

# Endnotes

- <sup>1</sup> Rusk, David. (1995). *Cities Without Suburbs*. Washington, D.C.: The Woodrow Wilson Center Press.; U.S. Congress, Office of Technology Assessment. (1995). *The Technological Reshaping of Metropolitan America*, OTA-ETI-634, Washington, D.C.:U.S. Government Printing Office.; Orfield, Myron. (1997). *Metropolitics: A Regional Agenda for Community and Stability*, Washington, D.C.: The Brookings Institution Press and The Lincoln Institute of Land Policy, Cambridge, MA.
- <sup>2</sup> Sorkin, Michael. (1997). "Can Williams and Tsien's Phoenix Art Museum Help This Sprawling Desert City Find Its Edge?" *Architectural Record*. 185(1): pp.84-97.
- <sup>3</sup> The Brookings Institution Center on Urban and Metropolitan Policy. (1999). *Moving Beyond Sprawl: The Challenge for Metropolitan Atlanta*.
- <sup>4</sup> The Citistates Group. (2000). "The San Diego Millennium Project." *San Diego Magazine*.
- <sup>5</sup> Definition of Employment Cores:

Indicator	Downtown/ Midtown Phoenix (Primary–Level 1)	Sky Harbor/Tempe/ Scottsdale/Metrocenter (Secondary–Level 2)	Level 3	Level 4
Employment Density <sup>a</sup>	Over 6,800	4,100 to 4,800	2,800 to 3,700	1,700 to 2,700
Employment to Population Ratio <sup>b</sup>	greater than 2	greater than 1.5	greater than 1	n/a
No. of Industries with Concentration	7 to 8	5 to 7	3 to 5	n/a
Total Employment	n/a	n/a	n/a	greater than 15,000
- <sup>6</sup> Great Cities Institute. (2000). *Summary Findings of the Chicago Metropolitan Case Study* (draft). College of Urban Planning and Public Affairs, University of Illinois at Chicago.
- <sup>7</sup> This data is the best available – no alternative source was found.
- <sup>8</sup> The Brookings Institution Center for Urban and Metropolitan Policy. (1999). *A Region Divided: The State of Growth in Greater Washington D.C.*; The Brookings Institution Center for Urban and Metropolitan Policy. (1999). *Moving Beyond Sprawl: The Challenge for Metropolitan Atlanta.*; Great Cities Institute. (2000). *Summary Findings of the Chicago Metropolitan Case Study* (draft). College of Urban Planning and Public Affairs, University of Illinois at Chicago.
- <sup>9</sup> Gober, Patricia and Elizabeth K. Burns. (2000). "The Size and Scope of Phoenix' Urban Fringe." Submitted to *Journal of Planning Education and Research*.
- <sup>10</sup> Downs, Anthony. (1999). "Some Reality About Sprawl and Urban Decline." *Housing Policy Debate*, 10(4); Rusk *op. cit.*; Orfield *op. cit.*
- <sup>11</sup> Rusk *op. cit.*; Orfield *op. cit.*
- <sup>12</sup> Rusk *op. cit.*
- <sup>13</sup> Arizona State Land Department, Annual Report 1998-1999.
- <sup>14</sup> Gammage, Grady, Jr. (1999). *Phoenix in Perspective: Reflections on Developing the Desert*. Tempe, AZ: Herberger Center for Design Excellence, College of Architecture and Environmental Design, Arizona State University.
- <sup>15</sup> Pendall, Rolf. (1995). "Growth Controls and Affordable Housing in the United States: Results from a Recent Survey." Working Paper 636, Institute of Urban and Regional Development, University of California at Berkeley.
- <sup>16</sup> Pendall, Rolf. (1999). "Do Land-Use Controls Cause Sprawl?" *Environment and Planning*. B26(4): pp. 555-571.
- <sup>17</sup> Morrison Institute for Public Policy. (1999). *What Matters in Greater Phoenix: Indicators of Our Quality of Life*. Tempe, AZ: Arizona State University.
- <sup>18</sup> Berman, David R. (1998). "The Growth Management Challenge in Arizona," In Morrison Institute for Public Policy *Arizona Policy Choices: Growth in Arizona: the Machine in the Garden*. Tempe, AZ: Arizona State University.
- <sup>19</sup> Frey, William H. and Ross C. DeVol. (2000). *America's Demography in the New Century: Aging Baby Boomers and New Immigrants as Major Players*. Milken Institute Policy Brief Number 9.
- <sup>20</sup> Ibid.
- <sup>21</sup> Morrison Institute for Public Policy. (1999). *Arizona Policy Choices: The New Economy: A Guide for Arizona*. Tempe, AZ: Arizona State University.

<sup>a</sup>Based in part on natural breaks. Employment density = employment per square mile.  
<sup>b</sup>Compared to county figure of 501; employment per square mile.  
n/a = not used in definition.  
Source: Calculated from Maricopa Association of Government's data.

## Notes and Methodology

We thank Dr. Charles Redman at the Central Arizona-Phoenix Long-Term Ecological Research project for the use of maps and data, as well as the Maricopa Association of Governments – their land use data, annexation maps, transportation development and financing data, and the 1995 Special Census data, etc. greatly enhanced this project. Finally, Scott Smith and Jana Fry at ASU's Information Technology Research Support Lab – GIS Services and Tom Rex at the Center for Business Research provided a great deal of data collection and analysis. We are very grateful.

**Map 1:** Source: U.S. Bureau of the Census. Map created by ASU Information Technology Research Support Lab – GIS Services.

### METHODOLOGY FOR DETERMINING BREAK POINTS:

The work done prior to determining these break points used four categories (three break points) to display data on each map. This was continued for most maps, except when the data were such that fewer (one case of three categories) or more (two cases of seven categories) was appropriate. (For comparison, the Brookings study "A Region Divided" used a standard of six categories.)

**Standard Error/Confidence Interval:** The census data were obtained from STF 3, which reports sample data obtained from the "long form," which is completed by one-in-six households. As such, the data include sampling error. This sampling error was one of the factors considered in determining break points. The distance between the break points at least equals one-half the confidence interval (discussed below).

The U.S. Bureau of the Census publishes the unadjusted standard error, which varies by universe size (the less populous the area, the higher the standard error) and percentage (the unadjusted error is smallest for a variable category that makes up 2 percent or less of the total universe). The Census Bureau also incorporated a "design factor" which varies by percentage (and to a lesser extent by variable), with the highest factor assigned to the lowest percentages. The unadjusted standard error is multiplied by this design factor to obtain the "adjusted standard error."

The confidence interval is calculated from the adjusted standard error. The U.S. Bureau of the Census reports the intervals at the 90 percent confidence level (in one in 10 samples, the confidence interval will not encompass the "true" value). However, the industry standard is to express intervals at 95 percent confidence. (An interval at 90 percent is not as wide as at 95 percent confidence, but is twice as likely to have the interval not encompass the true value.)

**Figure 2:** Land Consumption was calculated from the percent change in Urbanized Land Area from 1960 to 1990. Population Growth was calculated from the percent change in the population of Urbanized Areas. Source: U.S. Bureau of the Census.

**Figure 3:** Density was calculated by dividing the population of the Urbanized Area by the square miles of the Urbanized Areas. Source: U.S. Bureau of the Census.

**Map 2:** Employment Centers were defined by total employment and by employment density (employment per square mile); the various cores were based on the above, plus the employment-to-population ratio and industry concentration. Source: Calculated from Maricopa Association of Governments 1995 employment database.

**Maps 3 and 4:** Employment in Major Industry and High Technology Employment are calculated from employment density in each classification.

**Table 3 and Map 6:** The expenditures are only for federal and state, not local funds, and these results are based on Arizona Department of Transportation records. The Arizona Department of Transportation maintains digital files that record expenditures from 1986 to 1998. These data were prepared annually for statistical traffic reports (ADOT 1989-90 to present). The Maricopa County road network is described by 68 segments that are defined as any Interstate, U.S., or State highway section between its intersection with any other similar system component. Expenditures for each segment were organized for the annual ADOT reports, and obtained from Tony Gonzales of the Transportation Planning Division.

Expenditure data are reported as net expenditures per year to reflect multi-year construction periods. Final accounting for individual projects resulted in expenditure deficits for some projects. Expenditure data was then adjusted for inflation using the composite index for price trends for federal-aid highway construction (Federal Highway Administration 1998). Actual expenditures multiplied by the index were converted to the equivalent in 1998 dollars for each year.

The 5,660 entries in the Maricopa County database assigned to a particular segment were identified by fields for the project name, beginning and ending points, length in miles, description, expenditure amount. Over 99 percent of all expenditures were classified by type of activity. Right-of-way activities include land acquisition. Construction includes all activities involving descriptions such as construct, build, widen, and landscape. Design activities include miscellaneous administration, traffic control, signals, and monitoring. Utilities include flood control structures coordinated with the Maricopa County Flood Control District.

GIS intersection procedures linked the 68 route segments to census tract boundaries and attributed expenditures to 78 segments in Table 3 – Transportation expenditures. Source: Arizona Department of Transportation.

**Map 7:** Retirement communities were designated as those in a senior overlay zone or those with over 1,000 residents.

**Tables 5 and 6, Maps 8-10:** In Arcview GIS, the MAG planning area boundary was overlaid on the CAP-LTER data for different years to see what the land use status was for each time period, as well as change between periods. Using GIS, the different land uses were calculated. Note that some land may have been over generalized by CAP-LTER, and that GIS is a rough way to geographically categorize data. Overall though, the total acreage of land use as calculated in the GIS is 1,765 square miles which is very close to the 1,768 square miles that make up the MAG planning area. Source: 1995 CAP-LTER data from "Land Use Change in Phoenix: Phase 1."

**Figures 7 and 8:** Regional balance calculations were based on total numbers of each variable divided by the population, to get a per capita figure. Then, we divided by the regional per capita figure (the total of all cities for each variable, divided by the total population). This created the regional percentage for each city, to determine if there was a balance among jurisdictions. 100 percent is the regional average, and anything above 100 percent is greater than the regional average, and anything below 100 percent is below the regional average. The regional figures do not equal the county figures, in this case, as data was not available for all jurisdictions. These were left out of the regional average, in order to more properly compare the cities. Retail sales were calculated from retail sales tax revenue data, divided by the sales tax rate in each city. Retail sales were used, as opposed to sales tax revenue, because the measure was more closely related to housing units and jobs per capita. Since different cities have different sales tax rates, the revenue would have been skewed toward higher rates, as opposed to showing where the retail activity really is. Source: Housing Units – U.S. Bureau of the Census; Jobs – U.S. Bureau of the Census and Maricopa Association of Governments 1995 Special Census; Retail Sales – Arizona League of Cities and Towns; Arizona State Department of Revenue; Phoenix Department of Revenue; Tempe Department of Revenue.

**Map 15:** The 50 elementary and unified school districts include the Maricopa County regional school district – although the results do not change if it is removed from the study. There are six high school districts, which cover the same territory as the elementary school districts which feed into them. Unified districts are composed of both elementary and high schools. Because these are percent change figures, displaying unified and high school districts covers elementary school districts, and is the only way to display this data, given the structure of the school district boundaries. Elementary school districts experienced the same increases as the high school districts. Source: Arizona Department Education.

**Table 8:** The center school districts were Riverside Elementary, Roosevelt Elementary, Wilson Elementary, Creighton Elementary, Isaac Elementary, Alhambra Elementary, Madison Elementary, Osborn Elementary, Balsz Elementary, Phoenix Elementary, Murphy Elementary, and Phoenix Union High School. The northwest school districts were Washington Elementary, Glendale Elementary, Peoria Unified, Dysart Unified, Glendale Union High School, Wickenburg Unified, Morrissetown Elementary, Agiula Elementary, Nadaburg Elementary, and Ruth Fisher Elementary. The northeast school districts were Deer Valley Unified, Cave Creek Unified, Paradise Valley Unified, Scottsdale Unified, and Fountain Hills Unified. The southeast school districts were Mesa Unified, Tempe Elementary, Kyrene Elementary, Tempe Union High School, Gilbert Unified, Chandler Unified, Higley Elementary, and Queen Creek Unified. Southwest School districts were Litchfield Elementary, Fowler Elementary, Tolleson Elementary, Union Elementary, Littleton Elementary, Avondale Elementary, Liberty Elementary, Cartwright Elementary, Laveen Elementary, Buckeye Union High School, Pendergast Elementary, Aqua Fria Union, Buckeye Elementary, Palo Verde Elementary, Gila Bend Elementary, Arlington Elementary, Paloma Elementary, Sentinel Elementary, Mobile Elementary and Tolleson Union High School. There were determined roughly along major highway divisions, with a few exceptions. 1998 scores were based on the Stanford 9 Achievement Tests.

**Map 19:** Due to annexations, jurisdictional boundaries are not necessarily uniform, and show up on maps as additional lines – especially in the west and southeast portions of the region. Source: ALRIS (Arizona Land Resource Information System).

# Papers Prepared for *Hits and Misses: Fast Growth in Metropolitan Phoenix*

## RESEARCH PAPERS:

**Leonard G. Bower**, Economist

- Fiscal Matters in Phoenix Metro Area Cities: Revenues, Capacity, and Zoning
- Arizona Sales Tax in Maricopa County Cities: Structure, Rates, and Yields

**Elizabeth Burns**, Professor,  
ASU Department of Geography

- Transportation Trends, Urban Freeway Expenditures, and Spatial Disparities in Metropolitan Phoenix

**Patricia Gober**, Professor,  
ASU Department of Geography

- Public Policy Ramifications of Elderly Migration and Age Segregation in Metropolitan Phoenix
- Phoenix: A City of Migrants

**Kent Hill**, Assistant Research Professional,  
ASU Department of Economics

- Determinants of (Per Capita) Federal Funds Received by Metro Areas: A County-Level Analysis
- Housing-Related Tax Benefits in the Phoenix Metropolitan Area in 1990

**Glen Krutz**, Assistant Professor,  
ASU Department of Political Science

- City Growth Management Strategies in Greater Phoenix

**Tom R. Rex**, Research Manager,  
ASU Center for Business Research

- Employment in Metropolitan Phoenix
- Development of Metropolitan Phoenix: Historical, Current and Future Trends
- Population Density in Metropolitan Phoenix
- Population Demographics in Metropolitan Phoenix
- Housing in Metropolitan Phoenix

## BRIEFING PAPERS:

**William Fulton and Alicia Harrison**,  
Solimar Research Group

- Land Use and Metropolitan Form

**Rebecca L. Gau**, Senior Research Analyst,  
Morrison Institute for Public Policy

- Housing Affordability in Metropolitan Phoenix
- Race and Ethnicity in Metropolitan Phoenix
- Education Trends in Metropolitan Phoenix

**Glen Krutz**, Assistant Professor,  
ASU Department of Political Science

- Explaining Intergovernmental Funding Flows to Cities in Maricopa County
- Local and Regional Governance Structure

**Mark Muro**, Senior Research Analyst,  
Morrison Institute for Public Policy

- The State Lands and Growth
- Open Space and Growth
- Water and Growth

**Tina Valdecanas**, Senior Research Analyst,  
Morrison Institute for Public Policy

- Maricopa County Communities
- Migration in Metropolitan Phoenix
- Underlying Factors in Phoenix' Growth

**Mary Jo Waits**, Associate Director,  
Morrison Institute for Public Policy

- Growth at the Fringe
- Downtown Revitalization Efforts

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