speare (1988) group the nation's 39 largest 1980 SMSAs into six classes on the basis of their region location, population growth status, and their central city's age.
8. Hartshorn and Muller (1986) as reported in Stanback (1991).
9. On the whole, nonmetropolitan growth has dropped off during the 1980s (Frey and Speare 1991). However, Fuguitt's (1991a) analysis shows that, within nonmetropolitan counties, the territory that exists outside of incorporated places continues to grow faster than that within places.
10. Although the official definition does not use the term "hinterland," the requirement of a densely settled core and a surrounding area defined by commuting to that core is similar to the core-hinterland model.

References

Beale, Calvin L. 1984. "Poughkeepsie's Complaint or Defining Metropolitan Areas" American Demographics 6: 28-48.

Beale, Calvin L. and Fuguitt, Glenn V. 1978. "The New Pattern of Nonmetropolitan Population Change." In Karl E. Taeuber, Larry L. Bumpass, and James Sweet, eds., Social Demography. New York: Academic Press. Pp. 157-77.

Berry, Brian J.L. 1973. Growth Centers in the American Urban System. Cambridge, MA: Ballinger.

Bianchi, Suzanne M. and Spain, Daphne. 1986. American Women in Transition. New York: Russell Sage.

Bogue, Donald J. and Beale, Calvin L. 1961. Economic Areas of the United States. New York: Free Press.

Cervero, Robert. 1986. Suburban Gridlock. New Brunswick, NJ: Center for Urban Policy Research, Rutgers University.

Cervero, Robert. 1989. America's Suburban Centers: The Land Use Transportation Link. London: Unwin-Hyman.

Coombes, M.G.; Green, A.E.; and Openshaw, S. 1986. "An Efficient Algorithm to Generate Official Statistical Reporting Areas: The Case of the 1984 Travel-to-Work Areas Revision in Britain" Journal of Operations Research Society 37: 943-953.

Coombes, M.G.; Green, A.E.; and Owen, D.W. 1988. "Substantive Issues in the Definition of 'Localities': Evidence from Subgroup Local Labour Market Areas in the West Midlands" Regional Studies 22: 303-318.

Dahmann, Donald C. 1990. "County-based Approaches to Categorizing Settlement Areas and Their Applicability to U.S. Population Research." Presented at the Annual Meeting of the Association of American Geographers, Toronto, Canada.

Duncan, Otis Dudley and Reiss, Jr., Albert J. 1956. Social Characteristics of Urban and Rural Communities, 1950. New York: Wiley.

Forstall, Richard; Rives, Jr., Norfleet; and Gossette, Franklin. 1982. "Defining Commuting Clusters of Counties for Demographic Research" Proceedings of the

1982 Social Statistics Section of the American Statistical Association. Pp. 450-455.

Forstall, Richard L. 1991. "Metropolitan Area Delineation: A Brief History." Presented at the Annual Meeting of the Association of American Geographers, Miami, FL.

Frey, William H. and Spear, Jr., Alden. 1988. Regional and Metropolitan Growth and Decline in the United States. New York: Russell Sage Foundation.

Frey, William H. and Spear, Jr., Alden. 1991. "U.S. Metropolitan Area Population Growth, 1960-1990: Census Trends and Explanations." Research Report No. 91-212. Ann Arbor, MI: Population Studies Center, The University of Michigan.

Fuguitt, Glenn V. 1991a. "Did the Nonmetropolitan Population Reconcentrate in the 1980s?" Presented at the Annual Meeting of the Rural Sociological Society, Columbus, Ohio.

Fuguitt, Glenn V. 1991b. "Commuting and the Rural-Urban Hierarchy." Working Paper No. 91-26. Madison, WI: Center for Demography and Ecology, University of Wisconsin-Madison.

Fuguitt, Glenn V.; Brown, David L.; and Beale, Calvin L. 1989. Rural and Small Town America. New York: Russell Sage Foundation.

Garreau, Joel. 1991. Edge City: Life on the New Frontier. New York: Doubleday.

Gottmann, Jean. 1961. Megalopolis. Cambridge, MA: MIT Press.

Hartshorn, Truman A. and Muller, Peter O. 1986. Suburban Business Centers: Employment Expectations. Final Report. Washington, DC: Economic Development Administration, U.S. Department of Commerce.

Hawley, Amos H. 1950. Human Ecology. New York: Ronald Press.

Hawley, Amos H. 1971. Urban Society: An Ecological Approach. New York: Ronald Press.

Johnston, William B. 1987. Workforce 2000: Work and Workers for the Twenty-first Century. Indianapolis, IN: Hudson Institute.

Kasarda, John D. 1988. "Jobs, Migration, and Emerging Urban Mismatches." In Michael G. McGeary and Laurence E. Lynn, Jr., eds., Urban Change and Poverty. Washington, DC: National Academy Press. Pp. 148-198.

Killian, Molly Sizer and Tolbert, Charles M. 1991. "A Commuting-based Definition of Metropolitan and Nonmetropolitan Local Labor Markets in the United States." Presented at the Annual Meeting of the American Statistical Association, Atlanta, GA.

Long, John F. 1981. Population Deconcentration in the United States. Bureau of the Census. Special Demographic Analysis CDS-81-5. Washington, DC: U.S. Government Printing Office.

Long, Larry and DeAre, Diana. 1988. "U.S. Population Redistribution: A Perspective on the Nonmetropolitan Turnaround" Population and Development Review 14: 433-450.

McLafferty, Sara and Preston, Valerie. 1991. "Gender, Race, and Commuting among Service Sector Workers" The Professional Geographer 43: 1-15.

McKenzie, Roderick D. 1933. The Metropolitan Community. New York: McGraw-Hill.

Morrison, Peter A. ed. 1990. A Taste of the Country: A Collection of Calvin Beale's Writings. University Park, PA: Pennsylvania State University Press.

Muller, Thomas O. 1981. Contemporary Suburban America. Englewood Cliffs, NJ: Prentice-Hall.

Noyelle, Thierry J. and Stanback, Jr., Thomas M. 1984. The Economic Transformation of American Cities. Totowa, NJ: Rowman and Allanheld.

Pisarski, Alan E. 1987. Commuting in America. Washington, DC: Eno Foundation for Transportation.

Schnore, Leo F. 1965. The Urban Scene. New York: Free Press.

Stanback, Thomas M., Jr. 1991. The New Suburbanization: Challenge to the Central City. Boulder, CO: Westview Press.

Tolbert, Charles M. and Killian, Molly Sizer. 1987. "Labor Market Areas for the United States." Economic Research Service, U.S. Department of Agriculture, Staff

Report AGES870721. Washington, DC: U.S. Government Printing Office.

Treadway, Roy C. 1990. "Central Cities, Suburbs and the Metropolitan Core." Presented at the Annual Meeting of the Population Association of America, Toronto, Canada.

Treadway, Roy C. 1991. "Alternative Definitions of the Metropolitan Core." Presented at the Annual Meeting of the American Statistical Association, Atlanta, GA.

Zimmer, Basil G. 1975. "The Urban Centrifugal Drift." In Amos H. Hawley and Vincent P. Rock, eds., Metropolitan America in Contemporary Perspective. Beverly Hills, CA: Sage. Pp. 23-91.

METROPOLITAN CONCEPTS AND STATISTICS REPORT

Richard L. Morrill
Department of Geography
University of Washington

Summary

Although the title of this project is "Metropolitan Concepts and Statistics," I viewed the mandate from the start as one of finding the most useful statistical areas for describing the American settlement system in its entirety.

This report's introductory section discusses the American settlement system's formal character and its functional reality--a complex system of larger urban cores and associated smaller urban places and rural territory. I argue that despite revolutions in technology, our lives still revolve around daily work and home-based activities and that all this is predominantly local. Thus the basic functional system is a set of labor market or trade areas, which includes metropolitan areas as we have known them; comparable nonmetropolitan labor market areas; and outer nonmetropolitan areas of allegiance to, but not part of, metropolitan areas. These three types of labor market areas in turn cluster into larger metropolitan or communications regions.

The large majority of us live in large urbanized, or metropolitan, areas, and no attempt to describe the American settlement system would be valid without recognizing distinctions among inner and older parts of our metropolises, the newer suburban parts, and also rural and exurban parts.

The body of this report consists of this summary, an introduction, and three substantive research sections devoted respectively to: (1) metropolitan and nonmetropolitan statistical areas; (2) the internal structure of larger urbanized (metropolitan) areas; and (3) defining nonmetropolitan-level agglomerations with populations of less than 50,000.

Metropolitan and Nonmetropolitan Areas

It is first argued that any independent urbanized area (with a population of 50,000 or greater) should qualify as a metropolitan core regardless of the population of the associated city or county. This change from official practice would have the effect of adding 16 areas to the list of metropolitan areas defined using 1980 census data. It is next argued that one simple criterion variable--percent commuting to the core--be used as the basis for inclusion of outlying areas; the 15-percent level used in the current metropolitan area standards seems defensible. Ideally, such commuting should be measured to the urbanized area, but lacking the required data, I used commuting to the counties containing the urbanized areas (the "central counties") for the purpose of this research.

An extensive discussion of alternate building blocks follows, ending in frustration with the dilemma of the county as a terrible unit with good data and the ZIP Code area as a superior unit but with instability and uncertain data. It is suggested that statistical areas be defined both by ZIP Code areas and by counties--in New England as well as elsewhere.

Two kinds of nonmetropolitan areas are distinguished: (1) nonmetropolitan center areas, whose urban agglomerations are significant trade and employment centers but which are under 50,000 population; and (2) outer metropolitan areas, which are part of the labor market or trade influence area of metropolitan areas, but are beyond the more intense commuting zone (i.e., have less than 15 percent commuting to the metropolitan core). Most counties were fairly readily allocated into appropriate areas of one or the other kind, but there were difficult, marginal cases as expected, and unresolved issues, such as minimum sizes of centers or areas, if any. The use of cluster analysis for an alternative uniform, rather than functional, division of nonmetropolitan territory is discussed and rejected.

We provided an allocation of counties to areas that was done in a hierarchical fashion and that resulted in a six-level nested hierarchy of statistical areas--an exercise of uncertain utility.

Relative to the official 1980 census-based metropolitan areas, this metropolitan area/nonmetropolitan area experiment resulted in: (1) the addition of 16 new metropolitan areas; (2) a small addition of metropolitan territory in New England; and (3) a very significant addition of 246 counties and almost 6 million people to currently defined areas by using the 15 percent commuting criterion stripped of additional conditions required by the official standards. Together, these changes increased the metropolitan share of the 1980 U.S. population from 76 to 79 percent. Also, the experiment resulted in designation of 230 outer metropolitan areas with 12 percent of the national population and delimitation of 202 nonmetropolitan center areas with 9 percent of the population. About 750 statistical areas were found (314 metropolitan areas and 432 nonmetropolitan areas); but the number of functional labor market areas is 516 (314 metropolitan areas and 202 nonmetropolitan center areas). These numerous areas nest in turn into smaller numbers of areas of a higher level, for example about 120 regions and subregions.

Internal Structure of Metropolitan Areas

The second section of the report concerns the internal division of larger urbanized (metropolitan) areas into inner, older city zones and outer, newer suburban zones. The intent is to better capture the behavioral, social, and economic differences that are no longer expressed well by a simple central city-balance of metropolitan area dichotomy. Using several cities--Atlanta, Boston, Indianapolis, Portland, Seattle, and Spokane--it was found that the 1950 urbanized area boundary quite nicely delimited the older and newer portions of the built-up area, with significant differences observable across a number of social and economic variables such as household structure, age, poverty status, home ownership, and racial composition.

Agglomerations with under 50,000 Population

The report's third section argues for also delimiting all agglomerations over 2,500 population but smaller than 50,000 population. Using Washington as an example, this is shown to shift about 2.5 percent of the state's population from rural to urban. More important, it produces a significantly different pattern of numbers of places and

shares of population in size levels below 50,000. It especially brings out the true size and importance of the larger nonmetropolitan places that are the cores of nonmetropolitan center areas.

Conclusion

The various areas examined in this project--more simply defined metropolitan and nonmetropolitan areas; urban agglomerations under 50,000 population; and urbanized areas divided into older and younger portions--constitute, in the aggregate, a logical and unified system of statistical areas.

We do need to define urban cores on the basis of density, preferably housing unit density for consistency over space and time; and if we agree that the logical basis of a national division of settlement should be functional, or market areas in the broadest sense, then smaller as well as larger urban cores deserve recognition.

The internal division of urban cores, at least the larger ones, into inner and older and outer and newer zones is I think justified on programmatic as well as intellectual grounds.

The main work of this project concerned creation of an exhaustive national system of metropolitan and nonmetropolitan statistical areas. It is clear that the nation is already divided into a set of functional regions. Whether called communications regions or market areas, they are very real, and several approximations of this set have been defined and used by private and public organizations. All of the regions have one or more dense urban cores, most but not all of which are of metropolitan status. The larger of such functional regions contain a cluster of metropolitan areas. These regions also include varying proportions of areas beyond their metropolitan areas, their more intense labor markets. Some of these nonmetropolitan areas are potential metropolitan areas themselves; some are in the metropolitan influence areas but beyond the intense commuter zone.

This research report provides one realization of a national system. The regionalization uses counties, but ideally ZIP Codes could be used to "fine-tune" the system

where counties are inadequate. The basic set of metropolitan and nonmetropolitan statistical or labor market areas in turn are the logical building blocks for defining larger market areas or communications regions.

Table 1 provides a summary of the recommended statistical areas that can be used to delineate the American settlement system.

This research project is aimed at developing a classifactory system that would be used with 2000 census data. However, even if a full-scale new system is not officially in place until then, it is only sensible to work intensively, on the basis of 1990 data, to lay out alternate systems for evaluation by appropriate groups or agencies. If parts of a system are agreed to in the interim, why not implement them?

Introduction: The American Settlement System

A settlement system is at once morphological--the places we see on the landscape--and functional, the structure of interaction of people and activities among places, which in fact defines and alters that morphology. A good system of statistical areas for a nation needs to capture both of these aspects of settlement and relate them logically. It especially needs to recognize the actual regional organization that people have created.

Social scientists concerned with the settlement system tend to focus on how it changes. We write about the basic shifts from country to metropolis, from city to suburb, and from production to consumption; and we assess the immense impact of the interstate highways, of air travel, of communications, and of affluence and leisure time. These transformations are indeed vast and liberating, but they modify rather than overcome the "tyranny of space." All of us--yes even pilots, traveling salesmen, electronic wizards, and the homeless--are bound to places by personal and activity ties. And all of us--yes even the retired and the unemployed or welfare dependent--are bound to sites for work or school or services. In other words, we are all part of a structure of settlement and activity and communications that

Table 1: Summary of Settlement Areas

Level	Settlement Type	Building block units	Criteria for inclusion	Numbers
1	Urban core	ZIPs, census tracts, block groups	Building density	600 (approx.)
1A	Inner urban	"	Time of urbanization	--
1B	Suburban	"		--
2	Labor market areas	ZIP Codes, counties	Two-way commuting	746
2A	Metropolitan (labor market) areas	"	Commuting >15%	314
2B	Nonmetropolitan center (labor market) areas	"	High commuting to <50,000 population core	202
2C	Outer metropolitan (labor market) areas	"	Commute <15% but linked to metropolitan area	230
3	Communications regions	Labor market areas	TV, media markets	100-150
3A	Metropolitan clusters	2A areas	Contiguity, interaction	--
3B	Nonmetropolitan clusters	2B, 2C areas	"	--
3C	Metropolitan labor market areas	2A + 2C areas	"	--
4	Major communications regions	Combinations of level-3 areas	"	20-60

remains mostly local, that is mostly daily. Work, and yes, production, in its real, broad sense is still the foundation of human survival.

As we observe the landscape, by driving or flying or from satellite imagery, we discern that most of us, probably 90 percent, live in definable settlements, even if sometimes dispersed. Just as high a proportion of us work in similar clusters. Indeed, employment and other organized activities are vastly more centralized than residences, and this fact generates most of the stupendous visible (traffic) and invisible (communications) interaction that gives life to the settlement system.

How do we best describe this system? There is first the tangible, physical level of settlement, which means the places we live and work in, and which is best captured by the agglomeration. An agglomeration is simply a cluster of people and structures, the idea that they are closer to each other than to another such cluster. Such a cluster becomes urban when it exercises economic, social, and political functions of a character that mediate to the larger society. Whether the time-honored minimum cutoff of 2,500 people to qualify as urban remains meaningful or useful is not clear, but neither has it been proven obsolete.

Some of these agglomerations are more important than others in the sense of being larger and of having levels of activities, jobs, services, and communications that reach far beyond their physical limits to encompass rural countryside and smaller places, urban and rural. Perhaps there are in the U.S. as many as 1,000 of these agglomerations (or as few as 500), which together define the basic functional structure of settlement, and which delimit the urban cores and the hinterlands that encompass most daily human activity.

The largest of these agglomerations (with populations over 50,000) we have chosen to recognize as urbanized areas, and together with their hinterlands we have called them metropolitan areas. But any such arbitrary cutoff does not end the reality of such functional areas.

The basic, territorially exhaustive statistical unit we are after is the actual functional region of our landscape, the labor markets or service areas dominated by these

agglomerations. This is an idea that the metropolitan area was intended in part to capture, for some of the nation's territory, but many, probably over 200 urban areas under 50,000 in population also serve as centers of their own functional (labor market) regions. So a necessary overriding principle of describing the national settlement system is that we must recognize that all of the nation's territory is part of some functional labor market, large or small, and that if metropolitan labor market areas describe part of the territory, then nonmetropolitan labor market areas describe another equally real part.

As will be seen below, if we maintain our traditional sense of what is a metropolitan area, then there are really three kinds of territory: (1) the metropolitan (labor market) area, (2) the nonmetropolitan (labor market) area around smaller urban cores, and (3) the outer metropolitan (labor market) area around or beyond already recognized metropolitan areas. Depending on how delineation is accomplished, the number of basic labor market areas will vary. Using my criteria, I found 314 metropolitan areas, 215 of which also had one or more nonmetropolitan outer areas (termed outer metropolitan areas), and 202 nonmetropolitan center areas; that is, I delineated 516 labor market areas with their "own cores," but about 750 statistical areas, if inner metropolitan and outer nonmetropolitan parts of the extended metropolitan-dominated labor markets are distinguished (Table 1).

Is it meaningful to make this distinction--to divide the broader market area into a more intense area akin to the existing metropolitan area and an outer zone of less intense interaction? Killian and Tolbert in developing their labor market areas and the U.S. Bureau of Economic Analysis in creating its BEA economic regions did not think so. My view is that those who want the combined area can do so, but that there is a quantitative and qualitative difference that justifies retaining the metropolitan area as the zone of high level of interaction, one that really is identifiable on the built landscape in traffic patterns and in the very sense of people viewing themselves as part of the metropolitan area.

Is "labor market area" the right term? Does it put too much emphasis on employment? Do areas really have centers and hinterlands anymore? I prefer the terms "metropolitan areas," "nonmetropolitan center areas," and "outer metropolitan areas," but there may well be better ones. "Labor market areas" may be too restrictive, even though as argued above, work is still the dominant organizing activity of our lives, and I recommended that commuting--the journey to work or school--be the basic criterion variable for delineating statistical areas. Other information can and should be used, where commuting levels are very low but other forms of interaction are strong.

Again, as argued above, there really are centers and hinterlands, but admittedly these are not always unambiguous. Some areas may well have multiple, functionally related centers, such as with respect to health provision or television or air travel or industrial production. Some small areas or places really are torn equally between larger places. A few small areas may be only tenuously connected to any larger center. But overall, the argument is that spatial structure exists and that real functional regions can be defined, and that there will be relatively few marginal and ambiguous cases.

While we all belong in (and are aware of belonging in) these fairly numerous functional labor market areas, we also know that we are part of larger regions that are organized by more important centers of economic and social control. For decades, there have been academic, public, and private descriptions of this larger scale organization, from the Federal Reserve system to Rand McNally's trade areas. Such regions have been defined on the basis of railway activity, wholesale trade, newspaper circulation, telephone use, air travel, and more recently, by television. There is no doubt that these are real and meaningful--the reality is beaten into people every day through the news and advertising. Our lives are bound up in these regions that were traditionally called metropolitan regions or trade areas. Whatever the term, the defining interactions are mostly communications in the broad sense. Delimitation at this level requires us to go beyond census data to data in these forms of interaction (television, air travel, and telephone).

Generally these larger metropolitan regions will be found to consist of a small set of the basic labor market areas (one to several metropolitan areas--perhaps a larger area together with satellite areas), outer metropolitan areas, and some associated nonmetropolitan center areas, all dominated by the same metropolitan television, airport, or like activity. It is probably more difficult to define a standard set of such larger areas for official statistical purposes than it is to define the basic labor market areas, but ample research has documented that there is a hierarchy of regions in American life: from the "Big Three" dominated by New York, Los Angeles, and Chicago; to perhaps 20 large regional capitals; to perhaps 100 to 150 areas that define the broad commercial and economic structure of the country.

Returning to the urban agglomeration: a fundamental fact of American life is that a large majority of us live in urbanized areas, and most of us live in large urbanized areas with over 250,000 population. And, just as we know that we are part of a metropolitan region, we also know that we are part of the "city" or of "suburbia" or of "exurbia." These distinctions reflect variations in the character of the built environment; of social, economic, and political behavior; and of relative affluence and deprivation that are the stuff of politics, journalism, and academic research. We used to get at this distinction by means of a central city-balance of metropolitan area dichotomy. For a variety of reasons discussed below, that simple dichotomy is no longer valid; but it is worth tying to reinvigorate the distinction by means of a possible delimitation of an inner and older core from an outer suburban zone.

Metropolitan and Nonmetropolitan Statistical Areas

Introduction

Several of the project's tasks collapsed into one effort in the course of the analyses: the issue of simplifying the current official criteria for metropolitan status as detailed in the Office of Management and Budget metropolitan area standards, the matter of nonmetropolitan statistical areas, the interest in a possible hierarchy of

metropolitan (or of all statistical) areas, and even the possibility of defining metropolitan areas on the basis of subcounty units such as census tracts or ZIP Code areas. All of these tasks proved to be interrelated, so that this section of the report discusses an entire system of statistical areas, metropolitan and nonmetropolitan, a system that is also hierarchical in structure. The system is defined on the basis of county building blocks, absolutely including New England, which undoubtedly has the worst--that is most morphological and least functional--defined areas in the country under the current standards. However, ZIP Codes are discussed as a desirable alternative building block. An entire system of statistical areas is tentatively defined for the United States using 1980 data.

Purpose

The purpose here is to divide the country exhaustively into metropolitan and nonmetropolitan statistical areas. It is first necessary to distinguish what is metropolitan. Under the current official approach, this has become incredibly complicated with layer after layer of rules and criteria. Arbitrary cutoffs are obviously unavoidable in any classification scheme, but in principle they should be minimized.

Metropolitan Areas

The first task is what qualifies a place as a metropolitan core. The main operative requirement under the metropolitan area standards is having an urbanized area (with a population of 50,000 or greater). This is plausible and reasonable, but it has been conditioned by irrelevant criteria, such as county population or central city population, when of course county and city boundaries are arbitrary. Therefore, I simply use the urbanized area criterion, assuming it is not already inside a metropolitan area. I see no logical justification whatever to designate a metropolitan area like Victoria, TX because the city has over 50,000 population, or Visalia-Tulare-Porterville, CA because the county is over 100,000, but not Missoula or Grand Junction or Cheyenne (using 1980 data).

Adopting this approach with 1980 data would have had the effect of adding another 16 areas: Decatur, AL; Auburn-Opelika, AL; Yuma, AZ; Grand Junction, CO; Rome, GA; Pocatello, ID; Danville, IL; Hattiesburg, MS; Missoula, MT; Santa Fe, NM; Longview, WA; Rapid City, SD; Cheyenne, WY; Goldsboro, NC; Naples, FL; and Jackson, TN. Six of these were added as official metropolitan areas between 1984 and 1989. Two other added metropolitan areas, Merced and Jamestown, would not seem to have qualified with 1980 data, as the potential urbanized areas were under 50,000 population.

The second task is to define the extent of the metropolitan area. The inclusion of suburban counties under existing criteria is yet far more complex than the identification of metropolitan areas and is a function of county population growth, urbanization, density, pieces of urbanized area, and various levels and combinations of commuting. I reject these summarily as inconceivably complex and utterly illogical. Since density and proportion urban are morphological, not functional, they seem irrelevant to the issue of defining what is metropolitan. Metropolitan means that people are tied to the urban center in a behavioral way or functionally, by working, shopping, and obtaining services, not by the accident of the morphological character of settlement, which is what the urbanized area is rightfully about.

If one realistically reviews the host of functional variables that might be used, e.g., newspaper circulation, television viewing, hospital use, department store use, and so on, the only reasonably available and consistent variable is commuting to work, and it is by far the clearest and simplest indicator of functional integration.

Therefore I use the county's percent commuting as the only criterion variable. Here of course some arbitrary cutoff must be chosen. For want of an actual behavioral study, say of attitudes of people at various commuting levels as to whether they perceive themselves as part of the metropolis, I will operationalize my classification simply by accepting the 15 percent commuting level that is part of the metropolitan area standards. The difference will be that dozens more counties will obviously qualify if we

abandon the arbitrary conditions of density or urbanization. My conclusion, from knowledge of many of the newly qualifying counties, is that American metropolitan areas (especially in New England, but more on that later) are seriously and unrealistically underbounded, and that the results produced with a 15 percent cutoff are defensible and appropriate.

A third task arises as to what core area should any commuting cutoff apply? Logically and ideally, commuting should be to the urbanized area(s) that contains the employment or to the set of ZIP Code areas that most closely approximate the urbanized area. I am not sure, because I was unable to do the necessary work with the Urban Transportation Planning Package (UTPP) tapes, how easily one can calculate commuting from counties or parts of counties to the urbanized area as such; in theory it should not be too difficult, but in practice it may be. For 1980 this was evidently possible for metropolitan areas but perhaps not for nonmetropolitan ones. Another problem was the frequency of insufficient information to allocate workplaces. The 1990 data should be more complete.

So we turn to counties as core components. How much urbanized area should a county include to qualify it as a "central county" for commuting evaluation purposes (if the urbanized area extends beyond a single county)? I chose the cutoff that the proportion of urbanized-area population in a county must be one-third of that county's total population. The existing criterion is one-half; that seems excessively high. It would be desirable to know the proportion of the county's employment in the urbanized areas, but I do not know if this is readily available from census data.

If the statistical areas were defined on the basis of ZIP Codes, then the appropriate measure would be commuting from ZIP Code areas to the urbanized area.

My original intention was to examine a few sample states, but with excellent graduate student assistance, I decided to look at the entire United States to find all counties that would qualify as "central," and then to calculate the percent commuting to these central counties from all U.S. counties. Please see the results section for the net effect of this simplification and liberalization of

the criteria for metropolitan areas. Also, please bear in mind that we did not have available the county-to-county commuting matrix for this project, the use of which would have reduced the chance of errors in this exploratory effort.

The issue of alternate building blocks. The current metropolitan area classificatory system, in which counties are used as the building blocks in all states except in New England (where cities and towns are used), has long been criticized, and reasonably, because the inconsistency of results between New England and the rest of the country is great and indefensible. Now the criticism has largely been against the limitations of counties. Particular problems with using counties include:

1. the excessive areal extent of some counties, especially in the West or western Midwest, where part of a county can be clearly "behaviorally metropolitan" even though another part is remote;

2. the wide variability in population density within counties, causing difficulty in the context of the existing arbitrary morphological-type criteria, but also leading to problems in interpretation and meaning of such widely used variables/concepts as central city versus balance of metropolitan area (this has the effect of underbounding or overbounding metropolitan areas; e.g., Grand Forks, Terre Haute, and St. Joseph);

3. the position of some counties between competing central counties, so that parts of counties would logically be assignable to different areas, sometimes with the result that an obviously commuter county is not assigned at all (e.g., Shiawassee, MI).

Together these problems mean that a major issue for this investigation of metropolitan concepts is whether subcounty units, such as census tracts or ZIP Codes, are usable as building blocks of statistical areas.

Potential building blocks. There are three principal geographic units, or building blocks, that are sometimes named as candidates to replace counties in defining metropolitan areas.

1. Minor civil divisions (MCDs). Northeastern, Midwestern, and some states in the South do have MCDs for which population and a fair amount of other information may be available between censuses. This availability of data matters, because the main argument against using subcounty units is the inability to continuously update metropolitan area statistics, since metropolitan areas are incredibly heavily used statistical areas. Unfortunately MCDs do not exist in the West or much of the South, where census county divisions are provided by the Census Bureau but are otherwise not widely used, and for which intercensus estimates are not made.

2. ZIP Code areas. ZIP Code data are increasingly widely used, including in economic censuses, and are potentially popular and desirable for our purpose here, because much health, services, and economic data are only collected for counties, cities, and ZIP Codes. Also intercensus estimates are made for ZIP Code areas by national planning data firms, at least in many areas.

3. Census tracts. Census tracts are generally smaller than ZIP Code areas or minor civil divisions in metropolitan areas, but their nonmetropolitan counterpart block numbering areas may be larger in sparsely settled areas. For the potential purpose of an alternatively defined metropolitan area, census tracts and block numbering areas have the advantages of having census commuting data and reasonably consistent size and definition. Populations are estimated for these units between censuses, at least for some metropolitan areas.

There are three main problems in defining metropolitan areas on the basis of subcounty units.

1. Limited amount of data, especially between censuses. By far the most serious problem--perhaps a fatal flaw--is that vast amounts of data are collected for counties, but literally an order of magnitude less data (or worse) are collected for subcounty units. Relatively few data are collected for census tracts; more but still not enough are collected for ZIP Code areas or even MCDs, at least for most states. This means that even if metropolitan areas were defined by subcounty units, probably the majority of users would have to use the nearest county-based equivalents anyway. Obviously, this problem becomes far more serious between censuses.

2. Small area intercensus estimating error. Even where estimates are made, whether for MCDs, ZIP Code areas, or census tracts, errors are greater, the smaller the units, or the more rapidly changing. (This is true for sparsely settled counties, too.) Comparisons of local estimates with census data for 1990 are very sobering and suggest that errors of 20 percent or more are not uncommon, even in sophisticated areas with good information systems and well-qualified estimators. I analyzed 1985-1987 National Planning Data Corporation ZIP Code area estimates for much of the state of Washington. Errors of 10-20 percent were common; and errors in characteristics, like age, were far more serious.

3. Application of a subcounty criterion. If a subcounty building block is used, on what basis will a unit be inside or outside a metropolitan area? In my proposal for this research, in which I was moderately positive about the possibility of using subcounty units, despite the above problems, I suggested that commuting to the urbanized area would be the most consistent criterion. Commuting to central business districts, central counties, or central cities in this context would all be meaningless and utterly inconsistent. The urbanized area, which utilizes subcounty units, at least captures the urban zone of most employment. One difficulty with using the urbanized area solely, of course, is the presence of large secondary employment centers within the

metropolitan area but beyond the main urbanized areas, e.g., Newark, OH relative to Columbus.

Each of the subcounty units presents specific drawbacks. The major problem with MCDs is inconsistency; they exist in only some parts of the country. Limited although very valuable kinds of data are available for ZIP Code areas, but these areas are widely incompatible with census geographic units. Also, the postal service frequently changes ZIP Code areas, since their main purpose is for mail delivery. Finally, only some areas estimate census tract/block numbering area populations between censuses, and the quality of estimation varies widely; very limited data are compiled for these units between censuses.

In conclusion, we are faced with a real dilemma. Counties are inadequate geographic units with good data, while ZIP Code areas, MCDs, and census tracts/block numbering areas are much better units with dubious data. My tentative conclusion is that subcounty units will not work. They are nice in theory and impractical in reality, especially if we are talking about a national system of statistical areas, nonmetropolitan as well as metropolitan. The difficulties that seem insurmountable even in large, sophisticated metropolises, might be completely intractable in nonmetropolitan areas.

But, one could say, what about New England? This currently is the region of misapplication of metropolitan criteria and provides a rationale for abandoning the idea of subcounty units there as well as anywhere else. Far from being an advantage, the use of towns and cities as building blocks has, in effect, reinforced a morphological rather than a functional interpretation of the metropolis. This is indicated not only by the lack of difference between urbanized area and metropolitan area, but even more by the very designation as metropolitan areas of places that would be suburbs elsewhere: Meriden, Bristol, New Britain, and even Brockton, Stamford, and Norwalk fall in this group, although they were originally distinct areas and still may regard themselves as such. Are Nashua and Manchester really distinct metropolitan areas? These underbounded, over-specified places totally fail to reflect the real world of

interstate highways in 1990 (or of 1980), when the actual commuting zone of Boston goes beyond Manchester, NH and Kennebunk, ME along the coast.

In this interstate highway era, counties do about as well in New England as they do elsewhere. Yes, Worcester is a little odd, and New Haven and Waterbury are not wonderful together, but all that territory is currently unmistakably metropolitan. So I strongly argue for ending the differential treatment of New England, and for using counties everywhere. The New England county metropolitan areas (defined also under the metropolitan area standards) are surely more reflective of the current situation than the anomalous small metropolitan statistical areas and consolidated metropolitan statistical areas in that part of the country.

Still, having argued the case for using counties generally, I must also say that their problems are severe enough that we must experiment with an alternative geographic unit. ZIP Code areas are probably the only practical alterative. Fortunately these are very widely used and known; they are in the TIGER files and in local geographic information systems. Of the subcounty units, ZIP Code areas are the most promising in terms of data availability. ZIP Code areas typically and usefully distinguish major commercial-industrial from residential land uses. Origin-destination commuting data are easily coded for ZIPs, and Internal Revenue Service migration data are available as well.

Arguably, if ZIP Code areas were adopted to define metropolitan areas, then pressure would be created by the user community (business, government, and others) to rationalize the most census-incompatible ZIP Code areas, and also moderate their changeability. These considerations make it highly worthwhile to undertake an evaluation of two sets of statistical areas--ones based on ZIP Code areas and the closest county-based equivalents.

Nonmetropolitan Areas

The strategy to this point has been to delimit metropolitan areas on the basis of recognizing each independent urbanized area as a core and including within

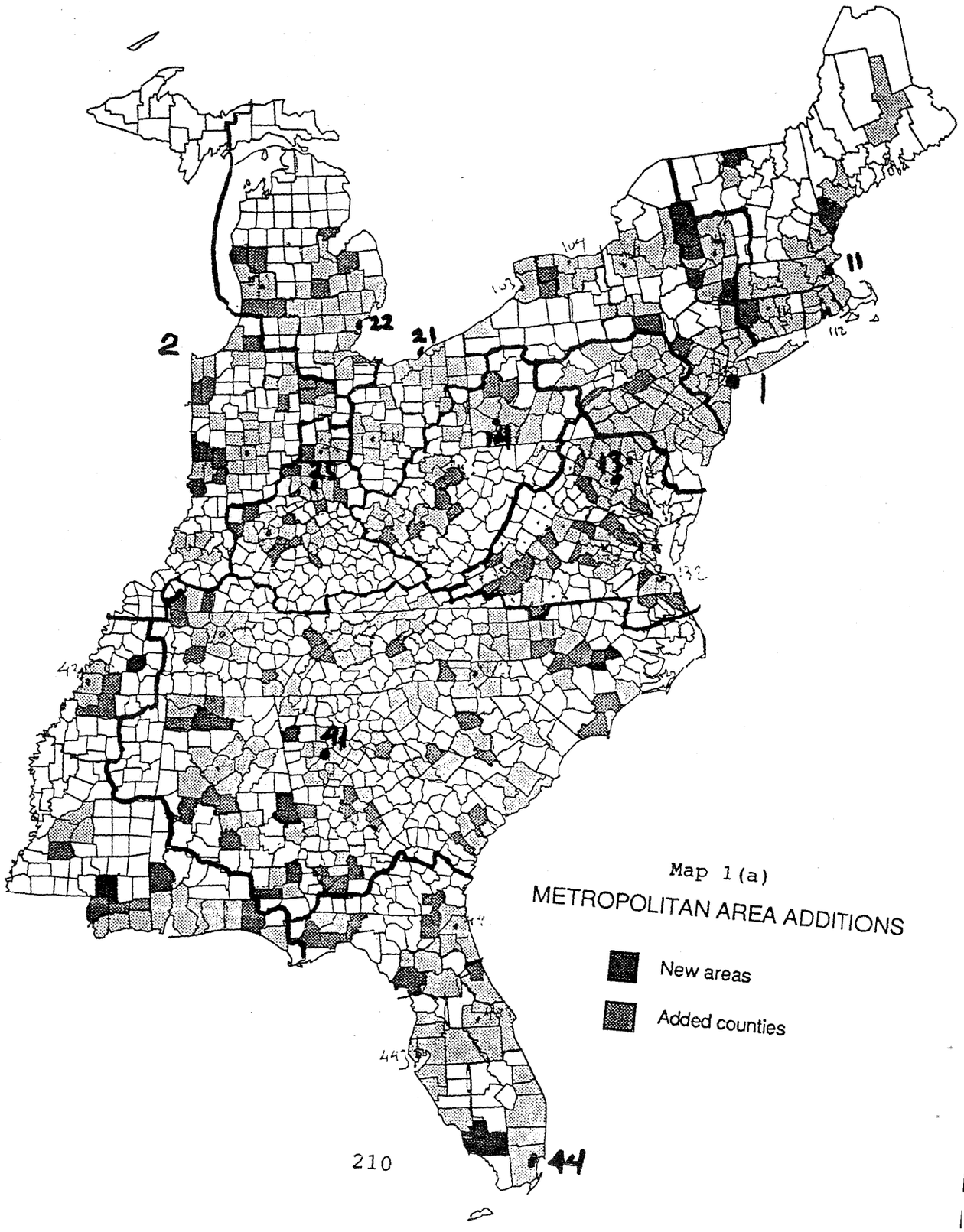
the metropolitan area all surrounding counties with commuting levels of greater than 15 percent to the core (or its county surrogate). The resulting metropolitan area changes are shown in Map 1.

This then leaves as residual territory and population all that is therefore nonmetropolitan. How to designate and divide it?

Examining maps and considering the character and population of nonmetropolitan counties relative to metropolitan areas reveals a fairly simple and obvious structure. There are hundreds of counties that are adjacent to metropolitan areas that have significant but less than 15 percent commuting to any core. These are obviously in the outer influence area of metropolitan areas, even if most of the population may not be metropolis-oriented in much of their daily life. As a result, it seems sensible to define outer metropolitan areas adjacent to defined metropolitan areas.

But there are also hundreds of nonmetropolitan counties either beyond any obvious daily metropolitan influence zone, or which, even if they are close to a metropolis, seem to be rather independent, and themselves potential new small metropolitan areas (indeed some of these will qualify on the basis of 1990 data and current metropolitan area standards, and more would qualify under my suggested criteria).

All of this latter kind of nonmetropolitan territory seems to be divisible into what might be called nonmetropolitan centers and their hinterlands, or simply nonmetropolitan center areas. Not surprisingly, in more densely settled parts of the country, like the Midwest, many of these areas will have populations between 25,000 and 50,000, while in low-density areas like eastern Montana or western North Dakota, or Nebraska or Kansas, the populations will be smaller. But they all have the characteristic of being trade, employment, and service centers in the same functional sense as metropolitan areas (with outer metropolitan areas). Because the populations of nonmetropolitan center areas are relatively small, there is no logic in separating their "central counties" from hinterland counties.

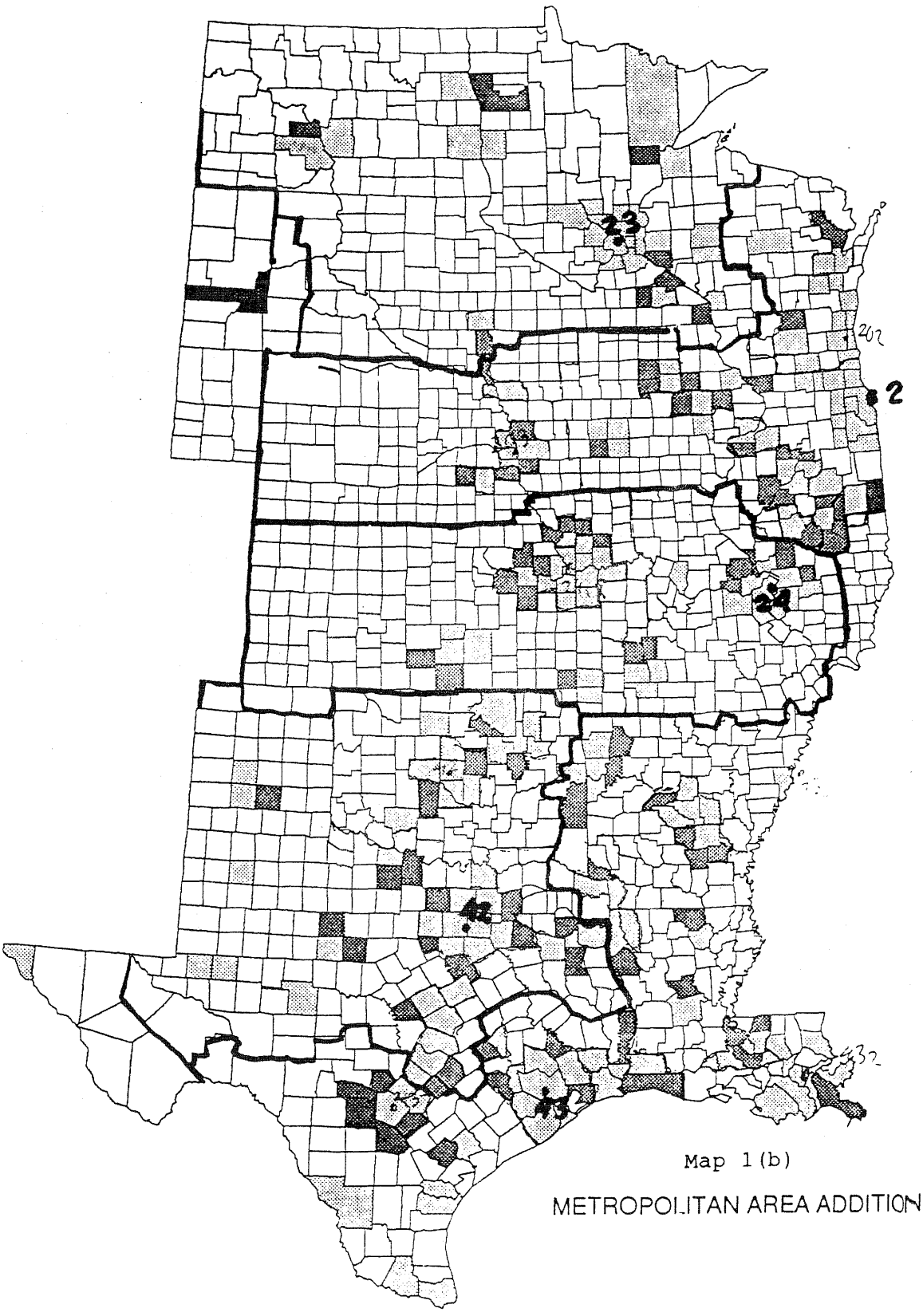


Map 1(a)

METROPOLITAN AREA ADDITIONS

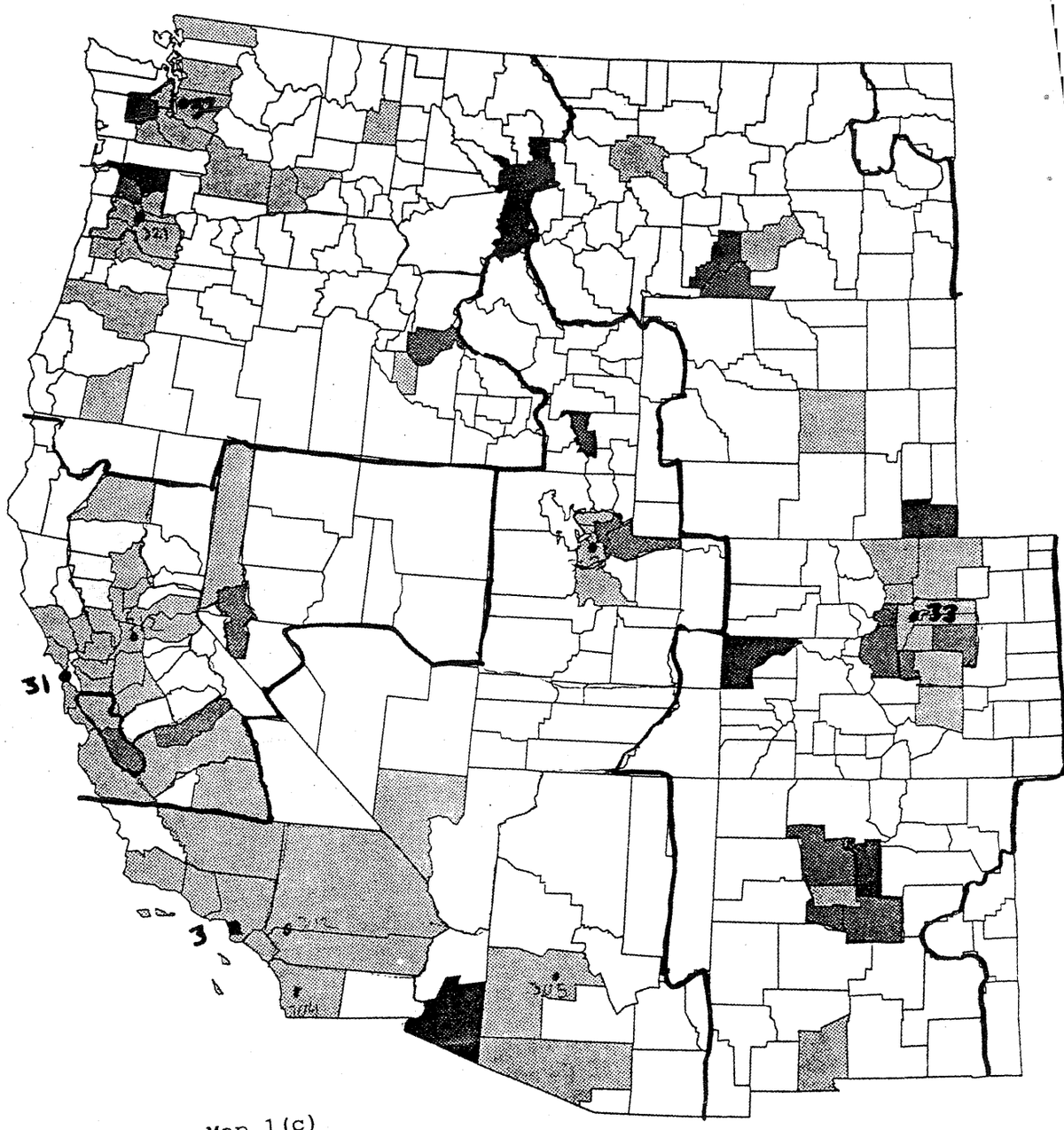
New areas

Added counties



Map 1(b)

METROPOLITAN AREA ADDITIONS



Map 1(c)

METROPOLITAN AREA ADDITIONS

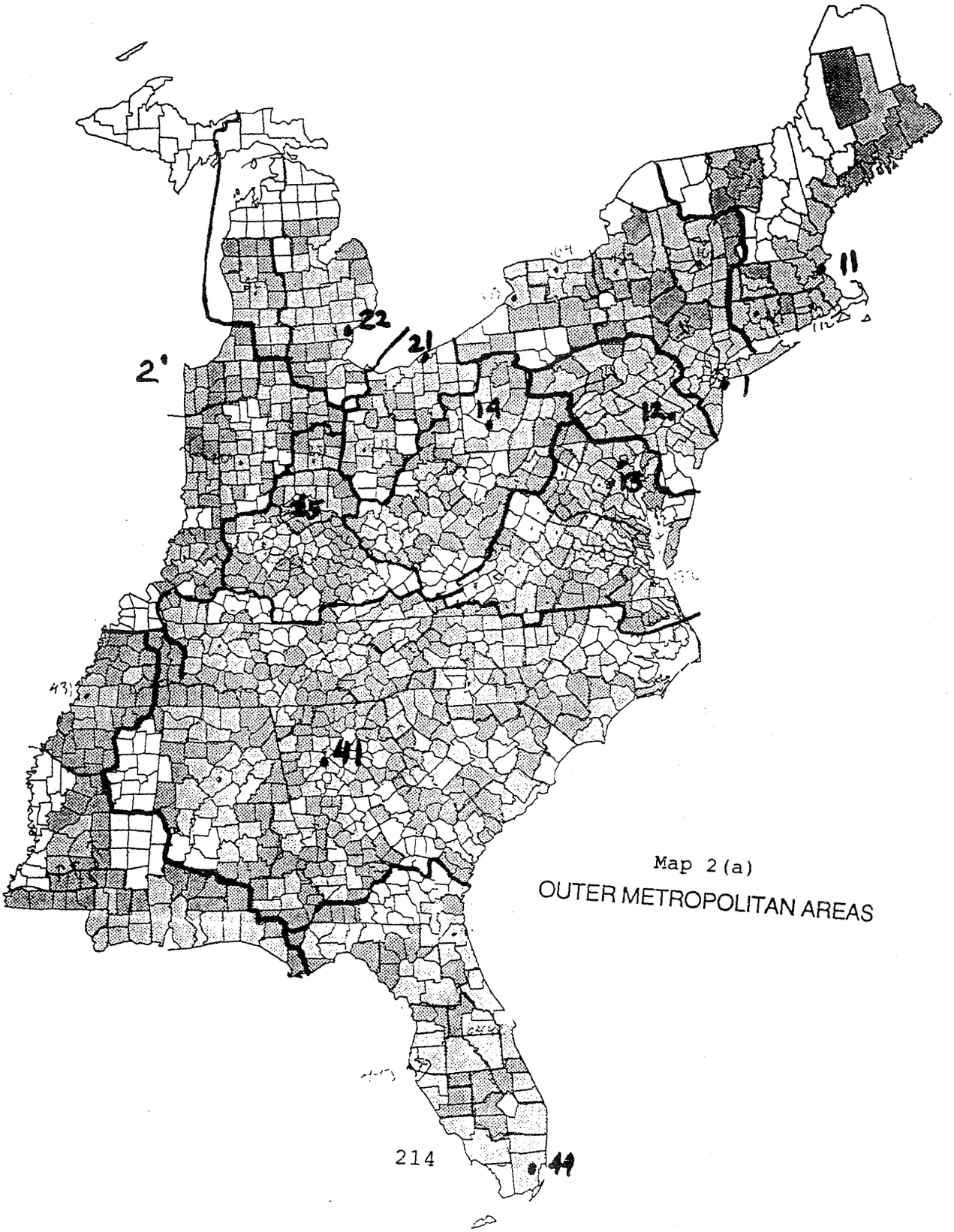
Having decided on this general strategy, we used the following kinds of information to delimit outer metropolitan areas and nonmetropolitan center areas:

- highway maps
- census population data for places, MCDs, and census county divisions
- census data on proportion commuting out of the county, and to any specific metropolitan area
- commercial maps of trade areas, such as Rand McNally's.

The strategy was first to identify counties--from their populations and locations, and from their low proportions of commuting out but high proportions of commuting in from neighboring counties--that served a surrounding hinterland. These were mapped, as were the proportions commuting to any and all metropolitan areas. For probably 90 percent of counties, this produced a fairly simple distinction between outer metropolitan areas and nonmetropolitan center areas (Maps 2 and 3). Naturally there were the 10 percent or so of marginal, difficult cases.

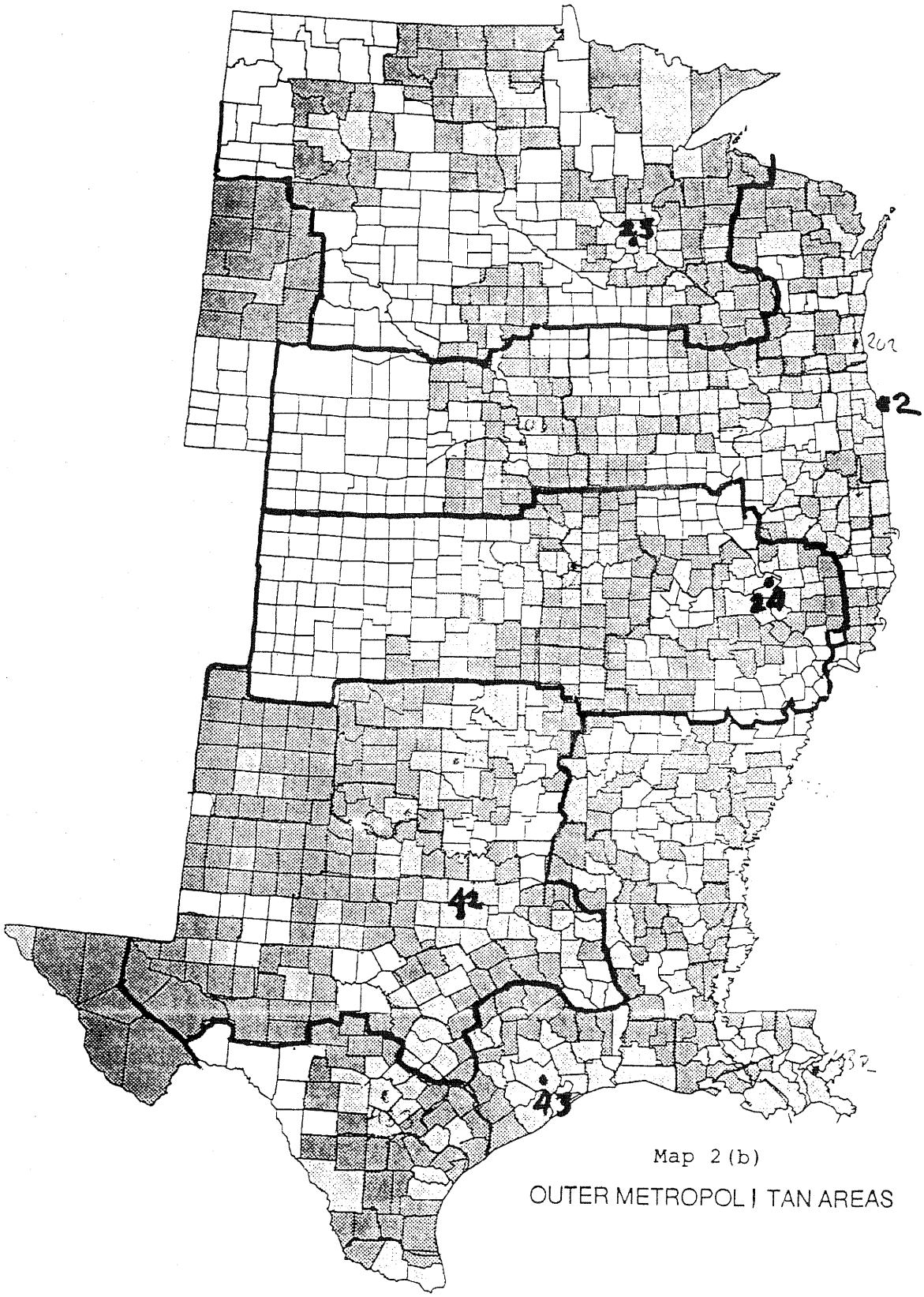
How small can a nonmetropolitan center be? I included small, remote places like Berlin, NH; Pikeville, KY; Craig, CO; Spencer, IA; West Plains, MO; and Ely, NV. More uncertain were some small cities near metropolitan areas--like Gainesville, GA (separate or outer Atlanta?), Talladega, AL (separate or outer Birmingham?), and Winona, MN (separate or outer Rochester?). Generally, centers/areas were recognized as separate if they had very low out commuting, and usually, at least another dependent county. Very likely, the most difficult part of implementing this conceptually simple idea will be the issues of whether particular centers/areas are independent or functional parts of larger ones; how to allocate really remote areas without significant commuting; and how to allocate areas with clearly split linkages to different work destinations.

In my initial proposal for this project, I suggested arguments for using cluster analysis to delimit regions of a relatively homogeneous character, for instance on the basis of industry or ethnic character, or perhaps using a



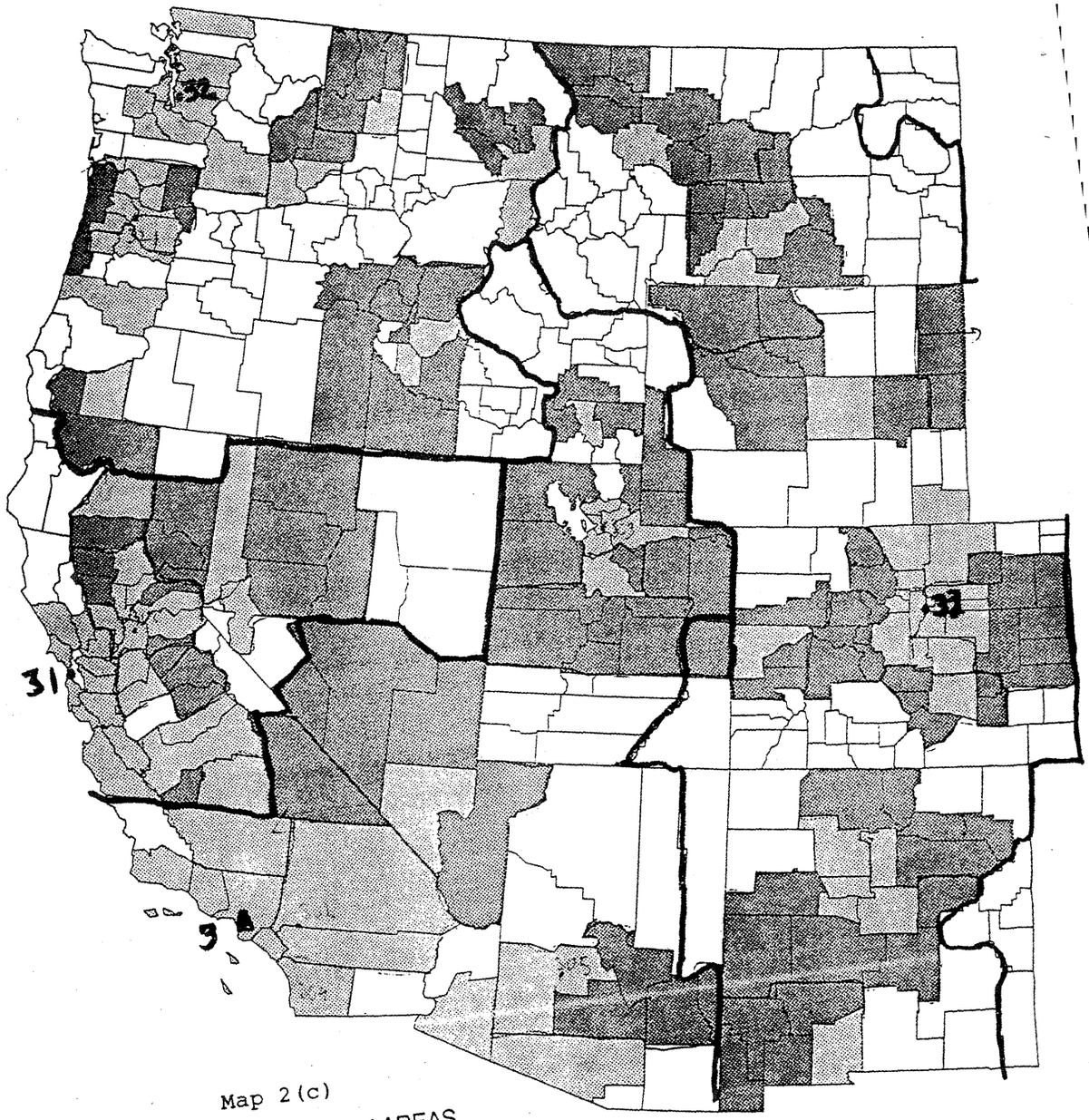
Map 2(a)

OUTER METROPOLITAN AREAS



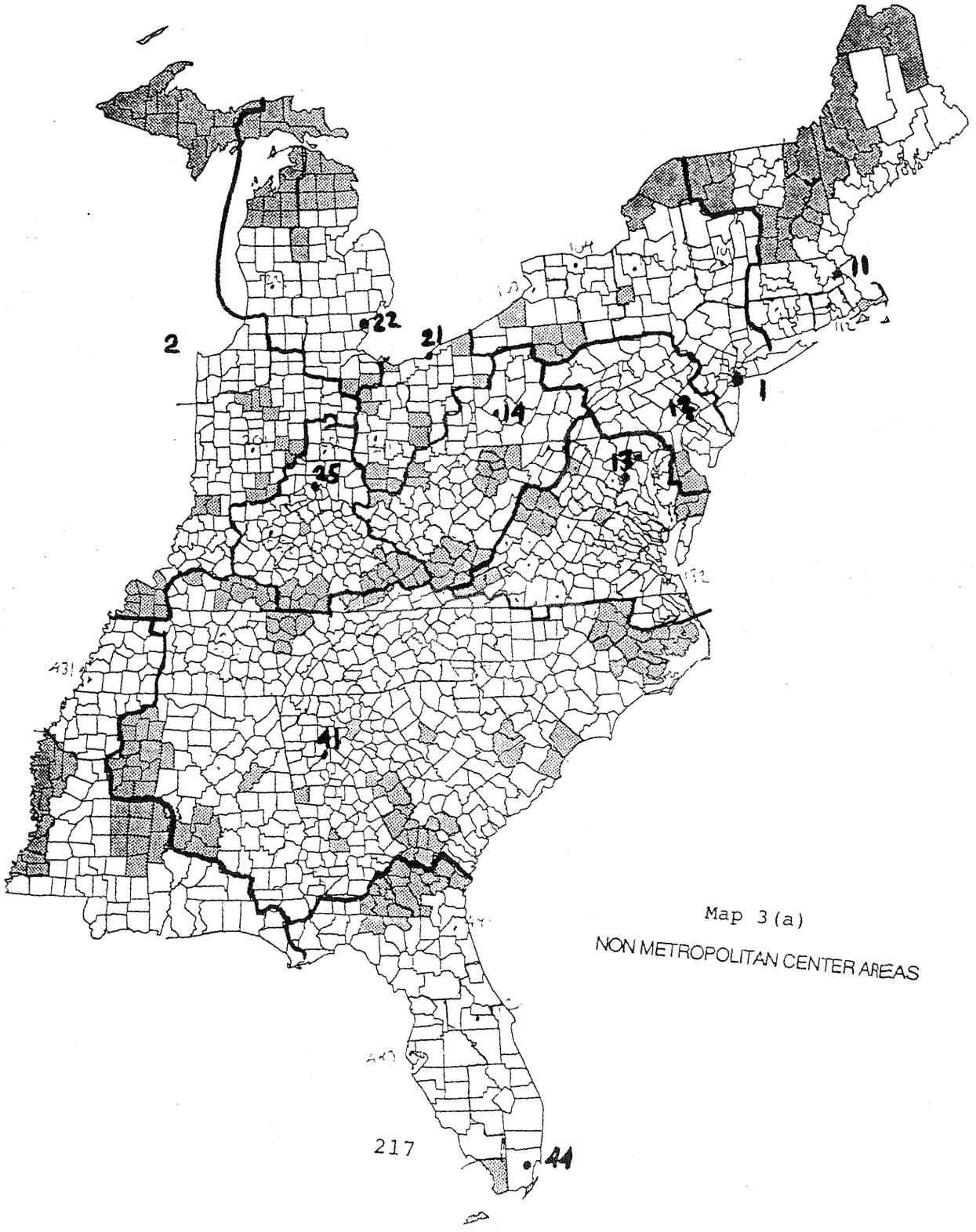
Map 2(b)

OUTER METROPOLITAN AREAS



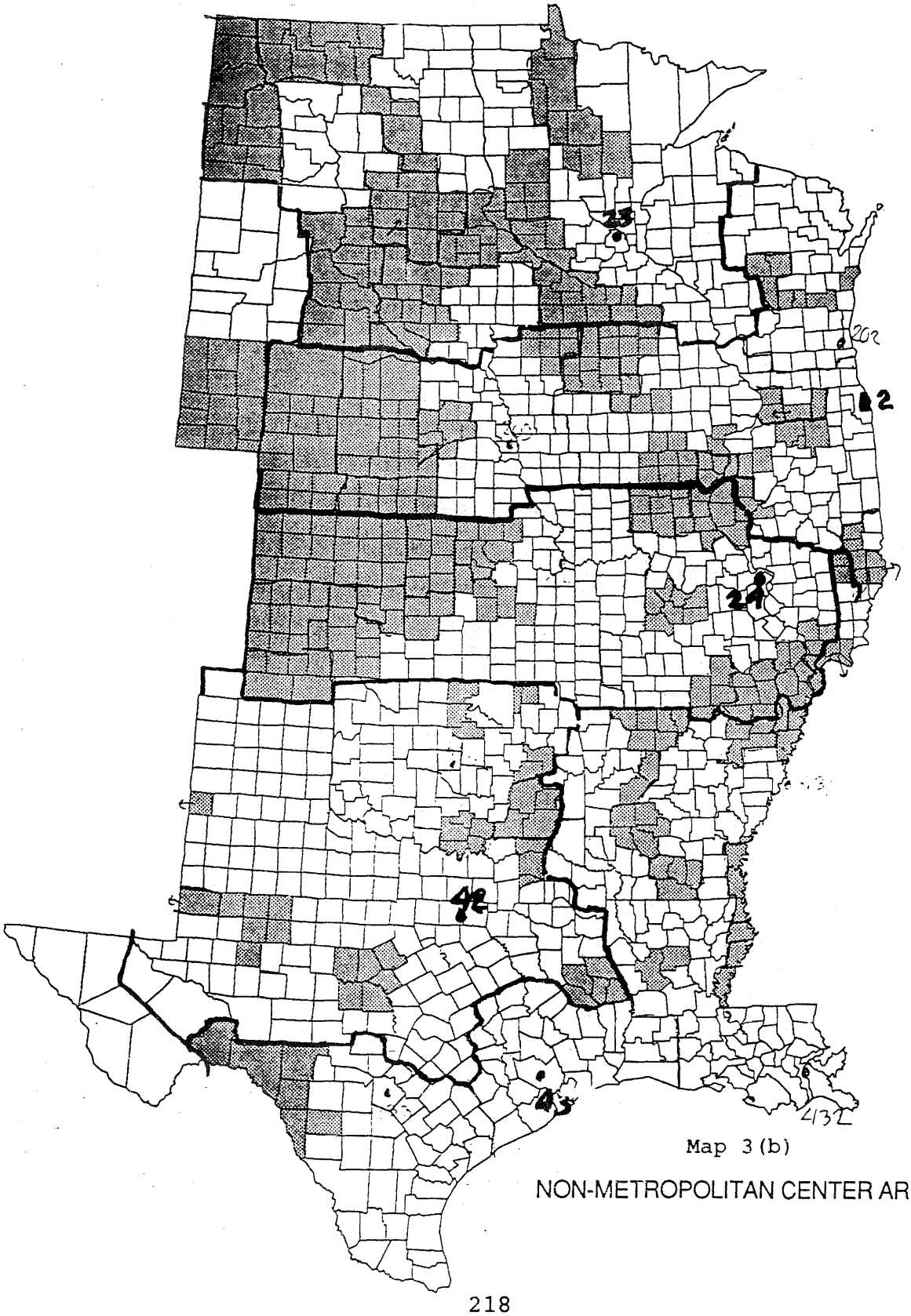
Map 2(c)

OUTER METROPOLITAN AREAS



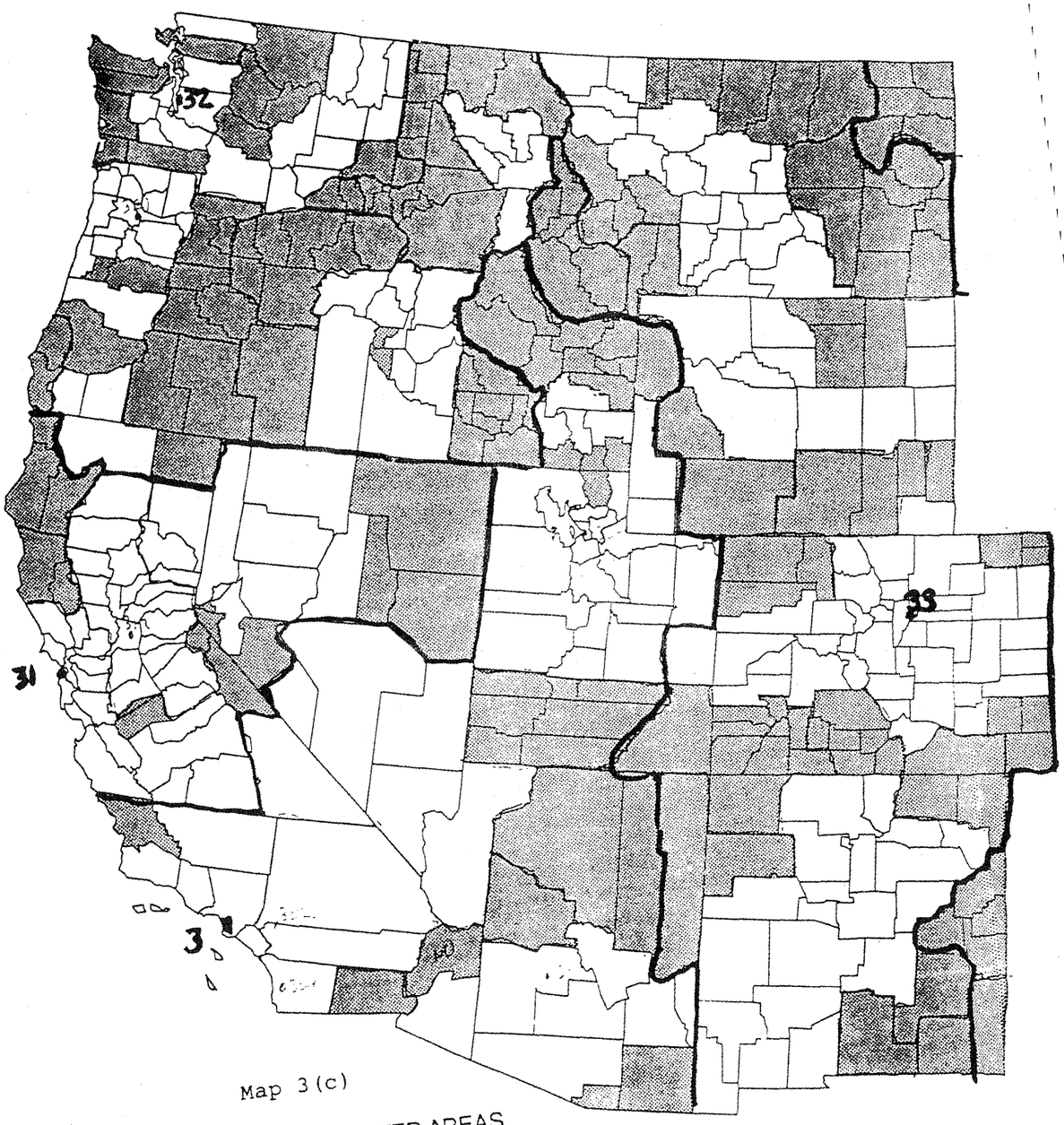
Map 3(a)

NON METROPOLITAN CENTER AREAS



Map 3 (b)

NON-METROPOLITAN CENTER AREAS



Map 3(c)

NON-METROPOLITAN CENTER AREAS

combination of a homogeneous and a functional approach. Confronted with the map evidence, this possibility simply evaporated, because large parts of what might be any homogeneous region proved to have fairly high commuting levels to some metropolitan area. Others were obviously part of a proto-metropolitan area, even if their character differed (e.g., Chelan and Douglas Counties, WA, where the joint agglomeration (Wenatchee) population is about 45,000). The functional character seems vastly more descriptive of everyday life than, say, land use. Also it seemed hopeless to agree upon meaningful variables for homogeneous regionalization. A potential exception to this conclusion could obtain if ZIP Code areas rather than counties become the basic building blocks. Then, it might be plausible to develop a second set of statistical areas for different purposes, such as one based on predominant industry or land use.

Hierarchy

I have not decided whether defining the hierarchical structure of the country is a meaningful exercise, but it somewhat naturally fell out of the analytic process of classification as I attempted to determine the logical boundaries between zones of influence. As anyone who has tried this has always found out, the settlement system is dynamic and competitive, and little regarding the hierarchy is obvious and clear cut. At any one time, there is an abundance of marginal areas and places that are "between levels" and between competing neighbors; indeed, the theory of competition in space in a free economy predicts the unlikelihood of simple nesting.

In any case, the result of the process was a six-level nesting classification of the statistical areas. The six levels resulted not from abstract principle, but empirically from what places seemed to be at a lower level or were dependent on some larger, better situated neighbor. In a preliminary sort of way, there was an association between urbanized area population and relative importance. Yet, there were many exceptions--places with large urbanized area populations but small hinterlands (like San Diego, CA), versus areas with modest urbanized area populations but

larger hinterlands (like Huntington, WV). The tentative classification reported in Table 2 is thus a compromise between, and approximately reflects the product of, the urbanized area population and the total subregional population. This has the effect of lowering the rank of satellite or suburban places and raising that of more isolated, subregional centers

The hierarchical classification of Table 2 also employs a regional numbering system: 1 for the Northeast, 2 for the Midwest, 3 for the West, and 4 for the South, which, when worked through in its detail, results in a broad regionalization of the nation somewhat different from the standard regions of the Census Bureau.

Findings

The results of the various analyses are summarized in several tables and maps. Table 3 summarizes the overall classification of counties in the three kinds of areas: metropolitan areas, outer metropolitan areas, and nonmetropolitan center areas, together with the population that would be in a different (now metropolitan) status under my simpler and more liberal criteria. Table 2 summarizes the regional hierarchy that emerged. Several additional detailed tables were provided the Census Bureau on diskette that include lists of individual areas, their population, and where appropriate, commuting proportions.

Additional metropolitan areas. As noted earlier, under my proposed approach (and using 1980 data) 16 additional metropolitan areas qualified because they had urbanized areas, even though they did not qualify under the metropolitan area standards (Table 3). This added 23 counties and 1,505,000 people to the metropolitan total (0.9 percent of the original metropolitan total, 0.7 percent of the U.S. population). Six of these 16 were added to the official inventory between 1984 and 1989. Of the 16, one was in the Midwest, eight in the West and seven were in the South (one-digit regions of Table 2, not Census Bureau regions). These additional metropolitan areas added about 2 percent to the West's metropolitan population and 1.7 percent to the South's.

Table 2. POPULATIONS OF PROPOSED METROPOLITAN AND NONMETROPOLITAN AREAS BY REGIONS AND SUBREGIONS		Total	Metro-politan areas	Nonmetropolitan areas	
				Outer metro-politan areas	Nonmetro-politan center areas
1	Northeast (NYC)	63724519	54817125	4420935	3240999
10	New York	24482523	22722807	1209773	549937
100	New York City	17898523	17675529	223313	
101	Albany	1186775	1094943	91822	
102	Syracuse	1961825	1264487	407753	289588
103	Buffalo	2096666	1562507	273807	260352
104	Rochester	1338415	1120347	213086	
11	Boston	11756715	9963848	728449	1064418
110	Boston	8036089	6335534	636137	1064418
111	Hartford	2300421	2208107	92323	
112	Providence	1420205	1420205		
12	Philadelphia	9989063	9347319	425378	219366
13	Washington-Baltimore	9956486	8449658	921327	585501
130	Washington-Baltimore	6251758	5662285	370727	218746
131	Richmond	2306010	1572071	367184	366755
132	Norfolk	1398718	1215302	183416	
14	Pittsburgh	7539732	4333493	1436008	821777
2	Midwest (Chicago)	61003799	44627464	8553440	7822860
20	Chicago	24915628	18391305	3332624	3192639
200	Chicago	14120145	11646002	1287769	1186714
201	Indianapolis	4773936	2988182	969387	816367
202	Milwaukee	3992664	2784180	594451	614033
203	Omaha	2028883	972341	481017	575525
21	Cleveland	6395547	5274164	532968	589415
210	Cleveland	4455198	3898132	216046	291020
211	Columbus	1940349	1375032	266922	298394
22	Detroit	9612187	8160355	834430	617402
220	Detroit	7817167	6562274	548797	406096
221	Grand Rapids	1795020	1298081	285633	211306
23	Minneapolis	6097984	3412678	1355500	1329791
24	St. Louis	8409613	5305368	1474897	1629348
240	St. Louis	4479015	2843003	754687	881325
241	Kansas City	3930598	2462365	720216	748023
25	Cincinnati	5570945	4083615	1023021	464309
250	Cincinnati	1902793	1727892	174901	
251	Dayton	1112050	980326	131834	
252	Louisville	2551992	1375397	716286	464309

Continued...

Table 2. POPULATIONS OF PROPOSED METROPOLITAN AND NONMETROPOLITAN AREAS BY REGIONS AND SUBREGIONS		Total	Metro-politan areas	Nonmetropolitan areas	
				Outer metro-politan areas	Nonmetro-politan center areas
3	West (LA)	43534345	36929566	2220733	4380442
30	Los Angeles	20173490	18625075	547096	1001319
300	Los Angeles	11405686	11104205	87317	214164
301	Honolulu	964691	762565	39082	163044
302	San Bernardino-Riverside	1558215	1558215		
303	Salt Lake	1682369	1208864	258431	215074
304	San Diego	1953956	1861846		92110
305	Phoenix	2129380	2008573	162266	316927
31	San Francisco	9381736	8555142	356373	470219
310	San Francisco	5298785	4681922	146644	470219
311	San Jose	1798661	1798661		
312	Sacramento	2274290	2074557	209731	
32	Seattle	8146945	5762258	582998	1798139
320	Seattle	4808457	3511554	270147	1023156
321	Portland	3338538	2250704	312851	774983
33	Denver	5832124	3987091	734268	1110765
4	South	59038881	42646905	11324315	5067701
41	Atlanta	21571299	14099069	2185800	2286430
410	Atlanta	8427975	5066704	2019234	742067
411	Birmingham	3683172	2281027	838165	563950
412	Charlotte	5390099	3572292	1220929	533878
413	Nashville	4067023	2579046	1197742	38050
42	Dallas	9967873	7282700	1739883	945230
420	Dallas	7204202	5468772	1215210	520220
421	Oklahoma City	2763671	1813988	254673	425010
43	Houston	17943440	12798324	3403165	1441951
430	Houston	4211797	3816565	395232	
431	Memphis	3711343	1994513	1125062	646696
432	New Orleans	7295785	4834891	1750520	710374
433	San Antonio	2664587	2147355	432351	84881
44	Miami	9556369	8466812	695367	394090
440	Miami	3539519	3371720	104701	63098
441	Jacksonville	1867404	1275373	260884	330992
442	Orlando	1347404	1242534	104870	
443	Tampa-St. Petersburg	2802197	2577185	225012	

Note: Single-digit code indicates level-one region: 1 (Northeast), 2 (Midwest), 3 (West), 4 (South). Two-digit code indicates the 19 level-two regions. Three-digit code indicates the additional 49 areas that form the subregional economic centers.

TABLE 3. SUMMARY OF METROPOLITAN AND NONMETROPOLITAN CLASSIFICATION

	Areas	Counties	Population
Additional metropolitan area (UAs in 1980, not accepted as metropolitan areas)			
Subsequently added (by 1989)	6	8	513000
No, but should have been	10	15	992000
Total	16	23	1505000
Added population, using counties in New England		4	339000
Commuter counties added to metropolitan areas			
NE		46	1699000
MW		83	1801000
West		18	283000
S		99	2005000
Total		246	5788000
Total added to metro areas		271	7632000
Nonmetropolitan areas			
Outer metropolitan areas			
NE	35		4494000
MW	67		8572000
W	33		2221000
S	95		11381000
Total	230		26668000
Nonmetropolitan centers areas			
NE	24		3241000
MW	73		7864000
W	56		4381000
S	49		4987000
Total	202		20473000
All nonmetropolitan	432		47141000

Reclassification of New England metropolitan areas. Converting from metropolitan areas based on towns and cities to use of counties resulted in adding a modest 339,000 people to New England's already high metropolitan share. The more liberal criteria add four counties (York, ME, Litchfield, CT, Newport, RI, and Franklin, VT) to the New England county metropolitan areas--county-based areas that are also defined for New England under the metropolitan area standards.

Additions to existing metropolitan areas. Simplifying and relaxing the current official criteria for inclusion of suburban counties in metropolitan areas resulted in the addition of significant area and population in all regions of the country. I determined that there were apparently 246 counties with commuting levels over 15 percent to metropolitan area cores that nonetheless failed to qualify as parts of metropolitan areas. These counties accounted for 5,788,000 people, which would represent an increase of 3.4 percent in the metropolitan population, and 2.6 percent of the national population (Table 3). Relatively few counties were added in the West, but a great many were added in the Midwest and South, as were a substantial number in the Northeast. The additions would add 5 percent to the South's metropolitan population, 4.2 percent to the Midwest's, and 3.2 percent to the Northeast's.

Metropolitan summary. The total addition to the metropolitan population from newly designated areas, shifting to county-based areas in New England, and adding counties to metropolitan areas based on commuting, amounts to 7.6 million people or an increase in the metropolitan population of 4.4 percent (3.4 percent of the U.S. population), raising the metropolitan share of the nation's population from 76 percent to over 79 percent. Is this increase inappropriate? Should we be moving in the other direction, toward a more strict "urban" sense of metropolitan? I do not believe so. The reality of American life in the era of television and interstate highways fully justifies, in a behavioral way, the liberalization of metropolitan. Indeed, the great importance of what I term "outer metropolitan areas" makes the metropolitan realm even more pervasive.

Nonmetropolitan territory. Broadly speaking, similar shares of the nonmetropolitan population are in the two categories I devised--12 percent in outer metropolitan areas and 9 percent in nonmetropolitan center areas. This varies somewhat by region of the country. Outer metropolitan territory is very prominent in the Midwest and especially in the South, both of which have large numbers of smaller metropolitan areas: outer metropolitan areas (Map 2) represent 14 percent of the Midwest's population, and 19 percent of the South's, but only 5 percent of the West's and 7 percent of the Northeast's. Nonmetropolitan center areas (Map 3) are especially important in the Midwest (13 percent of the regional population) but are important also in the West (10 percent of the population) and in the South (8.5 percent).

It is of more than passing interest, I believe, that the metropolitan area and outer metropolitan areas together account for more than 90 percent of the American population.

Numbers of statistical areas. The process of defining and redefining metropolitan and nonmetropolitan statistical areas resulted in a tentative maximum number of areas--that is at the lowest hierarchical level--of 746: 314 metropolitan areas, and 432 nonmetropolitan areas (230 of which are outer metropolitan areas) (Table 1). Thus, the number of basic functional areas is 516 (314 metropolitan (labor market) areas plus 202 nonmetropolitan center (labor market) areas). Because many of the outer metropolitan areas are quite large, I also suggest their division for statistical purposes.

The hierarchy. The tentative hierarchy of three levels of areas and regions is summarized in Table 1. The main purpose of this exercise has been the delimitation of the basic, lowest level of statistical area, metropolitan and nonmetropolitan. But these do somewhat organize into higher levels of regions. If the underlying rationale for this entire experiment is the division of the national territory into parts that are meaningful for statistical reporting and analysis, then a case can be made for recognizing the fuller structure of the settlement and economic system. This is of course done already in many ways in the public as well as the private sector.

There are clearly only three metropolitan areas at the top--New York, Chicago, and Los Angeles--all of which have urbanized area populations over 6 million (Table 2). At the next level, there seem to be 16+ areas (I treat Baltimore and Washington together). A couple, Pittsburgh and Cincinnati, are not as strong as the others. A few areas, notably San Diego, Phoenix, and New Orleans, might have pretensions for this rank but are not included. These 19 areas are the regional capitals of the nation. Their urbanized area populations range from 1.5 to 4.5 million (Table 2 and Maps 1-3).

At the third level, I find an additional 34 areas that round out the set of subregional economic centers of the country, for a total of 53 areas. Their urbanized area populations range from 400,000 to 1.8 million (Table 2). At the fourth level are classified another 61 areas, which now include both many subregional centers and lesser parts of major metropolitan clusters (not shown in Table 2). The urbanized area populations range from about 200,000 to 500,000.

The fifth level includes the majority of smaller metropolitan areas, with urbanized area populations from about 60,000 to 200,000; the sixth level includes the smallest metropolitan areas, including the newly designated ones and the nonmetropolitan centers (these levels are not shown in Table 2).

The first four levels of the hierarchy, with a total of 114 areas, comes somewhere close to the idea of metropolitan or communications regions, as discussed in the introduction. They are reasonably similar to the communications regions of Neilsen or Arbitron, but the correspondence is imperfect, because I recognize fairly high-level places that may be only part of a very large communications region, and I recognize only at a fifth level isolated smaller metropolitan areas that necessarily are communications centers. However, the system of basic units (746) nest readily and with only marginal boundary discontinuity into the recommended metropolitan/communications regions.

Summary: Meeting the Objectives of the Research on Metropolitan and Nonmetropolitan Statistical Areas

The following summarizes this section's findings relative to the project's ten objectives, as presented in the Introduction to this volume.

1. Conceptual basis. The metropolitan idea is an old one, yet it is not obsolete; it reflects social and economic behavior. The conclusion of this research is to emphasize the functional definition of the metropolis. The presence of an urbanized area (with a population of at least 50,000) as the bound between metropolitan and nonmetropolitan area is, to be sure, arbitrary and in a sense morphological, but the rationale is that, on average, meaningful differences in functional character appear at about that size.

2. Basic geographical units. As discussed in detail, counties are easiest to use as the building blocks everywhere, because of simplicity, consistency, coverage, and timeliness, but evaluation of an alternative ZIP Code area delimitation should be undertaken.

3. Aggregating geographic units. The criteria for aggregation should be simple and consistent. The idea of metropolitan, and yes, nonmetropolitan, is almost purely a functional one, and therefore functional criteria should be used.

4. Integration. It is argued that commuting be used everywhere to delimit metropolitan (and outer metropolitan) areas. For smaller nonmetropolitan center areas, commuting data will work in most cases. In some very sparsely settled areas, I resorted to simple map analysis, but other measures probably should be used, such as retail, wholesale, and health-service patterns (see item 6 below).

5. Relationships among areas. The components of the system proposed in this first section consist of metropolitan areas, outer metropolitan areas, and nonmetropolitan center areas, and these areas are nested into a regional hierarchical structure based on which ones seem to be dependent on which larger neighbors. The main justification for describing such a regional structure is presumably that the various levels would be of interest and value for different research or practical applications. There may be a level of metropolitan or communications region that best describes the functional structure of the nation.

6. Data availability. The essential data are the census information on counties, urbanized areas, and for smaller cities (agglomerations), and the journey-to-work data. In my view no other data are consistently available or needed. However, as noted above, other information, much of which is readily available in such sources as the Census Bureau's County and City Data Book can be used to help delimit nonmetropolitan areas when commuting data are not available. At the level of broad communications regions, additional data will be needed, such as television viewership, newspaper circulation, air travel, and telephone usage.

7. Role for local opinion? The basic scheme can be statistically laid out, but as discussed, there are marginal cases. I think the metropolitan designation should be more or less "mechanical" to avoid local absurdities--except that local views might be appropriate where counties have split allegiance, or where a place could be independent or part of a larger metropolis. Because they would be newly designated, local opinion and knowledge would be important in the delineation of nonmetropolitan areas, especially as to the relative zones of influence of smaller places, and as to the relative independence or importance of places. The risk, I

suppose, will be the tendency to try to delimit areas that are too small or too local.

8. Updating. The question of updating really raises broader issues regarding the census and possible revisions. Of course, places should be shifted to metropolitan status if they become eligible by special census. And new counties should be added to a metropolitan area, if local building and journey-to-work data as provided by a transport planning agency show that commuting has risen above critical levels. As more states and areas get improved geographic information systems, there is less and less excuse not to be able to maintain a much-improved picture of the system of statistical areas.

9. Official recognition of areas. Yes, more areas are proposed here for official recognition and reporting. Strictly, the distinction between outer metropolitan areas and nonmetropolitan center areas as types of nonmetropolitan areas may not be critical, but the behavioral difference is of interest.

10. Generates useful data? Surely this is a rhetorical question! The demand is tremendous and ever-expanding. The metropolitan area has been of stupendous statistical and practical value. Counties have simply been too small and inappropriate to serve as the vessels to describe the regional social and economic structure of the nation. We have long known that a complementary set of nonmetropolitan statistical areas is needed, and now is the time to delimit them.

Internal Structure of Metropolitan Areas

The "central city-balance of metropolitan area" distinction has long been used to reflect the difference between a metropolitan area's older core and the newer

suburban periphery. But because of the inconsistent definition of metropolitan areas and differences in the bounding of central cities, comparisons made among areas are suspect at best. This section evaluates dividing the metropolitan area, as previously defined, into a core based on what was an earlier urbanized area (1940 or 1950); suburbs that extend to the edge of the current (1980) urbanized area; and the remaining outer-most portion beyond the urbanized area, in order to try to capture the idea of "inner and older," "suburban," and "exurban" in a consistent way.

The urbanized area is the basic core of metropolitan labor markets. The large majority of the American population lives in these areas. While all of this territory may be consistently urban, its internal character varies tremendously--a variation that is at the heart of both the richness and the pathology of American life and of the social, political, and economic landscape.

The Task

Central cities of metropolitan areas vary tremendously in their boundaries. Some central cities are small relative to their metropolitan areas (e.g., Boston). Some, because of different histories or legal contexts, are very large relative to their areas (e.g., San Antonio or Indianapolis). Similarly, metropolitan areas include widely varying amounts of small town or rural territory, from virtually none in New England, to as much as half or more of the total territory elsewhere. Yet there is widespread analytic, local government, and programmatic interest in, and recognition of, the idea of a dichotomy featuring an inner and older core with higher levels of poverty and social needs and a newer and more affluent "suburbia," a dichotomy that is no longer captured by the central city-balance of metropolitan area distinction.

Some urban scholars may want to believe that the highly interdependent modern metropolis with its "edge cities" and gentrified high-rise downtown, its suburban apartment complexes, and minorities in the suburbs, makes this exercise obsolete. But let the data speak for themselves. The truth is that inner city and suburb are still very

different--in appearance, in racial composition, in economic class, in political and social behavior, and in housing character. Despite the diversity within the suburbs, in many areas the polarization between a more affluent suburban ring and a core of deprivation is worse than it has ever been, and this dichotomy is not captured by the boundary formed by central city corporate limits.

Strategy

If places are too variable in size to use as building blocks, it is logical to use census tracts. The expectation is that older settled areas are, even recognizing recent processes of gentrification, likely to exhibit greater evidence of social needs than newer areas. The strategy employed, then, was to find the 1980 tract equivalents of both the 1940 and 1950 urbanized areas, and to separate the (1980) metropolitan area into two (or three) components: an inner area that was the tighter urbanized area as of 1950 (or 1940); the suburbs added between 1950 (or 1940) and 1980; and of less consequence, the area within the metropolis that lay beyond the urbanized area. The last of these, of course, will be quite inconsistent because of variable sizes of counties and amounts of rural territory, so it is not expected to be very useful (unless the metropolitan area itself were based on subcounty units: see separate discussion).

Both 1940 and 1950 urbanized areas were used because, a priori I did not know which would provide the clearer contrast between core and suburb. In fact, urbanized areas were not defined until 1950, but built-up areas (i.e., metropolitan districts) were defined for larger cities in 1940, and the 1950 census data on year houses were built permitted a reasonable picture of what the 1940 urbanized area would have been.

Data

In order to test the meaningfulness of the approach, I investigated a small sample of metropolitan areas: Atlanta, GA; Boston, MA; Indianapolis, IN; Portland, OR-WA; Spokane, WA; and Seattle-Everett, WA. As indicators, I chose the

following characteristics, out of many possible ones, to illustrate social and economic variability:

- Proportion over age 65; proportion under age 5
- Proportion minority
- Proportion female headed households; proportion non-family households
- Percent of persons below the poverty level
- Percent of civilian labor force unemployed
- Percent of households renting

I decided that residential population density would not be very useful, unless one took into account commercial and industrial land. In what follows, differences between the inner core and the suburban ring are emphasized, but values are compared to those for central cities as well.

Findings

Table 4 summarizes the findings for the sample areas by providing the 1980 characteristics of: the 1950 urbanized area (UA), the 1980 urbanized area (UA), and the 1950-1980 added suburban ring. Table 5 gives greater detail, presenting data for: the 1940 urbanized area, the urbanized area added between 1940 and 1950, the 1950 urbanized area, the urbanized area added between 1950 and 1980, the 1980 urbanized area, the exurban area (1980 metropolitan area minus urbanized area), 1980 metropolitan area, and 1980 dominant central city. For all metropolitan areas, and almost universally across the variables, the 1950 urbanized area proved more useful for our purposes (defining cores) than the 1940 area; that is, by 1980, the area added immediately after World War II was more like the 1940 inner core than like the 1950-1980 suburban ring. This is fortunate, since it is a lot easier to define the core based on the 1950 urbanized area. If this were undertaken on a large scale using the 1990 census, I still suspect that the 1950 urbanized area would be the best core indicator, but the 1960 urbanized area could be explored as well.

TABLE 4. CHARACTERISTICS OF INNER CORE AND SUBURBAN RINGS OF METROPOLITAN AREAS BASED ON 1950 AND 1980 DELINEATIONS

Time	Atlanta	Boston	Indian-apolis	Portland	Seattle	Spokane
1950 UA Pop	448899	1836818	364001	490269	650133	181200
1980 UA Pop	1613550	2678762	836472	1026144	1391535	266709
1950-1980 Chg	1164656	841944	472471	535875	741402	85509
1950 % >65	12.4	13.9	12.9	15.0	14.2	15.4
1980 % >65	7.5	12.8	10.0	11.3	10.2	12.9
1950-80 >65	5.6	10.4	7.7	7.8	6.7	8.1
1950 % <5	6.6	5.0	7.8	6.7	5.2	7.3
1980 % <5	7.0	5.2	7.4	7.3	6.3	7.4
1950-1980 <5	7.2	5.5	7.1	7.9	7.3	7.7
1950 % Minority	58.8	15.2	33.4	13.2	19.7	7.0
1980 % Minority	30.8	11.5	20.6	9.2	12.7	6.0
1950-80 % Minority	20.0	3.3	10.7	4.4	9.6	3.8
1950 % Poverty	24.3	11.5	16.4	11.9	9.8	13.3
1980 % Poverty	12.8	19.7	10.4	9.3	7.6	11.7
1950-80 Poverty	8.0	4.7	5.8	6.9	5.7	7.3
1950 % FHH	19.3	13.0	15.5	9.4	9.1	10.4
1980 % FHH	13.7	11.7	11.9	9.2	8.5	9.5
1950-80 FHH	11.2	7.9	5.9	8.3	7.9	7.4
1950 % NFH	42.2	37.7	34.1	42.2	44.6	38.5
1980 % NFH	28.7	32.8	29.1	34.4	35.0	32.8
1950-80 NFH	23.0	20.8	25.1	25.3	24.6	19.3
1950 % Rent	59.2	56.3	41.6	47.4	46.5	38.8
1980 % Rent	45.1	48.1	39.6	40.4	38.5	34.2
1950-80 Rent	38.9	27.1	38.1	33.1	30.0	20.8
1950 % Unemp	7.5	4.9	9.2	7.2	5.9	8.4
1980 % Unemp	5.0	4.5	6.6	6.2	5.5	8.2
1950-80 Unemp	4.0	3.7	4.9	5.3	5.2	7.4

TABLE 5. CHARACTERISTICS OF INNER CORE AND SUBURBAN RINGS OF METROPOLITAN AREAS BASED ON 1940, 1950, AND 1980 DELINEATIONS

DETAILED CHARACTERISTICS OF CORE AND SUBURBAN RINGS

	1940 UA	UA added 1940-50	1950 UA	UA added 1950-80	1980 UA	Exurban (Net-UA)	1980 Metro	1980 City
Population								
Atlanta	219492	229402	448894	1164656	1613550	416160	2029710	452022
Boston	1683837	152981	1836818	841944	2678762	84595	2763357	562994
Indianapolis	255938	108063	364001	472471	836472	330103	1166575	700807
Portland	305877	184392	490269	535875	1026144	216450	1242594	366383
Spokane	111384	69816	181200	85509	266709	75126	341835	171300
Seattle	423500	226633	650133	741402	1391535	215934	1607469	493846
% Over 65								
Atlanta	13.2	11.7	12.4	5.6	7.5	8.0	7.6	11.5
Boston	13.9	13.5	13.9	10.4	12.8			12.7
Indianapolis	13.5	11.5	12.9	7.7	10.0	9.2	9.8	10.3
Portland	16.4	13.0	15.0	7.8	11.3	9.0	10.9	15.3
Spokane	17.3	12.6	15.4	8.1	12.9	6.5	11.5	15.3
Seattle	15.4	12.1	14.2	6.7	10.2	8.0	9.9	15.4
% Under 5								
Atlanta	6.7	6.6	6.6	7.2	7.0	7.6	7.2	7.0
Boston	5.1	4.9	5.0	5.5	5.2			5.3
Indianapolis	8.2	7.1	7.8	7.1	7.4	7.4	7.5	7.5
Portland	6.8	6.7	6.7	7.9	7.3	7.8	7.4	6.5
Spokane	7.4	7.0	7.3	7.7	7.4	8.3	7.6	7.2
Seattle	5.0	5.4	5.2	7.3	6.3	8.0	6.5	4.9
% Minority								
Atlanta	68.5	49.6	58.8	20.0	30.8	11.2	26.8	68.0
Boston	16.4	2.2	15.2	3.3	12.5			36.4
Indianapolis	35.8	27.8	33.1	10.7	20.6	1.5	15.2	10.3
Portland	17.1	6.6	13.2	4.4	9.2	5.6	8.4	14.9
Spokane	8.4	4.5	7.0	3.8	6.0	6.0	6.1	7.1
Seattle	25.1	9.5	19.7	9.0	12.7	5.5	11.7	22.3

Continued...

TABLE 5. CHARACTERISTICS OF INNER CORE AND SUBURBAN RINGS OF METROPOLITAN AREAS BASED ON 1940, 1950, AND 1980 DELINEATIONS

	DETAILED CHARACTERISTICS OF CORE AND SUBURBAN RINGS							
	1940 UA	UA added 1940-50	1950 UA	UA added 1950-80	1980 UA	Exurban (Met-UA)	1980 Metro	1980 City
% Poor								
Atlanta	30.6	18.2	24.5	8.0	12.8	9.9	12.2	27.5
Boston	12.0	5.9	11.5	4.7	9.7			20.2
Indianapolis	19.4	9.4	16.4	5.8	10.4	6.5	9.3	11.5
Portland	14.3	8.0	11.9	6.9	9.3	7.0	8.9	13.0
Spokane	17.0	8.0	13.3	7.3	11.7	10.0	11.5	13.9
Seattle	11.7	6.2	9.8	5.7	7.6	6.7	7.5	11.2
% Female-headed households								
Atlanta	21.4	17.3	19.3	11.2	13.7	7.7	12.6	21.8
Boston	13.2	10.5	13.0	7.9	11.7			16.0
Indianapolis	16.8	12.8	16.4	5.9	11.9	6.4	10.5	12.6
Portland	10.5	9.0	9.9	8.3	9.2	6.1	8.7	9.7
Spokane	10.7	9.9	10.4	7.4	9.5	6.0	8.8	10.5
Seattle	9.3	8.6	9.1	7.9	8.5	6.3	8.2	8.8
% Non family households								
Atlanta	46.5	38.1	42.2	23.0	28.7	14.3	26.1	39.7
Boston	38.5	28.2	37.7	20.8	32.8			46.7
Indianapolis	35.5	31.1	34.1	25.1	29.1	17.2	26.0	30.2
Portland	46.7	34.1	42.2	25.3	34.1	17.8	31.7	43.8
Spokane	43.9	28.8	38.5	19.3	32.8	18.7	30.4	38.5
Seattle	50.2	33.0	44.6	24.6	35.0	19.2	33.1	47.7
% Renting								
Atlanta	63.1	54.9	59.2	38.9	45.0	17.3	38.6	58.9
Boston	58.1	36.6	56.3	27.1	48.1			74.5
Indianapolis	43.8	36.2	41.6	38.1	39.6	21.0	34.7	40 ?
Portland	52.4	38.8	47.4	33.1	40.4	19.4	37.2	46.8
Spokane	45.2	27.1	38.8	20.8	34.2	27.3	32.8	38.8
Seattle	52.0	34.8	46.5	30.0	38.5	18.1	36.1	50.0
% Unemployed								
Atlanta	8.6	8.6	7.5	4.0	5.0	4.1	4.8	8.1
Boston	4.9	4.5	4.9	3.7	4.5			6.1
Indianapolis	10.8	6.1	9.2	4.9	6.6	5.5	6.3	6.7
Portland	7.8	6.2	7.2	5.3	6.2	6.1	6.2	6.9
Spokane	9.1	7.4	8.4	7.4	8.2	7.7	8.0	8.2
Seattle	6.5	5.0	5.9	5.2	5.8	6.7	5.7	5.9

Some variables chosen were not as useful for differentiating between the core and suburban areas as others. The proportion over age 65 varied markedly in allcities between the inner core and suburban ring, sometimes by more than a factor of two; but the proportion under age 5 was not a consistent indicator, because it is affected by racial composition. It is true that in all but one metropolitan area, the proportion under age 5 increases outward, but in Indianapolis the reverse is true, because of racial minority effects. All of the areas varied greatly in minority proportions in core and suburb, often by a factor of 3 to 1, whatever the overall racial composition of the metropolis.

Household structure also varied significantly. The proportion of female-headed households is especially great in the core of eastern and southern sample metropolitan areas, while the proportion of non-family households is higher in the cores of the Atlanta and western areas.

Unemployment decreases consistently with distance outward, but the degree of difference varies, again perhaps because of racial composition or the general economic climate. Similarly the proportion renting decreases consistently outward, as expected, but the degree of difference is not consistent across cities, because of varying kinds of housing markets.

The use of the 1950 core and the 1950-to-1980 suburban ring is superior to the central city. Since Indianapolis merged with much of Marion County, it is meaningless as an inner core identifier. From the data it appears that Boston greatly underbounds the true core. The cities of Portland and Seattle are also too small, while Spokane is quite close. Atlanta has the "correct" size, but the areas are not coincident, causing some differences in character.

The "exurban" area beyond the metropolitan area's urbanized area showed fairly consistent behavior; that is, it was even less central-city like than the suburban ring, with a few exceptions. Boston statistics are not provided because the area and population are too small. We find that for the other five areas, the balance of territory within counties does not do a bad job of measuring the exurban territory. For example, in all but Spokane, the proportion

of the population over age 65 is higher beyond the suburbs than within them--the effect of the rural or small town areas not yet transformed.

There is little difference between suburban ring and exurban territory in the proportion under age 5; nor are there consistent differences in the proportion minority. In all cases, the poverty rate is higher beyond the suburbs than within them, although the differences are not great. Proportions of female-headed households beyond the suburban ring are lower, except for Indianapolis, while proportions of exurban non-family households are always lower. The proportion renting is often much lower beyond the suburbs, except in Spokane. Unemployment is consistently higher. The suburban-exurban distinction looks like it might be interesting and maybe useful, if less so than the inner core-suburban one, but delimitation cannot be done consistently on the basis of counties.

However, if metropolitan areas were to be defined on the basis of ZIP Code areas, then the residual exurban area might be of great interest, since in most metropolitan areas it is the area of the most rapid rate of change.

Summary: Meeting the Objectives of the Research on the Internal Structure of Metropolitan Areas

The following reports the findings of this section relative to the ten research objectives provided in the Introduction.

1. Conceptual basis. The intellectual basis for a core-suburb distinction is a rich academic tradition in many fields distinguishing the character of "city" and "suburb," as well as a virtually universal acceptance within the general population. The geographic distinction between them should be made correctly. In this case, the criterion for distinction is broadly morphological and historical --territory defined as urban at different points in time. But the value of making the distinction rests more on the expected difference in the character of social and economic life; that is, in itself the morphology is not important.

2. Basic geographic units. Census tracts are the only units sufficiently small and stable to make possible this geographic division within metropolitan areas. Cities are too large and diverse in settlement timing. Possibly ZIP Code areas, especially if they become widely used to define the metropolitan areas themselves, could be used to distinguish inner areas from suburban ones, even if they do not exactly follow 1950 (or other) urbanized area limits.

3. Agglomerating geographic units. The criterion for agglomeration here is simply urban character at a point in time--a land-use criterion. Again, this is only a way-station or surrogate to find the areas of "inner" and "outer" character that are being sought.

4. Integration. The decision was to use only urban character. Clearly it would be possible to propose a host of variables, and one could use cluster analysis and discriminant analysis to divide the urban territory in far more sophisticated ways. I think this would get one into all kinds of difficulties as to variables and their weights, the effect of renewal, problems of discontinuity, and lack of consistency of data. It would be high-risk, methodological overkill. Nevertheless, the proposed methodology is readily criticized as imposing an <u>a priori</u> division which may well not maximize the difference between "inner" and "suburban." There are available factorial ecologies and cluster analyses of many cities. It would at least be desirable to compare my results with an alternative that defines areas on the basis of selected variables, or even to test, and if needed reclassify and adjust boundaries, via a discriminant analysis of my division. I wanted to avoid prejudging criterion variables, so I prescribed a geographic division based on period of development instead.

5. Relationships among areas. The main purpose is to capture a character difference between core and

suburb, and to a degree, an outer exurban zone. These differences should be more meaningful and consistent among metropolitan areas with my simplified criteria for metropolitan status. No levels are implied.

6. Data availability. The only data needed are the maps of 1950 urbanized areas. Probably city and county administrative records would be needed to delimit what would have been 1950 urbanized areas that were not delineated by the Census Bureau in 1950. I did not address this problem. In many parts of the country, the territory of incorporated cities as of 1950 might be a close approximation.

7. Role for local opinion? Local review by city and county officials could help in estimating the 1950 character, especially of rapidly changing areas.

8. Updating. Since the idea of inner and outer areas is a dynamic one, it will certainly be necessary to review the basis for delineation at least each decade. Thus, already for 1990 the issue arises as to whether the 1950 urbanized area is the appropriate boundary to separate inner from outer (should it be replaced by the 1960 limit?)

9. Official recognition of areas. It is certainly intended that the delimitation could be a recognized statistical reporting area.

10. Generates useful data? The purpose of this inner core-suburban distinction is to better define what everyone knows to be real, a distinction that is no longer captured by the central city-balance of metropolitan area dichotomy. The expectation is that the units and data will prove to be very useful and in demand for local planning, and possibly for a wide variety of programmatic applications.

Agglomerations with under 50,000 Population

Urban cores or agglomerations are the concentrated places of human activity, of residence, of employment, of trade and service, and of communication. They constitute the centers of a system of labor markets that functionally divide the territory of the nation and are the basic set of statistical areas for the United States.

In the past we have defined only urbanized area agglomerations with populations over 50,000. But a large number of labor market areas have one or more urban cores with populations of less than 50,000, which are nevertheless centers of employment, trade, and communication. If we define a fuller set of functional labor market areas, it becomes logical to define their smaller-than-50,000 agglomerations--not because of any particular minimum cutoff, but to have a comparative and consistent sense of their relative sizes and roles.

The experiment reported below carries the idea of urban agglomerations down to places of 2,500 population in order to be able to discover the true urban population. Only a few of these agglomerations would likely constitute urban cores of nonmetropolitan statistical areas (see below).

Agglomerations under 50,000 Population in Washington State

This experiment takes advantage of the block data from the 1990 census and delimits small "urbanized areas" or agglomerations for the state of Washington. The aim is to identify all agglomerated places, no matter how small, to the extent possible, but reported here are only agglomerations with over 2,500 population--that is, ones that would qualify as urban if they were a single place.

Urbanized areas (over 50,000) have permitted a real understanding and classification of settlement by size. This has not been practical for places with under 50,000. This is here attempted for all settlements in Washington. The results reveal that with the added territory:

1. Several (nine) settlements pass the urban threshold of 2,500 population;

2. Many places pass higher thresholds of 5,000, 10,000, and 25,000;

3. A more accurate and meaningful hierarchy of future metropolitan and of larger nonmetropolitan centers is produced, an outcome that better indicates functional importance than data reported separately for individual places.

In many cases, smaller places cluster together, but there is also a significant amount of unincorporated but "urban" fringe around even fairly small places (annexation is difficult in the State of Washington). As a consequence of including that additional settled area, the state's urban population would rise by about 2 percent.

The main data table (Table 6) presents three figures for each agglomeration: the minimum populations of the component places (e.g., for Wenatchee this is 21,756); a strictly defined area, adding blocks with greater than 1,000 people per square mile (for Wenatchee this is 42,330, table footnote a); and a more generous definition, usually defined on the basis of the closest block groups, and which may include some lower-density areas, but for which the overall density remains at urban levels (for Wenatchee this is 46,640, table footnote b).

Significance

Table 7 gives the number of places by size class, without and within agglomerations.

Table 7. Washington Agglomerations of 2,500 to 50,000 Population by Size Class

Size class	# places	# agglom	Move up	Merge Up	Stay
25,000-50,000	1	5	0	0	1
10,000-25,000	12	8	4	1	7
5,000-10,000	15	22	1	3	11
2,500-5,000	41	29	11	10	20
<2,500		9	18		

Table 6. Population of Component Places and Total Population of Urban Agglomerations Strictly Defined and Generously Defined for Urban Agglomerations with under 50,000 Population in the State of Washington: 1990

Over 25,000		
Wenatchee		
Wenatchee	21,756	
Sunnyslope (u)	1,907	
S. Wenatchee (u)	1,207	
W. Wenatchee (u)	2,220	
East Wenatchee	2,701	
East Wenatchee Beach (u)	12,539	
	[42,330](a)	46,640(b)
Aberdeen		
Aberdeen	16,565	
Hoquiam	8,972	
Cosmopolis	1,372	
Central Park (u)	2,669	
	[29,578]	32,024
Centralia		
Centralia	12,101	
Chehalis	6,527	
Fords Prairie (u)	2,480	
	[21,108]	26,132
Mt. Vernon		
Mt. Vernon	17,647	
Burlington	4,349	
	[21,996]	28,805
Walla Walla		
Walla Walla	26,478	
Walla Walla (u)	2,959	
College Place	6,308	
Garrett (u)	1,004	
	[36,749]	40,691
Lewiston (ID) (Washington Part)		
Clarkston, WA	6,753	
Clarkston Hts (u)	2,832	
W. Clarkston (u)	3,913	
	[13,498]	13,830
10,000 to 25,000		
Port Angeles		
Port Angeles	17,710	
Port Angeles E. (u)	2,672	
	[20,382]	20,818
Moses Lake		
Moses Lake	11,235	
Moses Lake N. (u)	3,677	
Cascade Valley (u)	1,288	
	[16,200]	21,258
Anacortes	11,451	11,630
Sunnyside	11,238	12,517
Ellensburg	12,361	14,396
Oak Harbor		
Oak Harbor	17,176	
Ault Field (u)	3,795	
sep	23,829	
Pullman	23,478	23,687
[Camas-Washougal?]		
5,000 to 10,000		
Othello	4,638	7,319
Prosser	4,476	5,334
Sequim	3,616	5,683
Ephrata	5,349	5,656
Port Townsend	7,001	7,072
Raymond		
Raymond	2,901	
South Bend	1,551	
	[4,452]	5,472
Snohomish	6,499	6,735
[Arlington]		
Arlington	4,073	
Smoky Point (u)	2,620	
	[6,657]	7,362

Continued...

Table 6. Population of Component Places and Total Population of Urban Agglomerations Strictly Defined and Generously Defined for Urban Agglomerations with under 50,000 Population in the State of Washington: 1990

Lynden	5,709	6,008	
Ferndale	5,398	6,884	
North Bend North Bend Snoqualmie	2,578 1,546 [4,124]	[9,124]	
Enumclaw	7,227	[8,227]	
Cheney	7,723	7,851	
Monroe	4,278	8,418	
Poulsbo	4,848	5,658	
Shelton	7,241	8,069	
Omak Omak Okanogan N. Omak	4,117 2,370 515 [7,002]	9,386	
Sedro Wooley	6,031	8,929	
Toppenish	7,419	7,615	
Wapato	3,795	5,300	
Grandview	7,169	7,604	
[Battle Ground]	[3,758]		
2,500 to 5,000			
Benton City	1,806	2,676	
Cashmere	2,544	3,581	
Chelan	2,969	3,839	
Forks	2,862	4,431	
Dayton	2,458	2,945	
Duvall	2,770	[3,220]	
Buckley	3,516	[4,516]	
White Salmon White Salmon Bingen	1,861 645 [2,506]	3,449	
Colville	4,360	4,665	
Colfax	2,713	2,780	?
Blaine	2,489	2,495	[2,545]
Castle Rock	2,067	3,246	
Woodland	2,500	3,867	?
Quincy	3,735	3,938	
Elma	3,011	3,271	?
Montesano	3,064	3,161	3,789
Winslow	3,081	[3,581]	
Goldendale	3,319	3,618	
Grand Coulee Elmer city Coulee Dam Electric City Grand Coulee	290 1,087 910 984 [3,271]	3,321	
Yelm Yelm N. Yelm	1,337 2,078 [3,415]	[3,415]	

continued...

Table 6. Population of Component Places and Total Population of Urban Agglomerations Strictly Defined and Generously Defined for Urban Agglomerations with under 50,000 Population in the State of Washington: 1990

Medical Lake	3,664	3,772
Deer Park	2,278	2,735
Sultan	2,236	[2,536]
White Swan (u)	2,669	
Birch Bay (u)	2,656	
Bango (u)	3,702	
Suquamish (u)	3,105	
Irondale-Hadlock (u)	2,742	
Brush Prairie (u)	2,650	

(u) is a census designated place (CDP).
(a) total population for urban agglomeration strictly defined.
(b) total population for urban agglomeration generously defined.

There are substantial upward shifts, of places 10,000-25,000 to the over-25,000 class, and of places 2,500-5,000 to over-5,000. The number of places 2,500-5,000 falls because many move up (11) and many (10) are merged into larger places, even though several (nine) places would be urban (over 2,500) if clusters of places and/or fringe were recognized.

The effect of delineating agglomerations is to shift population to larger settlement population size categories, especially from 10,000-to-25,000 to over 25,000 and from 2,500-to-5,000 to 5,000-to-10,000. The total urban population rises as much as 120,000, 2.5 percent of the state population (Table 8). A more precise and conservative estimation of fringe would reduce it by about half, but this would still mean almost a 2 percent increase in the proportion urban population.

The effect of recognizing agglomerations is especially important in the critical 25,000-to-50,000 size class, the major nonmetropolitan centers from which future metropolitan areas will come and which are almost invisible when only places are considered. The distributions of sizes and places and populations is shown to be radically, not just marginally, different and suggest that such calculation should be done for the rest of the nation, so that we can get a realistic depiction of American settlement.

Table 8. Population by Size Class and Urban Population

Size Class	Population of places	Population of agglomerations
25,000-50,000	26,478	174,292
10,000-25,000	185,254	141,965
5,000-10,000	101,236	156,108
2,500-5,000	136,757	97,306
Total	449,725	569,671
Revised urban population	569,671	
Old urban population	449,725	
Differences	119,946	(2.5 percent of state)
Rural places	42,162	
Fringe	77,784	

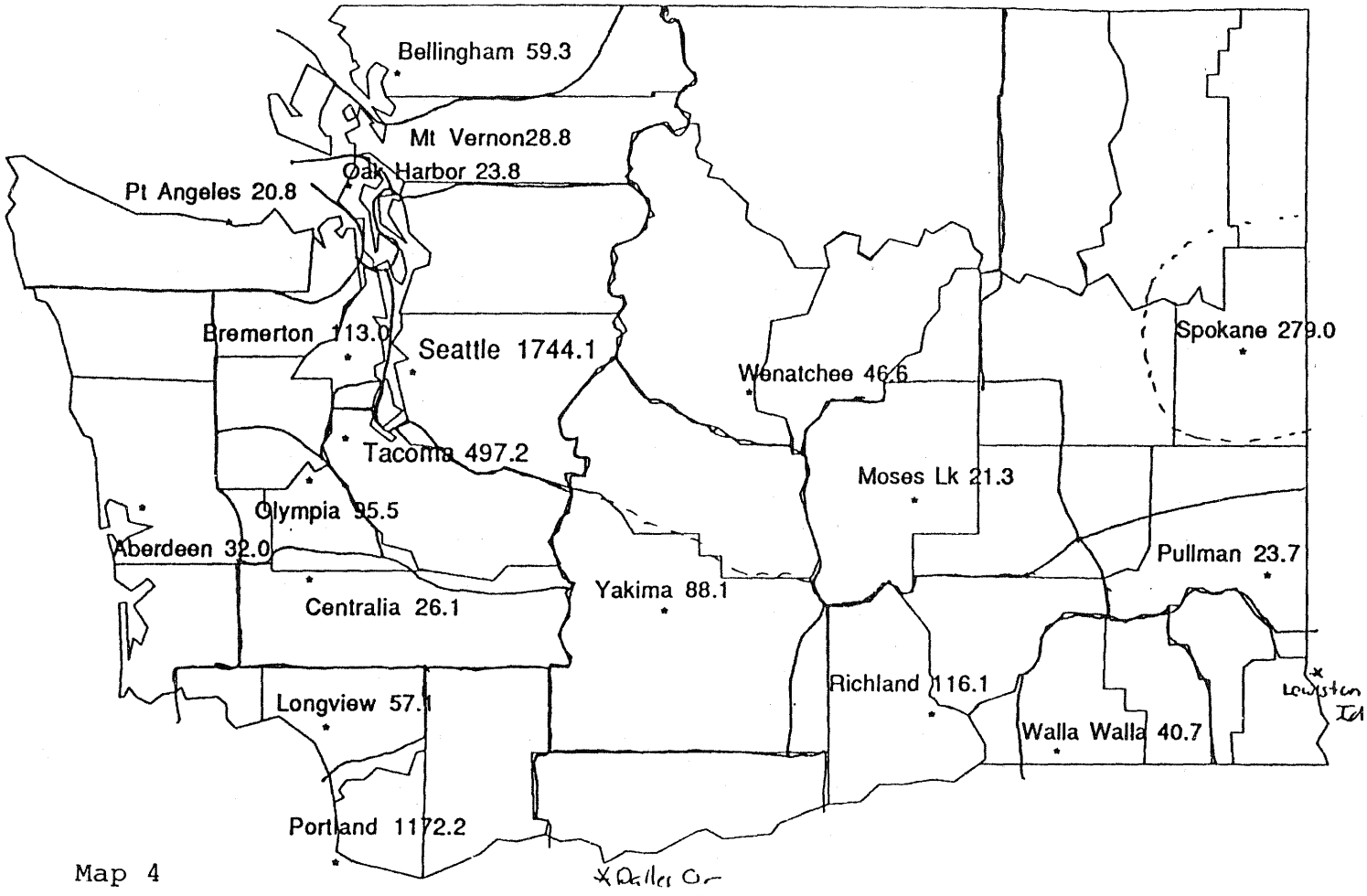
Utilizing this information, we can ask what are the logical labor market areas for the entire state of Washington? Beyond the existing 1990 metropolitan areas and the recognition of urbanized areas over 50,000 (which would add Longview even though the county is under 100,000), nine additional nonmetropolitan labor market statistical areas are created for the state of Washington. These additional areas (and their component counties) are listed in Table 9. The entire set of areas is shown in Map 4.

Table 9. Additional Labor Market Areas

Area (counties)	Center	Population
Outer Seattle-Ever. (Island)	Oak Habor	23,829
Mt. Vernon (Skagit, San Juan)	Mt. Vernon	28,805
Pt Angeles (Clallam, Jefferson)	Pt Angeles	20,818
Wenatchee (Chelan, Douglas, Okanogan, Kittitas)	Wenatchee	46,640
Outer Spokane (Ferry, Lincoln, Stevens, Pend Oreille)	--	--
Lewiston, ID (Asotin, Garfield)	--	--
Pullman-Moscow (Whitman)	Pullman	23,687
Outer Richland (Grant, Adams)	Moses Lake	21,258
Walla Walla (Walla Walla, Columbia)	Walla Walla	40,691
Aberdeen (Grays Harbor, Pacific)	Aberdeen	32,024
Centralia (Lewis)	Centralia	26,132

Summary: Meeting the Objectives of the Research on Agglomerations with under 50,000 Population

1. Conceptual basis. There are two rationales for delineating settlement agglomerations with under 50,000 population. The first is simply to extend the already accepted and understood principle of the urban agglomeration--the urbanized area--as a key element of the settlement system to smaller cities. Without this we cannot accurately describe the national settlement system or adequately distinguish urban from rural populations. In this case the



Map 4

AGGLOMERATIONS OVER 20000 IN WASHINGTON STATE

Those over 50000 are urbanized areas; over 59000 cores of metro areas

The rest are likely centers of non-metro statistical areas.

basis is fairly morphological--that is urban density. The second is to define the urban cores of the nonmetropolitan labor market areas.

2. Basic geographic units. The building blocks are simply block groups, and where necessary blocks. Even blocks fail at times to separate "urban" from "rural," which leads to continuing concern with the problems of defining blocks (another project?).

3. Agglomerating geographic units. The criterion for agglomeration is simply adjacency --essentially the same rules as for urbanized areas.

4. Integration. The only issue that arises, as with urbanized areas, is where one settlement ends and another begins, as in the case of a string of places along a beach. Here data on functional centers might be useful.

5. Relationships among areas. Inherently smaller population agglomerations represent a lower level than urbanized areas. This does raise the issue of levels of urbanized areas, or clusters of urbanized areas. These obviously exist, especially around larger cities.

6. Data availability. The basic data are in the decennial census: area, housing units, and people. I am inclined to suggest a dual approach--that an area qualifies as urban if it has 1,000 persons or 360 housing units per square mile, which will tend to even out problems of group quarters, empty nesters, and the like. The great advantages of the housing density approach is that it enables the delimitation prior to the census and also encourages application of geographic information systems.

7. Role for local opinion? The process is statistical, unless local opinion is needed to distinguish

internal divisions along a string or cluster of urbanized areas.

8. Updating. Decennial census-based updating generally will be satisfactory, but areas are easily updated by land management records.

9. Official recognition of areas. Smaller agglomerations should be officially recognized--in my opinion at least down to all places over 2,500 population. We now underestimate the true urban population significantly.

10. Generates useful data? Data on smaller agglomerations would appear to be of special benefit or value to local and regional planning, growth management, and environmental and transport planning. It will permit a consistent definition of the American settlement system for the first time.