

Weighing Sprawl Factors In Large U.S. Cities

Executive Summary

Over a 20-year period, the 100 largest Urbanized Areas examined in this study sprawled out over an additional 14,545 square miles. That was more than 9 million acres of natural habitats, farmland and other rural space that were covered over by the asphalt, buildings and sub-divisions of suburbia. And that was just for the half of Americans who live in those 100 cities.

Americans have become increasingly alarmed, making urban sprawl one of the nation's hottest political issues.

A major controversy in the efforts to halt the rural land loss is whether land-use and consumption decisions are the primary engines of urban sprawl, or whether it is the nation's continuing population boom providing most of the power driving the expansion.

A careful analysis of U.S. Census Bureau data found that the two sprawl factors share equally in the blame:

- (1) **Per Capita Sprawl:** About half the sprawl nationwide appears to be related to the land-use and consumption choices that lead to an increase in the average amount of urban land per resident.
- (2) **Population Growth:** The other half of sprawl is related to the increase in the number of residents within those 100 Urbanized Areas.

On average, there are more of us, and each of us is using more urban land, and therein lie the two halves of the problem. Those and other findings in U.S. Census Bureau data on Urbanized Areas lead the authors to the following conclusions:

- The toll of urban sprawl on ecosystems, farmland and scenic open spaces cannot be substantially halted unless anti-sprawl efforts include a two-pronged attack using both land-use/consumption tools and population tools.
- Anyone advocating U.S. population stabilization who derides the importance of consumption and planning controls is ignoring half the story of American sprawl.
- Similarly, any Smart Growth advocate who relegates population growth to a side issue is turning a blind eye to half the problem and, thus, approximately half the solution which is population stabilization.
- Although the circumstances of each city are different, the power of both sprawl factors is potentially the same in each. Every city that wishes to restrain its land expansion will need to continually keep in mind the impacts on sprawl of both growth factors. Cities with no recent per capita land consumption growth should not throw away land-use tools, lest Per Capita Sprawl resume. And cities with no recent population growth will still need to be reminded regularly of the role population can play in sprawl, lest they thoughtlessly create incentives to promote population growth in the future.
- The forces driving overall national population growth cannot be ignored as contributors to sprawl, since national population growth manifests itself as growth in local communities.

Those conclusions pose a challenge to most anti-sprawl efforts that focus on only one or the other of the two sprawl factors. And of the two, population is the factor most often ignored, according to a literature search. It found that

TERMS

This study uses three terms extensively and precisely (see pages 24 and 55 for further description).

Sprawl – the rural acres lost as an Urbanized Area spreads outward over a period of time.

Percent Sprawl – the percentage increase of total acres of land in an Urbanized Area over a period of time.

Urbanized Area – a central city and its contiguously developed suburbs, as meticulously calculated by the Census Bureau.

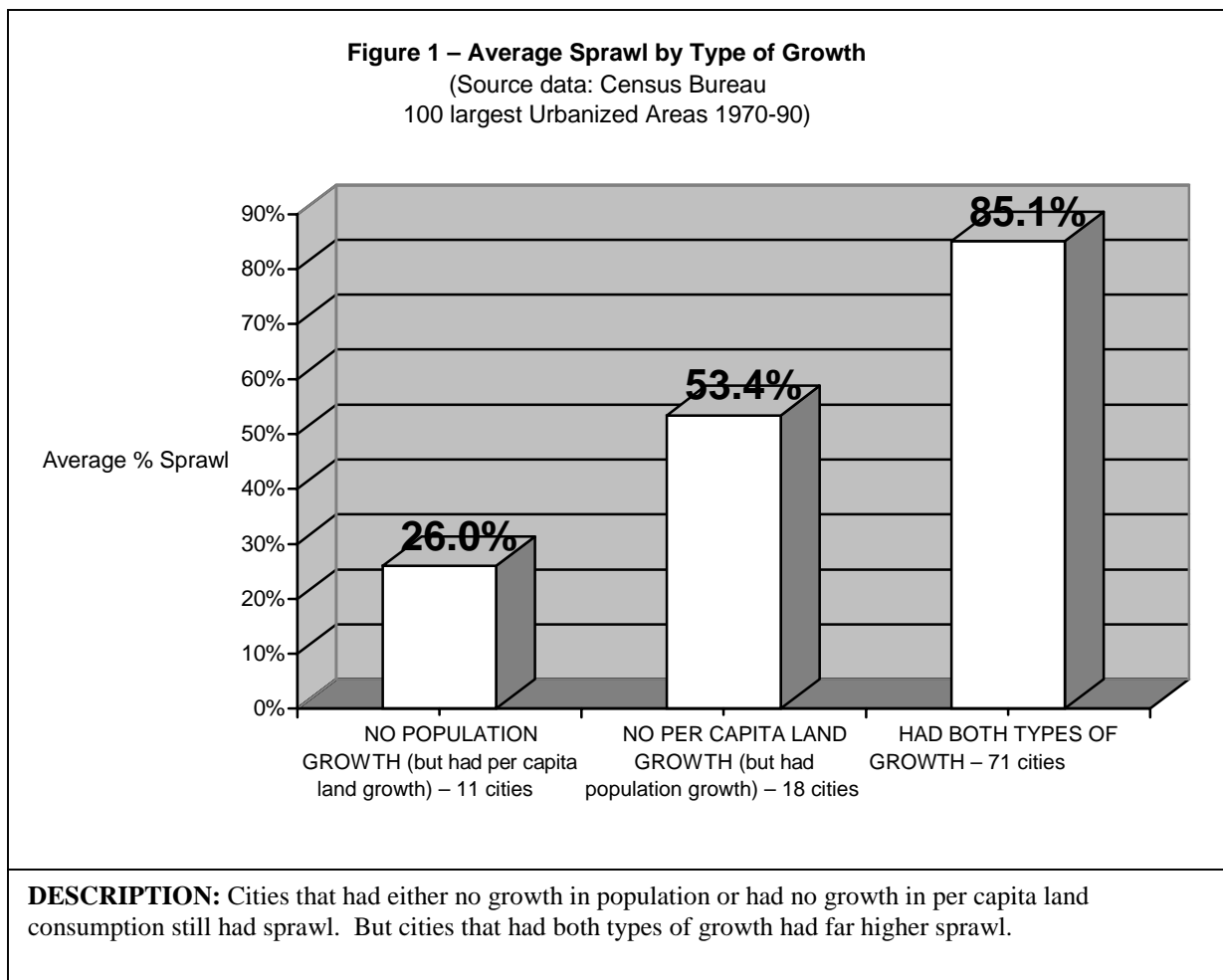
media stories, advocacy programs, governmental reports and plans, and political statements about controlling sprawl rarely suggested that substantially reducing population growth is a necessary anti-sprawl tool. Our analysis of Census data indicates that anti-sprawl efforts that deal almost exclusively with land-use decisions are properly focused to deal with around half the nation's sprawl problem; it also indicates, however, that if continued without a population-stabilization component, those efforts are destined to fall far short of protecting the agricultural land and natural habitats surrounding cities.

WHAT ABOUT DETROIT?

According to the literature search, many have resisted making the reduction of population growth a co-goal of anti-sprawl efforts because of doubts raised by cities where population already has stopped growing. A common comment has been something like this: “But what about Detroit? Clearly, population growth is not a key factor – or a national factor – in sprawl when you consider that Detroit had no population growth whatsoever between 1970 and 1990, but it still was swimming in sprawl – 28.4%.” Indeed, others have added, what about Pittsburgh, Milwaukee, Dayton, Akron or Flint? There was no population growth in any of them, but all had sprawl. The average sprawl (percentage increase in total urban land) for the 11 Urbanized Areas with no population growth was 26%.

Our analysis of the Census data, however, provides a context in which those cities appear to reinforce – not contradict – the conclusion that population growth is a powerful determinant of sprawl. **Figure 1** shows that compared to the Detroit and Pittsburghs of the country that had no population growth:

- Average sprawl was twice as high (53.4%) for those Urbanized Areas that had population growth even though they had stopped per capita land consumption growth (the middle bar).



- Average sprawl was more than three times as high (85.1%) for those that had population growth while also continuing per capita land consumption growth (the bar on the right).

Thus, rather than proving that population-stabilization is a minor or secondary goal in anti-sprawl efforts, Detroit indicates just the opposite. When considered in the context of all 100 largest Urbanized Areas, the answer to the question, “What about Detroit?” might be: If it had not had a population decline, its sprawl likely would have been far greater.

Such a finding also reinforces the primary conclusion of the study: Unless a city fights both sprawl factors, it likely will continue to have lots of sprawl. The bars on the left and the middle of Figure 1 illustrate that well.

CHOOSING HOW TO MEASURE

This study measures sprawl in terms of the actual amount of rural land that is lost to urbanization. There are other ways to measure. Often, urban planning institutions focus more on the style of the conversion of rural land to urban use than on the amount of the conversion. Organizations whose chief concerns involve urban planning goals may tend to emphasize the qualitative attributes of sprawl – such as attractiveness, pedestrian-friendliness, and compactness.

But for those who are most concerned about the effect of sprawl on the natural environment and agricultural resources, the more important overall measure of sprawl is the actual amount of land that has been urbanized. Knowing the actual square miles of urban expansion provides a key, but not the only, indicator of the threat to the natural environment and to the nation's agricultural production.

Both the urban planning and environmental approaches to sprawl are valid ones for achieving sometimes differing, though not necessarily competing, goals. Here, however, we concentrate on the environment.

THE IMPORTANCE OF ‘PER CAPITA SPRAWL’

The amount of land covered by an Urbanized Area is equal to the average amount of urban land per resident multiplied by the number of residents:

$$\text{Total Urbanized Land} = \text{Per Capita Land Use} * \text{Urban Population}$$

Despite the considerable complexity of sprawl in an urban area, nearly all of the complexity can be boiled down to this: Overall Sprawl is the growth in the total amount of land of an Urbanized Area; that overall change is caused by the combination of the changes in per capita land consumption and the changes in population. The Census Bureau provides data to calculate all of that information.

The concept of per capita land consumption is essential to the analysis in this study and, we would contend, to any clear analysis of sprawl. That statistic tidies up the effects of all decisions that affect consumption, such as urban planning, development, transportation, taxing, affluence, business and consumer preferences. We usually cannot know the specific effect of any one of those decisions, but we can know the combined effects of all of them by looking at the single statistic that tells us how much urban land is used on average for each resident to satisfy housing, transportation, work, recreation and commercial needs. In most of the 100 cities, per capita land consumption in 1990 was between one-sixth and one-half acre. (See Appendix E for how this is calculated.)

When per capita land consumption increases, we call that “Per Capita Sprawl.”

If the population of a city remains stable, but the land use for the average resident increases, that Per Capita Sprawl will cause the urbanization of surrounding rural land. (Detroit and Pittsburgh were examples of this phenomenon.) Most current anti-sprawl efforts, particularly those under the name of “smart growth,” focus on stopping Per Capita Sprawl.

This study has calculated the Per Capita Sprawl percentage for each of the 100 largest Urbanized Areas and displays those in Appendix A.

CALCULATING EACH FACTOR'S 'SHARE' OF SPRAWL

By placing the Per Capita Sprawl percentage next to the Population Growth percentage for each Area, we can visually and immediately gain a fairly clear idea about which factor has played a larger role in the equation that has produced an Urbanized Area's sprawl.

Table 1 allows us to do that for the 10 Urbanized Areas that are ranked here for having had the most square miles of sprawl. Looking at New York City and Philadelphia, we immediately notice that Per Capita Sprawl was a much greater factor than Population Growth. The two factors are quite similar in Washington D.C. and Minneapolis. In the other six, Population Growth is the obvious primary change factor in their Overall Sprawl.

With percentages for the two growth factors available, it is possible to look at their ratio to each other. We used a standard method of calculating those ratios to allow us to figure "shares of sprawl" for each factor. That allowed us, for example, to state that Population Growth was related to 63.5% of the Overall Sprawl in Atlanta, the nation's top sprawler. And Per Capita Sprawl was related to 36.5% of the sprawl.

Urbanized Area	% Growth in Per Capita Land Consumption	% Growth in Population
1. Atlanta, GA	42%	84%
2. Houston, TX	26%	73%
3. New York City, NY-NJ	24%	- 1%
4. Washington, DC-MD-VA	41%	36%
5. Philadelphia, PA-NJ	48%	5%
6. Los Angeles, CA	- 8%	37%
7. Dallas-Fort Worth, TX	- 15%	59%
8. Tampa-St. Petersburg-Clearwater, FL	13%	98%
9. Phoenix, AZ	- 18%	132%
10. Minneapolis-St. Paul, MN	21%	22%

Source: U.S. Census Bureau data

When using the population and land figures for all 100 Areas, the calculation method found that 50.9% of the sprawl was related to growth in population, and 49.1% was related to growth in per capita land consumption (see Figure 8 on the back cover).

The usefulness of proportioning exercises is not in the mathematical precision of such an equation but in general approximations. Whether Population Growth's share of the nation's sprawl was 50.9%, 50.6% or 45% or 55%, it is obvious that Population Growth and Per Capita Sprawl played roughly equal roles in the rapid expansion of cities over surrounding rural areas.

We applied the results of the apportioning method to the total square miles of sprawl by the 100 largest Urbanized Areas during the most recent 20 years for which data are available. The results are illustrated in Figure 3 (on page 15): Per Capita Sprawl was related to 7,141 square miles of sprawl, and Population Growth was related to 7,403 square miles of sprawl.

To ignore either growth factor, for sure, would be to ignore a vast amount of lost natural habitats, farmland and other rural space.

RESULTS CONSISTENT WITH OTHER STUDIES

The finding of general parity between the two sprawl-inducing factors in 100 large Urbanized Areas between 1970 and 1990 is consistent with several other studies of somewhat different time periods and number of cities:

- Daniel McGrath of the University of Illinois Great Cities Institute studied the most populated 20 coastal regions from 1950 to 1990. He concluded that just over half the urban land expansion was determined by population growth while just under half was determined by other factors such as affluence and technology.¹

¹ Press Release, "Predicting urban sprawl in top 20 U.S. coastal cities," December 5, 2000, Illinois-Indiana Sea Grant.

- The U.S. Department of Housing and Urban Development studied the nation's cities in the very recent 1994-97 period and declared that urban areas were expanding at about twice the rate of population. As is explained later, that is another way of saying that Population Growth and Per Capita Sprawl were roughly equal.²
- The U.S. Department of Agriculture surveyed the development of all rural land (minus Alaska) from 1982 to 1997.³ We applied the apportioning method to those results (released in January 2001) and found: 49.7% of the transformation of rural land into developed land was related to population growth, and 50.3% was related to per capita land consumption growth.
- Oft-quoted urban planning consultant David Rusk studied the expansion of 213 Urbanized Areas between 1960 and 1990. He found that population increased by 47% while the total land use expanded by 107%. When placed in the apportioning method, the Rusk results showed that 54% of Overall Sprawl had been related to Population Growth, while 46% of sprawl had been related to Per Capita Sprawl.⁴

TWO-PRONGED ATTACK NEEDED NATIONALLY, NOT JUST IN SOME REGIONS

The relative roles of the two sprawl factors differ widely from region to region, and within the regions. This raises the possibility that the two-pronged attack suggested by aggregate national sprawl data may not be appropriate or necessary in all regions of the country. Part of the public debate among anti-sprawl advocates has been whether population is primarily a problem in just a few regions, thus arguing against a relatively uniform national anti-sprawl campaign that is similar in all regions.

To test that possibility, we sorted the 100 Urbanized Areas into 12 geographic regions. Because of their size and exceptionally high levels of sprawl, the states of California, Texas and Florida were each considered a region unto themselves.

We then calculated the “shares of sprawl” for the average Urbanized Area in each region, allowing us to place each region into one of five categories based on quintiles of shares of sprawl:

Category I: (no regions fit this criteria)

Per Capita Sprawl was the overwhelming factor (81-100%) in Overall Sprawl
Population Growth was a minor factor (0-19%) in Overall Sprawl

Category II: Northeast, Border States, Great Lakes

Per Capita Sprawl was the primary factor (61-80%) in Overall Sprawl
Population Growth was a significant factor (20-39%) in Overall Sprawl

Category III: Plains, Old South, Chesapeake Bay Watershed

Per Capita Sprawl was a primary factor (40-60%) in Overall Sprawl
Population Growth was a primary factor (40-60%) in Overall Sprawl

Category IV: Pacific Northwest, Texas

Per Capita Sprawl was a significant factor (20-39%) in Overall Sprawl
Population Growth the primary factor (61-80%) in Overall Sprawl

Category V: California, Desert Southwest, Mountain West, Florida

Per Capita Sprawl was a minor factor (0-19%) in Overall Sprawl

² “A Complex Relationship: Population Growth and Suburban Sprawl,” viewed Feb. 10, 2001, on the Sierra Club website, based on “The State of the Cities 2000,” U.S. Department of Housing and Urban Development, 2000.

³ Calculated by the U.S. Department of Agriculture; these data concern development both near and far from urban areas in the 49 states excluding Alaska. USDA Natural Resources Conservation Service. 2000. *Summary Report 1997 National Resources Inventory*. Table 1, p. 11.

⁴ See note 2, “The Debate on Theories of David Rusk,” *The Regionalist*, Fall 1997.

Population Growth was the overwhelming factor (81-100%) in Overall Sprawl

Per Capita Sprawl was a significant factor of 20% or more in 8 of the 12 regions. It was a minor factor of 19% or less in 4 regions. It was not the overwhelming factor in any of the regions.

It is much more obvious that Population Growth is truly a national factor; it was a significant factor of 20% or more in all 12 regions. Of those, it was a primary factor in 9 of them, including 4 in which it was the overwhelming factor of 81% or more.

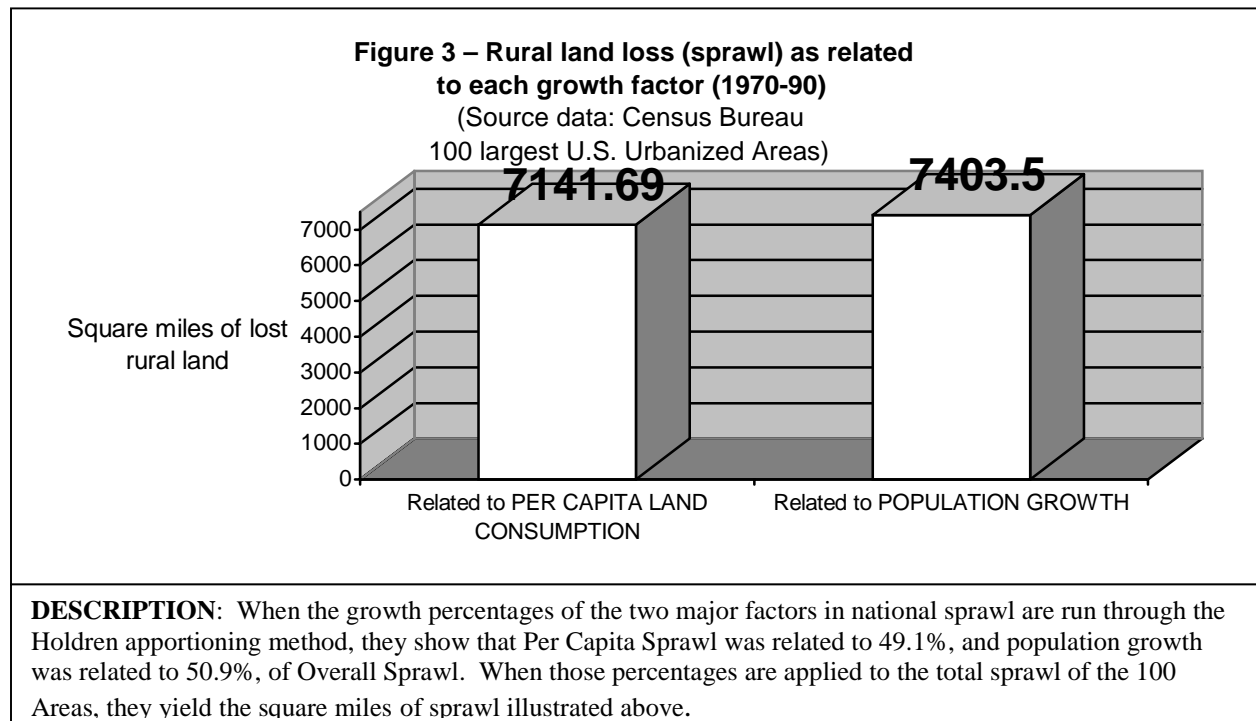
Thus, there is no apparent reason to de-emphasize Population Growth in any of the regions, as many have suggested. And, as no major anti-sprawl leaders have suggested de-emphasizing Per Capita Sprawl in the four regions where it was a minor factor, we do not suggest it either. We cannot find a convincing justification, for example, for withholding land-use information from the Urbanized Areas of San Diego, Phoenix and Orlando just because each had less than 10% of their sprawl related to Per Capita Sprawl – which points again to a primary conclusion of the study: Every community should be helped to understand the sprawl power of both Population Growth and Per Capita Sprawl as they design their local programs according to their own unique circumstances.

DATA UNDERLYING THIS STUDY OFTEN HAVE BEEN MISUNDERSTOOD

To some, the conclusions of this study may seem like little more than common sense. As noted above, they do not contradict a number of other studies that are well-known to those who are working to control sprawl.

Yet, our literature search found very little among anti-sprawl efforts that works toward restraining population growth. That is in sharp contrast to this study's conclusion that real and sustainable controls on sprawl are not practicable without vigorous national and local efforts to attack half the source of sprawl by moving toward population stabilization.

Because it is difficult to believe that people who are seriously concerned about sprawl would deliberately choose to ignore or minimize something that is half the problem – or that journalists would intentionally mislead their readers so often in that way – the explanation appears to be that there has been a massive misunderstanding of the data that the Census Bureau provides.



Perhaps the most consequential has been the misuse of “doubling” statistics. We have found repeated instances where the role of population growth was dismissed as only a minor factor because the urban area was expanding at double the rate of population.

Charlotte, North Carolina, is such an Urbanized Area. It’s population grew by 63% while the total urban area grew by twice as much – 128.7%. Was Population Growth a minor player in that sprawl? To answer the question, it helps to know what the other sprawl factor was doing. In fact, Charlotte’s per capita land consumption was growing by 40.3% while the population was growing by 63%. Not only was Population Growth a significant factor, it was the majority factor.

To understand the role that semantics may play in how policies get formed and executed, consider the difference between “urban areas are expanding at double the rate of the population” and “population growth is the primary sprawl factor and accounts for more than half of urban sprawl.” Technically, both statements state the same information, but only the latter apparently communicates a clear message to most people.

POPULATION GROWTH WITHOUT SPRAWL APPARENTLY NOT PRACTICABLE

The virtual void of population-stabilization plans within the anti-sprawl programs around the country is related to a belief that population growth can be accommodated without causing sprawl.

Theoretically, that is possible – for awhile: All new residents would have to move into the existing urban area, and none of the previous residents could move to the edge of the city. Such an occurrence over any period of time could happen only through the continual demolition of existing housing to make room for higher-density cluster houses, condominiums or apartment buildings; the demolition of apartment buildings to build higher apartment buildings; higher occupancy rates in existing structures, including some structures not intended for residential use such as garages, and building on any remaining vacant land.

Even if Americans were to accept the escalating governmental regulations that would be required to handle each year’s population growth within existing boundaries, such a success would not ease the massive “ecological footprint” on the rural areas of the country.

It is important to recognize that the per-capita-land-consumption figure upon which nearly all conventional anti-sprawl efforts focus includes only the land consumed by an average resident inside his/her own Urbanized Area. It does not include all the rural land in other parts of the country that is required to obtain the food, fiber, minerals and energy for that resident, and to dispose of that resident’s wastes – termed the ecological footprint of the Area.

This study failed to find any American community that has shown an inclination to adopt the regulations and make the personal behavior changes that would counteract the effects of population growth for even a few years, let alone in perpetuity – which essentially is what would be required if current national population policies stay in place.

Los Angeles is a prime example of the limits to how far Americans will go in packing additional people into their neighborhoods. No city in America may be a better model of the goal of attempting to restrain sprawl by channeling population growth into ever-denser settlements, both in the urban core and throughout the suburbs. Between 1970 and 1990, per capita land consumption fell until the L.A. Urbanized Area was the most densely populated in the country. Many people find this hard to believe because of Manhattan's skyline. But New York's suburbs are only 60% as dense as those of Los Angeles. No other Urbanized Area provided so little land per resident as Los Angeles (0.11 acre). Most American communities have refused to come anywhere near the L.A. densities.

Yet despite accepting the densest living conditions in the country, the Los Angeles Area sprawled across another 394 square miles of orchards, farmland, natural habitat and other rural land. The reason? The addition of another 3.1 million residents.

STUDY RESULTS PROVIDE MEASURE FOR SERIOUSNESS OF FUTURE ANTI-SPRAWL EFFORTS

The failure of Los Angeles and any others among the 100 largest Urbanized Areas to substantially control sprawl in the face of population growth suggests that those who would attempt to save surrounding environmental habitat and farmland will certainly need to address (a) local incentives that entice more people to move into particular cities, (b) state policies that attract residents from other states, and (c) federal policies that add population to the nation.

Population policies, phenomena and trends – along with the land-use/consumption ingredients in Per Capita Sprawl – are central to understanding the future of sprawl in American cities and how to prevent it. The findings of this study suggest that plans and programs from governmental agencies, think tanks, universities and advocacy groups must tackle both population growth and land-use factors if they are to help the nation find a sustainable solution to the sprawl that is devouring thousands of square miles of natural habitat and farmland each decade.