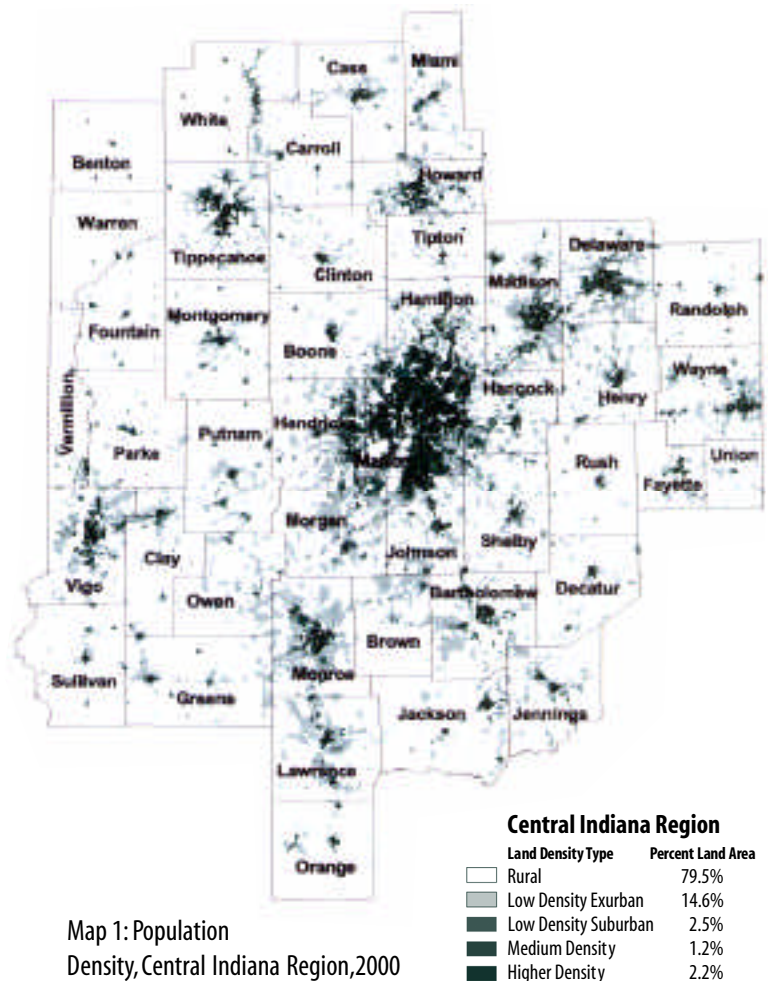


## Low Density Development Increasing in Central Indiana

New residential and commercial development at the periphery of urban areas, sometimes called *urban sprawl*, has been the focus of intense debate across the nation. Critics charge that this type of development removes land from agricultural production, harms environmentally-sensitive areas, and increases automobile travel, traffic congestion, air pollution, and infrastructure costs. Developers counter that they merely build what people want and the market demands, and that the benefits of new development rarely are measured. Meanwhile, some researchers are stepping back, asking deceptively simple questions such as, What is sprawl? These researchers are trying to develop indicators of urban form such as compactness or density that can help clarify the debate over development patterns.

Many analysts have used population density as one indicator of sprawl. As part of the ongoing initiative, *Central Indiana: Understanding the Region and Identifying Choices*, researchers at the Center for Urban Policy and the Environment (Center) are using data from the census to analyze changes in density of development in the region focusing on low density exurban development taking place outside of existing urbanized areas. These analyses show:

- Central Indiana remains mostly rural, but significant portions of the region are impacted by large areas of low density exurban development.
- The area of Central Indiana covered by low density exurban development increased more in absolute terms than any other residential density category between 1990 and 2000, although proportionate increases in higher density classifications were greater.
- The extent and growth of low density exurban development varies widely across counties and is increasing rapidly in counties in the southwestern part of the region.



Map 1: Population Density, Central Indiana Region, 2000

### Using Census Data to Analyze Development Patterns

Virtually all analyses of populations and population change rely on data from the U.S. Bureau of the Census. Population data typically are summarized for political jurisdictions such as counties and



Table 1: Central Indiana Land Area and Population by Population Density, 2000

Population Density Category	Persons per Acre	Land Area		Population	
		Acres	Percent	Persons	Percent
Rural	Less than 0.1	8,854,735	79.5%	288,479	9.5%
Low Density Exurban	0.1–0.5	1,620,545	14.6%	319,087	10.5%
Low Density Suburban	0.5–1.5	279,561	2.5%	239,445	7.9%
Medium Density	1.5–3.0	129,283	1.2%	277,870	9.1%
Higher Density	Greater than 3.0	250,194	2.2%	1,924,580	63.1%
Total Area		11,134,317	100.0%	3,049,461	100.0%

municipalities but also are available in smaller spatial units called tracts and blocks. Census “blocks,” which are the smallest units for which data are available, typically are city blocks in urban areas but may be significantly larger in rural areas. With the widespread availability of geographic information systems (GIS) technology, analysis of the spatial distribution of populations in these blocks now is much easier.

Analysts use population density as one indicator of sprawl because it is an indicator of how efficiently land is being used. To gain insight into differences in population density in Central Indiana, the Center obtained census data from 1990 and 2000 and classified blocks into five density classes in units of persons per acre. The classes of 0.5–1.5 persons per acre, 1.5–3.0 persons per acre, and more than 3.0 persons per acre represent the range of urban development from typical low density suburban development through higher density urban development. The lowest class at the other extreme, less than 0.1 persons per acre, repre-

sents land that remains largely rural. These are areas in agriculture or other rural uses where little development has occurred.

The remaining class, 0.1–0.5 persons per acre, can be characterized as low density exurban development. This is the very low density development that typically occurs outside of existing urbanized areas. Land in this category generally has one housing unit for every 5 to 25 acres. Some of these areas are fully built out with large-lot residential development that makes additional construction difficult or impossible. Other areas are more rural with scattered housing on smaller lots where infill still could occur.

### Most Land in Central Indiana Remains Rural

Map 1 (on page 1) shows the population distribution in Central Indiana in the year 2000 using the results from the 2000 census. Nearly four-fifths of the land in the region had a population density of less than 0.1 persons per acre in 2000 and is classified as rural (see Table 1). Conversely, in the more urbanized areas, the

Table 2: Central Indiana Land Area and Land Area Change by Population Density, 1990–2000

Population Density Category	Persons per Acre	Land Area 1990		Land Area 2000		1990–2000 Percent Change	
		Acres	Percent	Acres	Percent	Acres	Percent
Rural	Less than 0.1	9,092,469	81.7%	8,854,735	79.5%	-237,735	-2.6%
Low Density Exurban	0.1–0.5	1,467,128	13.2%	1,620,545	14.6%	153,416	10.5%
Low Density Suburban	0.5–1.5	249,656	2.2%	279,561	2.5%	29,905	12.0%
Medium Density	1.5–3.0	111,718	1.0%	129,283	1.2%	17,565	15.7%
Higher Density	Greater than 3.0	213,345	1.9%	250,194	2.2%	36,849	17.3%
Total Area		11,134,317	100.0%	11,134,317	100.0%	–	–



three classifications that include all land with a population density greater than 0.5 persons per acre account for about 6 percent of the land in the region. Yet these areas are home to almost 2.5 million people, about 80 percent of the total population of the region.

### Low Density Exurban Development Is Widespread and Increasing

Low density exurban development (0.1–0.5 persons per acre), which seems to be the focus of debates about sprawl, accounted for nearly 15 percent of the land area in Central Indiana in 2000. Over 10 percent of the population of the region lived in these areas.

Comparisons with 1990 data show that within the region, more land has been converted from rural to low density exurban than to any other higher density classification, but the more urban classifications grew at greater rates (Table 2). The amount of rural land in Central Indiana (land with less than 0.1 persons per acre) decreased from nearly 82 percent in 1990 to 79.5 percent in 2000. The amounts of land in each of the other density categories increased, reflecting population growth and new urban development. The density category that showed the greatest increase in absolute terms was low density exurban, with 0.1–0.5 persons per acre. Land in this category increased from just over 13 percent of the land in the region in 1990 to nearly 15 percent of the land in 2000, an increase of over 10 percent. Although far fewer acres were developed in the more urban categories, the percentage growth of land with more than 0.5 persons per acre exceeded the percentage growth in the rural and low density exurban residential categories.

### Extent of Low Density Exurban Development Varies Greatly across the Region

As Map 1 shows, the presence of low density exurban development varies widely among counties within the region. As would be expected, much of the low density exurban development occurs in the areas surrounding the major population centers in the region, in the counties surrounding Indianapolis, and in the counties containing the other major urban areas in the region.

The extent of low density exurban development varies greatly in the non-metropolitan counties. Some counties in the north-western part of the region, for example, have little low density exurban development. On the other hand, the non-metropolitan

Table 3: Central Indiana Percent of Land Classified as Low Density Exurban by County, 1990 and 2000

County	Percent of Land with 0.1–0.5 Persons per Acre, 1990	Percent of Land with 0.1–0.5 Persons per Acre, 2000	Change in Percent with 0.1–0.5 Persons per Acre
Bartholomew	18.3%	19.7%	1.4%
Benton	0.4%	0.4%	-0.1%
Boone	12.3%	13.7%	1.5%
Brown	12.7%	19.0%	6.4%
Carroll	8.0%	9.8%	1.8%
Cass	10.3%	11.0%	0.7%
Clay	11.6%	12.5%	0.9%
Clinton	6.2%	8.4%	2.1%
Decatur	8.0%	8.0%	0.0%
Delaware	22.2%	25.9%	3.6%
Fayette	12.5%	11.0%	-1.6%
Fountain	4.1%	4.3%	0.1%
Greene	10.3%	12.4%	2.2%
Hamilton	24.4%	23.0%	-1.4%
Hancock	24.6%	25.9%	1.3%
Hendricks	28.6%	30.0%	1.4%
Henry	15.4%	15.7%	0.3%
Howard	20.7%	23.6%	2.9%
Jackson	9.0%	10.7%	1.6%
Jennings	14.7%	16.9%	2.1%
Johnson	22.8%	25.3%	2.5%
Lawrence	19.7%	25.2%	5.5%
Madison	24.1%	25.5%	1.4%
Marion	19.0%	15.5%	-3.5%
Miami	11.0%	12.6%	1.6%
Monroe	33.2%	35.5%	2.3%
Montgomery	7.1%	7.6%	0.4%
Morgan	27.0%	32.4%	5.4%
Orange	6.0%	5.7%	-0.3%
Owen	12.2%	19.1%	6.9%
Parke	4.0%	4.7%	0.7%
Putnam	8.8%	11.4%	2.7%
Randolph	5.0%	4.7%	-0.3%
Rush	4.3%	3.4%	-0.9%
Shelby	14.7%	16.1%	1.4%
Sullivan	4.8%	4.9%	0.1%
Tippecanoe	16.2%	18.0%	1.8%
Tipton	7.7%	8.7%	1.1%
Union	4.2%	5.7%	1.5%
Vermillion	6.3%	7.1%	0.8%
Vigo	25.1%	27.0%	1.9%
Warren	2.5%	1.3%	-1.2%
Wayne	17.0%	19.0%	2.0%
White	4.0%	3.3%	-0.7%



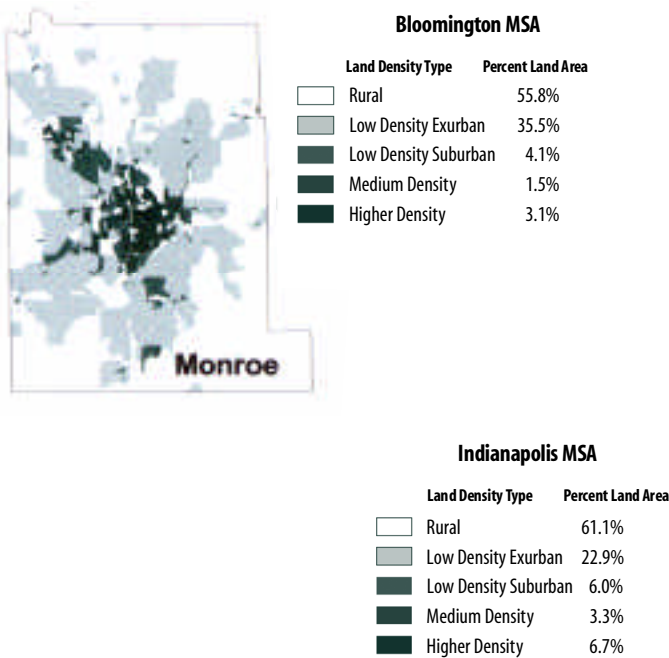
counties surrounding Bloomington and Monroe County, including Brown, Lawrence, Owen, and Putnam counties, now have fairly extensive areas of low density exurban development.

Gauging the extent of low density exurban development in different parts of the region just by looking at the map can be difficult. For a more detailed picture, the percentage of land in low density exurban development in 2000 has been calculated by county. The results are shown in Figure 1 (page 6) and Table 3 (page 3). Monroe, Morgan, and Hendricks counties have the highest proportions of their land areas in low density exurban development, each with 30 percent or more of their land area in the 0.1–0.5 persons per acre category. Eleven of the 44 counties have more than 20 percent of their land in low density exurban development, and 4 more counties almost reach that level. On

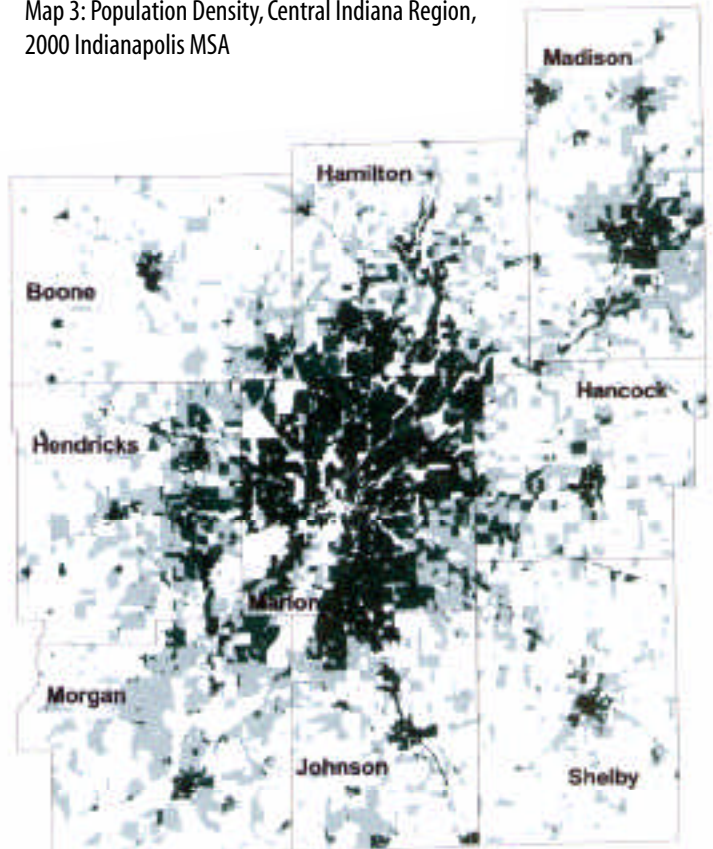
the other hand, 16 counties have less than 10 percent of their land in the 0.1–0.5 persons per acre category.

Because growth typically spreads out from the urban core, counties within metropolitan areas tend to have the highest percentages of land in low density exurban use. The U.S. Bureau of the Census has designated six Metropolitan Statistical Areas (MSAs) in Central Indiana: Bloomington, Indianapolis, Kokomo, Lafayette-West Lafayette, Muncie, and Terre Haute. These MSAs include 18 counties. Maps 2 through 7 include summaries of land use by density class for each of these MSAs, and illustrate the population distributions. Nine of the 10 counties with the most area of low density exurban development are in these metropolitan areas: Monroe (Bloomington MSA); Hancock, Hendricks, Johnson, Madison, and Morgan (each in the Indianapolis MSA);

Map 2: Population Density, Central Indiana Region, 2000  
Bloomington MSA



Map 3: Population Density, Central Indiana Region, 2000 Indianapolis MSA





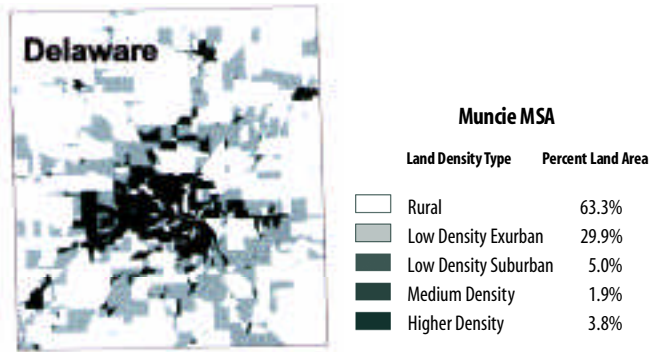
Howard (Kokomo MSA); Delaware (Muncie MSA); and Vigo (Terre Haute MSA).

Two metropolitan counties (Marion and Tippecanoe) that contain the central city of one of the six MSAs are not among these 10. Marion County is lower because more of the county has higher density development.

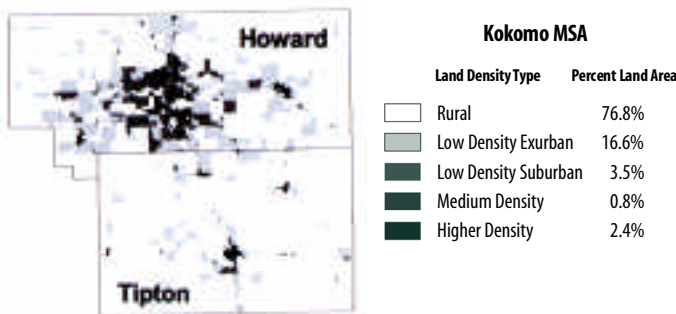
In the Indianapolis MSA, Boone, Marion, and Shelby counties have the least low density exurban development. Vermillion County (in the Terre Haute MSA), Clinton County (in the Lafayette-West Lafayette MSA), and Tipton County (in the Kokomo MSA) have the lowest proportions of low density exurban development of all counties in MSAs.

Among the counties that are outside the boundaries of an MSA, the extent of low density exurban development varies widely.

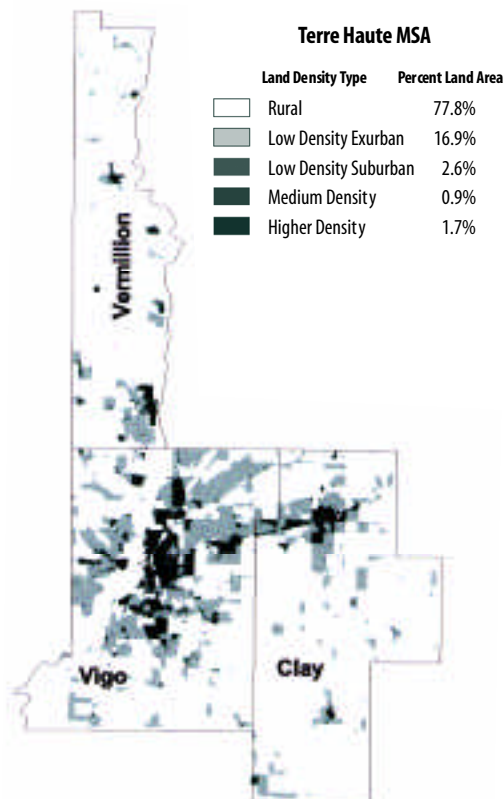
Map 6: Population Density, Central Indiana Region, 2000  
Muncie MSA



Map 4: Population Density, Central Indiana Region, 2000  
Kokomo MSA



Map 7: Population Density, Central Indiana Region, 2000  
Terre Haute MSA



Map 5: Population Density, Central Indiana Region, 2000  
Lafayette/West Lafayette MSA

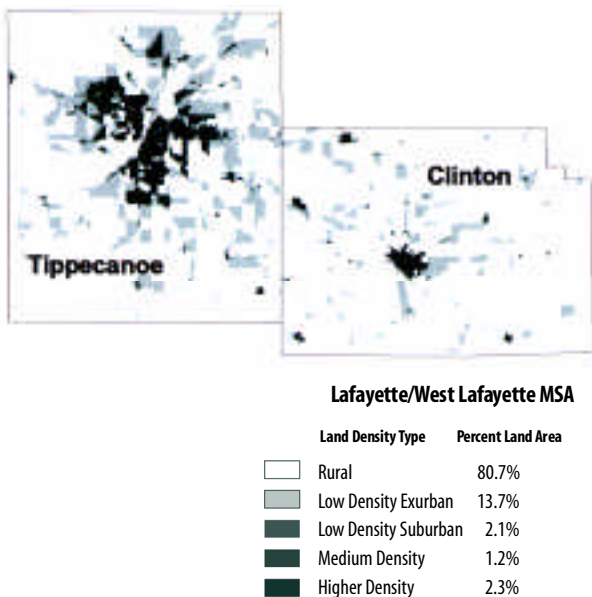
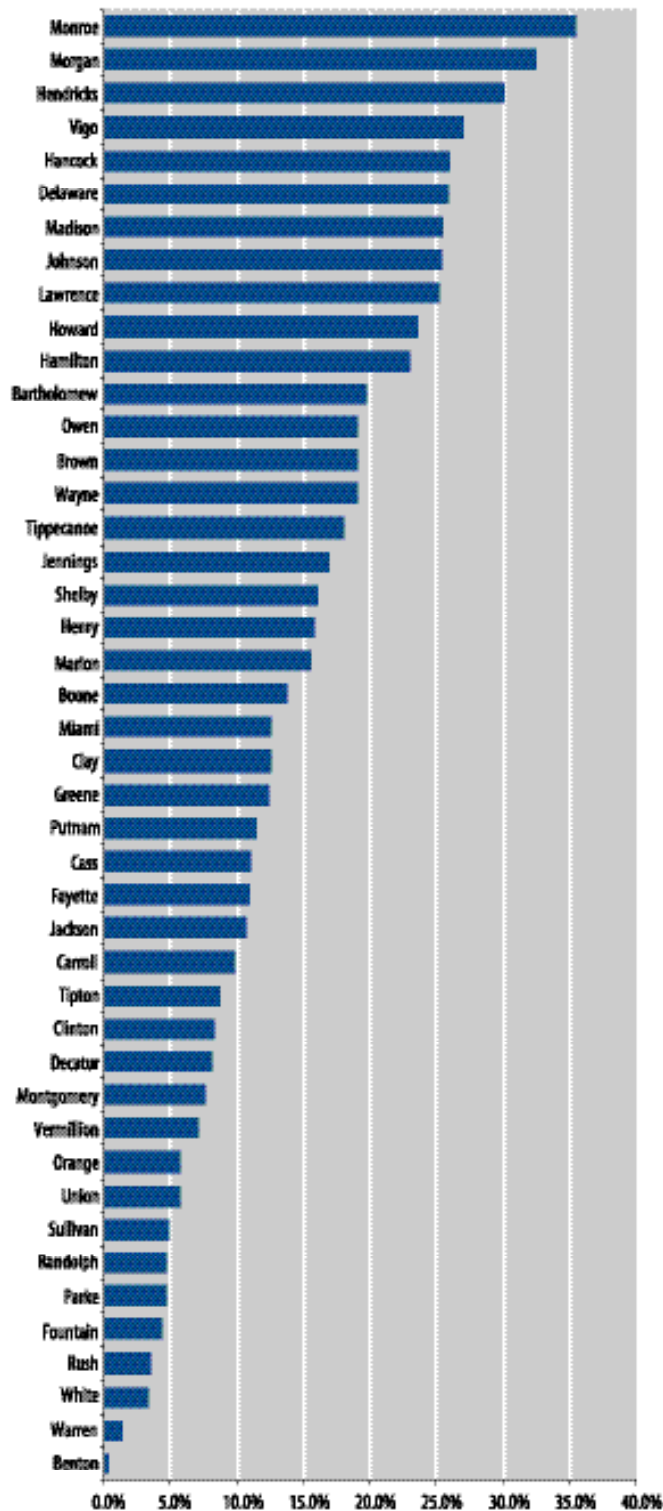




Figure 1: Central Indiana Counties by Percent of Land Area with Density of 0.1–0.5 Persons per Acre, 2000



Lawrence, Bartholomew, Owen, Brown, and Wayne counties have the highest levels of 19 percent or more of their land areas with 0.1–0.5 persons per acre. If one considers that large parts of Brown County are in the state park and forest and may not be developed, the effective proportion of potentially developable land in low density exurban development is actually even higher.

The counties in the region that have been least impacted by low density exurban development are Benton, Warren, White, Rush, Fountain, Parke, Randolph, and Sullivan counties, each with less than 5 percent of their land with 0.1–0.5 persons per acre.

### Low Density Exurban Development Is Growing South and West of Indianapolis

Estimates of the total area of low density exurban residential development in a county reflect growth patterns over long periods of time, while estimates of increases during the past decade show where changes have occurred most recently. The area to the south and west of Indianapolis and Marion County generally shows the highest increases in low density exurban development in the region from 1990 to 2000 (see Figure 2). Owen, Brown, Lawrence, Morgan, Putnam, Johnson, and Monroe counties are seven of the nine counties with the highest increases in the percent of land with 0.1–0.5 persons per acre. The exceptions to this geographic trend are Delaware County (with Muncie), and Howard County (with Kokomo), which experienced the fifth and sixth highest increase in low density exurban development.

Marion and Hamilton counties showed significant declines in the percentage of land with low density exurban residential use. These declines occurred from the conversion of land from low density exurban development to higher densities with additional development.

The declines in several other smaller counties may or may not represent real change. The amount of land in counties with 0.1–0.5 persons per acre may vary slightly from 1990 to 2000 because of changes in the block boundaries, even with no changes in settlement patterns or population distribution.

### Trends in Low Density Exurban Development Show the Complexity of the Sprawl Debate

In the debates about sprawl occurring across the nation, there is little agreement about definitions of sprawl, let alone its environmental, economic, or fiscal effects. Low density exurban



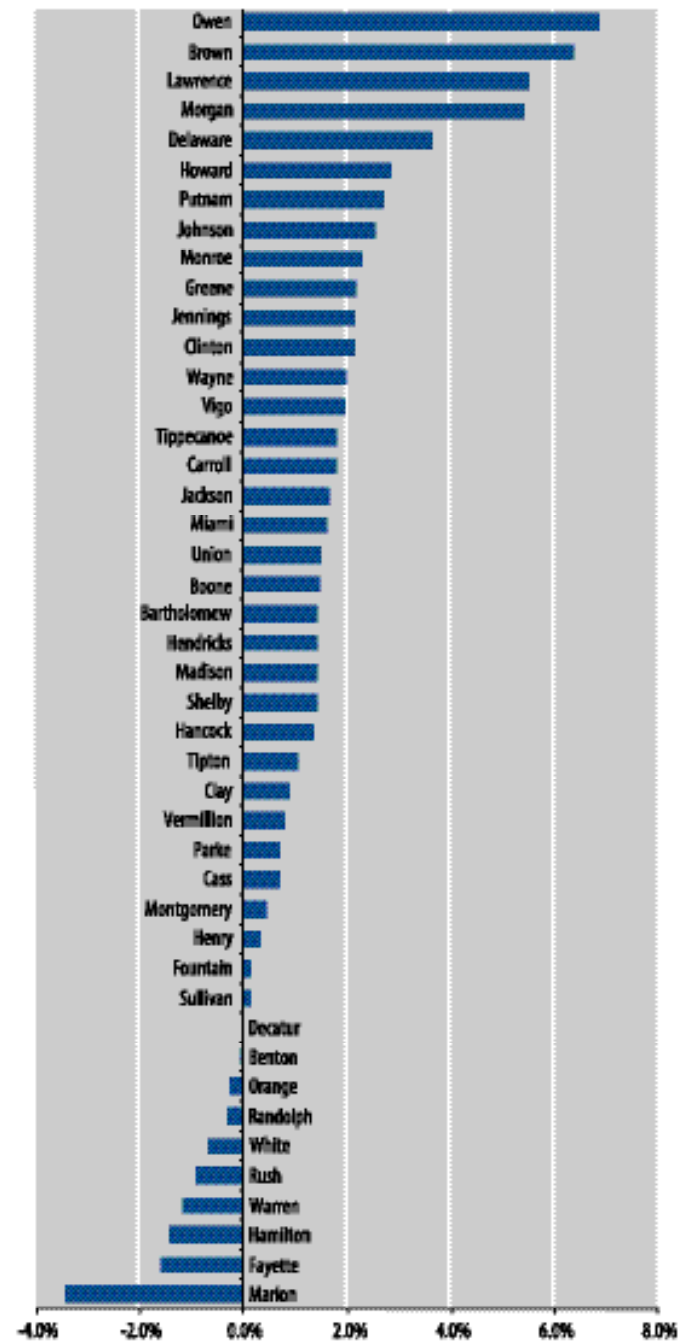
development (with between 0.1–0.5 persons per acre) is one indicator of sprawl. This analysis of Central Indiana shows that more land is in low density exurban use than in any other density category except rural use (Table 2, page 2). It also shows that from 1990 and 2000, more land was converted from rural to low density exurban residential than to other suburban or urban categories with higher densities. The increase in land in low density exurban residential use (153,416 acres) was more than four times the increase in land with more than 3.0 persons per acre (36,849). At the same time, the analysis also shows that the proportionate increase in land in the two highest density categories (1.5–3.0 persons per acre and more than 3.0 persons per acre) was greater than the proportionate increases in all other categories, including low density exurban residential.

These findings illustrate the complexity of the debate about sprawl. To the extent that low density exurban development actually does result in loss of sensitive areas and increases traffic, congestion, and pollution, these results provide evidence for concern. At the same time, if higher density development is a policy objective, these results show some progress. Land in higher density classifications grew proportionately more than land in lower density classifications in the 1990s, although the absolute increase in acreage in higher density uses was much smaller than the increase in lower density uses.

Although the proportion of land in low density exurban residential use is a useful indicator of sprawl, like all indicators, it suffers from some limitations. Without other information, for example, it is not clear whether land in low density exurban use will remain so or whether densities can be increased with additional construction. This limitation occurs because of the nature of the block data produced by the census. The use of population density as an indicator of sprawl also does not directly address the problem of leapfrog development, another concern raised by critics of current development patterns. Researchers are exploring measures of contiguity, but no standardized indicators have been developed.

Progress in all policy debates hinges upon common definitions of the problems at hand. Progress in solving “sprawl” will not occur unless participants agree on what it is. Low density residential development may be a component of sprawl, but it certainly is not a complete definition of it. Much work remains to be done to develop reasonable policies for land use in Central Indiana.

Figure 2: Central Indiana Counties by Change in Percent of Land Area with Density of 0.1–0.5 Persons per Acre, 1990–2000



*Readers may be interested in the Land Use in Central Indiana Model (LUCI) developed by John Ottensmann of the Center for Urban Policy and the Environment. This model can be accessed through the Center's Web site at [www.urbancenter.iupui.edu](http://www.urbancenter.iupui.edu).*



## Central Indiana's Future: Understanding the Region and Identifying Choices

Central Indiana's Future: Understanding the Region and Identifying Choices, funded by an award of general support from Lilly Endowment, Inc., is a research project that seeks to increase understanding of the region and to inform decision-makers about the array of options for improving quality of life for Central Indiana residents. Center for Urban Policy and the Environment faculty and staff, with other researchers from several universities, are working to understand how the broad range of investments made by households, governments, businesses, and nonprofit organizations within the Central Indiana region contribute to quality of life. The geographic scope of the project includes 44 counties in an integrated economic region identified by the U.S. Bureau of Economic Analysis.

People across the nation are debating the definition and impacts of urban sprawl. Low density exurban development is one indicator of urban sprawl. This issue brief examines the population distribution across Central Indiana and the change in low density exurban development from 1990–2000 in the region.

The Center for Urban Policy and the Environment is part of the School of Public and Environmental Affairs at Indiana University–Purdue University Indianapolis. For more information about the Central Indiana Project or the research reported here, contact the Center at 317-261-3000 or visit the Center's Web site at [www.urbancenter.iupui.edu](http://www.urbancenter.iupui.edu).

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*Central Indiana Region*



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