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**Air, Earth, Fire, and Water—
Indiana's Environmental Issues**

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Air, Earth, Fire, and Water— Indiana's Environmental Issues

By the end of the century, Indiana's five million people will face many crises arising from conflicting pressures on our state's natural resources—our air, water, land, energy and mineral resources, and forests. Increasingly, our citizens ask that concerns over the quality of

our environment be considered as we expand the use of our state's natural resources. This conflict, present at the national level as well, centers on the increased use of these resources associated with population growth and economic development colliding with stricter protection afforded them by recent and likely future environmental legislation.

One need not go to the rain forests of Brazil or the forest home of the spotted owl in the Pacific Northwest to observe this collision. The nation's interest in protecting North American air, water, and land resources from the damage caused by mining and burning coal makes it harder for our state's high-sulfur coal mined in open pits to compete in national and world energy markets. A similar interest in protecting the land and water resources from the effects of intensive farming practices makes it imperative that we develop new and less damaging ways of growing crops. Our state's electric utilities are asked by environmentalists to discourage electricity use while at the same time being asked by those with interests in state industrial economic development to encourage such use.

It is clear that for Indiana's economy to grow, we must continue to make intelligent use of the natural resources we have in our state, and capitalize on the advantages these resources give us relative to the other states and regions in the United States. How are our natural resources currently being utilized, relative to their total availability?

The state's 18 billion tons of economically recoverable coal reserves represent an amount of energy that exceeds that of the *entire nation's* oil and gas reserves. Indiana mines about 33 million tons of coal per year, placing it ninth in U.S. coal production by state. That extraction rate can continue for 500 more years before our resource is exhausted.

In 1985, Indiana's water consumption represented less than 1 percent of the amount of water the state receives in rainfall, and less than 2 percent of the surface water outflows. During that year, 9,360 Mgal/day were withdrawn, placing Indiana 14th in withdrawal by state, but *first* in industrial use. (Power generation accounts for two-thirds of total withdrawals.)

Almost six million of our state's 14 million acres of cropland were identified by the Governor's Soil Resources Study Commission (1985) as being in an unsustainable situation because of topsoil losses greater than the five tons per acre/per year average

rate of topsoil formation. Indiana's "T by 2000" program is a critical effort to reduce the loss on those six million acres to the tolerance limit for those soils over the coming decade, an effort that will require changing practices and implementing new technology for the state's agriculture.

Our state's hardwood forest resources, once the mainstay of our industrial economy, still contribute more than \$2 billion a year to the state's economy and afford a livelihood for more than 50,000 Hoosiers by providing high-quality, high-value wood products to the nation's furniture and lumber industries. The industry is under increasing pressure by preservationists/environmentalists to limit timber harvesting, particularly on public lands. Competition in a world economy is requiring the industry to dramatically increase its efficiencies of procurement, harvesting, and wood utilization. Currently, logging leaves unused 25 to 50 percent of the wood volume utilized, and only 40 to 60 percent of a sawlog is recovered as lumber.

A recent inventory of our state's forest resources revealed that timberland increased from 3.9 million acres reported in a 1967 survey to 4.3 million acres, or 19 percent of the state's total land area. The volume of growing stock and saw timber were both up over 50 percent from 1967 figures. Timber removals from both categories represented about 2 percent of the inventory, and roughly two-thirds of natural growth. However, the figures don't tell the whole story. The quality of Indiana's much sought-after fine hardwoods (oaks, walnut, cherry, ash) continues to decline as the world demand for the higher grades of these hardwoods exceeds growth. The Midwest may be the final "frontier" for some hardwood species.

Indiana's electricity resources, historically a major advantage relative to other regions, has entered a decade in which the state's collective peak and baseload capacity will no longer be sufficient to meet its electricity needs. New peaking capacity is needed by 1997, and new baseload capacity by 1999. Will Indiana coal continue to be the primary fuel for electrical generation?

Although the environmental quality of virtually every state in the union needs serious attention, Indiana's condition is particularly troublesome:

A recent environmental index by a noted environmental interest group ranked Indiana 43rd out of 50 for overall quality. The index is the aggregate score resulting from the consideration of 256 different environmental indicators. Although many of the parameters making up this index are subjective in nature, many are based on quantitative information publicly available.

The quality of Indiana's air is rated as the nation's lowest. In 1990, Hoosier industries released

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some 110 million pounds of chemicals into the air. This translates to nearly 3,000 pounds of chemicals per square mile.

Due to the intensity of our corn and soybean production methods, our topsoil is vulnerable to erosion as well as the effects of pesticide residues and soil compaction, all contributing to possible declines in their productivity.

Surface water and groundwater are often contaminated with soil, fertilizers, pesticides, and industrial waste. There is growing concern over longer-term pollution of deeper groundwater in the coming decades associated with past environmental practices (or the lack thereof) attributable to landfills, dumps, and waste deposits over the years.

Weather extremes, such as the recent droughts of 1983, 1988, and 1991, may be linked to global scale events such as sea surface temperature anomalies in the Pacific Ocean and volcanic activity. Recent economic losses to Hoosier farmers and related businesses are virtually unprecedented since the Dust Bowl era of the 1930s.

All of these concerns are increasingly becoming matters of government policy. It is critical that appropriate options be developed and assessments made of the consequences of alternative options. Such assessments must include recognition of the tradeoffs among government regulation, market forces, and the economic needs of Indiana's farms and factories.

The environmental impact is not limited to the confines of Indiana. Our state's power is almost totally dependent upon the burning of fossil fuels (principally coal), which adds to the growing crisis of increased global amounts of CO₂, the suspected culprit of global warming. Furthermore, the combustion of Indiana's coal with high-sulfur content produces airborne SO₂, the principal agent in the production of acid rain. Indiana and adjoining states are recognized as the principal contributors to the acid rain problems of the northeast quadrant of the U.S. and neighboring Canada, and national environmental regulations target these sources.

The 1970s was the decade of conservation and environment. In the 1980s, emphasis was placed on improving productivity and competitiveness. However, the investments in infrastructure, new technology, and human capital needed to accomplish this were not made. The 1990s have brought a renewed focus on managing and planning for the long-term sustainability of the U.S. environment, much of this through regulation. Some rediscovery of the "environmental ethic" is taking place, along with a slow "greening" of many industries. Increasingly there are global concerns that will force U.S. actions to be consistent with a world view.

Everyone is a polluter. All of our actions are directly associated with some type of environmental damage. For example, air quality is a reflection of the amount of carbon dioxide, carbon monoxide, sulfur dioxide, and various oxides of nitrogen and ozone. Across the United States last year, electrical generation released 135 pounds of sulfur dioxide, 56.4 pounds of nitrogen oxides, and 7.4 pounds of carbon dioxide per person. Fertilizer was used at a rate of 1.9 pounds per person, while pesticide use was estimated at 3.9 pounds per person. It is estimated that some 268.6 million tons of solid municipal waste—that's 2,170 pounds per person—is generated each year. Hence, contamination of our environment reflects our use.

The stability of the ecosystem—our earth—is challenged by these and many other forms of pollution. Such pressures, along with increasing population pressures, challenge the preservation of biological diversity. In order to preserve biodiversity, conservation of species and protection of fragile lands such as wetlands, forests, and prairies is critical.

If we are to address these and other serious state problems, we must begin to understand the magnitude and significance of this change in public values and look for ways to minimize the conflict. This will require the thoughtful integration of scientific research, public education, and legislative initiative. What is being done to lessen the impact?

U.S. Global Change Research Program

The goal of the U.S. Global Change Research Program, created in 1989 by the federal government as an interagency research program, is to establish the scientific basis for national and international policy making related to natural and human-induced changes in the global earth system. The objectives of the U.S. Global Research Program are to:

- Establish an integrated comprehensive program of documenting the earth system on a global scale.
- Conduct a program of focused studies to improve our understanding of the physical, geological, chemical, biological, and social processes and trade on global and regional scales.
- Develop integrated conceptual and predictive earth system models.

The basic tenets of the program are to integrate science into the policy process, to maintain a partnership among all participants, and to focus on interdisciplinary science and interaction. The following quote is from the program description:

Environmental policy formulation requires scientific understanding of how the earth system, hydrological cycle, carbon cycle,

and biological resources vary naturally, how human activities change them, and how they might respond to future changes in environmental conditions.

Although a national research agenda can help our state, Indiana needs its own initiative, dictated by the state's own special circumstances. Our agenda should be focused on finding ways to *protect* and *extend* the use of our state's natural resources, while at the same time living within the ever stricter environmental rules and regulations necessary to maintain the quality of our state's, our nation's, and our planet's environment.

The research challenge facing those who manage our coal resources is to develop new pre-combustion, combustion, and post-combustion technologies for this enormously valuable resource that can reduce the impact of new acid rain legislation, and possible future limits on CO₂ emissions. In addition, we need to investigate new non-traditional applications, such as the use of Indiana coals in blast furnaces, which could add up to seven million tons per year to our demand, if the technical problems involved could be overcome.

The research challenge for those who manage our water resources is to extend the use of this plentiful resource without endangering its quality. We must also continue basin and aquifer characterization studies, which specify more precisely the true condition of this critical resource.

The research challenge for those who manage our electricity resources is to develop least-cost means of meeting the growing statewide demand for electricity. Policies designed to encourage utility-financed electricity conservation should be investigated in those circumstances when it is advantageous for our state's ratepayers.

The research challenge for land managers is to devise less polluting methods of maintaining the enormously high productivity of our croplands and forests. Our agricultural research efforts are now aimed at preserving and maintaining the quality of lands and soils. Pest management practices that minimize the number of chemical applications while maximizing their effectiveness are being developed. Fertilizer application practices that provide plant nutrients only when the plant will fully utilize the applied materials are presently being tested. Clearly, the long-term strategy should be to view soil as a key part of the state's economy—a part that must be protected and enhanced if we are to maintain our competitive agricultural edge.

The research challenge for our industrial and service sectors is to find and adopt technologies that place less strain on our environment during the

manufacture, use, and disposal of Indiana-made products, while maintaining our ability to compete with other states and nations. Finally, we need to develop an overall state strategy for dealing with the problems caused by the collision between environmental protection and economic growth.

Can we design strategies that might allow us to continue to use our natural resources as a cornerstone of future economic growth, yet at the same time achieve the worthwhile goal of protecting the environment? We can, if we recognize that the true collision is in the bottom line of the profit and loss statements of the private sector. We can, if we focus on ways of maintaining the profitability of our natural resource-based industries in the face of increased expenditures to satisfy the growing list of environmental regulations.

Two strategies suggest themselves to maintain margins:

1. Increase the revenues arising from utilization of the resources by increasing the value of those resources before they enter the market; for example, export tofu and electricity, not soybeans and coal. (The agricultural sector has emphasized this strategy for some years.)

2. Decrease the costs of such regulations by developing cheaper compliance technologies and/or switching to less polluting state-supplied raw materials; for example, use recycled and renewable raw materials in place of more polluting ones.

Enhanced competitive position, increased productivity, lower food costs, improved quality, nutritional content, and convenience can all arise from such successful research. To their list we can add one more—the higher profit margins associated with increasing the value added to our state's resources. This will enable the companies to absorb the higher costs of environmental compliance with less difficulty.

We should learn from the agricultural sector's successes. Their model can be adapted as one central focus for all of our state's natural resources; not just those used by the agricultural sector. Vertical integration of plants and processes can produce efficiencies not available to processes in separate locations. For instance, it is estimated that integrating the sawmill operation with a furniture operation to allow the log to be cut to maximize the number of arms, legs, and structural components of the furniture types then being manufactured could substantially reduce the 40 to 60 percent waste produced during the logging operation. We need to start now to develop high value-added feedstock uses for Indiana coals that can supplement their current major use as a heat source for steam production in electric generating stations. One thing is certain: the last 10 to 20 percent of the coal mined in Indiana will be far too valuable as a

feedstock for the chemical industry to be used as a source of BTUs.

When considering methods of reducing the cost of compliance with environmental regulations—in addition to the obvious objective of developing cleaner, cheaper, more efficient ways of producing and using the resources—we should look for other less polluting natural resources that might be substituted for those currently in use. One obvious target is increased use of recycled materials as a source of raw materials for our state's industries. Recycling state waste, rather than disposing of it, can be a "win-win" strategy for the state, if cheaper methods of recycling can be found. Substituting the recycled renewable resources for new non-renewables makes sense in many ways. It offers us the opportunity of maintaining the market for our state's resources (waste is,

after all, as much a "natural resource" as coal, oil, or water), while at the same time having the potential to reduce the environmental impacts of their use.

In summary, we should develop a statewide strategy for mitigating the impact of the new environmental ethic on our state's natural resource utilization. The cornerstones of the strategy should be:

- Increase the value added to Indiana's resources before they enter the market.
- Increase the use of state-generated recycled products as a substitute for our natural resources.
- Develop less expensive ways of complying with environmental legislation for our key natural resource using industries.
- Carry out studies to identify changes in Indiana's regulatory climate that foster the three strategies above.

Performance of the Indiana Economy by County: Second Quarter 1979 to Third Quarter 1990

Since the end to the long-running cyclical expansion of the U.S. economy occurred in July 1990, it is propitious to determine the geographical winners in the Indiana economy over the last business cycle. Growth in employment and real payroll are the criteria used, and the county is the smallest geographical entity considered.¹

The appropriate period to analyze is from cyclical peak to cyclical peak (or cyclical bottom to cyclical bottom). The national economy's last two cyclical peaks were July 1990 and July 1981, but it is more appropriate to return to January 1980—the peak before July 1981—for analyzing the performance of Indiana's economy. The "smokestack" states generally did not reach new cyclical peaks in the short national business cycle between January 1980 and July 1981. Their economies just experienced a respite in their dramatic falls during the two cyclical downturns in the national economy between 1980 and 1982.

The exact cyclical peak in employment in Indiana preceded the corresponding January 1980 cyclical peak in the national economy. Employment in Indiana peaked in second quarter 1979, the beginning (or base) period used in this analysis.

The most recent cyclical peak (the ending period) in the Indiana economy occurred during third quarter 1990. This corresponded roughly with the national economy's July 1990 cyclical peak.

Figure 2
Employment Indices for Indiana and the U.S.
3rd Quarter 1978—3rd Quarter 1990

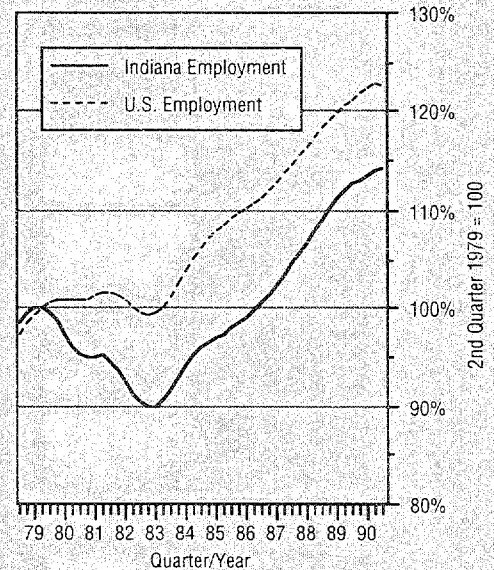
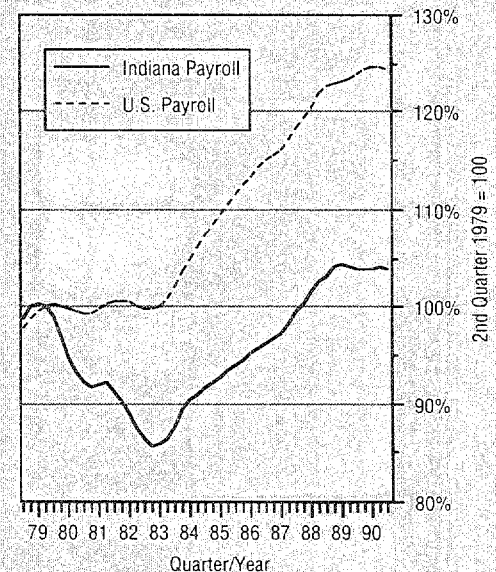


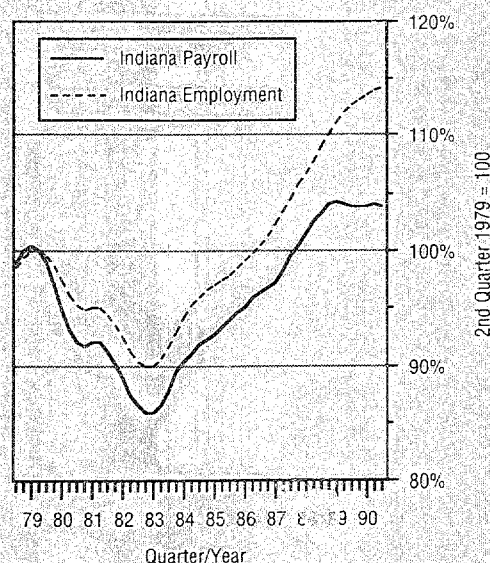
Figure 3
Real Payroll Indices for Indiana and the U.S.
3rd Quarter 1978—3rd Quarter 1990



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Figure 1
Real Payroll & Employment Indices for Indiana
3rd Quarter 1978—3rd Quarter 1990



ANALYSIS OF COMPOSITE STATE PERFORMANCE

Between second quarter 1979 and third quarter 1990, employment in Indiana grew 14.1%, while real payroll grew only 3.8% during the comparable period (see **Figure 1**). Because of the severe economic downturn between 1979 and 1982, employment and real payroll fell 10.1% and 14.3%, respectively, between second quarter 1979 and fourth quarter 1982.

During the 1979-1990 period, U.S. employment grew 22.7%. All of the approximately 9% deterioration in Indiana employment growth relative to U.S. employment growth occurred during the difficult 1979-1982 period (see **Figure 2**).

As contrasted with employment, Indiana's real payroll continued to deteriorate relative to the U.S. after 1982 (see **Figure 3**). As of third quarter 1990, the state's real payroll was 20.6% below that of the United States.

INDIVIDUAL COUNTY WINNERS AND LOSERS

Hidden in the aggregate performance of Indiana's economy during the 1979-1990 period are dramatic differences in performance of individual counties. Employment change ranged from -14.7% in Randolph County to 101.7% in Hamilton County. Real payroll

change ranged from -30% in Lake County to 122.4% in Hamilton County (see **Table 1**).

Employment

Thirty-nine counties—more than 42%—had employment growth exceeding the U.S. growth rate during the comparable period (see **Table 1** and **Figure 5**). U.S. employment grew 22.7% during the 1979-1990 period.

Eighteen counties—20%—experienced a loss in employment during the 1979-1990 period.

Real Payroll

Twenty-five counties had growth in real payroll equal to or exceeding the U.S. growth rate of 24.4%:

Hamilton	122.4%	Hancock	33.7
Steuben	81.4	Noble	33.3
Owen	61.3	Decatur	32.6
Brown	60.2	Dekalb	32.5
Hendricks	50.0	Harrison	32.4
Johnson	48.0	Pulaski	31.5
Ripley	45.7	Dubois	31.4
Daviess	43.6	Spencer	31.0
Kosciusko	41.3	Floyd	28.9
Morgan	39.9	Vermillion	28.3
Monroe	35.6	Boone	27.5
Franklin	34.2	Lagrange	24.4
Whitley	34.0		

Fifteen counties had a decrease in real payroll exceeding 10% for the 1979-1990 period:

Lake	-30.0%	Bartholomew	-14.6
Randolph	-28.0	Madison	-14.1
Sullivan	-24.1	Pike	-13.2
Perry	-22.4	Blackford	-12.4
Jay	-21.5	Warren	-12.0
Henry	-19.1	Tipton	-11.9
Fountain	-19.1	Cass	-11.0
Benton	-18.0		

Employment and Real Payroll

Figure 4 shows employment change and real payroll change *relative to* employment change for each of the 92 counties. No counties fall in the northwest quadrant, so all 18 counties that had decreased employment experienced a decrease, rather than an increase, in relative real payroll (the southwest quadrant).

Only six counties had real payroll growth relatively greater than employment growth (the northeast quadrant):

Hamilton	10.3%	Vermillion	2.3
Kosciusko	8.3	Franklin	1.0
Ripley	6.6	Jasper	0.3

Table 1
Employment and Real Payroll Changes by County in Indiana
2nd Quarter 1979—3rd Quarter 1990

County	Employment	Real Payroll	County	Employment	Real Payroll
Adams	9.5	-0.4	Madison	-5.5	-14.1
Allen	15.2	5.5	Marion	22.4	17.4
Bartholomew	1.4	-14.6	Marshall	28.3	20.3
Benton	-5.1	-18.0	Martin	12.6	7.7
Blackford	-2.4	-12.4	Miami	-0.3	-2.4
Boone	32.8	27.5	Monroe	41.7	35.6
Brown	61.4	60.2	Montgomery	26.6	21.7
Carroll	0.3	-8.6	Morgan	46.0	39.9
Cass	3.5	-11.0	Newton	18.6	17.0
Clark	28.8	22.0	Noble	39.5	33.3
Clay	20.4	11.9	Ohio	9.9	6.5
Clinton	15.9	13.3	Orange	10.3	10.1
Crawford	38.9	15.1	Owen	75.7	61.3
Daviess	47.2	43.6	Parke	25.4	16.7
Dearborn	-5.7	-5.4	Perry	-14.0	-22.4
Decatur	40.7	32.6	Pike	-3.0	-13.2
Dekalb	43.6	32.5	Porter	18.3	-0.4
Delaware	9.2	-3.4	Posey	16.3	13.2
Dubois	37.4	31.4	Pulaski	33.7	31.5
Elkhart	30.4	21.3	Putnam	20.3	1.3
Fayette	-4.8	-6.6	Randolph	-14.7	-28.0
Floyd	31.6	28.9	Ripley	36.7	45.7
Fountain	-11.1	-19.1	Rush	9.2	-1.5
Franklin	32.9	34.2	St. Joseph	30.8	11.5
Fulton	11.8	7.2	Scott	24.7	20.7
Gibson	14.0	5.6	Shelby	39.8	31.0
Grant	-2.3	-7.0	Spencer	14.1	-1.4
Greene	29.1	22.9	Starke	85.7	81.4
Hamilton	101.7	122.4	Steuben	13.6	5.2
Hancock	36.1	33.7	Sullivan	0.2	-24.1
Harrison	36.7	32.4	Switzerland	12.2	8.3
Hendricks	57.8	50.0	Tippecanoe	26.2	20.7
Henry	-5.5	-19.1	Tipton	-6.8	-11.9
Howard	-1.8	-5.1	Union	31.7	9.2
Huntington	17.0	9.6	Vanderburgh	10.6	3.6
Jackson	25.0	23.9	Vermillion	25.4	28.3
Jasper	23.9	24.4	Vigo	-0.1	-8.6
Jay	-8.3	-21.5	Wabash	-2.4	-9.3
Jefferson	12.7	2.8	Warren	-0.1	-12.0
Jennings	21.0	12.2	Warrick	16.4	-6.9
Johnson	57.6	48.0	Washington	25.7	22.4
Knox	12.2	-0.8	Wayne	4.1	-8.0
Kosciusko	30.5	41.3	Wells	22.1	8.3
Lagrange	36.7	24.4	White	13.0	7.8
Lake	-11.8	-30.0	Whitley	34.7	34.0
LaPorte	5.4	-4.7	INDIANA	14.1	3.8
Lawrence	13.0	-2.9			

The remaining 68 counties had an increase in employment and a decrease in relative real payroll (the southeast quadrant).

Twenty-four counties experienced more than 10% declines in real payroll relative to their respective changes in employment:

Sullivan	-24.3%	Lawrence	-14.1
Lake	-20.7	Cass	-14.0
Warrick	-20.9	Starke	-13.6
Crawford	-17.2	Benton	-13.5
Union	-17.1	Warren	-11.9
Porter	-15.8	Knox	-11.6
Bartholomew	-15.8	Wayne	-11.6
Putnam	-15.8	Delaware	-11.5
Randolph	-15.7	Wells	-11.2
Scott	-14.7	Dearborn	-10.5
Henry	-14.4	Pike	-10.5
Jay	-14.4	Blackford	-10.2

Who are the winners and losers considering changes in both employment and relative real payroll during the 1979-1990 period? Obviously the closer to the upper right quadrant in Figure 4 a county lies, the more of a winner it is. But a comprehensive ranking is difficult.

Hamilton County is the indisputable winner, employment and relative real payroll having increased 101.7% and 10.3%, respectively. The reason is that because *both* its employment and its relative real payroll growth exceeded that of all 91 other counties. Thus, in Figure 4 it lies to the right of and above every other county.

Why isn't Steuben County, for example, an indisputable winner? Its employment growth of 85.7% was second best, but its relative real payroll decline of 2.4% placed Steuben County 18th. Seventeen counties had higher relative growth (or less of a decline) in relative real payroll—the five counties (excluding Hamilton County) lying in the northwest quadrant being obvious ones.

Consequently, one is left with determining the tradeoff between job growth and job "quality" before a ranking can be made—not an easy task. What is clear is that Steuben County is better than 74 other counties, because its employment and relative real payroll both exceeded those of 74 counties. (Graphically, 74 counties lie to the left and below Steuben County.)

Consider Brown and Owen counties in Figure 4. Which had the better performance considering both employment growth and relative real payroll growth? Brown County had employment and relative real payroll growth of 61.4% and -0.7%, respectively, compared to 75.7% and -8.2% for Owen County. Brown County had less of a decline in job "quality" and Owen County had greater growth in jobs.

Consider ranking from the bottom up. Lake County is an obvious candidate with employment and relative real payroll decreases of 11.8% and 20.7%, respectively. However, Sullivan County had a relative real payroll decline of 24.3% (with a slight 0.2% increase in employment), so it is disputable as to which county was worse. What is indisputable is that 88 counties ranked above Lake County in combined employment and relative real payroll performance. That is, in Figure 4, 88 counties lie to the right of and above Lake County.

Geographical Distribution of Employment Winners and Losers

Figure 5 shows the geographical distribution by county of employment change between 1979 and 1990. Change was subdivided into three classes:

- 1) 22.7% or greater—39 counties
- 2) 0-22.6%—35 counties
- 3) less than 0%—18 counties

Figure 4
Percent Change in Employment vs. Relative Real Payroll Change for Indiana Counties
2nd Quarter 1978—3rd Quarter 1990

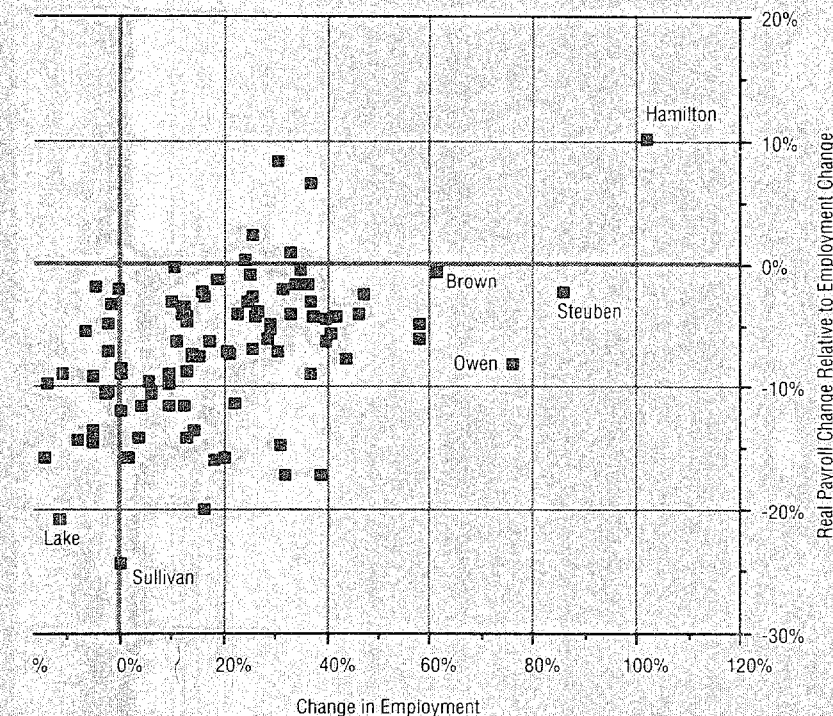
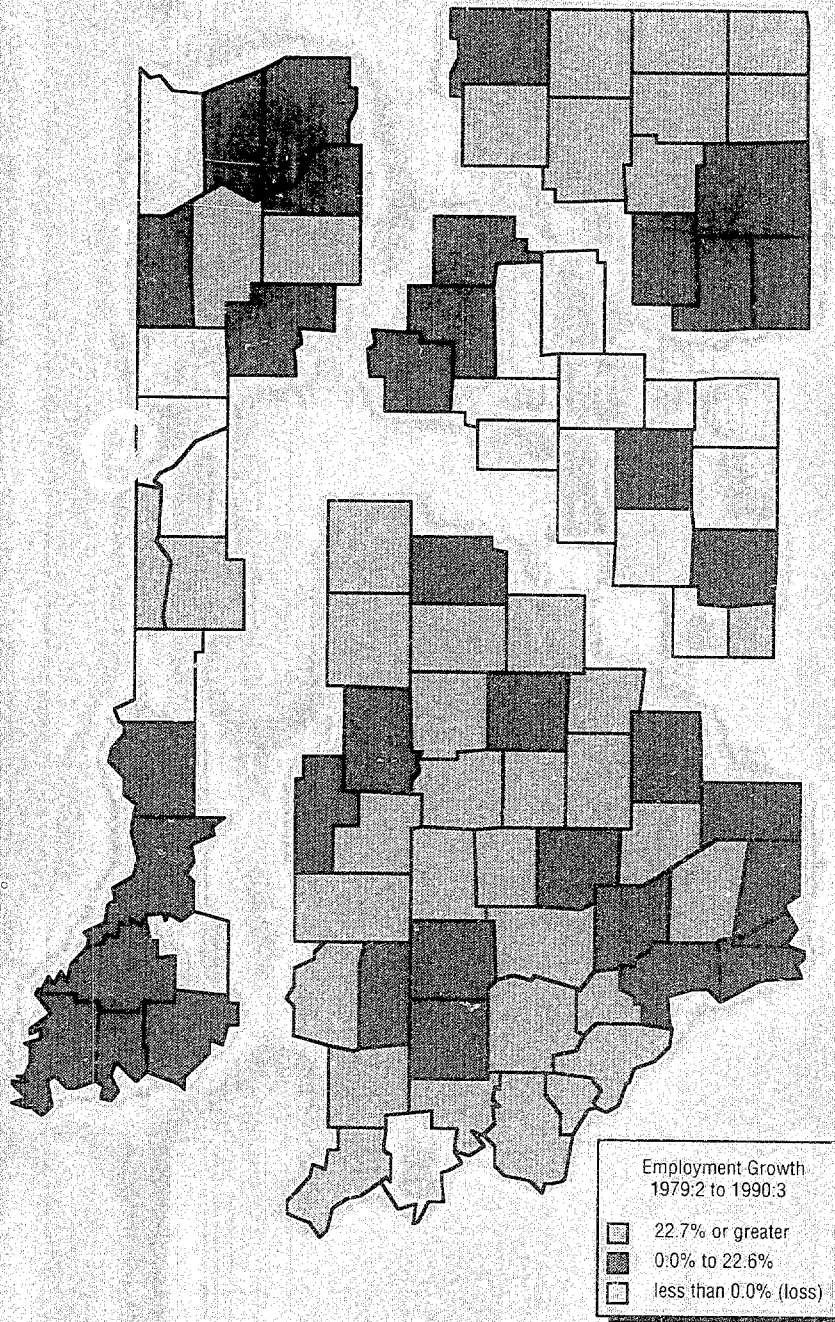


Figure 5
Employment Winners and Losers
2nd Quarter 1979- Quarter 1990



(U.S. employment growth for the comparable period was 22.7%.)

Winners. Geographically, the counties making up the winning group were the 41 located in the triangle formed by the Ohio River and two lines drawn from Tippecanoe County due south to the Ohio River, and from Tippecanoe County to Franklin County (south of Richmond). These 41 counties had aggregate employment and real payroll growths of 27.0% and 20.5%, respectively (see **Table 2**). All counties had employment growth except one: Perry County, with a decline in employment of 14%, the second worst of the 92 counties.

Second to the "group of 41" were 13 counties in the northeast corner of the state that lie on or near a line connecting South Bend and Fort Wayne. This "group of 13" had a 22% increase in employment and a 13.7% in real payroll between 1979 and 1990 (see **Table 2**). Eight of the 13 counties had employment growth exceeding employment growth nationally, and none experienced a decline.

Losers. Sandwiched geographically between the two winning groups was a group of losers. Seventeen counties lying on or near a line connecting Logansport, Muncie, and Richmond had a 0.5% decrease in employment and a 9.1% decrease in real payroll (see **Table 2**). Eleven of these 17 counties experienced employment declines. The one anomaly of the group is tiny Union County, which had employment growth of 31.7%. However, to include Union and Fayette counties in the "group of 17" or the "group of 41" is debatable. Assuming they have economic ties to the city of Richmond (Wayne County), then it is appropriate to include them as part of the "group of 17."

Remainder. The remaining 21 counties all lie on or near the western border of the state; on or near a line connecting Gary and Evansville. As a group, they experienced negligible employment growth of 0.7% and real payroll decline of 15% during the 1979-1990 period.

However, it is probably inappropriate to consider the 21 counties as a group. The problem is that their aggregate performance was largely determined by the dismal performance of Lake County, which had employment and real payroll declines of 11.8% and 30%, respectively. (Lake County accounted for 37% of third quarter 1990 employment.) Eleven of these 21 counties fell into the middle class of employment growth and four were in the top class, but their growth was swamped by Lake County's decline.

This was not the case with respect to the other three geographical groupings identified above. In each of those groupings, the employment growth trend of the non-urban, smaller counties tended to enhance the trend in the major urban area(s) in the respective geographical areas.

Table 2
Indiana Counties: Winners, Losers, and the Rest
2nd Quarter 1979—3rd Quarter 1990

<i>Counties</i>	<i>Change in Employment</i>	<i>Change in Real Payroll</i>
Bartholomew, Boone, Brown, Clark, Clay, Clinton, Crawford, Daviess, Dearborn, Decatur, Dubois, Floyd, Franklin, Greene, Hamilton, Hancock, Harrison, Hendricks, Jackson, Jefferson, Jennings, Johnson, Lawrence, Marion, Martin, Monroe, Montgomery, Morgan, Orange, Ohio, Owen, Perry, Putnam, Ripley, Rush, Scott, Shelby, Spencer, Switzerland, Tippecanoe, and Washington	27.0%	20.5%
Adams, Allen, Dekalb, Elkhart, Huntington, Kosciusko, Lagrange, Marshall, Noble, St. Joseph, Steuben, Wells, and Whitley	22.0%	13.7%
Blackford, Carroll, Cass, Delaware, Fayette, Fulton, Grant, Henry, Howard, Jay, Madison, Miami, Randolph, Tipton, Union, Wabash, and Wayne	-0.5%	-9.1%
Benton, Fountain, Gibson, Jasper, Knox, Lake, LaPorte, Newton, Parke, Pike, Porter, Posey, Pulaski, Starke, Sullivan, Vanderburgh, Vermillion, Vigo, Warren, Warrick, and White	0.7%	-15.0%

SUMMARY

Employment and real payroll growth in Indiana were substantially less than comparable growth at the national level in the 1979-1990 period. The comparative employment loss was concentrated in the 1979-1982 period. Real payroll experienced a substantial comparative loss in the 1979-1982 period, and the comparative loss continued to widen in the 1983-1990 period.

Individual county employment and real payroll growth in Indiana varied dramatically. With respect to employment, there were three geographical concentrations of "winning" and "losing" counties. A geographical concentration of 41 counties had aggregate employment growth of 27%, and another concentration of 13 counties grew 22%. Geographically sandwiched between these two groups was a concentration of 17 counties that declined 0.5%.

Notes

1. Covered employment and payroll data (commonly known as ES 202 data) collected and reported by the state were used. Employment and payroll are reported monthly and quarterly, respectively. To make the two data series comparable for purposes of analysis, employment in the middle month of each quarter was used to make a quarterly data series. Covered employment and payroll data beginning in 1978 represent about 96% of nonagricultural wage and salaried employment and 89% of all employment.

The fixed-weighted price index for personal consumption expenditures (PCEs) as reported by the U.S. Department of Commerce, Bureau of Economic Analysis, was used to deflate the nominal payroll data.

To smooth and seasonally adjust the data series simultaneously, centered five-term moving averages were calculated before determining the indices reported herein. For example, $Emp_{qtr\ 1\ 1979} = .125 \times Emp_{qtr\ 3\ 1978} + .250 \times Emp_{qtr\ 2\ 1978} + .250 \times Emp_{qtr\ 1\ 1979} + .250 \times Emp_{qtr\ 2\ 1979} + .125 \times Emp_{qtr\ 3\ 1979}$

The Age Distribution of Indiana's Population, 1990

From 1980 to 1990, Indiana's population grew by fewer than 54,000 people, or only 0.98%. This increase in population was significantly less than the state's nearly 300,000 person (5.71%) increase from 1970 to 1980, and the percentage increase was only one-tenth that of the U.S. (9.8%) for the same period. Not only was the increase in population small, it was not evenly distributed across the state. Of Indiana's 92 counties, 43 increased in population and 49 decreased. Unemployed workers and their families leaving Indiana as a result of the recession in the early part of the decade, and a lack of foreign immigration into the state, were the primary factors leading to the low growth.

As in the 1970s, the youngest age groups declined in numbers while the older groups increased. Children aged 14 and younger declined by more than 91,000 persons (6.97%). However, the decline in the number of people in this category in the 1980s was significantly less than the nearly 224,000 decline (14.6%) of the 1970s. Young adults aged 15 to 24 years old declined by more than 203,000 (19.37%), a

dramatic turnaround from the more than 131,000 increase during the 1970s. Adults aged 25 to 64, showing the effects of the Baby Boom, continued to grow, increasing by more than 237,000 (9.30%). Finally, the 65-and-over age group increased nearly 111,000 (18.93%). As a result of these changes in the age categories, Indiana's population continued to age, going from a median age of 27.2 years in 1970, to 29.2 years in 1980, to 32.8 years in 1990. The state's population pyramid is shown in **Figure 1**, while additional information on the changes in cohort sizes can be found in **Figure 2**.

Children (the cohort under the age of 15) made up 29.5% of the state's population in 1970. By 1980 their share had dropped to 23.8%, and by 1990 it had further dropped to 21.93%. Young adults (age cohort 15 to 24) increased from 17.66% of the total population in 1970 to 19.09% in 1980, but fell to 15.25% in 1990. The 25-to-44 age cohort increased its share from 23.5% of the 1970 total to 27.10% in 1980 and 31.28% in 1990. Much of the decrease in the share of the total for the 15-to-24 cohort and the increase of the 25-to-44 cohort can be explained by the passage of the Baby Boomers from the former to the latter during the 1980s. Further details of the age and sex distribution of Indiana's population appear in **Table 1**.

The median age of a county is defined as that age at which one-half of the residents of the county are older than the given number of years and one-half are younger. Sullivan County, as in 1980, had the distinction of having the highest median age of Indiana's 92 counties. In 1980, the median age in Sullivan County was 33.7 years, and in 1990 it was 36.7 years. The county with the lowest median age was Monroe County at 25.7 years, up from 24.6 years in 1980. Lagrange County was lowest among the non-college counties with a median age of 28.0 years, up from 26.0 years in 1980. Median ages and ranks for all counties in the state are shown in **Table 2**.

In 1980, more than 29% of the population of Indiana was under the age of 18. By 1990, this figure had dropped to 26.3%. Once again, Lagrange County had the highest percentage of population 17 and under. Down from 37.2% in 1980, 35.1% of the residents of Lagrange County were under 18 years of age in 1990. In 1980, three counties had more than one-third of their population under 18: Lagrange, Franklin, and Adams counties. In 1990, this number had dropped to only one: Lagrange. Data for all counties are provided in **Table 2**.

In 1990, Sullivan County again had the greatest percentage of population 65 and over, 17.9%, an increase of 1.5% over 1980. Vermillion County was a close second with 17.3%. The county with the lowest percentage of 65 and over was Hamilton County, with only 8.3%. **Table 2** carries additional detailed data.

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Figure 1
1990 Indiana Population Pyramid

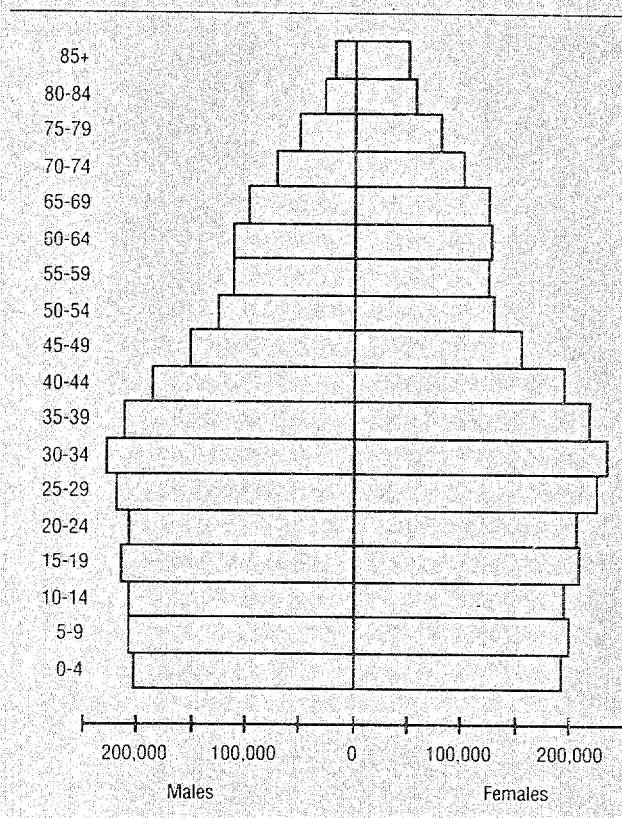


Figure 2
Population Change by Cohort, 1980-1990

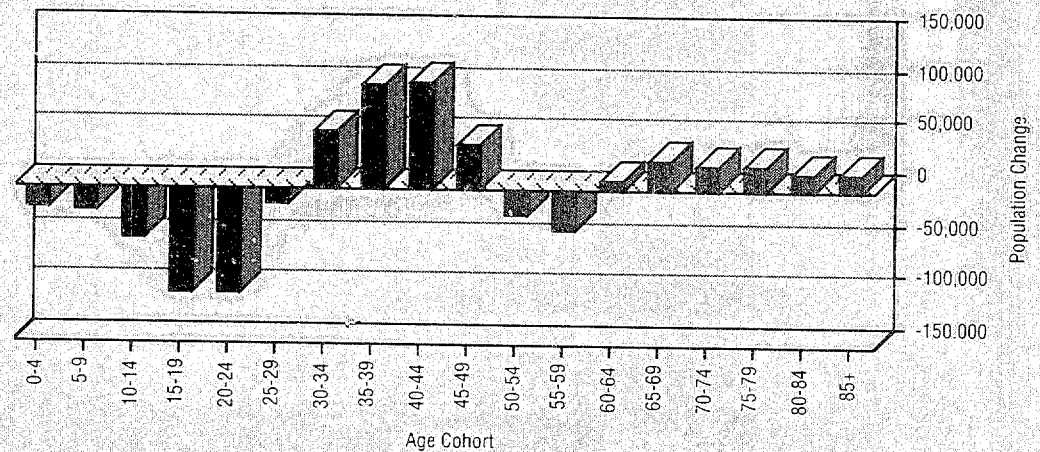


Table 1
Indiana Population by Sex and Age, 1990

	1990 POPULATION			PERCENT OF POPULATION			Change From 1980 Total	Percentage Change Total
	Male	Female	Total	Male	Female	Total		
<i>Children</i>								
0-14	623,619	592,013	1,215,632	23.20	20.73	21.93	(91,013)	-6.97
Under 5	203,984	194,672	398,656	7.59	6.82	7.19	(20,108)	-4.80
Under 1	36,447	34,536	70,983	1.36	1.21	1.28	(18,222)	-20.43
1-4	167,537	160,136	327,673	6.23	5.61	5.91	(1,886)	-0.57
5-14	419,635	397,341	816,976	15.61	13.91	14.74	(70,905)	-7.99
5-9	210,824	199,639	410,463	7.84	6.99	7.40	(22,590)	-5.22
10-14	208,811	197,702	406,513	7.77	6.92	7.33	(48,315)	-10.62
<i>Young Adults</i>								
15-24	426,701	418,513	845,214	15.87	14.65	15.25	(203,075)	-19.37
15-19	217,475	210,104	427,579	8.09	7.36	7.71	(102,049)	-19.27
15-16	81,491	77,331	158,822	3.03	2.71	2.86	(48,297)	-23.32
17-19	135,984	132,773	268,757	5.06	4.65	4.85	(53,752)	-16.67
20-24	209,226	208,409	417,635	7.78	7.30	7.53	(101,026)	-19.48
20-21	90,139	89,284	179,423	3.35	3.13	3.24	(35,779)	-16.63
22-24	119,087	119,125	238,212	4.43	4.17	4.30	(65,247)	-21.50
<i>Adults</i>								
25-64	1,363,760	1,423,357	2,787,117	50.73	49.84	50.27	237,211	9.30
25-44	855,797	878,473	1,734,270	31.83	30.76	31.28	246,279	16.55
25-34	451,555	463,554	915,109	16.80	16.23	16.51	40,701	4.65
25-29	221,289	226,787	448,076	8.23	7.94	8.08	(14,775)	-3.19
30-34	230,266	236,767	467,033	8.57	8.29	8.42	55,476	13.48
35-44	404,242	414,919	819,161	15.04	14.53	14.78	205,578	33.50
45-64	507,963	544,884	1,052,847	18.90	19.08	18.99	(9,068)	-0.85
45-54	280,110	290,681	570,791	10.42	10.18	10.30	20,679	3.76
55-59	114,684	125,008	239,692	4.27	4.38	4.32	(38,329)	-13.79
60-64	113,169	129,195	242,364	4.21	4.52	4.37	8,582	3.67
<i>Aging</i>								
65 and Older	274,201	421,995	696,196	10.20	14.78	12.56	110,812	18.93
65-74	174,219	227,822	402,041	6.48	7.98	7.25	51,582	14.72
75 and Over	99,982	194,173	294,155	3.72	6.80	5.31	59,230	25.21
75-84	81,130	141,274	222,404	3.02	4.95	4.01	41,889	23.21
85 and Over	18,852	52,899	71,751	0.70	1.85	1.29	17,341	31.87
TOTAL ALL AGES	2,688,281	2,855,878	5,544,159	100.00	100.00	100.00	53,935	0.98

Historically, demographers have referred to the ratio of those in the so-called "dependency" ages to those in the working ages as the "dependency ratio"—that is, the sum of the under-18 and 65+ populations divided by the 18-to-64 population. The dependency ratio has been used as an indication of how a population's age structure is likely to affect its ability to support itself. Lagrange County leads the state with a dependency ratio of 82.8%, with Adams County

close behind at 82.3%. In both cases, the results are primarily due to the high percentage of people under 18. For the state, the dependency ratio is 63.4%—that is, for every 1,000 Hoosiers between the ages of 18 and 64, there are 634 Hoosiers either under 18 or over 64. The dependency ratio in 1980 was 67%, and in 1970 it was nearly 82%. Therefore, the state's ability to support itself, based on this measure, continues to improve.

Table 2
Selected Age Characteristics, by County

	Median Age		% Over 18		%65 and Over		Dependency Ratio			Median Age		% Over 18		%65 and Over		Dependency Ratio	
	#	Rank	#	Rank	#	Rank	#	Rank		#	Rank	#	Rank	#	Rank	#	Rank
INDIANA	32.8		26.3		12.6		63.4										
Adams	30.6	89	31.7	2	13.4	49	82.3	2	Lawrence	35.3	13	25.5	69	14.5	33	66.7	58
Allen	32.1	81	27.8	32	11.3	81	64.2	70	Madison	34.8	25	24.8	81	14.0	40	63.4	71
Bartholomew	34.2	32	25.9	65	11.5	79	59.7	85	Marion	31.8	85	25.5	70	11.6	76	59.1	88
Benton	34.7	27	28.2	22	16.7	5	81.2	4	Marshall	33.3	59	28.5	14	13.4	50	72.1	23
Blackford	35.7	10	25.4	73	15.2	20	68.4	43	Martin	34.2	34	27.0	45	13.8	43	69.1	42
Boone	34.4	30	27.4	39	12.8	58	67.1	54	Miami	31.5	87	28.4	18	11.6	77	66.8	56
Brown	36.5	2	24.6	83	12.7	60	59.5	86	Monroe	25.7	92	18.4	92	8.5	91	36.8	92
Carroll	35.0	21	26.5	55	14.8	27	70.3	32	Montgomery	34.0	40	25.2	77	14.3	35	65.3	64
Cass	35.0	20	26.5	56	15.3	19	71.5	28	Morgan	32.9	69	27.8	30	10.3	85	61.8	78
Clark	33.8	42	25.7	68	12.1	69	60.7	81	Newton	33.6	48	29.0	6	13.3	53	73.2	15
Clay	35.2	16	26.1	62	16.9	3	75.4	8	Noble	31.9	84	29.3	4	12.1	68	70.7	30
Clinton	34.1	37	27.6	34	15.5	16	75.8	7	Ohio	34.1	36	26.2	58	14.0	41	67.2	53
Crawford	34.0	38	27.5	37	14.3	37	71.8	27	Orange	34.7	28	26.7	49	15.2	21	72.2	21
Daviess	33.6	49	28.9	8	16.0	7	81.5	3	Owen	34.7	26	26.8	48	13.4	52	67.0	55
Dearborn	33.1	64	28.6	13	11.9	73	68.0	47	Parke	36.3	4	25.1	78	15.8	10	69.4	38
Decatur	32.6	77	28.9	9	13.4	51	73.0	16	Perry	33.5	52	25.9	63	14.6	31	68.1	46
Dekalb	31.9	83	28.9	7	12.0	71	69.2	40	Pike	36.3	5	24.5	85	15.7	13	67.3	52
Delaware	31.4	88	22.1	90	12.7	62	53.2	90	Porter	32.7	73	27.6	36	9.8	99	59.7	84
Dubois	32.1	80	28.1	23	12.3	65	67.9	48	Posey	33.4	54	28.0	24	12.0	70	66.7	57
Elkhart	31.8	86	28.5	16	11.2	82	65.8		Pulaski	33.8	41	28.6	12	15.6	15	79.4	5
Fayette	35.1	18	26.5	52	14.5	32	69.6	36	Putnam	32.1	79	23.1	88	12.7	61	55.7	89
Floyd	34.0	39	26.5	54	12.7	59	64.5	68	Randolph	35.6	11	25.9	66	15.4	17	70.2	33
Fountain	35.9	8	25.9	64	16.7	4	74.1	13	Ripley	33.1	66	28.5	15	14.1	38	74.4	10
Franklin	32.7	74	29.6	3	12.4	63	72.4	19	Rush	33.6	47	27.9	28	14.7	30	74.3	11
Fulton	35.3	12	26.6	51	16.0	9	74.2	12	St. Joseph	32.8	72	25.3	75	14.1	39	65.0	65
Gibson	35.1	19	25.7	67	15.7	12	70.7	29	Scott	32.7	75	27.8	31	11.9	72	65.7	60
Grant	34.9	24	24.8	82	13.8	44	62.8	73	Shelby	33.1	63	27.3	40	12.2	67	65.4	63
Greene	35.9	9	25.4	72	16.4	6	71.9	25	Spencer	33.7	46	27.3	41	13.1	56	67.6	49
Hamilton	32.9	70	29.0	5	8.3	92	59.4	87	Starke	33.3	57	28.0	25	14.4	34	73.8	14
Hancock	34.2	31	27.6	35	10.4	84	61.2	80	Steuben	33.4	53	26.1	61	13.1	55	64.5	67
Harrison	33.2	61	28.3	21	11.4	80	65.7	61	Sullivan	36.7	1	25.5	71	17.9	1	76.5	6
Hendricks	33.3	60	27.9	29	9.7	89	60.2	83	Switzerland	35.2	14	27.0	42	15.1	23	72.8	17
Henry	36.1	6	24.6	84	14.8	29	64.9	66	Tippecanoe	26.5	91	21.0	91	9.4	90	43.7	91
Howard	34.1	35	26.7	50	11.7	75	62.3	77	Tipton	36.2	15	26.1	60	14.8	28	69.3	39
Huntington	32.8	71	27.7	33	14.3	36	72.2	20	Union	33.7	44	28.0	27	13.9	42	71.9	26
Jackson	33.6	50	27.0	47	13.6	45	68.2	45	Vanderburgh	34.5	29	23.9	86	15.7	14	65.6	62
Jasper	32.0	82	28.7	11	12.3	66	69.6	37	Vermillion	36.5	3	24.9	80	17.3	2	72.8	18
Jay	35.0	22	26.5	53	15.4	18	72.0	24	Vigo	33.0	67	23.0	89	15.1	24	61.4	79
Jefferson	33.7	45	25.0	79	13.5	46	62.7	74	Wabash	33.7	43	26.3	57	14.8	26	69.9	34
Jennings	33.1	62	27.0	46	11.6	78	62.7	75	Warren	36.0	7	26.2	59	14.9	25	69.8	35
Johnson	32.6	76	27.0	43	10.6	83	60.4	82	Warrick	33.3	55	28.3	20	10.3	86	62.9	72
Knox	33.5	51	23.2	87	16.0	8	64.3	69	Washington	33.3	56	27.4	38	13.5	47	69.2	41
Kosciusko	32.2	78	28.8	10	11.9	74	68.4	44	Wayne	34.9	23	25.2	76	15.1	22	67.6	50
Lagrange	28.0	90	35.1	1	10.2	87	82.8	1	Wells	33.1	65	28.4	17	13.5	48	72.2	22
Lake	33.0	68	28.0	26	12.3	64	67.6	51	White	35.1	17	27.0	44	15.8	11	74.8	9
LaPorte	34.2	33	25.3	74	13.1	54	62.4	76	Whitley	33.3	58	28.4	19	13.0	57	70.6	31

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