Distributing State Road Use Tax Funds to Counties

Iowa Department of Transportation
Project HR–386
Sponsored by the
Iowa Highway Research Board

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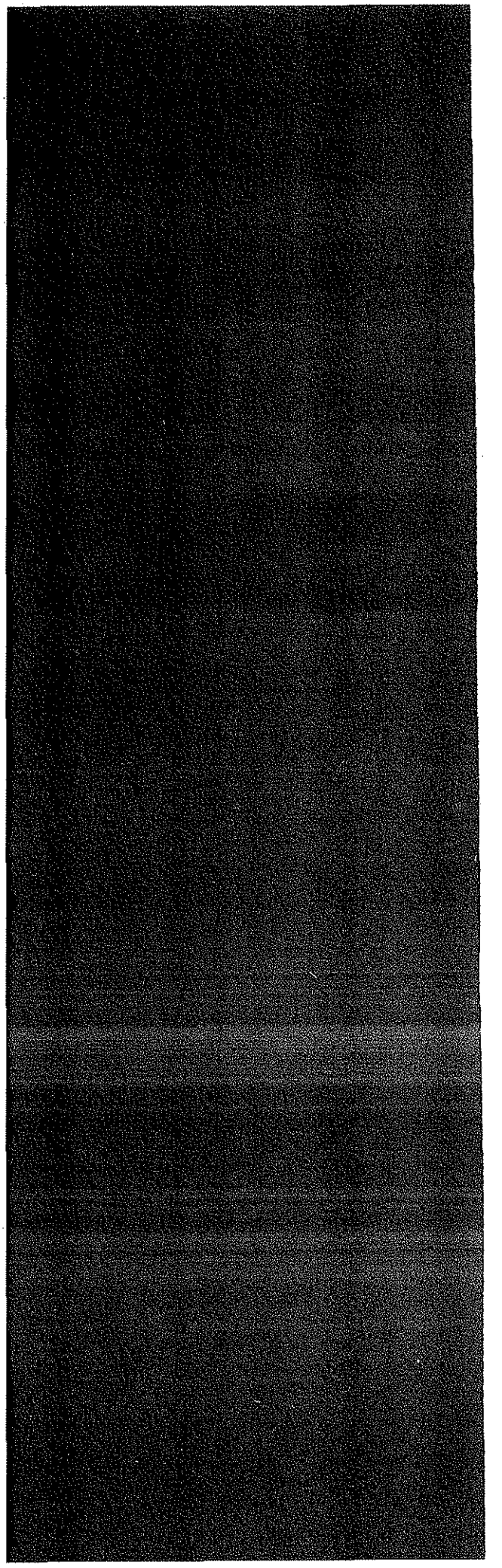

THE UNIVERSITY OF IOWA
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PREFACE

In July 1995 a group of county engineers met with researchers at the University of Iowa Public Policy Center to discuss the possibility of studying alternative approaches to distributing state transportation funds among Iowa counties. The challenge they proposed was intriguing: to design an allocation approach that is stable, comprehensible, predictable, and sensitive to the diverse nature of the state's 99 counties. At the end of the discussion, the Center agreed to develop a proposal outlining an approach to the study. Ultimately, the proposal was funded by the Iowa Highway Research Board (HRB), and work commenced late in 1995.

From the very beginning it was clear that this project would need to be a collaborative effort involving not only university researchers but also a representative sample of engineers from diverse counties. Mark Nahra, chair of HRB, formed an advisory committee that included county engineers from all parts of the state; from urban and rural counties; and from counties that vary in terms of terrain, drainage basins, and other significant attributes. Throughout the study, the advisory committee played an active role, discussing each technical issue that emerged.

In the end, an allocation approach emerged that contains six factors. Both the factors included and the relative weights attached to them were products of technical analysis and compromise. Allocations to one type of county had to be balanced with those to another. The approach that emerged received strong support at a meeting of the Iowa Association of County Engineers in October 1996.

Although this project entailed hundreds of computer runs and a very large database, it was much more than a technical exercise. At the heart of the project was a highly qualified, diverse advisory committee that made a substantial contribution of ideas and time. Through discussions that were at times intense, the advisory committee helped guide the project to the point where a recommended allocation procedure could be produced.

ACKNOWLEDGMENTS

In the preface, we mention that funding for this project was provided by the Iowa Highway Research Board. Using funds from the county portion of its research budget, the Board expedited an early start to this project. We are grateful to HRB members and to Vernon Marks, staff member to HRB, for the smoothness with which the project was facilitated.

Members of the advisory committee, listed on the inside cover, contributed greatly to this research effort. Attendance at all meetings was very near 100 percent, and the enthusiasm, support, and commitment we saw was both helpful and inspiring. Our special thanks go to Mark Nahra, Cedar County Engineer. Mark led the advisory committee with an objective mind and a real desire to find a sound approach for distributing Road Use Tax Funds among counties. He was a highly effective leader who deserves great credit for the positive environment he fostered throughout the study.

Data needs for this project were enormous. Many people helped us acquire necessary data, but Paul MacVey deserves our special thanks. Each of our many requests was quickly answered, always with the same cheerful, supportive demeanor. Paul also provided us with insight into how the complex existing allocation procedure operates. We greatly appreciate his many contributions.

Our thanks go to Professor C. Phillip Baumel, who served as a technical advisor on the project. Phil is Iowa's most recognized authority on agricultural transportation economics, and we were fortunate to have had his expertise.

Without the efforts of people at the Public Policy Center, this project would not have been possible. Carolyn Goff provided administrative support throughout the project. We also express our appreciation to Anita Makuluni who supported our work in many vital capacities, including editor and advisor. She also made sure the text and graphics would be accessible to a wide audience.

To all of the people we have mentioned and some we may have missed, our thanks.

TABLE OF CONTENTS

FIGURES

TABLES

CHAPTER 1
INTRODUCTION

Iowa's county road system is a vital part of the state's transportation system. It represents the initial means for moving crops and livestock from the farm, increasingly serves rural commuters, and enables diverse economic activities to take place in smaller Iowa communities. As farm sizes have grown and most smaller communities have lost population, the ability of many Iowa counties to pay for critical services, including roads, has declined. At the same time, counties within or adjacent to growing metropolitan areas are experiencing steady increases in traffic volumes on their secondary roads as commuting from rural locations becomes more common. In short, Iowa's county road system serves many critical functions in a changing environment.

With these and other changes, county road finance has become a more complex issue in Iowa. Many counties with very different social, economic, and demographic circumstances do not have adequate resources to provide the desired level of service on their secondary road systems. How the state's Road Use Tax Fund (RUTF) is distributed among counties is therefore of great importance.

This report presents the results of a year-long study of how to distribute RUTF resources among Iowa's 99 counties. The project was undertaken at the request of county engineers who wish to replace the current method of allocation with one that is more stable, comprehensible, and predictable. In this report, we describe the current allocation method, examine how other states distribute road funds to counties, and discuss potential allocation factors that could be included in a revised procedure. We also summarize the process undertaken to narrow the range of possible formulas and determine the one to recommend. Finally, we present the allocation formula recommended by the project advisory committee, along with how it would operate.

IOWA: A STATE UNDERGOING CHANGE

Over the past half century, Iowa experienced considerable change. The state continues to evolve in terms of the nature and location of its economic activity. This evolution has major implications for the types of transportation services that will be necessary for and affordable by Iowa's counties. For reference purposes, Figure 1–1 shows the boundaries of Iowa's 99

counties. The names of the state's eight cities with populations over 50,000 are indicated and the 11 metropolitan counties are outlined.

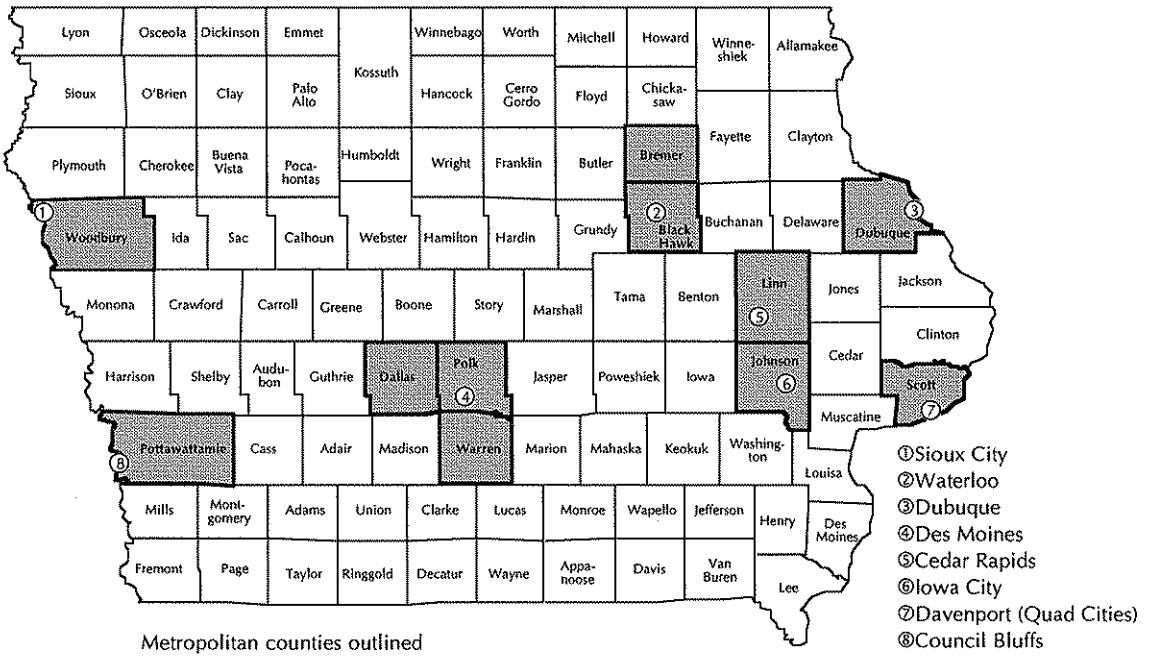

Figure 1–1. Iowa's 99 counties and metropolitan areas

Population changes

Iowa's overall population fell during the 1980s, after having grown for almost all of the twentieth century. This loss in population reflects poor economic conditions in the state during these years. Perhaps as significant as statewide changes, however, were the longer-term changes in where people lived within the state. Figure 1–2 illustrates some of these changes, from the vantage point of 1980. The figure shows that most counties reached their maximum populations before 1980, and in some cases, many decades earlier. Moreover, in 1980, 27 counties had less than three-quarters of the maximum population they had reached at an earlier time. Indeed, six counties had less than half of their maximum population. The 20 counties still growing in 1980 were clustered around large urban centers: Des Moines, Waterloo, Cedar Rapids and Iowa City, Davenport, and Dubuque.

Figure 1–3 reflects 1990 census data showing how the population of Iowa's counties changed during the 1980s. Two changes are particularly noticeable. First, only seven counties, mainly clustered around Des Moines and Iowa City, gained population during this trying decade.

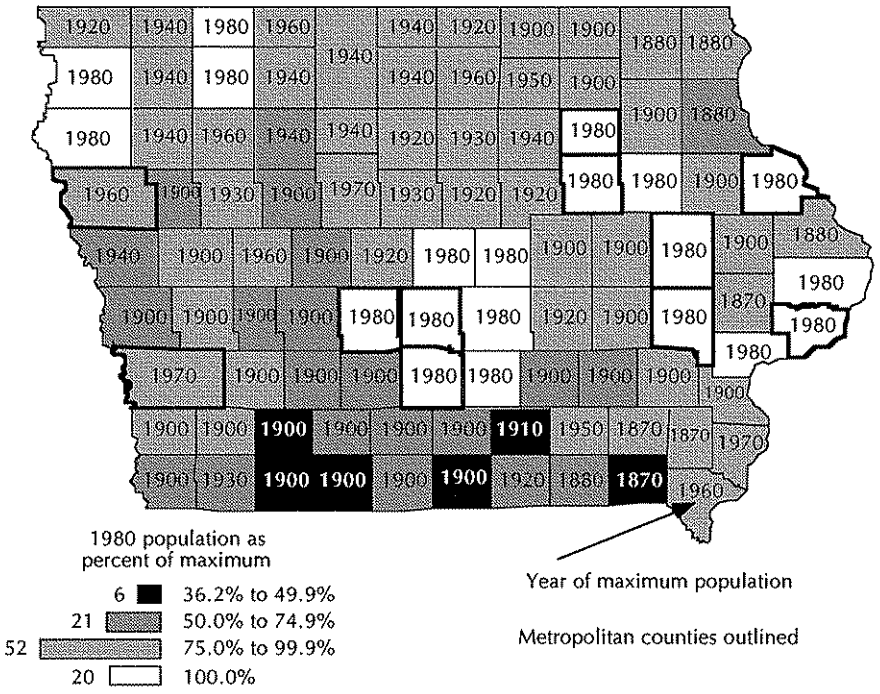

Figure 1–2. County population changes in Iowa up to 1980

SOURCE: Andriot (1983).

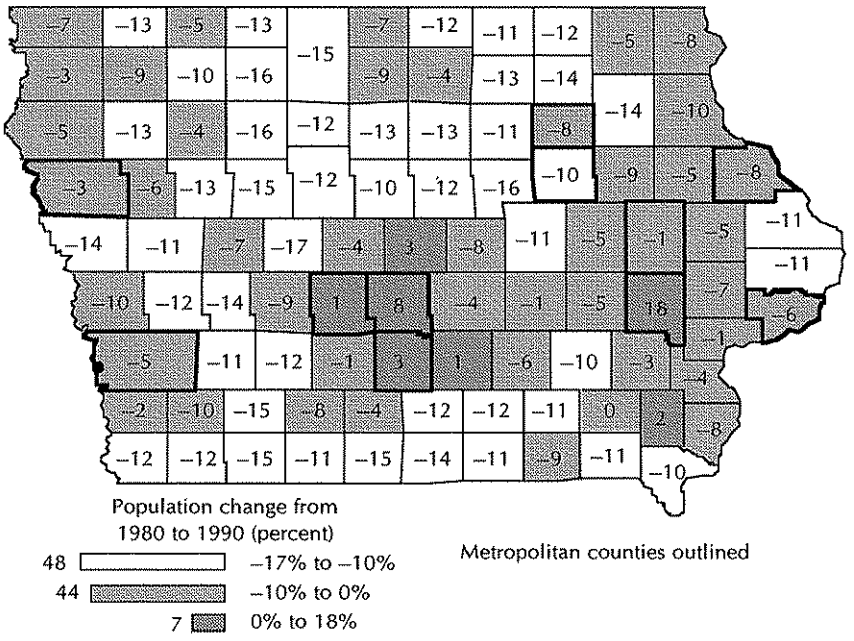

Figure 1–3. Change in Iowa's county populations from 1980 to 1990 (percent)

SOURCES: Andriot (1983) and Goudy and Burke (1990, pp. 6–8).

Second, almost half of Iowa's 99 counties lost over ten percent of their 1980 population, especially those in southern and north central Iowa. Also noteworthy is the fact that half of the state's cities with populations over 5,000 lost five or more percent of their residents between 1980 and 1990, after many decades of sustained growth.

Economic changes

The past three decades have brought significant economic changes to Iowa. For one thing, the state's employment across industries has shifted in important ways. Manufacturing has dropped as a fraction of total employment: from 25.6 percent of all nonagricultural employment in 1965 to 19.1 percent in 1989. Equally important are changes in the location of manufacturing jobs within the state. As Figure 1–4 shows, manufacturing employment has decreased significantly in some metropolitan areas, particularly Waterloo and the Quad Cities (9,328 and 6,909 fewer jobs, respectively). In fact, the 11 metropolitan counties collectively lost 30,207 manufacturing jobs, while nonmetropolitan counties experienced a small increase of 296 jobs. Thus, while manufacturing employment in Iowa has dropped at about the same rate as the nation overall, it has also shifted slightly in terms of location.

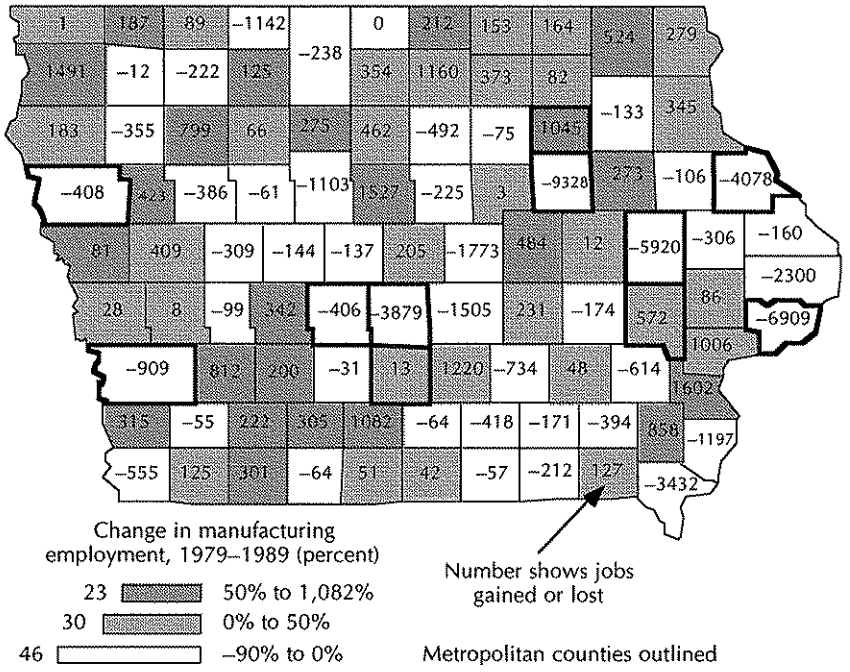

Figure 1–4. Change in manufacturing employment in Iowa, by county, from 1979 to 1989

SOURCE: U.S. Bureau of the Census (1981; 1991).

Part of the observed shift can be explained as a result of changes in the manufacturing sector nationally. Increasingly, major manufacturers are outsourcing component production to specialized firms. These firms must compete with one another, and cost-effective labor is the most critical variable. Rural Iowa is a competitive location for outsourcing plants because the quality of labor and cost of conducting business are both favorable. Manufacturing nationally is becoming less centralized, and this trend is much in evidence in Iowa.

Despite a degree of decentralization in manufacturing, total employment in Iowa is becoming increasingly centralized. Across Iowa, about 42,000 more people had jobs in 1990 than in 1980, even though the state decreased in population. Several counties experienced large job gains: residents of Polk County had over 25,000 more jobs in 1990 and residents of Johnson County gained over 11,000 jobs. Fifty-four counties had fewer residents with jobs in 1990 than in 1980. It is worth noting that many counties saw significant gains in the number of residents with jobs outside their county of residence. This divergence between place of residence and location of employment is becoming significant for many counties, and the economic interdependence of where people live versus where they earn their living is likely to increase.

Figure 1–5 shows how the percentage of employed Iowans who worked outside their county of residence varied across Iowa in 1990. For nonmetropolitan counties, the figure also shows the percentages of all workers employed in a metropolitan county. For example, in Grundy and Tama Counties (southwest of Waterloo), over 30 percent of those who were employed worked outside the county (as shown by shading). In Grundy County, however, 22 percent of employed residents worked in a metropolitan county, probably in Black Hawk County (Waterloo). In contrast, Tama County had the same level of commuters, but only eight percent of employed residents worked in a metropolitan county.

The message in Figure 1–5 is that although counties adjacent to metropolitan areas tend to have large numbers of commuters, not all of them should be assumed to be drawn to larger cities. Intercounty commuting can be just as significant. Statewide, about 18 percent of all employed persons worked outside their county of residence. About one-quarter of Iowa's counties had significant proportions of out-of-county workers, with more than 30 percent of their residents working elsewhere. The figure does not show commuting between counties within the same metropolitan area; over half of the employed residents of Dallas and Warren counties within the Des Moines metropolitan area work outside their county of residence. Yet the most sizable increases in percentages of workers commuting outside the county have been in counties further out from metropolitan areas.

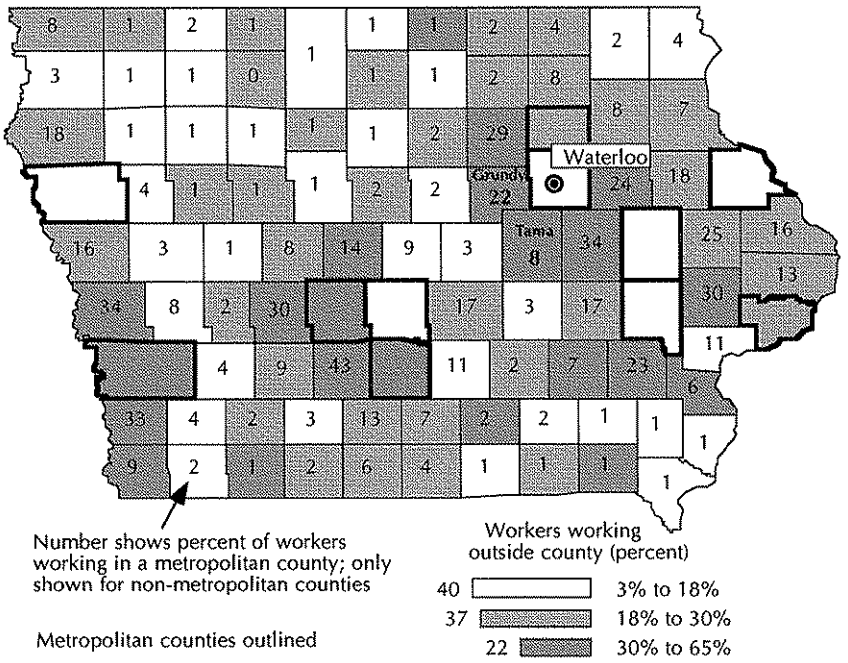

Figure 1–5. Percent of workers employed outside county of residence in Iowa, and percent of workers from nonmetropolitan counties working in metropolitan areas (of all who work outside home)

SOURCES: Burke and Goudy (1992, individual reports for Iowa's 99 counties).

In many rural counties, commuting trips are becoming commonplace, and these trips are often quite long. Even though the populations of rural counties are shrinking, increases in commuting trips mean that traffic volumes on parts of Iowa's rural road network have not declined proportionally. Some of these trips are taken by farmers who have part-time employment off the farm, or by their spouses who are traveling to jobs, particularly those that provide health care benefits.

Agricultural changes

Just as other sectors of Iowa's economy have been changing greatly, so is the state's agricultural sector. Of particular consequence to the state's county road system, is the increase in corn and soybean crops being hauled to market by semitrailer truck (Perkins 1996). According to a survey conducted by Iowa State University, more corn left the farm aboard semitrailer trucks in 1994 than any other transportation mode. A total of 578 million bushels, 37 percent of the 1994 crop, was shipped by semitrailer truck. Equally important is the increasing tendency for trucks to bypass country elevators and transport corn directly to processing plants or river terminals. Similar practices are used in shipping soybeans, with only a slightly lower

dependence on large trucks. While a sizable portion of the trip is made on primary roads, additional travel by large trucks on the state's county road system is becoming a reality.

Even grain shipments that do not traverse longer distances have important ramifications for the county road system. The typical size of delivery vehicle used to haul grain to county elevators is either a tandem axle truck that hauls 550 bushels with a loaded gross weight of 54,000 pounds, or a farm tractor pulling two wagons and hauling 1,000 bushels with a gross weight of 70,000 pounds (Beenken 1992). Often the entire trip is made on county roads, and significant wear and tear results because of the very high axle loads. Such extensive shipment by heavy trucks and wagons, along with a general increase in agricultural productivity, has led to increased demands on the county road system.

Implications for county roads

The many changes occurring in Iowa point to a different but very significant role for the state's county road system. It is true that most of Iowa's counties have experienced population losses, but increasing proportions of rural residents are employed off the farm. Commuting is becoming a feature of rural living, so the need for safe, reliable collector roads is great.

Economic activity in many rural areas has been growing. Smaller manufacturing plants have located in rural Iowa to capitalize on the high quality labor force resident there. Traffic to and from these plants is largely served by the primary road system, but many of the employees make at least a portion of their commutes on county roads.

Agricultural production in Iowa is taking place on larger farms, and crops are being transported to more distant locations. Both of these trends portend greater use of county roads, as well as travel by vehicles with comparatively high axle loads.

COUNTY ROAD FINANCE

In Iowa, state transportation funds are placed in the Road Use Tax Fund (RUTF). During fiscal year 1996 (FY 1996), the RUTF totaled an estimated $808.3 million. After approximately $63.6 million in off-the-top allocations were made, the remaining funds were distributed via a legislatively-determined formula. This formula apportions 47.5 percent to the primary road system, which is the responsibility of the Iowa Department of Transportation (Iowa DOT); 32.5

percent to the county road system; and 20 percent to municipal streets and roads.[1] Within the 32.5 percent for county roads, 24.5 percent is devoted to secondary roads, and 8.0 percent is allocated to farm-to-market roads, which are a subset of the secondary road system.

In FY 1996, an estimated $179.4 million in RUTF resources was available for allocation to the state's 99 counties for their secondary roads, and an estimated additional $57.4 million was distributed to the counties for farm-to-market roads. Both secondary road and farm-to-market funds are distributed among the counties on the basis of a need study as directed by the state legislature. The specific need study method currently used was adopted by the Iowa DOT and is examined in Chapter 2.

RUTF allocations to the counties are supplemented by locally-generated funds, principally from the county property tax. In FY 1996, 32 percent of the total expenditures by counties on roads came from local property tax revenue. It is important to stress that Iowa law defines the portion of the county real property tax base that can be taxed for purposes of financing county roads. State law also restricts the maximum property tax millage rate (tax dollars per $1,000 of assessed valuation).[2] For each county, the maximum millage rate times the eligible tax base can be thought of as the maximum tax potential for that county's roads. Figure 1–6 depicts a three-year average (FY 1994 through FY 1996) of the actual tax levies in each county as a percentage of its maximum tax potential.

Iowa law also stipulates that counties must tax themselves sufficiently to generate at least 75 percent of their maximum tax potential. If a county does not achieve this level of fiscal effort, the shortfall is deducted from its RUTF allocation. Actual county local effort may exceed the maximum tax potential because local discretionary funds can be devoted to secondary roads. Figure 1–6 shows that 31 counties exceeded their maximum tax potential in FY 1996. It should be stressed that since FY 1994, state law restricts counties from increasing the amount of their property taxes, even though assessed valuations have been increasing. The result has been an unavoidable downward tendency in actual tax levies as a percent of maximum tax potential.

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[1] The current RUTF distribution formula was mandated by the Iowa legislature in 1988 and took effect in FY 1992. Prior to that, 45 percent of the fund was distributed to primary roads, 37 percent to county roads, and 18 percent to municipal streets and roads.

[2] A county may enact a maximum levy for roads of $.16875 per $1,000 assessed valuation of all eligible property within the county and $3.00375 per $1,000 of all rural valuations. These rates effectively define the maximum tax potential.

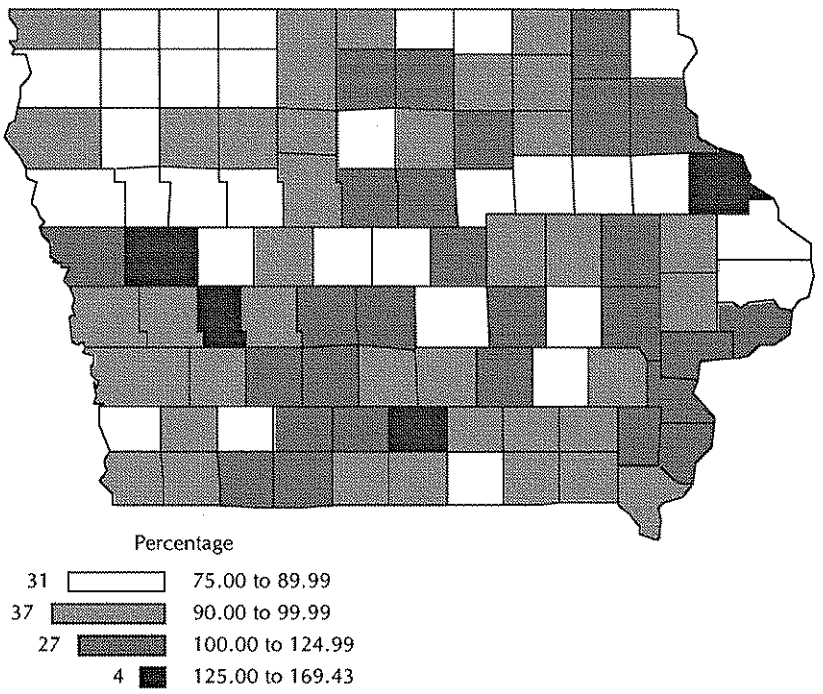

Figure 1–6. Actual tax levies as a percentage of maximum tax potential, average for FY 1994 to FY 1996

ISSUES IN RUTF ALLOCATION

The foregoing discussions document the fact that (1) Iowa is changing in terms of its economy and travel patterns and (2) there is generally not much counties can do to supplement their RUTF allocations. Several key issues thus emerge that are highly salient to the subject of this report: distributing the county portion of the RUTF. These issues include

- Accommodating increased vehicular traffic in counties within or contiguous to growing metropolitan areas,
- Providing a reasonable level of access in counties where the population is much less than it was when county roads were built,
- Serving rural commuters who journey to job sites, often in metropolitan areas or in different counties,
- Facilitating the transportation of agricultural commodities and livestock from farm-to-market, including the increased use of larger trucks, and

- Providing good access to industrial sites in smaller communities, both for workers and for trucks transporting materials in and products out.

With limited resources, it is not possible to provide a high level of service on all 89,468 miles of county roads within the state of Iowa. Traffic volumes on county roads vary from extremely light to quite high. Should counties with relatively high traffic volumes receive large allocations, given that they are serving greater numbers of travelers? Should counties with larger systems be given proportionately larger allocations, recognizing that it costs more to maintain these more extensive systems?

Clearly, a variety of objectives must be balanced when RUTF resources are allocated to Iowa's rather diverse counties. Many counties have weak economies, and reductions in allocations would increase the fiscal stress they are experiencing. Meanwhile, the pressures of growth in other counties need to be addressed. In the chapters to follow, we work toward an allocation approach that is sensitive to these and other complex issues faced by counties in providing road access.

CHAPTER 2
CURRENT ALLOCATION APPROACH

The means by which Iowa's Road Use Tax Fund (RUTF) is distributed to the primary road system, secondary road system, and municipal streets is determined by the state legislature. So also is the way in which the secondary road system portion of the RUTF is distributed among the 99 counties. In this section, we summarize how the current allocation approach operates and the legal basis for that approach. We then assess how stable, comprehensible, and predictable the current approach is.

AN OVERVIEW OF THE CURRENT APPROACH

Currently, individual county shares of the RUTF are determined on the basis of 30 percent land area and 70 percent need. The Iowa DOT quadrennial need study report defines the need portion using a complex computer algorithm developed by the Federal Highway Administration (FHWA), known as HWYNEED. The algorithm takes into account a county's road system size, functional classification of the segments that comprise the road system, and present system condition based on surveys. It forecasts each county's level of need for the next 20 years and computes a ratio of each county's level of need to the need of all counties added together. Methods for surveying need are as follows:

1. Iowa DOT survey teams assess the adequacy of both existing and future conditions for each road section, bridge, and railroad crossing. The survey data are entered into the HWYNEED program.

2. HWYNEED then provides an estimate of the costs for the improvements along with the cost of maintenance and administration to determine total dollar need. These dollar needs are then adjusted by staff of the Iowa DOT who have developed cost area factors to reflect the varying costs in different areas of the state based on the relative cost of right-of-way, construction, and maintenance.

The need study methodology relies heavily on adequacy surveys and forecasts of future road conditions. The results of the need analysis therefore depend greatly on the accuracy and frequency of both. Updates to inventory and appraisal data can result in sizable changes to a

county's share over time. These large changes also stem from the fact that the allocation procedure used is complex because it is based on the forecasting of numerous factors that change simultaneously. In a study titled *Clarifying the Quadrennial Need Study Process*, James Cable (1993) used sensitivity testing on selected Iowa counties to arrive at a better understanding of what contributes most to observed shifts in allocations. He selected the counties based on characteristics likely to show changes in the overall need factor and found that significant shifts in allocations occurred with changes in the following four factors:

- Traffic volumes,
- Road condition ratings between plus and minus two points of the 1990 ratios,
- Structure condition ratings, and
- The assignment of construction cost areas between consecutive need studies.

If a change in one of these factors can create instability, it seems likely that some or all of the factors could also interact to create highly unstable allocations. Road conditions vary not only by the types of costs captured in the need study, but also by local infrastructure and taxation choices and changes in federal support for local projects.

The reassignment of cost areas is a special concern, considering their impact on the final need factors. The need study methodology considers cost differences in seven areas: right of way, grade and drain, base and surface, structure construction, road maintenance, structure maintenance, and administration. Counties are grouped into cost areas based on right of way costs; the remaining factors (e.g., grade and drain) are expressed as average expenditures for the counties in the assigned cost area over a seven-year period. The statewide average for each type of expenditure is the base for an index of each cost area's average expenditure relative to the state's average expenditure. This index reflects whether expenditures in the group are relatively higher or lower for each factor than the statewide average.

Reliance on historical expenditures presents a problem in that expenditures do not equal costs, nor do they reflect *need*. What a county spends on its road system is more directly a function of what it is *able* to spend. A county's ability to invest in its secondary system depends very much on its local tax base, local taxation choices, and, importantly, its past history with the need study. Fluctuations in allocations based on need studies can change the expenditure choices of individual counties so that what a county *actually* spends may or may not be what it *should* be spending.

Grouping the counties into cost areas according to right of way costs can also cause problems. Cost areas might bring together counties with quite different terrain, or counties in which the availability of quarries is quite different (two factors that may influence road system costs). For instance, cost area 10 includes both Jackson and Crawford counties, even though they lay on opposite sides of the state. It is conceivable, then, that one or two counties that have received substantial increases in their allocations as a result of the need study could pull up the average expenditures for the entire group of counties. The same type of effect could occur with counties that experience major cuts in their allocations.

Considering the incomprehensibility of past allocations, the concept of horizontal equity—equal treatment of equals—takes on a very important role in this analysis. There is a clear need for simplification so that counties with similar systems receive similar levels of funding support. It makes sense to develop broader measures of fiscal requirements that are as easy as possible for the Iowa DOT to administer and that county engineers can predict from year to year.

LEGAL ISSUES

Changing to a new allocation approach will require a legislative change in the Iowa Code and an administrative change in Iowa DOT policies and procedures. According to Iowa Code, chapter 307A.2.14, the Iowa Transportation Commission shall "prepare, adopt and cause to be published the results of a study of all roads and streets in the state. The study shall be so designed to investigate present deficiencies and future twenty-year maintenance and construction needs of the roads and the ability of each applicable authority to meet the needs for the planning, construction, repair and maintenance of roads within their jurisdiction. The commission may gather information necessary to complete this study and shall be furnished assistance from any state agency as necessary to prepare, update and publish a report to be referred to as the 'quadrennial need study' for the purposes of this chapter and chapter 312."

Chapter 312.3 of the Iowa Code describes apportionment to counties based on the quadrennial need study. According to this section, apportionment among the counties should be "in the ratio that the needs of the secondary roads of each county bear to the total needs of the secondary roads of the state for each fiscal year based upon the total needs of secondary roads of the state as shown in the latest quadrennial need study report developed by the state department of transportation, ... seventy percent of the allocation from road use tax funds which is credited to the secondary road fund of the counties." The section goes on to describe the 30 percent apportionment according to the county share of total state area: "in the ratio that the

area of each county bears to the total area of the state, thirty percent of the allocation from road use tax funds which is credited to the secondary road fund of the counties."

Chapter 312.5 discusses the division of farm-to-market road funds. These funds are also divided 70 percent need and 30 percent area. Again, the need allotment for farm-to-market road funds "shall be allotted among the counties in the ratio that the needs of the farm-to-market roads in each county bear to the total needs of the farm-to-market roads in the state for each fiscal year based upon the total needs of the farm-to-market roads in the state as shown in the latest quadrennial need study report developed by the state department of transportation."

The language clearly indicates the use of the quadrennial need study as the basis for the 70 percent need and 30 percent area allocation. Therefore, any change to a new method of allocation will require legislative changes to chapter 312 (and possibly chapter 307) of the Iowa Code.

If a legislative change were to be enacted, the quadrennial need study would still be an important inventory of the state's secondary road system. The move away from use of the study as an allocator has potential to significantly improve the need study methodology. Currently, any changes in the need study methodology will result in zero-sum changes among the counties for their secondary roads allocation. Under a different allocation method, the Iowa DOT would be able to test new and updated methods for estimating need without redistributing funds among counties in the need study.

PERFORMANCE OF CURRENT APPROACH

Applying the criteria of stability, comprehensibility, and predictability, we examined the performance of the current approach for distributing RUTF resources among the counties.

Stability

Figure 2–1 illustrates how individual counties fared in terms of allocations based on the 1986, 1990, and 1994 quadrennial need studies. The horizontal axis represents the percentage change in allocation factors (share of total available funds a given county receives) from the 1986 to the 1990 need study. The vertical scale depicts percentage change in allocation factors from the 1990 to 1994 need studies.

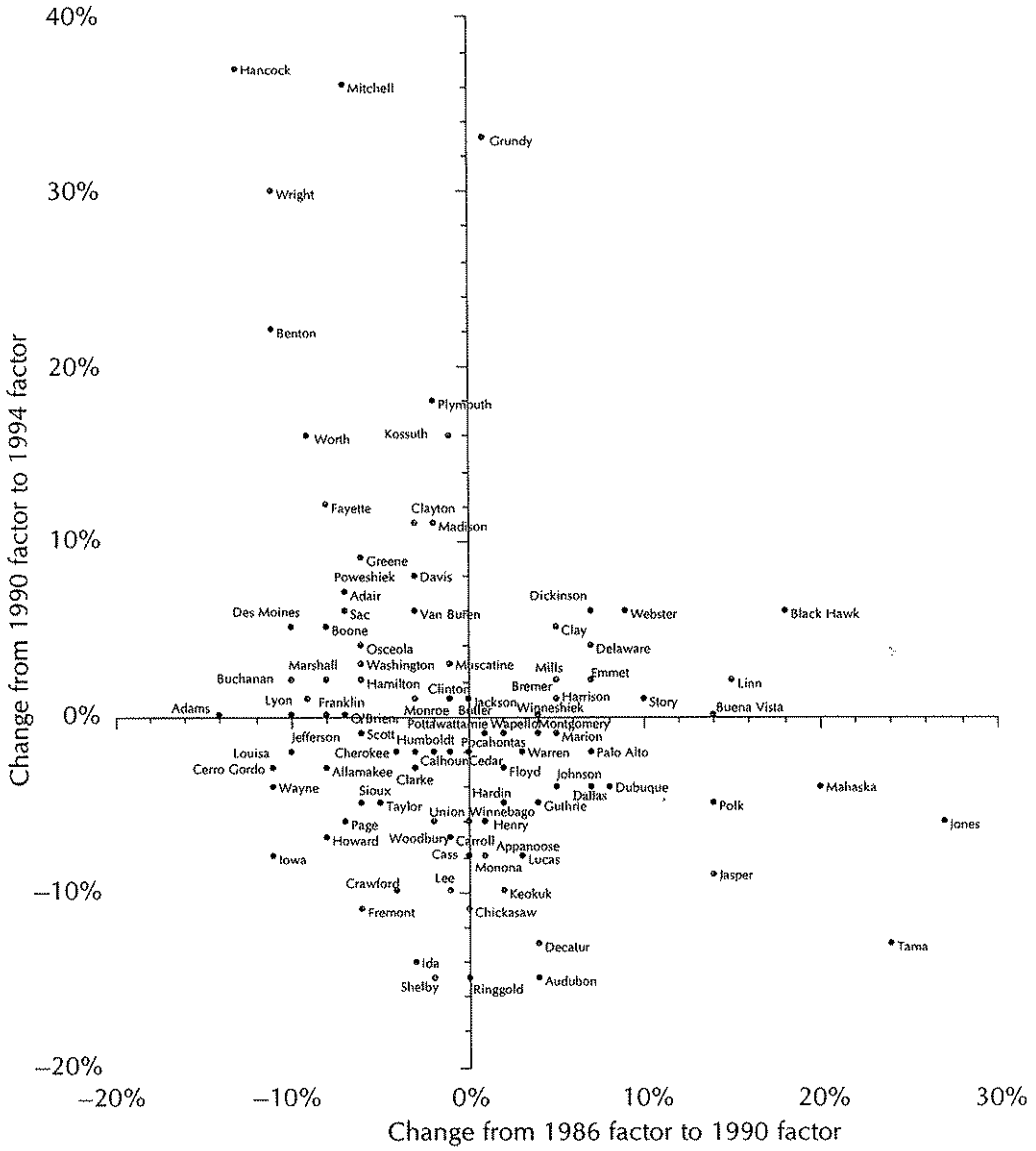

Figure 2–1. Percentage changes in county RUTF allocations, 1986 to 1990 and 1990 to 1994

The graphic shows that in many counties very large swings occurred between need studies. From 1986 to 1990, Polk, Mahaska, Jasper, Jones, and Tama counties gained more than ten percent, while Cerro Gordo, Wayne, and Iowa counties lost over ten percent. From 1990 to 1994, Hancock, Mitchell, Grundy, Wright, Benton, Plymouth, Worth, Kossuth, Fayette, Clayton, and Madison counties experienced gains of more than ten percent, while Fremont, Chickasaw, Ida, Shelby, Decatur, Tama, Ringgold, and Audubon counties lost more than ten percent.

Significantly, Hancock gained over 37 percent from 1990 to 1994, having lost over 13 percent from 1986 to 1990. Likewise, Mitchell, Wright, and Benton posted sizable gains from 1990 to 1994, following losses from 1986 to 1990. On the other hand, Tama county lost over ten percent from 1990 to 1994, after posting a 24 percent gain from 1986 to 1990.

The rather scattered plotting of counties in Figure 2–1 reveals that RUTF allocations have not been particularly stable. Points in the "northwest" and "southeast" quadrants represent counties that gained in one need study and lost in another. A total of 53 counties lie in these quadrants.

Comprehensibility

The 1993 study by Cable was unable to completely decipher the basis for the sometimes sizable swings in allocation factors between need studies. It is the case, however, that Iowa DOT staff have been able to provide explanations of shifts in county funding levels. Yet, individual county engineers have been mystified by changes in their allocations because they have felt that these changes did not correspond to significant adjustments in the size or condition of their road systems. Part of the problem seems to be that when a given county's road system is inventoried to determine the condition of its roads–such surveys are carried out once a decade–its road and bridge structure ratings may well change. The resulting effect on need can be dramatic (Cable 1993, p. 20), though the exact reason may not be understood.

Another characteristic that affects the comprehensibility of the need study (and HWYNEED program) is how the factors interact. It is a complex allocation procedure based on long-term forecasting with numerous areas of simultaneous change. Not surprisingly, individual counties often have had difficulty understanding how their specific allocations came about.

Predictability

With sizable decreases in allocations in the last four quadrennial need study reports, counties have difficulty estimating what they will receive in coming years. The specter of 20 to 30 percent cuts in a county's RUTF allocation looms every four years. Also important is the fact that it is not clear what impacts changes in a county's road system will have on allocations. For example, Cable (1993) found that a 50 percent increase in vehicle miles traveled (VMT) resulted in a 100 percent increase in need for each of the functional classifications of roads. A county experiencing growth or reductions in traffic would have difficulty predicting the implications on its future levels of RUTF funding. Likewise, a road condition survey could greatly affect future years' funding levels. Cable (1993, p. 20) observed that a one point change in road condition (on a five-point scale) would change need 30 to 50 percent.

SUMMARY

Need studies are an important management tool because they provide a basis for estimating the condition of road systems and the cost of bringing them to an acceptable standard. It is arguable, however, that need studies are far less satisfactory as a basis for distributing resources among Iowa's 99 counties. They do not tend to provide a stable, comprehensible, and predictable method for allocating resources as would a more direct approach that takes into account system attributes that change quite slowly. In particular, the FHWA HWYNEED program currently used in Iowa and the data input to it have produced sizable funding swings for many counties, and the basis for these increases or decreases has often not been clear.

CHAPTER 3
ALLOCATION APPROACHES IN OTHER STATES

All 50 states allocate state and federal transportation funds to cities, counties, or townships. To gain a broader perspective of the approaches that could be used in Iowa, we reviewed current practices in other states. It is important to keep in mind that the states vary considerably in terms of their mix of highly populated and more rural counties, the functions of their county road systems, and their road financing approaches. Additionally, the responsibilities of counties for local road construction and maintenance vary greatly among the states. It is, in fact, the case that there are as many allocation methods as there are states.

COMMON ALLOCATION FACTORS

Despite the many differences in allocation methods among the states, several allocation factors are commonly included. The most common allocation factors are motor vehicle registrations, population, and secondary road miles. Presumably, population and motor vehicle registration are seen as measures of potential for road use. Allocating funds on the basis of road use minimizes redistribution among counties; those that pay greater amounts of use taxes receive greater allocations. North Dakota, for example, allocates all available funds to its counties on the basis of motor vehicle registrations, and Arizona distributes its funds solely by county population.

Miles of secondary or county roads is the second most common basis for allocating state road funds to counties. While only New Mexico bases its allocation levels entirely on system mileage, Maryland and Missouri base half, and Montana, Texas, and Oklahoma base 40 percent of their allocations to counties on road system mileage.

A surprising number of states base allocations of road use tax funds to counties on factors with very weak, if any, relationship to road system characteristics. Eight states distribute a portion of available funds to counties equally, regardless of any differences that may exist among them; this criterion accounts for as much as 45 percent (in Alabama). Washington bases 30 percent of its allocation to counties on fiscal need.

Many states redistribute funds among their counties in the sense that they do not attempt to allocate resources in ways that closely reflect where the funds were collected. Only Louisiana bases 100 percent of its allocation to counties on motor fuel sales, though as noted earlier, motor vehicle registrations are a very common allocation factor.

OVERVIEW OF ALLOCATION PRACTICES IN OTHER STATES

FHWA (1995, Table MF–106) provides a good summary of the methods and criteria used by the states when distributing road funds to counties. Table 3–1 contains a simplified presentation of allocation approaches by those states that have codified bases for distributing funds.

Table 3–1. Bases for state allocations to counties

Alabama

- Construction fund—100 percent by equal distribution among counties
- Maintenance fund
  - 45.45 percent by equal distribution
  - 54.55 percent based on population
  - municipalities get ten percent of individual county share

Arizona

- Funds available to counties:
  - 47 percent to counties with 1.2 million population or more
  - 28 percent to counties with 400,000 to 1.2 million population
  - 26 percent to counties with less than 400,000
- Suballocated within the three population classes by share of total population in the class

Arkansas

- 31 percent by land area
- 17.5 percent by total population
- 17.5 percent by motor vehicle registrations
- 13.5 percent by rural population
- 20.5 percent shared equally among counties

California

- County road work funds (1)
  - 75 percent by motor vehicle registrations
  - $60 times each county road mile, minus the allocation received from 75 percent of motor vehicle registrations
  - each county receives identical allotments for engineering and administration

(continued on next page)

Table 3–1. Bases for state allocations to counties (continued)

California (continued)

- County road work funds (2)
  - a county's share is determined by whichever of the following is the largest proportion of the state total, divided by the sum of all counties' allocations so determined
    - $1,000,000 in proportion to motor vehicle fuel tax receipts
    - $750,000 in proportion to motor vehicle registration
    - $250,000 in proportion to number of county road miles
- City/County fund
  - each city receives $400 a month; each county receives $800
  - 100 percent of remainder is allocated by motor vehicle registrations
  - suballocated between city and county depending on the share of assessed valuation in incorporated versus unincorporated areas
  - share between cities based 100 percent on population

Colorado

- $69,000,000 divided according to the county's share received in FY 1987–1988
- Remaining funds
  - 15 percent by rural motor vehicle registrations
  - 15 percent by total motor vehicle registrations
  - 60 percent by county road miles
  - 10 percent by square feet of bridge deck

Florida

- 25 percent by land area
- 25 percent by population
- 50 percent by fuel tax collections from the county

Idaho

- 10 percent shared equally among counties
- 45 percent by motor vehicle registrations
- 45 percent by improved road mileage

Illinois

- 16.74 percent to counties with populations greater than 1,000,000
- 18.27 percent to counties with populations less than 1,000,000
- County share within its particular population group determined by motor vehicle registrations

Indiana

- County aid
  - 5 percent shared equally among counties
  - 65 percent by secondary road mileage
  - 30 percent by motor vehicle registrations

(continued on next page)

Table 3–1. Bases for state allocations to counties (continued)

Indiana (continued)

- County aid
  - 5 percent shared equally among counties
  - 65 percent by secondary road mileage
  - 30 percent by motor vehicle registrations

Kansas

- $5,000 annually to each county
- Revenues from $0.04 per gallon fuel tax
  - 33 1/3 percent by vehicle registration fees
  - 33 1/3 percent by average daily vehicle miles traveled (noninterstate)
  - 33 1/3 percent by total county road system mileage
- Other county funds
  - 50 percent by average daily vehicle miles traveled
  - 50 percent by motor vehicle registration fees

Kentucky

- 20 percent shared equally among counties
- 20 percent by rural population
- 20 percent by rural road system mileage
- 40 percent by rural land area

Louisiana

- 100 percent by motor fuel sales

Maryland

- 50 percent by total county road system mileage
- 50 percent by motor vehicle registrations
- Suballocated at the county level between counties and cities
  - 50 percent by county road system mileage within the municipalities
  - 50 percent by county's total motor vehicles registered in municipalities

Michigan

- County primary road system
  - 75 percent by registration fees
  - 15 percent shared equally among counties
  - 10 percent by the primary road system mileage in each county
- County local road system
  - 65 percent by the local road system mileage
  - 35 percent by population

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Table 3–1. Bases for state allocations to counties (continued)

Minnesota

- 10 percent shared equally among counties
- 30 percent by secondary road mileage
- 10 percent by motor vehicle registrations
- 50 percent by need determined on 25-year basis
  - estimate from each county engineer on expense to update system to current standards
  - needs are updated annually
  - reviewed by screening committee consisting of one county engineer from each district
  - no county's need can increase over 20 percent beyond the overall state increase
  - some minimum counties are protected by law: regardless of factors, counties cannot receive a lower percentage share of the total funds than they did in 1958

Mississippi

- 1/12 of the population of incorporated municipalities times 75 cents

Missouri

- 50 percent by county road mileage
- 50 percent by rural land valuation

Montana

- 40 percent by population
- 40 percent by road system mileage
- 20 percent by land area

Nebraska

- 20 percent by rural population
- 10 percent by total population
- 10 percent by lineal feet of bridges
- 20 percent by rural motor vehicle registrations
- 10 percent by total motor vehicle registrations
- 20 percent by local rural road system mileage
- 10 percent by dollar value of farm products sold
- Incentive payment to employ a qualified full-time county highway superintendent
  - size of incentive payment depends on rural population

Nevada

- County gasoline tax fund
  - 25 percent by land area
  - 25 percent by population
  - 25 percent by county road and street system mileage
  - 25 percent shared with municipalities based on ratio of assessed valuation in incorporated versus unincorporated areas

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Table 3–1. Bases for state allocations to counties (continued)

New Mexico

- County government road fund—100 percent by road system mileage

North Dakota

- 100 percent by motor vehicle registrations
- Shared with municipalities
  - 73 percent to county for highways
  - 27 percent to incorporated cities based on population formulas

Ohio

- Gasoline excise tax fund—100 percent shared equally among counties

Oklahoma

- 40 percent by road system mileage
- 60 percent by population and land area

Oregon

- County road fund—allocated 100 percent by motor vehicle registrations

South Carolina

- 33 1/3 percent by land area
- 33 1/3 percent by population
- 33 1/3 percent by county road mileage

South Dakota

- Does not award funds by formula
- Provides the local match for federal aid

Tennessee

- 50 percent shared equally among counties
- 25 percent by land area
- 25 percent by population

Texas

- 20 percent by land area
- 40 percent by rural population
- 40 percent by road system mileage

Utah

- 32 percent by road system mileage
- 54 percent by population
- 14 percent by land area

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Table 3–1. Bases for state allocations to counties (continued)

Washington

- Rural Arterial Trust Account
  - divides state into five regions
  - shares to regions
    - 33.33 percent by rural land area
    - 66.66 percent by mileage of arterial road system
- County fund
  - all taxes from San Juan County and 50 percent from Island County refunded to collecting counties
  - 10 percent shared equally among counties
  - 30 percent by population
  - 30 percent by road costs
  - 30 percent by monetary need

Wisconsin

- Allocation based on an average of reported expenditures for six years
- County share cannot decrease more than two percent from year to year
- County share cannot increase more than 15 percent from year to year

SOURCE: FHWA (1995, Table MF–106).

SUMMARY

It is noteworthy that few states attempt to base their allocations to counties on need studies. Cable (1993) reported that only Idaho and Utah use the FHWA HWYNEED program for anything other than analyzing highway system conditions, and the FHWA (1995) made no mention of those states basing allocations on need studies.

The most common allocation factors relate to the amount of, or at least potential for, motor vehicle use. System size is another general category of factors on which states often base a portion of their distributions to counties. Generally speaking, the states tend to balance potential for system use in the respective counties with attempts to provide some level of statewide road coverage.

CHAPTER 4
FACTOR SELECTION AND WEIGHTING

The two main elements of devising a procedure for distributing road use tax funds among counties are (1) factors included and (2) relative weights assigned to the respective factors. In this section, we review the factor selection process followed in this project, explain the basis for those ultimately selected, and discuss the weights assigned to the several factors.

PROCESS FOLLOWED

During the course of the study, the research team and advisory committee met seven times. Our first three meetings focused on determining which factors should be included in the allocation approach. Key points raised are touched upon in our discussion of candidate factors later in this chapter. After the factors to be included were generally agreed upon, two meetings were largely devoted to discussing the relative weights to be assigned to the several factors. After some counties expressed a desire for the research team to test other factors, two meetings involved discussions of the merits of additional factors and the weights that should be assigned to them.

Prior to each meeting, the research team sent a memorandum to advisory committee members. These memoranda discussed the major decisions the committee would face in its next meeting; they also showed the implications of formulas under discussion. Maps and tables indicated the specific effects that would result if different factors were included and alternative weighting schemes were used. We also presented interim results to a meeting of the Iowa Association of County Engineers on one occasion and the recommended approach on another.

In the discussion that follows, we present a summary of our efforts to narrow the choice of factors to be included in a new method for allocating RUTF resources to Iowa's counties.

ALLOCATION FACTORS CONSIDERED BUT NOT INCLUDED

Table 4–1 presents the factors considered for inclusion in the allocation approach. After reviewing the approaches currently used by other states, the study team developed this list.

Table 4–1. Allocation factors initially considered

- Property valuation
  - Rural property valuation
  - Property tax levy
- Secondary road mileage
  - Total mileage
  - Mileage by functional classification
- Cost differences
  - Labor
  - Soil type
  - Cost of rock/aggregate
  - Stream characteristics
  - Terrain
- Miscellaneous factors
  - Dollar value of farm products sold
  - Local match for federal county aid
  - Motor fuel sales
  - Land area
- Population
  - Rural population
  - Urban population
  - Licensed drivers
- Motor vehicle registrations
  - Passenger vehicle registrations
  - Truck/trailer registrations
  - Rural motor vehicle registrations
  - Registration fees
- Rural bridges
  - Lineal feet of bridges
  - Square feet of deck
  - Number of structures
- Vehicle miles traveled (VMT)
  - Total VMT
  - VMT by passenger vehicles
  - VMT by truck/trailer/etc.

Several of the potential factors listed in Table 4–1 were excluded from further consideration. Excluded factors and bases for eliminating them from further analysis are summarized in turn.

Cost components

In three of its meetings, the advisory committee discussed the merits of taking into account the relative cost in different counties of road construction and maintenance. Several county engineers expressed concern that the ability of different counties to provide certain levels of secondary road service was restricted by comparatively high costs of critical items, particularly aggregate (rock). Their point was that taking cost into account in the allocation approach would place counties on similar footing with respect to what they would be able to provide to the users of their road systems.

Several difficulties exist with including relative cost in the RUTF allocation method:

- No workable data exist on the relative costs of aggregate and labor, the two greatest expense categories of secondary road construction and maintenance. Because these data are not available, allocation approaches that include relative costs could not be tested. The limited data available indicate a small and statistically insignificant correlation coefficient (0.03) between the relative costs of aggregate and labor among Iowa's counties. Thus, neither measure is a reasonable proxy for total relative cost.

- It is problematic to base allocations to counties on factors that can be manipulated by suppliers of aggregate or labor. The concern is that such suppliers would have an incentive to raise their prices because doing so may not make the county significantly worse off: its allocation would increase. The net result would be that statewide, a lower level of service would be possible with a given amount of resources. In short, it is generally not wise to reward higher spending levels with greater resources; rewarding greater output tends to be better public policy.

- If aggregate costs were to be included, both the price at the quarry and transportation to the point of application would be germane. Additionally, the fact that some quarries are county-owned while others are privately owned must be taken into account. Thus, data on the following would be required:

  - cost per ton at the quarry (factoring in ownership by the county, if applicable),
  - average distance from the quarry to point of application, and
  - average of the above two measures for all quarries used.

- Labor costs consist of wages paid to several categories of workers. The classifications of workers performing various functions differ somewhat among counties, as does the combination of functions performed. It would not be satisfactory to use the hourly wage of a single labor category as an indicator of total labor cost. Rather, hourly costs of several worker categories would need to be considered, along with the number of hours worked by employees in each category.

If aggregate and labor costs were to be taken into account in the allocation approach, a survey of county engineers would be necessary. The information gathered would need to be detailed enough to provide

- A workable basis for deriving measures of relative cost per delivered ton of aggregate and hour of labor,

- A record that would lend itself to verification through audits, and

- Confidence that the bases for differences in county-level costs are accurately represented.

For the reasons just discussed, the advisory committee and research team agreed not to give further consideration to relative cost as a factor in a new allocation approach.

Functional classification and facility condition

The level of investment in a road is reflected by its functional classification. County rural secondary roads fall into two of 12 classifications: (1) arterial connector/trunk/trunk collector roads and (2) area service roads. Within these two classifications, there are eight "highway groups" and 24 design standards. A county has some discretion as to the design standard it will use for secondary roads: it may choose to use asphalt or a granular road surface, different shoulder widths and surface, or particular curve radii, for example.

Level of road investment is a local decision that reflects the preferences, priorities, and resource levels of individual counties. The advisory committee therefore took the position that level of road investment should not be a determining factor in a county's share of RUTF resources. Also of concern to the committee was the rather imprecise relationship between design standards and total maintenance costs. Although higher standard roads cost more to construct, their prorated annual maintenance cost may not be significantly greater than that of lower standard roads.

A related point is that the advisory committee felt the number of substandard bridges or roads in need of rehabilitation should not be directly addressed. Committee members noted that historically a given county may have tended to undermaintain its bridges somewhat but maintain its roads very well. Another may have made bridge maintenance a higher priority than keeping all of its roads in good shape. A factor that would increase funding to counties with a large number of substandard bridges, then, would implicitly favor the county with undermaintained bridges over the county with undermaintained roads. The advisory committee felt that each county should decide its own priorities and the allocation procedure should steer clear of supporting some priorities more than others.

Vehicle mix

The types of vehicles that use a particular roadway can greatly influence the cost of constructing and maintaining it. Ideally, if VMT were included as a factor, it would be weighted by the fraction of traffic accounted for by heavy vehicles. Heavy vehicles pay higher user charges but impose much greater costs; both points argue for allocating greater RUTF resources to counties with more such vehicles in the traffic mix.

Unfortunately, adequate measurement of vehicle mix on county roads is highly problematic. Because most of these roads have comparatively low traffic volumes, sampling vehicle mix accurately would be very time-consuming and thus expensive. Whereas measuring VMT per se

can be accomplished with electronic counting equipment, vehicle mix must be observed. Because accurate, reliable data must be the basis for funding allocations, the research team and advisory committee determined that it would be impractical to include vehicle mix as a factor.

Land area

As discussed in Chapter 2, 30 percent of the current allocation procedure is based on counties' land area in square miles. The advantage of this measure is its stability: county areas do not change. Its disadvantage is that it is not directly related to the county's road system. Although we obtained a correlation of 0.93 (based on a scale from zero to one) between secondary road system mileage and the county's land area, road system mileage is a more direct, applicable measure than land area which is only a proxy. Furthermore, size of road system includes other elements, such as the number of bridges. Land area does not reflect road system size in a comprehensive manner.

Agricultural products sold

Early in the project, the advisory committee considered a factor that would include a measure of agricultural products grown within the county and sold off-farm. The rationale was that counties selling large amounts of corn, soybeans, and other agricultural products have comparatively greater heavy vehicle traffic. This traffic is important to the state's economy, and it occasions cost by virtue of its weight.

We did not include this measure because other heavy vehicles also damage roads. Heavy vehicles include combination trucks that ship inputs to and products from manufacturing and warehousing facilities (which are locating increasingly in rural areas). Not including all heavy vehicles would present an inaccurate picture of heavy vehicle traffic on Iowa's county roads. Another problem is that vehicles transporting agricultural commodities often traverse all or part of another county en route to a terminal. Counties servicing extensive through traffic would therefore not be properly compensated if sales data were recorded only at the point of origin.

Vehicle registrations

In Iowa, vehicles are registered by county with no distinction between vehicles owned by urban versus rural residents. Although counties with large urban areas have registered many vehicles, by no means do all of them operate in rural areas. As a result, this measure would favor counties that contain larger urban areas. Stated differently, county-wide registrations are a poor indicator of travel on county roads.

Rural population

Like vehicle registrations, population is a surrogate measure of travel demand and, hence, system use. Unlike vehicle registrations, it is possible to divide U.S. census population counts into urban and rural components. The salient question is whether the number of rural residents within a county is an appropriate factor in allocating RUTF resources. Two counties may have the same rural populations but very different county road systems and travel patterns. One county might be much larger with a scattered population while the other might have a smaller area, a less extensive road system, and traffic that is concentrated on relatively few roads. Additionally, a given county might serve comparatively heavy traffic that is traversing it en route to a metropolitan area. That traffic volume may not be reflected by the county's population.

Another problem with using population as an allocation factor is the infrequency of decennial censuses. It would be possible for three four-year allocation analyses to occur using the same census figures. Using very old population data would benefit counties losing population at the expense of those whose populations are increasing. It would be possible to apply population estimation techniques to update census figures, but such techniques have difficulty separating rural population from overall county population.

Summary

The research team began by reviewing other states' allocation approaches and developing a list of factors that might be used to allocate Iowa's RUTF among its 99 counties. Possible factors were examined by the research team and discussed in meetings with our advisory committee. Probably the topic that was given the greatest attention was cost. All involved recognized that the cost of providing county road service varies due to the cost of labor, availability and quality of aggregate, and other conditions that vary within the state of Iowa. Yet the difficulties discussed in this section made it infeasible to include a measure of relative cost. Other factors that were excluded include functional classification and facility condition, vehicle mix, land area, agricultural product sales, vehicle registrations, and rural population.

ALLOCATION FACTORS INCLUDED

Three general types of allocation factors have merit: those that measure (1) secondary road system size, (2) level of system use, and (3) equity-related considerations. System size can be thought of as a fixed factor in the relative costs of county road systems. County secondary road systems vary in terms of miles of road, as well as number and lengths of bridges and culverts. All else equal, those with larger systems need greater resources.

Level of use is also important because counties with higher traffic volumes face greater maintenance costs; they are also supporting more service to the traveling public. On the basis of both cost and value of service, a strong argument can be made that counties with higher VMT should receive larger allocations.

The third general type of allocation factor, equity, is normative in nature. If one views the statewide secondary road network as a system, some degree of cross-subsidization is bound to occur. Because equity is normative, it is difficult to establish criteria for which counties should receive larger allocations. After protracted discussions with the advisory committee, we focused on two equity-related factors: terrain and property tax base. Both would assist counties whose circumstances may not be adequately addressed by measures of system size and level of use.

Each of the allocation factors included in the recommended approach is discussed in turn.

Bridges and culverts

A major expense for Iowa counties is the construction, rehabilitation, and maintenance of secondary road system bridges and culverts. More lineal feet of bridge structures and culverts mean greater costs. Given a certain total length, however, the number of such structures is also important. County engineers stress that it is far more expensive to maintain numerous bridges and structures of short to medium length than a smaller number of longer ones.

A practical question that had to be addressed was the minimum length of bridge or culvert to include in the allocation procedure. We use a minimum length of 20 feet because shorter bridges and culverts are not included in the statewide inventory maintained by the Iowa DOT. Also, few counties know the exact number of culverts less than 20 feet long on their road systems, and counties with greater numbers of longer bridges and culverts probably also have greater numbers of shorter bridges and culverts.

Our approach has been to develop a factor that represents each county's share of the state's total lineal feet of bridges and culverts 20 feet or greater in length. This share is adjusted by the county's number of such structures relative to the average number per county statewide. Expressed algebraically, this factor is presented below:

$$\frac{l_i \left(n_i \Big/ \frac{\sum n_i}{99} \right)}{\sum \left[l_i \left(n_i \Big/ \frac{\sum n_i}{99} \right) \right]}$$

where:

l_i = lineal feet of bridges and culverts 20 feet or more in length in county i

n_i = number of bridge and culvert structures 20 feet or more in length in county i

Figure 4–1 is a map of Iowa's 99 counties with the number of bridges and culverts 20 feet or more in length, and Figure 4–2 shows the total lineal feet of such structures by county. Generally speaking, the number of bridges and culverts is quite high across the state, reflecting the presence of the state's many rivers and tributaries. Total lengths of bridges and culverts are also quite large, with greater lengths existing along the Missouri River and in counties where river basins are found.

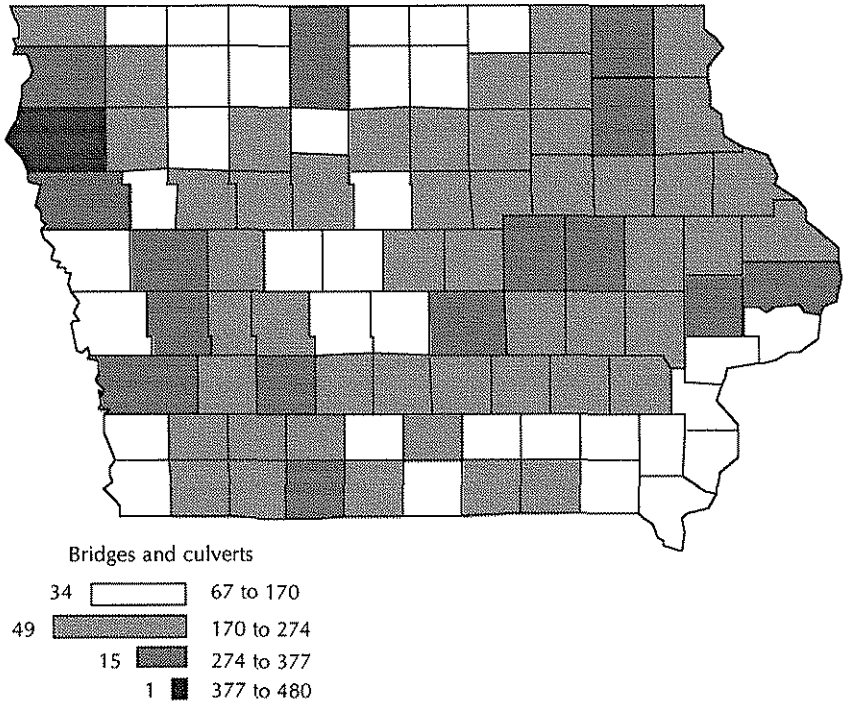

Figure 4–1. Number of bridges and culverts over 20 feet in length

Incidentally, the two measures (number of structures and their total length) correlate at 0.85 (based on a scale from zero to one). This suggests that counties with many bridges and culverts tend to have a large number of lineal feet of such facilities. Taken together in a multiplicative form, they provide a composite indication of the relative extent to which bridges and culverts exist within the respective counties.

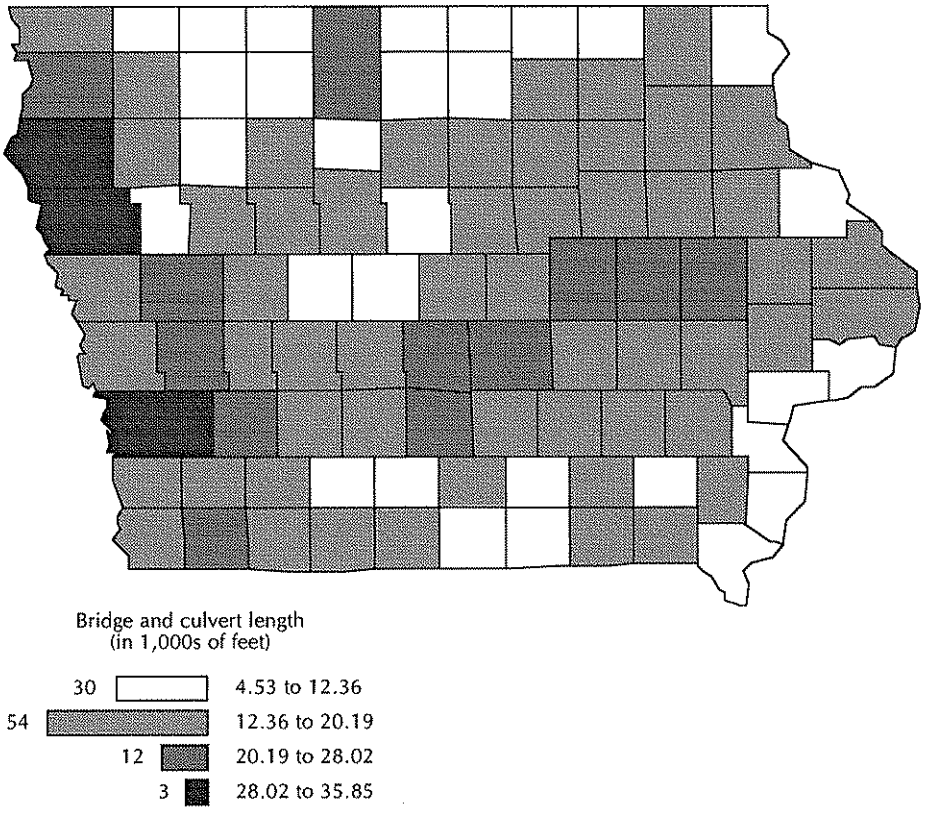

Figure 4–2. Total bridge and culvert length (in 1,000s of feet)

Secondary road mileage

A second factor related to system size is mileage of secondary roads. There is, of course, a direct relationship between the number of miles of secondary roads in a county and the cost of providing service. As discussed earlier, we make no distinction between roads within higher and lower design standards; the level of investment in a particular road is a county-level decision. Likewise, no assessment is made as to whether a county has more secondary road mileage than is necessary. Rather, the size and condition of a county's road system are taken as given values, and secondary road mileage is viewed as a good indication of the relative expense of providing secondary road service within the respective counties.

Figure 4–3 shows the range of road mileages in Iowa's 99 counties: from 550 to 1660 miles. Noteworthy are the comparatively small road systems in the extreme northern and southern tiers of counties, as well as these along the Mississippi River.

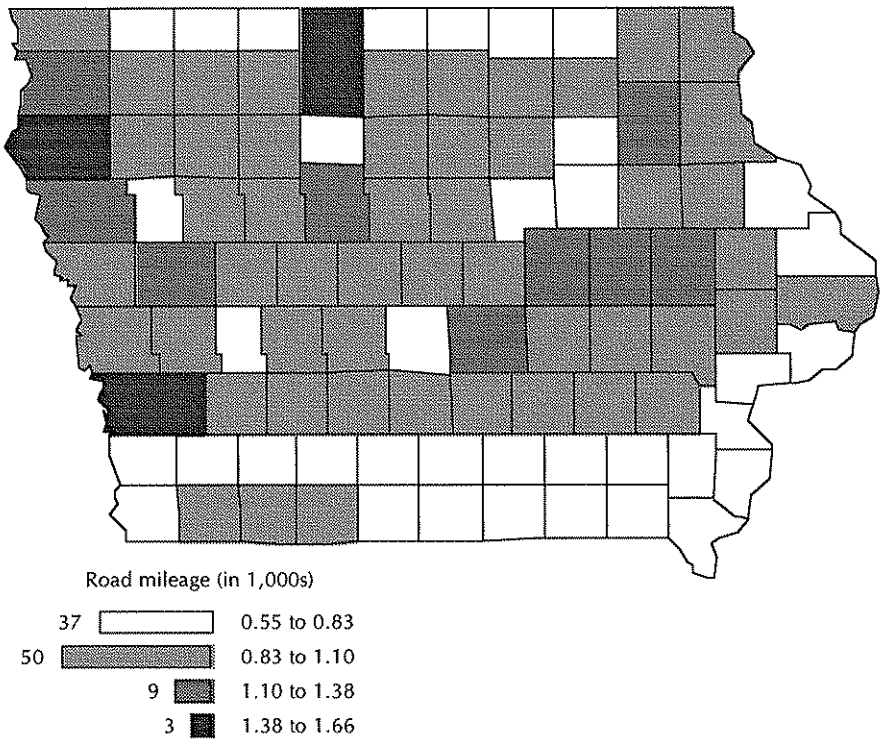

Figure 4–3. Secondary road miles (in 1,000s)

Vehicle miles traveled (VMT)

A direct and easily understood measure of road system use within a county is vehicle miles traveled. The cost of providing any type of road or highway is greatly influenced by the volume and type of traffic operating on it. Ideally, VMT would be divided into several classes of vehicles because heavy vehicles damage roads and bridges far more than those that have lower gross weights (Small, Winston, and Evans 1989). Because it would be very expensive to adequately measure VMT by vehicle type on the entire 89,468 mile secondary road system in Iowa, good data on vehicle mix are unlikely to become available.

Even without considering vehicle mix, however, VMT is a logical basis for allocating RUTF resources to individual counties. Counties with higher traffic levels generate greater amounts of motor fuel tax revenue and serve more travelers.

As Figure 4–4 indicates, VMT is highest in counties within or near the state's larger metropolitan areas. Not surprisingly, the lowest average daily VMT figures are found in the most rural counties, particularly those in western and southern Iowa.

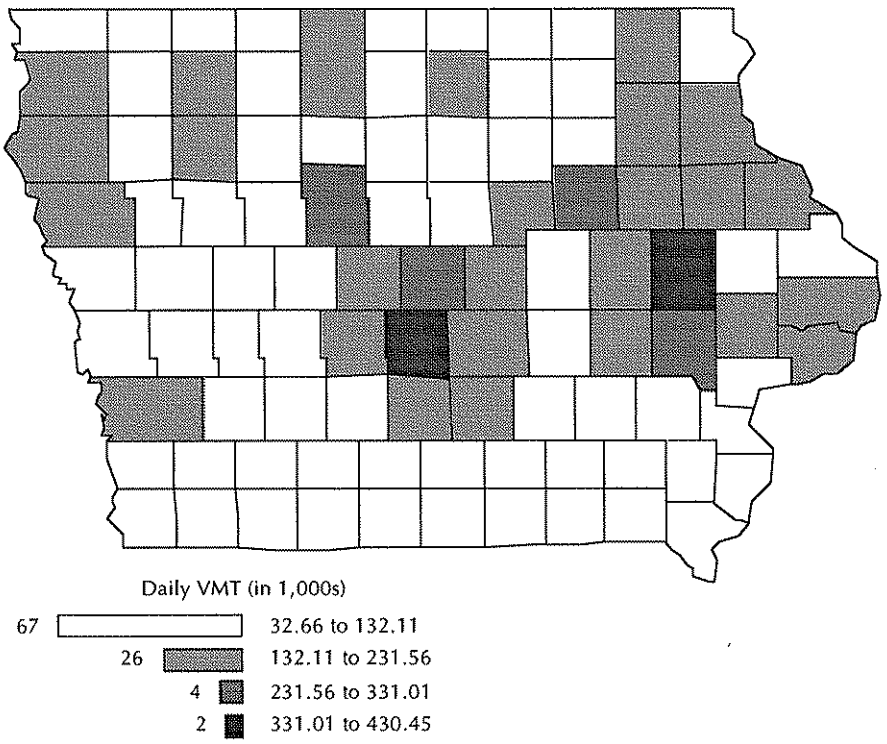

Figure 4–4. Average daily VMT (in 1,000s)

VMT per road system mile

Certain counties with smaller secondary road systems and relatively high traffic densities are disadvantaged by a formula that considers only system size and total VMT. Adding a VMT per system mile factor takes traffic density into account. We should stress that this factor is an indicator of system productivity and measures a different phenomenon than does VMT per se (which measures use level). Balancing VMT per system mile with system VMT enables both overall traffic volume and relative productivity of a county's road system to be taken into account.

Average daily VMT per secondary road mile for the 99 counties is shown in Figure 4–5. The map in this figure corresponds with that showing VMT in Figure 4–4. Generally, metropolitan counties have some of the smaller secondary road system mileages (see Figure 4–3), largely due to annexations, but have comparatively high traffic volumes.

Terrain

County engineers generally share the view that it costs more to construct and maintain roads in hilly terrain. Water runoff is a particularly severe problem; it can erode roads and wash out

bridge supports. It is important to note that both the gradient of a road and the topography near the road are relevant. Each affects water flow in the road environment.

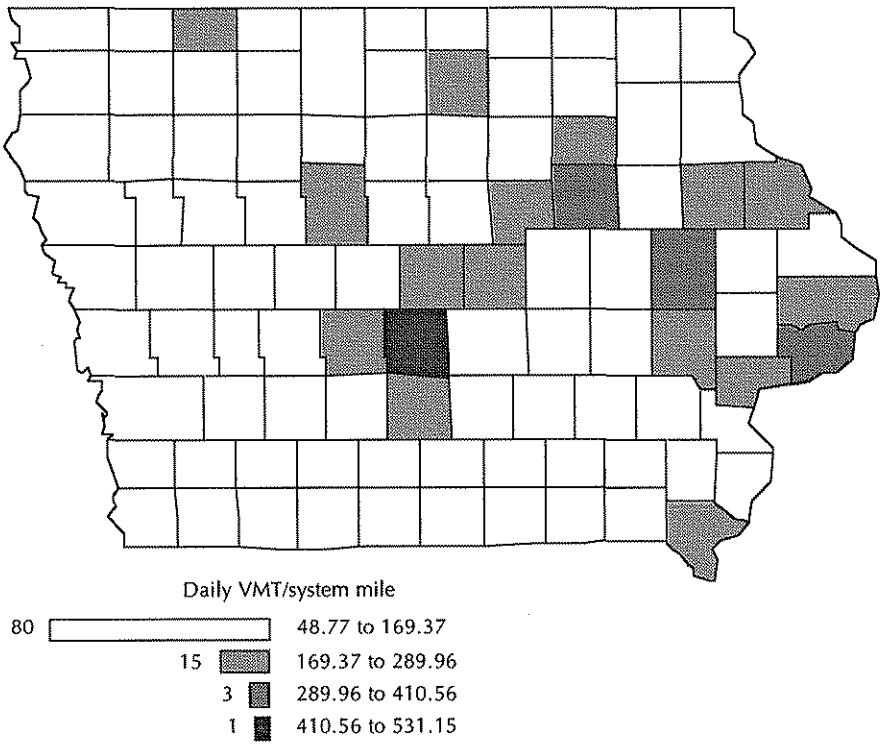

Figure 4–5. Average daily VMT per secondary road mile

We developed three separate measures of terrain:

- *Elevation data from the Iowa State Geological Survey Bureau.* These data are elevations at points 200 feet apart within each of the 99 counties. Relative variability of points with the respective counties is an indicator of hilliness.

- *Hydrologic regions from the U.S. Geological Survey (Lara 1987).* Iowa has five levels of hydrologic regions distinguished by peak volumes of water discharged per square mile. Areas with higher discharge rates vary primarily on the basis of land form and physiographic characteristics.

- *Need study road surveys.* The Iowa DOT surveys each county's road system once a decade. Crews use instruments installed in the survey vehicle to measure percent grade and distance. Nearby terrain is judged by the survey crew and is intended to reflect the dominant character of the surrounding land.

Following discussions with the advisory committee, we incorporated the third measure. The advantage of need study road survey data is that they enable us to take into account both actual road gradient and nearby topography, which influences the rate of water runoff and resultant damage to roads and bridges.

Data from the need survey are structured as follows:

- Road gradients fall into three categories of zero to five percent, five to ten percent, and ten percent or more.
- Terrain is classified as flat, rolling, or hilly.

As we have constructed the terrain factor, greater weight is given to roads with grades of ten percent or more (weight of two) than to roads with grades of five to ten percent (weight of one). Both of these classes of road gradients are weighted by the category of terrain adjacent to the road. The weights assigned to terrain categories are flat (1), rolling (2), and hilly (3). Thus, a mile of road with a grade of ten percent or more and adjacent terrain that is hilly is assigned a weight of six (two times three). To control for road system size (which is explicitly addressed by another factor), the sum of both gradient classes weighted by terrain category is divided by the total secondary road mileage for the county. The result is an index that ranges from 0.02 to 2.92.

Below, the factor is expressed algebraically:

$$\frac{t_i \Big/ \frac{\Sigma t_i}{99}}{\Sigma \left[t_i \Big/ \frac{\Sigma t_i}{99} \right]}$$

where:

t_i = terrain index, as described above

Notice that the greater a county's terrain index value is relative to the average of the 99 counties' values, the larger its terrain factor and RUTF allocation will be.

Figure 4–6 depicts the distribution of terrain index values across the state. Clearly in evidence is the flat Des Moines lobe that runs from the northern tier of counties to the central part of the state. The hilly terrain found in northeastern Iowa and in the southwestern and southern portions of the state also are discernible. Because most counties (56) fall in the lowest quartile of

index values, no county experiences a sizable burden in terms of a reduced allocation, but counties with the greatest index values benefit significantly.

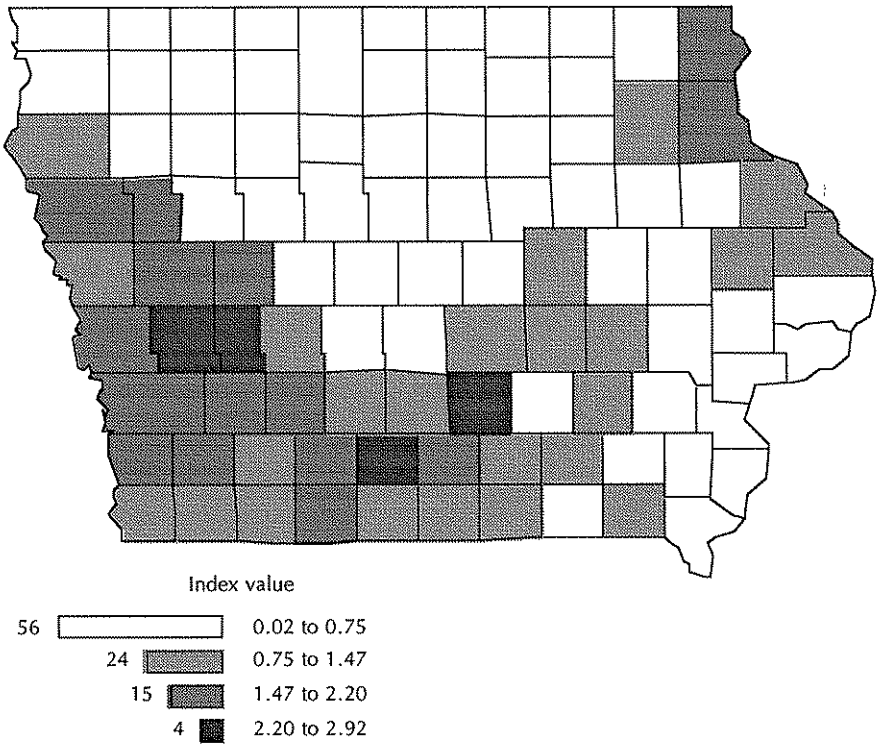

Figure 4–6. Composite index of road grade and surrounding terrain

Property tax potential

In all counties, the RUTF allocation is augmented by local property tax revenue. Counties vary greatly in terms of ability to augment RUTF allocations because maximum property tax potential is wide-ranging among counties. A number of county engineers have argued that larger state allocations are justifiable to counties with less ability to augment RUTF allocations.

If ability to tax is to be included in the allocation procedure, full tax potential is the relevant measure, not partial tax potential such as the relative value of farmland. A county with low farmland value but considerable real property (e.g., a factory or nonfarm residential development) in rural areas very well may have greater tax potential than another county with higher farmland value but less real property.

To equalize valuations, a measure of tax potential per square mile has merit. This sort of measure controls the fact that larger counties are bound to have more tax potential, but on a per-road-system-mile basis, this may not be the case. Controlling for secondary road system

size enables a true indication of property tax revenue potential to be derived. Taking the inverse of this potential yields relative "need" for fiscal resources from the RUTF. In other words, a county with low property tax potential will have a high value for this factor.

Expressed algebraically, this factor is presented below:

$$\frac{1 \Big/ \frac{r_i}{m_i}}{\Sigma\left[1 \Big/ \frac{r_i}{m_i}\right]}$$

where:

r_i = maximum property tax potential for secondary road financing in county i

m_i = secondary road mileage in county i

Figure 4–7 depicts the resulting factor. Primary beneficiaries of including this factor are in the bottom two tiers of counties.

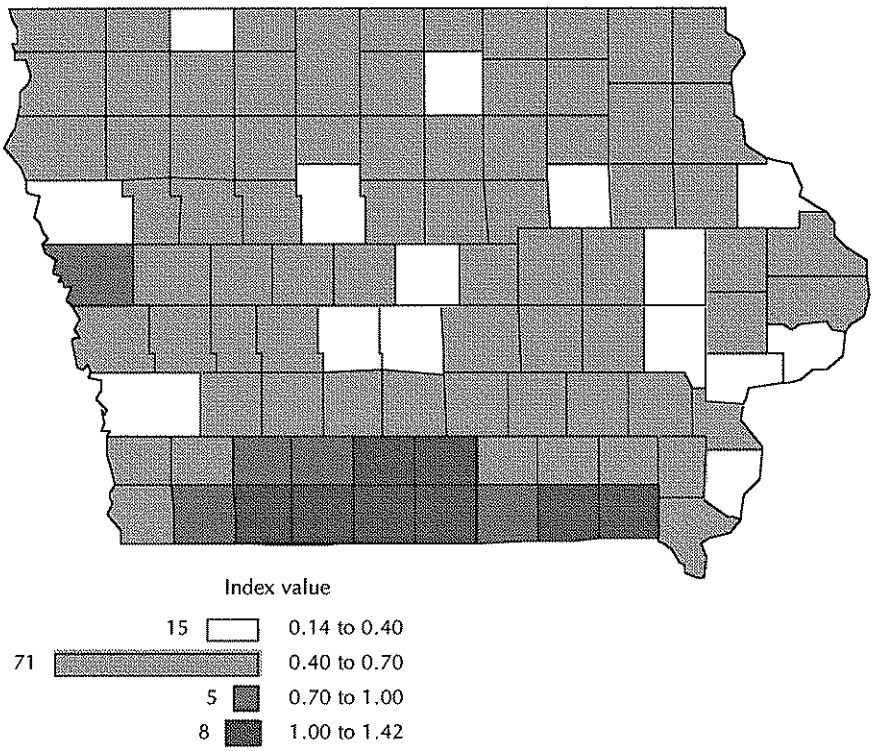

Figure 4–7. Inverse of maximum property tax potential
(values in legend are 1,000 times the inverse of dollars per square mile)

Summary

Different counties in Iowa face divergent problems in providing acceptable secondary road systems. Some counties have large numbers of bridges and culverts or many miles of roads, some support high traffic volumes, some have hilly terrain with its attendant problems, and some have relatively limited abilities to supplement RUTF resources with local tax dollars. By including the six factors just discussed, a balance can be achieved that addresses the diverse problems faced by counties when providing road access.

FACTOR WEIGHTING

Nearly as important as the selection of factors to be included in the allocation approach is the emphasis or weight given to each of the respective factors. Four key considerations in determining these weights are:

- Relative weight on fixed system (size) factors pertaining to the secondary road system versus the level of use (traffic) on that system,
- Relative weight on the two fixed system factors (those pertaining to bridges and road mileages),
- Emphases on VMT versus VMT per secondary road system mile, and
- Amount of weight on the two equity-related factors (terrain and property tax potential).

Fixed versus use-related factors

Fixed factors, such as the number of secondary road miles and number and total length of bridges and culverts, are measures of inputs or service provided. Use-related factors measure output or service consumed. Businesses, of course, are evaluated by stockholders on the basis of output: more sales are considered a good thing. Analogously, a strong argument can be made that counties serving more travelers should receive larger allocations. On the other hand, secondary road systems provide access to scattered rural locations in low demand settings. Counties that must serve greater numbers of such locations require more resources.

The trade-off between fixed and use factors is conceptually complex. If heavy weight is given to use factors, secondary road systems have greater difficulty serving dispersed locations. Conversely, placing heavy weights on fixed factors would ignore the fact that it costs more to maintain heavily traveled roads, and these roads generally need to be of better quality. As a

consequence, users of more heavily traveled roads would tend to receive a lower quality of service, even though arguably the service provided to them should be superior.

One empirical way to evaluate the consequences of alternative fixed versus use factor weights is to compare the results of applying them to current allocation practices. Specifically, we found that a weight of 0.7 on fixed factors and 0.3 on use factors minimized the overall deviation from allocations based on the current need and area formula. In brief, our approach was to compare (1) each county's allocation share for candidate formulas we developed with (2) the share from the 1994 quadrennial need study. The percentage differences between the two shares were made absolute (sign ignored) and summed. Using weights of 0.7 on fixed factors and 0.3 on use factors minimized the sum of absolute percentage changes.

We have mixed reactions to this comparison. On the one hand, the 1994 need study resulted in allocation shifts among counties that were difficult to understand, just as previous need studies had. Therefore, to view the 1994 need study as a point of reference is problematic. On the other hand, current allocations to Iowa's 99 counties are determined by the 1994 need study, so for better or worse, it is the *de facto* reference point. A case can be made for using weights in a new allocation procedure that minimize overall gains and losses among the counties if the new procedure were implemented.

Aside from the comparison just discussed, it is reasonable to place stronger weight on fixed factors, given the principal role of the secondary road system which is to provide access to rural areas within the state. All considered, the 0.70/0.30 weights were considered appropriate by the advisory committee and research team.

Bridges and culverts versus roads

Within the fixed component of the allocation procedure, weights must be assigned to the bridge and road factors. Our approach to determining these weights was to calculate the total ten-year county-level expenditures on bridges and on secondary roads. These expenditures include both construction and maintenance and are reported annually to the Iowa DOT by the respective counties. Ratios of road or bridge and culvert expenditures to total expenditures have been remarkably stable over time: 83 percent for roads and 17 percent for bridges and culverts.

Because these percentages reflect long-term expenditure patterns by counties, using them to weight funding allocations between the two fixed factors has merit. Thus, we apply a ratio of 0.83/0.17 to road versus bridge and culvert factors.

VMT versus VMT per road mile

As discussed earlier, VMT and VMT per road system mile each measure different phenomena. Placing heavier weight on VMT favors counties with higher overall traffic levels, while placing greater weight on VMT per road system mile benefits counties that may not have high overall traffic counts but do have relatively heavy traffic on smaller road systems (i.e., they have high traffic density).

The advisory committee and research team agreed that there is no compelling reason to apply a greater weight to either of the two use factors than to the other. As Figures 4–4 and 4–5 show, a number of counties have high values on both factors, and our tests revealed that varying the relative weights on these two factors would not greatly impact allocations to most counties, though a few would be substantially affected. Accordingly, we have assigned equal weights to VMT and VMT per road system mile.

Equity-related factors

Two equity-related factors—terrain and property tax potential—were included in the allocation approach because counties in parts of Iowa tend not to have large systems or traffic volumes. Some such counties have steep terrain that makes providing secondary road services comparatively difficult, and hence more expensive. Similarly, some counties are less able to augment state RUTF allocations with county-level revenues. In Iowa, by far the most significant source of locally-generated road funds is the property tax. A county with a comparatively small taxable property base is thus more dependent on the RUTF to finance its secondary road system. Including a measure of property tax potential (literally, the inverse of potential) helps equalize the abilities of counties to provide access to rural residents, farms, and businesses across the state.

The advisory committee spent considerable time discussing whether to include equity-related factors and, if so, how much weight to attach to them. After reviewing several analyses completed by the research team, the committee agreed that five percent of each county's allocation should be determined by each of the two equity-related factors. These weights would enable the two factors to have an impact on allocations, without greatly altering the basic emphasis on system size and use level.

THE RECOMMENDED FORMULA

Including the selected factors and applying the relative weights just discussed, we defined a formula for distributing RUTF resources among Iowa's 99 counties. The recommended formula is:

$$S_i = 0.11\left(\frac{l_i\left(n_i \Big/ \frac{\sum n_i}{99}\right)}{\sum\left[l_i\left(n_i \Big/ \frac{\sum n_i}{99}\right)\right]}\right) + 0.52\left(\frac{m_i}{\sum m_i}\right) + 0.135\left(\frac{v_i}{\sum v_i}\right) + 0.135\left(\frac{\frac{v_i}{m_i}}{\sum \frac{v_i}{m_i}}\right) + 0.05\left(\frac{t_i \Big/ \frac{\sum t_i}{99}}{\sum\left[t_i \Big/ \frac{\sum t_i}{99}\right]}\right) + 0.05\left(\frac{1 \Big/ \frac{r_i}{m_i}}{\sum\left[1 \Big/ \frac{r_i}{m_i}\right]}\right)$$

where:

S_i = share of RUTF allocation for county i

l_i = lineal feet of culverts and bridges 20 feet or more in length in county i

n_i = number of culverts and bridges 20 feet or more in length in county i

m_i = secondary road mileage in county i

v_i = VMT on secondary roads in county i

t_i = terrain index value for county i [3]

r_i = maximum property tax potential for secondary road financing in county i

Consistent with discussions earlier in this chapter, the bases for factor weights in the formula are as follows:

- Adjustment factors (terrain and property tax potential) are each assigned five percent weights.
- Within the remaining 90 percent, weights on system size versus system use are 0.70 and 0.30, respectively.
- Within the system size portion of the formula, relative weights assigned are 0.83 on road mileage and 0.17 on bridge and culvert length and number of structures.

Applying these principles, the six allocation factors within the formula are assigned weights as follows:

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[3] Portion of total road mileage in county i that has a five to ten percent grade and portion with over a ten percent grade, weighted separately by surrounding terrain according to Iowa DOT classifications of "flat," "hilly," and "rolling."

- Bridge and culvert length and number of structures: 0.70 (system size) times 0.17 (bridges and culverts) times 0.90 (other than terrain and property tax) equals 0.11
- Road mileage: 0.70 (system size) times 0.83 (roads) times 0.90 (other than terrain and property tax) equals 0.52
- VMT: 0.30 (system use) times 0.50 (equal weights for VMT and VMT per system mile) times 0.90 (other than terrain and property tax) equals 0.135
- VMT per system mile: same as VMT above
- Terrain: 0.05
- Property tax potential: 0.05

The weights in the formula sum to 1.0.

Performance of the allocation approach

The formula is applied twice. First, the secondary road portion of the RUTF is distributed among Iowa's 99 counties. Then, the farm-to-market portion of the RUTF is allocated to the counties. As discussed earlier, the farm-to-market road system is a subset of the secondary road system; the additional allocation to this subset of the system is intended to enable a higher level of maintenance on roads that are particularly critical to the rural economy.

In FY 1996, an estimated $179.4 million was allocated to the counties for their secondary road systems; additionally, an estimated $57.4 million was distributed for their farm-to-market roads. For purposes of reference, Figure 4–8 shows the pattern of actual allocations for secondary roads in FY 1996, using the current need and area approach (farm-to-market road allocations are not included). Figure 4–9 depicts the comparable pattern of allocations that would have resulted if the recommended approach had been used, without any form of phase in or hold harmless provision. There is no significant change in the general pattern of allocation levels across the state, although fewer counties receive relatively low allocations. Specifically, 43 counties received $1.6 million or less in FY 1996 under the current approach. If the recommended approach were applied, that number would be reduced to 33 counties.[4]

[4] We should stress that Figures 4–8 and 4–9 should be compared only in terms of general allocation patterns. A given county may be at the very edge of one of the four levels on one map and barely into a different level on the other map.

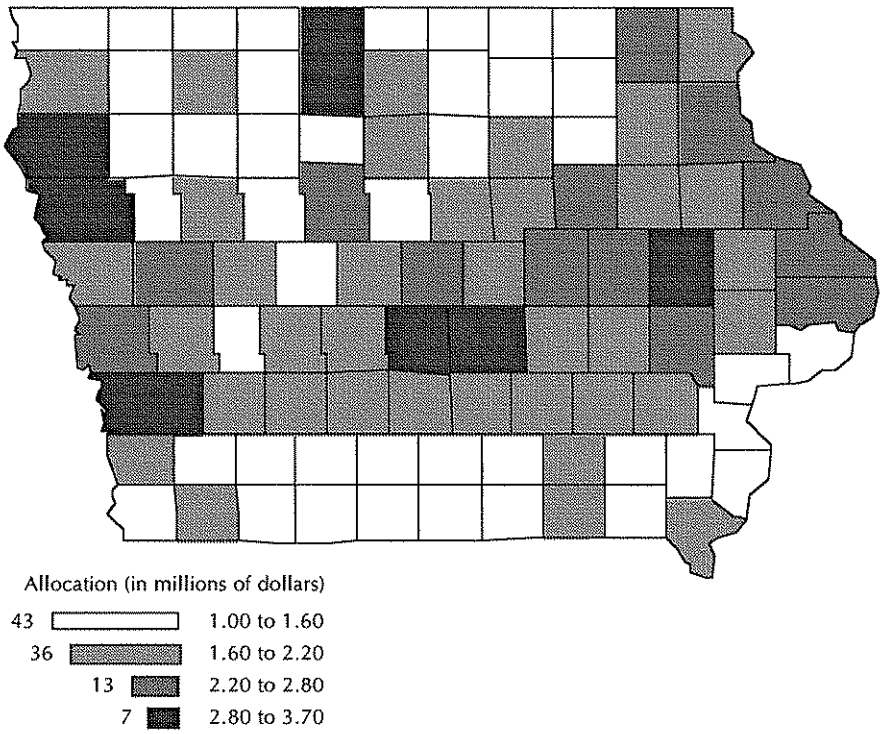

Figure 4–8. Allocations for FY 1996 based on 1994 quadrennial need study

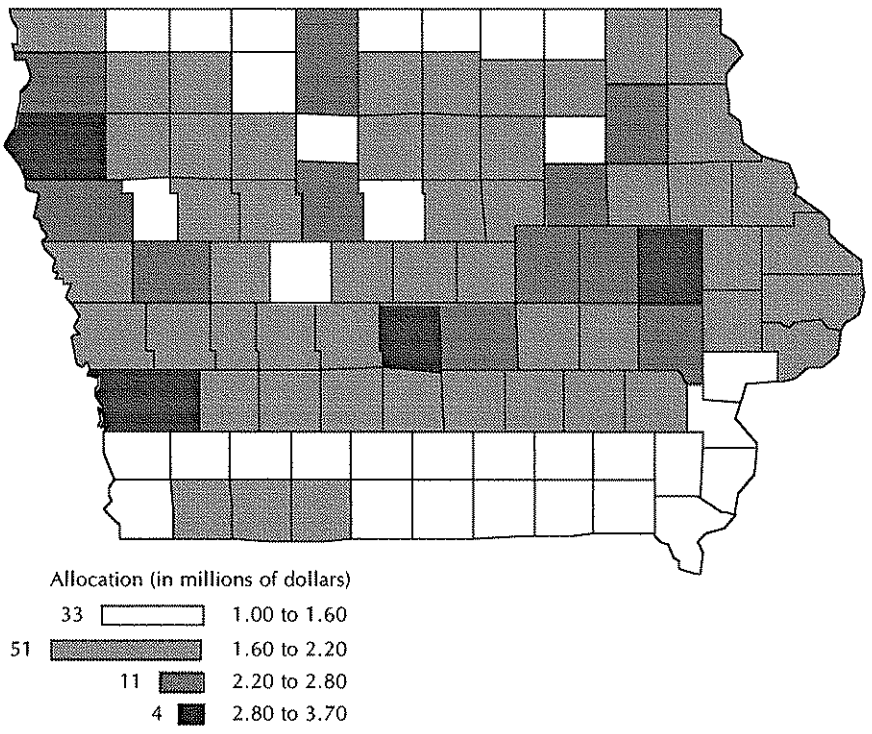

Figure 4–9. Allocations for FY 1996 based on recommended allocation approach

Appendix A lists by county the allocations depicted in Figure 4–9 (those that result if the recommended approach is applied to FY 1996 allocations). Note that the allocations in Appendix A also ignore any form of phase-in or hold harmless provision. Such a provision is discussed in detail in Chapter 5.

In Appendix A we do not compare allocations with the recommended approach to those that actually occurred via the need and area approach currently in use. Our objective is not to mirror that approach, but rather to develop one that is stable, comprehensible, and predictable. Applying these criteria, we can compare the recommended approach with the current one.

Stability. Table 4–2 compares the stability in allocations to counties that would have occurred if the recommended approach had been instituted in FY 1986 versus what actually took place using the current need and area approach.

Table 4–2. Comparison of four-year percentage changes in secondary road allocations: recommended versus current approaches

Time period (fiscal years)	Recommended approach (percentage change)		Current need and area approach (percentage change)	
	Average*	Maximum†	Average*	Maximum†
1986–1990	2.12 (2.11)	12.58 (4.01)	6.04 (5.13)	26.91 (14.02)
1990–1994	1.66 (1.62)	12.03 (6.73)	6.47 (7.31)	37.36 (15.35)

* Values in parentheses are standard deviations.

† In each of the four cells in the table, the maximum percentage change is a gain; values in parentheses are the maximum percentage losses.

The table shows that secondary road allocation shares to Iowa's 99 counties would have changed by a total of 2.12 percent on average during the four-year period from FY 1986 to FY 1990 and by 1.66 percent on average during the four-year period between FY 1990 and FY 1994. Year-to-year changes would be well less. The current approach has produced changes in shares almost three times larger, on average. Equally noteworthy is the fact that the standard deviations of changes in shares with the current approach have also been quite large (over seven percent during the period from FY 1990 to FY 1994). Maximum four-year percentage changes in county shares were over three times as great between FY 1990 and FY 1994, as would have been the case using the recommended approach. In short, the recommended approach will produce allocation shares to the counties that are far more stable than has been the case under the current need and area approach.

Comprehensibility. As discussed in Chapter 2, it has not been possible for county engineers to completely understand the basis for changes in county allocation shares under the current approach. The recommended approach is based on a formula that lends itself to easier interpretation. Weights specify which factors are the most influential, and the basis for a county's scores on each factor is clearly shown. In fact, a county engineer can readily determine the impact of adding or removing a certain number of secondary road miles or bridge structures. In this sense, the formula can serve as a planning tool.

Predictability. Because the current need and area approach has produced major funding swings for individual counties, it is unclear what a given county's share will be in the next iteration of the quadrennial needs study, due in FY 1998. Applying the recommended approach, individual county shares will change slowly, as VMT growth and decline take place and incremental changes in system size are made.

For example, if Marion County had closed one 75-foot bridge, its FY 1996 allocation using the recommended approach would have declined by $1,789. If Appanoose County had added ten miles of secondary roads, its FY 1996 allocation would have increased by $8,054. A one percent increase in VMT within Linn County would have added $15,257 to its FY 1996 allocation. Predictability is a major strength of the recommended approach.

A note of caution

In Chapter 1 we highlighted the fact that Iowa's counties are highly diverse. The recommended formula is finely tuned to avoid any form of systematic bias favoring or working against different types of counties. We strongly advise against changing the weights assigned to the respective factors because doing so will definitely change the pattern of allocations, perhaps greatly.

We conducted a series of sensitivity analyses, varying factor weights and studying the resulting changes in allocations. The results generally were significant. Reducing the emphasis on VMT even slightly tends to greatly impact metropolitan counties whose allocations are more dependent upon the two VMT factors than is the case with other counties. Likewise, changes in weights applied to system size factors produce sizable changes in allocations to comparatively rural counties, especially those that have relatively large land areas or are near enough to major rivers to have numerous tributaries and, hence, bridges.

The key point is that the several factors vary in terms of their importance to different counties. Adjusting the weights without the benefit of computer analyses of resultant allocation changes should be discouraged. As a reference, Appendix B contains rank orders of counties on the

basis of the attributes contained in the recommended formula. The appendix also contains rankings of counties for each of the six factors included in the recommended formula. This appendix, coupled with the various maps of factor values, provides an indication of which factors are most important to a given county's allocation.[5]

[5] Actual data values for attributes relevant to the six factors are contained in Appendix C.

CHAPTER 5
IMPLEMENTING THE NEW APPROACH

One of the unattractive attributes of the current need and area allocation procedure is the at times large and abrupt changes in RUTF allocations resulting from successive quadrennial need studies. While the recommended procedure will virtually eliminate sizable changes from year to year, some counties will experience one-time adjustments, positive or negative, as the state transitions from the current to the new allocation approach. In this chapter, we suggest methods for easing this transition.

MAGNITUDE OF THE ADJUSTMENT

The recommended approach for distributing RUTF resources among Iowa's counties is conceptually different from the current approach. It follows that allocations to the respective counties will vary to some extent when the new approach is implemented. As the new approach was being formulated, comparisons were made between the allocations that would occur with it and those that actually occurred, based on the 1994 quadrennial need study (70 percent) and county land area (30 percent).

As discussed in Chapter 4, a consideration in selecting weights for the individual factors included in the new approach was minimizing the extent of changes in funding levels from the current approach. While the overall pattern of allocations is similar, we found it difficult to closely replicate individual allocations based on the 1994 need study because, as discussed in Chapter 2, it is not very easily understood. Furthermore, there was no good reason to believe that the allocations resulting from the current procedure are in any way optimal. Designing a new approach that closely replicates such a procedure has little merit. Having said this, weights were adjusted to prevent any particular group of counties from experiencing harsh decreases in RUTF allocations.

Because quadrennial need studies have produced anomalies in allocation levels, a few counties' shares are bound to increase or decrease somewhat when the new approach is implemented. Comparing allocations between the recommended approach and the current need and area approach, the majority of counties (53) would gain or lose ten percent or less.

Another 30 counties would experience increases or decreases of ten to 20 percent, and only 16 would see more sizable changes: ten would gain more than 20 percent (a maximum of 40 percent), and six would lose more than 20 percent (the maximum loss is 26 percent). It should be remembered that successive need studies have produced changes in allocations at least as large as this one-time adjustment.

A HOLD HARMLESS PROVISION

One way to ease the adjustment from the current to the recommended approach would be to implement a hold harmless provision. Such a provision could take many different forms, but all would include two key elements:

- The minimum percentage of its previous year's allocation that a county would receive during the transition from the current to the new approach (termed the "floor percentage") and
- An assumed level of growth in the RUTF and therefore the amount of funds available to be distributed.

Regarding the first point, using a "flat floor" approach (floor percentage of 100) would mean that no county would receive a smaller allocation in a future year than in the final year that the current need and area approach is in place. For such a floor to be maintained while counties slated for increases ramp up to their new funding levels, some rate of positive revenue growth must occur. Logically, the greater the rate of revenue growth, the more quickly the state could transition to the new approach without any county experiencing a reduction in funding.

To speed the transition, a "sinking floor" (or floor percentage of less than 100) may be preferable, such that the minimum a county experiencing a decrease in funding would receive would be some percentage (e.g., 98 or 96 percent) of its previous year's allocation. The smaller the guaranteed floor percentage, the more quickly a transition to the new approach could be effected. Once the transition is complete, all counties would experience increases at the rate of statewide revenue growth, unless their scores on the respective factors changed. As Table 4–2 shows, however, year-to-year redistributions among counties will tend to be small (about one to two percent).

Historic RUTF growth rates

Because the rate of RUTF growth greatly influences the number of years any sort of hold harmless transition would take, it is instructive to review historic growth rates. As Table 5–1

shows, growth rates have averaged 4.97 percent from FY 1986 to FY 1996, excluding FY 1992. In FY 1992, a revised legislatively-mandated formula was implemented for allocating RUTF resources to the primary road system, county road system, and municipal streets and roads. Beginning in that year, the county road system's share was cut from 37 percent to 32.5 percent, so the funds available to counties decreased.

Table 5–1. Total secondary road fund from FY 1986 to FY 1995

Fiscal year	Total fund	Percentage growth
1986	$118,124,269	—
1987	$125,834,057	6.13
1988	$129,003,929	2.46
1989	$143,711,947	10.23
1990	$151,055,237	4.86
1991	$154,794,696	2.42
1992	$148,814,493	– 4.02*
1993	$149,279,864	0.31
1994	$159,562,290	6.44
1995	$166,556,196	4.20
1996	$179,400,006	7.71
Average	—	4.97

*The decrease in FY 1992 was due to a legislative change that reduced the percentage of the road use tax fund going to the secondary road fund. The average does not include that year.

Continued growth in the RUTF will require increases in vehicular traffic, as has been the case in past years. Generally speaking, total VMT within Iowa and other states tends to increase more substantially in years when the economy is strong. Due to steady increases in fuel efficiency within the fleet of cars and trucks using the state's road system, VMT growth will need to more than offset this effect.

For purposes of illustration, we use an RUTF growth rate of three percent. This is a relatively conservative rate, almost two percent less than average increases in recent years. It is unlikely that future years' increases will average much less than this rate. If, however, in a given year an actual decrease in total RUTF resources were to be experienced, reductions in all counties' allocations would be necessary, and the transition to the new approach would be extended.

Operation of a hold harmless feature

Figure 5–1 provides a schematic overview of how a hold harmless feature would operate. Several complexities warrant brief discussion, including the redistribution process. Consider first those counties whose allocation shares would decrease. The reduction in actual allocations from year to year would be governed by the floor percentage, as discussed above (Steps 1 and 2). If the percentage were 100 percent, no actual reductions in allocations would occur, even though these counties' shares of the growing pool of total funds available would decline during the transition period as counties with increases receive additional funds. In Step 3, the amount of total allocations to counties with decreases in the previous year is calculated and from it is subtracted the result of Step 1 (total actual allocations to counties with decreases for the next year). The result is the funds available from a sinking floor, if any. If the floor percentage is 100 percent, the result of Step 2 would be zero: no redistribution funds would exist.

Multiplying the rate of RUTF growth times the total previous year's allocation to counties with decreases (Step 4) yields the new funds available for redistribution. In Step 5 the results of Steps 3 and 4 are summed to yield the total funds available to redistribute to counties with increases.

Turning to counties with increases, in Step 6 the target allocation (based on the new allocation procedure with the RUTF growth rate included) minus the previous year's allocation yields the funding shortfall. It is this shortfall that needs to be made up over a few years by applying redistributed funds from Step 5.

In Step 7, the magnitude of shortfall for each county with an increase is divided by the total shortfall for all counties with increases. The result is the fraction of all redistributed funds to be allocated to a given county (in Step 8). The previous year's allocation to counties with increases is raised in Step 9 by the growth rate of the RUTF. Adding the results of Steps 8 and 9 yields the total allocation for each county with an increase (Step 10).

To summarize, assuming overall revenue growth in the RUTF, a county that is to receive a smaller share of the RUTF would never experience a decrease greater than that dictated by the floor percentage. As the RUTF grows, but the allocation to a county with a decrease does not, its share of overall county funding gets smaller until the county reaches its target share. At that time, the county's allocation will begin to grow at the same rate as the overall RUTF.

In the case of a county that is to receive a greater share of the RUTF, its shortfall as a fraction of the total shortfall of all counties with increases dictates its rate of growth. Thus, counties that are furthest from their target allocations gain at a faster rate than counties closer to their target

allocations. The rate of growth in the share to counties with increases is faster than the rate of growth in the overall RUTF until they reach their target shares. At that time, they begin to grow at the same rate as the overall RUTF.

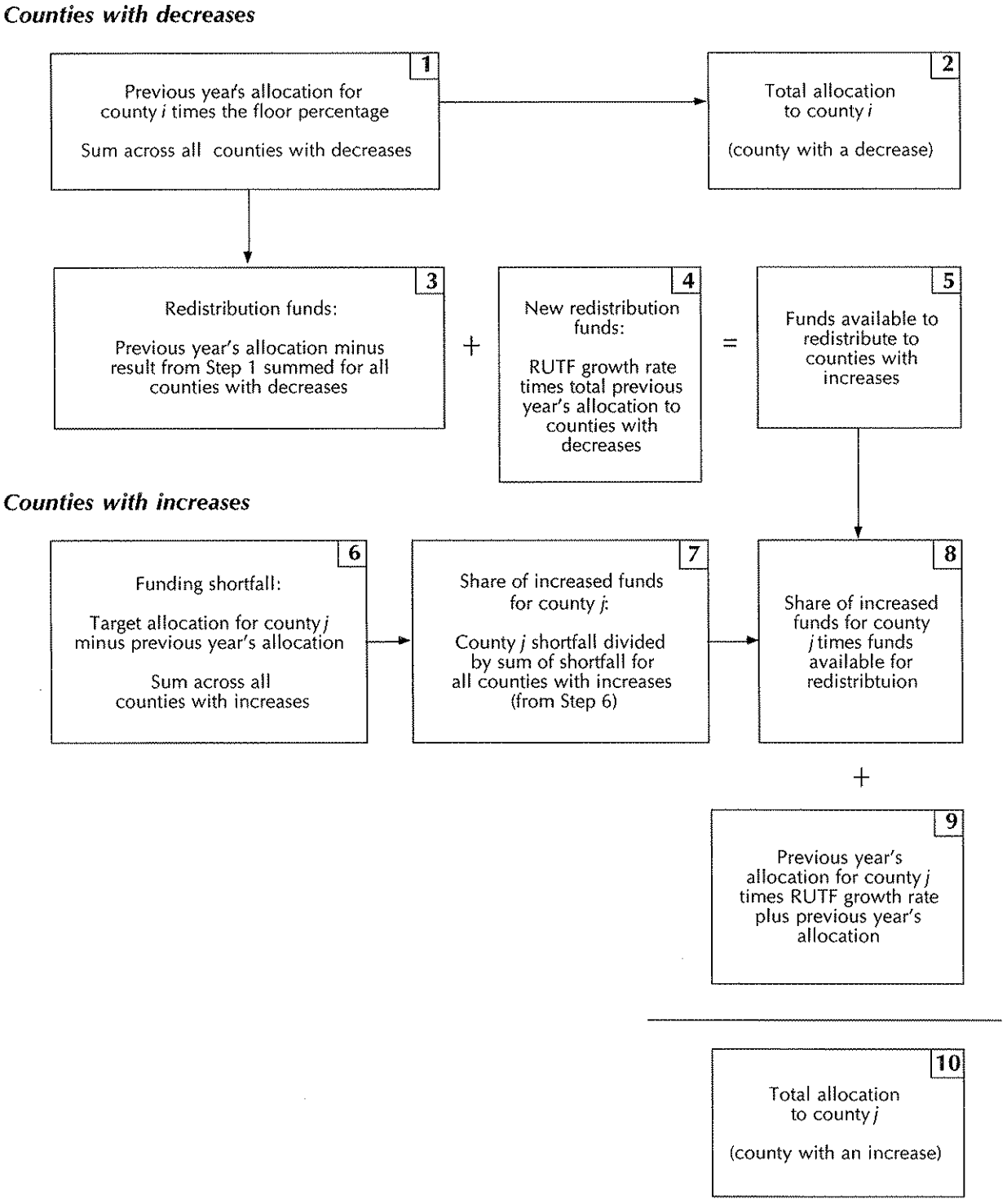

Figure 5–1. Schematic representation of hold harmless feature

Choice of floor percentage

Quite simply, the lower the floor percentage, the more quickly the transition from current to target shares for all counties will be accomplished. Table 5–2 shows that with an assumed three percent revenue growth, a 96 percent floor would enable a complete transition for all counties in only five years; with a 100 percent floor the process would require 11 years.

Table 5–2. Hold harmless options

	Years to complete adjustment	Number of counties with increases in three years	Number of counties with increases in five years
Three percent revenue growth			
Minimum of 100 percent of FY 1996 allocation	11	78	87
Minimum of 98 percent of the previous year's allocation	8	87	96
Minimum of 96 percent of the previous year's allocation	5	94	99
Four percent revenue growth			
Minimum of 100 percent of FY 1996 allocation	8	81	93
Minimum of 98 percent of the previous year's allocation	6	91	98
Minimum of 96 percent of the previous year's allocation	4	96	99

Table 5–2 also shows that if overall RUTF growth proves to be four percent, the transition will be accelerated. In fact, a 96 percent floor with a four percent RUTF growth rate would enable a transition from current to target allocations to be completed in only four years. With this scenario, it is significant that counties with decreases would endure four percent annual funding cuts for at the most four years (few would have cuts for more than two years). Following that, they would begin gaining in terms of dollars received at a rate of four percent, on average.

Example application

Appendix D contains a sample application of the hold harmless feature. In this example, a floor of 98 percent is used, along with a conservative three percent revenue growth rate for the RUTF. This transition would take eight years, but 67 counties would be experiencing revenue growth during the first year, 80 counties within the second year, and 87 counties within the third year.

Summary

In this chapter, we have presented strategic choices for transitioning from the current need and area allocation approach to our recommended approach for distributing RUTF resources to Iowa's 99 counties. It is possible to enact a hold harmless provision that would minimize the annual rate of funding reductions for counties that would receive reduced allocation shares. As a practical matter, the floor percentage used determines the length of time the transition would take, given a certain growth rate of the RUTF.

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APPENDIX A
ALLOCATIONS WITH THE RECOMMENDED APPROACH

This appendix shows what the Iowa Road Use Tax Fund allocations for secondary roads to the state's 99 counties would have been in FY 1996 if the recommended approach had been in place and no phase-in period or hold harmless provision had been used. See Chapter 5 for a discussion of possible transition strategies. This appendix has two columns, one showing secondary road system allocations by county and one indicating total allocations, including farm-to-market road system allocations. Exactly the same county shares are used for farm-to-market road system allocations as are the basis for secondary road system allocations.

FY 1996 allocations with the recommended approach

County	Secondary	Total
Adair	$1,976,108	$2,608,375
Adams	1,408,889	1,859,671
Allamakee	1,742,332	2,299,800
Appanoose	1,504,782	1,986,245
Audubon	1,612,294	2,128,156
Benton	2,440,820	3,221,773
Black Hawk	2,286,426	3,017,980
Boone	1,736,207	2,291,716
Bremer	1,564,100	2,064,542
Buchanan	1,878,622	2,479,697
Buena Vista	1,747,487	2,306,605
Butler	1,889,491	2,494,044
Calhoun	1,696,828	2,239,737
Carroll	1,981,009	2,614,844
Cass	1,752,777	2,313,587
Cedar	1,993,716	2,631,616
Cerro Gordo	1,860,459	2,455,723
Cherokee	1,757,510	2,319,835
Chickasaw	1,693,751	2,235,676
Clarke	1,336,519	1,764,146
Clay	1,756,617	2,318,656
Clayton	2,133,748	2,816,452
Clinton	2,145,559	2,832,042
Crawford	2,275,813	3,003,972
Dallas	1,798,334	2,373,721
Davis	1,580,177	2,085,763
Decatur	1,572,517	2,075,652
Delaware	1,970,989	2,601,618
Des Moines	1,268,334	1,674,144
Dickinson	1,355,538	1,789,250
Dubuque	1,913,788	2,526,115
Emmet	1,118,598	1,476,500
Fayette	2,210,149	2,917,298
Floyd	1,627,811	2,148,638
Franklin	1,801,702	2,378,166
Fremont	1,417,817	1,871,455
Greene	1,545,858	2,040,464
Grundy	1,772,845	2,340,076
Guthrie	1,818,243	2,400,000
Hamilton	1,566,833	2,068,150
Hancock	1,696,742	2,239,624
Hardin	1,744,357	2,302,473
Harrison	1,833,753	2,420,472
Henry	1,577,761	2,082,574
Howard	1,401,170	1,849,482
Humboldt	1,292,719	1,706,331
Ida	1,396,648	1,843,513
Iowa	1,942,988	2,564,658
Jackson	1,672,306	2,207,369
Jasper	2,615,395	3,452,205

FY 1996 allocations with the recommended approach (continued)

County	Secondary	Total
Jefferson	1,447,272	1,910,335
Johnson	2,354,225	3,107,472
Jones	1,685,362	2,224,603
Keokuk	1,712,883	2,260,929
Kossuth	2,755,345	3,636,933
Lee	1,498,985	1,978,593
Linn	3,251,477	4,291,805
Louisa	1,184,942	1,564,071
Lucas	1,386,623	1,830,281
Lyon	1,836,148	2,423,634
Madison	1,800,460	2,376,527
Mahaska	1,747,062	2,306,044
Marion	1,982,026	2,616,186
Marshall	2,054,638	2,712,031
Mills	1,390,715	1,835,682
Mitchell	1,455,931	1,921,764
Monona	1,832,323	2,418,585
Monroe	1,122,890	1,482,165
Montgomery	1,539,493	2,032,062
Muscatine	1,430,685	1,888,440
O'Brien	1,813,592	2,393,861
Osceola	1,306,600	1,724,654
Page	1,857,384	2,451,664
Palo Alto	1,472,579	1,943,739
Plymouth	3,062,245	4,042,027
Pocahontas	1,702,255	2,246,901
Polk	2,889,283	3,813,725
Pottawattamie	2,993,567	3,951,375
Poweshiek	1,782,405	2,352,695
Ringgold	1,796,487	2,371,283
Sac	1,780,403	2,350,053
Scott	1,769,296	2,335,392
Shelby	2,077,725	2,742,504
Sioux	2,724,759	3,596,560
Story	2,174,507	2,870,252
Tama	2,225,336	2,937,344
Taylor	1,724,569	2,276,354
Union	1,412,887	1,864,948
Van Buren	1,477,788	1,950,614
Wapello	1,526,607	2,015,053
Warren	2,083,231	2,749,772
Washington	1,694,139	2,236,188
Wayne	1,460,001	1,927,136
Webster	2,430,103	3,207,628
Winnebago	1,242,712	1,640,324
Winneshiek	2,111,470	2,787,046
Woodbury	2,741,205	3,618,268
Worth	1,234,399	1,629,352
Wright	1,677,752	2,214,558
Total	$179,400,006	$236,800,008

APPENDIX B
ALLOCATION AND FACTOR RANKINGS

This appendix contains rankings of total allocations for Iowa's 99 counties. The higher the ranking of a given county, the greater its allocation. Also shown are rankings of the six factors included in the recommended formula.

Rankings for the secondary road system, 1994

County	Allocation factor	Bridge and culvert length	Bridge and culvert structures	Secondary road miles	Vehicle miles traveled (VMT)	VMT per road mile	Terrain index value	Inverse of maximum property tax potential
Linn	1	6	23	10	1	2	57	95
Plymouth	2	2	1	3	12	45	40	50
Pottawattamie	3	1	2	2	23	65	7	88
Polk	4	15	68	68	2	1	65	99
Kossuth	5	11	10	1	9	58	98	64
Woodbury	6	3	5	5	19	48	11	90
Sioux	7	4	4	4	15	43	47	62
Jasper	8	10	3	7	8	24	23	58
Benton	9	12	8	8	10	27	55	46
Webster	10	57	40	9	3	7	88	85
Johnson	11	19	29	48	5	5	39	97
Black Hawk	12	22	22	70	4	4	69	92
Crawford	13	9	9	6	65	89	13	18
Tama	14	14	6	11	44	70	34	38
Fayette	15	23	14	12	21	37	46	55
Story	16	54	46	40	6	6	80	87
Clinton	17	32	13	26	14	18	44	82
Clayton	18	58	31	14	31	38	6	40
Winneshiek	19	16	7	16	26	34	72	29
Warren	20	8	34	56	18	14	27	83
Shelby	21	5	16	35	66	75	1	32
Marshall	22	30	27	45	16	12	50	73
Cedar	23	26	15	38	27	26	54	75
Marion	24	36	48	60	24	20	9	53
Carroll	25	46	19	27	35	42	26	56
Adair	26	18	12	17	79	91	16	13
Delaware	27	34	28	51	20	16	52	77
Iowa	28	43	37	42	28	25	31	79
Dubuque	29	73	36	69	13	8	25	96
Butler	30	17	38	37	33	33	73	34
Buchanan	31	21	24	44	32	30	96	67
Cerro Gordo	32	86	77	39	11	10	89	80
Page	33	7	35	47	78	82	19	12
Lyon	34	35	33	23	53	62	60	17
Harrison	35	37	74	13	74	90	21	21
Monona	36	42	84	15	55	72	41	14
Guthrie	37	20	21	43	80	86	14	30
O'Brien	38	45	18	19	48	55	97	51
Franklin	39	39	51	24	36	44	74	57
Madison	40	27	41	52	59	60	38	16
Dallas	41	50	91	54	17	11	66	93
Ringgold	42	33	11	58	94	97	17	3
Poweshiek	43	48	20	30	69	77	33	47
Sac	44	55	42	18	52	64	64	31
Grundy	45	51	44	65	22	13	81	69
Scott	46	80	90	99	7	3	58	98
Cherokee	47	67	47	25	50	56	59	49
Clay	48	71	81	34	29	29	82	54
Cass	49	13	30	53	86	93	15	28
Buena Vista	50	97	79	21	30	32	71	61

Rankings for the secondary road system, 1994 (continued)

County	Allocation factor	Bridge and culvert length	Bridge and culvert structures	Secondary road miles	Vehicle miles traveled (VMT)	VMT per road mile	Terrain index value	Inverse of maximum property tax potential
Mahaska	51	28	43	31	71	79	43	41
Hardin	52	56	59	29	43	47	62	60
Allamakee	53	70	61	57	62	59	5	45
Boone	54	88	95	32	25	28	68	76
Taylor	55	25	26	50	96	99	32	4
Keokuk	56	41	25	46	81	85	28	24
Pocahontas	57	59	45	22	56	68	92	42
Calhoun	58	52	54	28	51	57	94	48
Hancock	59	87	71	20	38	50	90	70
Washington	60	62	64	55	47	41	51	52
Chickasaw	61	24	17	62	60	54	75	25
Jones	62	68	56	61	45	35	42	65
Wright	63	65	62	33	46	52	91	68
Jackson	64	44	53	63	61	53	29	39
Floyd	65	69	65	59	41	36	85	26
Audubon	66	38	32	71	89	84	2	15
Davis	67	40	39	66	88	88	49	2
Henry	68	64	88	76	40	21	53	23
Decatur	69	29	60	72	93	92	24	1
Hamilton	70	83	87	49	49	46	87	74
Bremer	71	49	58	85	37	17	79	66
Greene	72	72	78	36	67	76	77	27
Montgomery	73	31	55	81	87	80	4	22
Wapello	74	63	73	88	54	23	35	78
Appanoose	75	74	52	78	75	67	37	9
Lee	76	78	86	87	39	19	56	81
Van Buren	77	47	67	77	85	78	45	5
Palo Alto	78	92	89	41	68	74	84	44
Wayne	79	90	75	64	92	94	36	6
Mitchell	80	79	70	67	57	40	99	35
Jefferson	81	82	80	74	64	49	48	20
Muscatine	82	89	93	96	34	9	67	94
Fremont	83	66	83	75	83	73	22	59
Union	84	75	63	86	91	81	20	11
Adams	85	60	49	82	97	96	18	10
Howard	86	77	50	73	72	61	83	19
Ida	87	85	66	79	90	83	12	37
Mills	88	53	76	92	84	71	8	84
Lucas	89	61	57	94	95	87	10	8
Dickinson	90	98	98	91	42	15	70	91
Clarke	91	84	72	90	99	98	3	7
Osceola	92	76	69	80	76	66	86	33
Humboldt	93	96	94	84	63	39	95	72
Des Moines	94	93	96	95	58	22	63	89
Winnebago	95	94	85	83	77	69	76	43
Worth	96	95	97	89	73	51	93	36
Louisa	97	91	92	98	70	31	61	86
Monroe	98	81	82	97	98	95	30	71
Emmet	99	99	99	93	82	63	78	63

APPENDIX C
SECONDARY ROAD DATA FOR 1994

In this appendix are the data for Iowa's 99 counties that form the basis for the allocations presented in Appendix A. These data are for 1994, the latest year for which complete system data are available.

Secondary road data, 1994

County	Bridge and culvert length in feet	Bridge and culvert structures	Secondary road miles	Average daily VMT	Average daily VMT per road mile	Terrain index value	Inverse of maximum property tax potential
Adair	19,708	295	1,026	70,151	68	1.95	0.0012
Adams	13,714	202	719	41,974	58	1.88	0.0013
Allamakee	12,341	179	877	94,235	107	2.42	0.0009
Appanoose	12,055	192	737	74,279	101	1.33	0.0014
Audubon	16,550	236	764	56,825	74	2.54	0.0011
Benton	21,338	319	1,209	176,979	146	0.74	0.0008
Black Hawk	19,495	258	765	249,805	327	0.33	0.0005
Boone	9,464	105	970	141,472	146	0.35	0.0007
Bremer	15,130	185	710	121,300	171	0.19	0.0008
Buchanan	19,605	251	933	134,036	144	0.05	0.0007
Buena Vista	6,144	141	1,003	138,418	138	0.30	0.0008
Butler	19,773	223	955	131,484	138	0.26	0.0009
Calhoun	14,519	190	981	106,571	109	0.08	0.0008
Carroll	15,279	262	990	123,694	125	1.66	0.0008
Cass	21,249	239	903	60,834	67	1.95	0.0009
Cedar	18,694	277	953	140,521	148	0.77	0.0007
Cerro Gordo	10,244	146	951	174,932	184	0.12	0.0007
Cherokee	13,010	209	995	108,516	109	0.57	0.0008
Chickasaw	18,839	270	840	95,991	114	0.24	0.0009
Clarke	10,376	152	660	32,661	49	2.54	0.0016
Clay	12,209	140	963	138,544	144	0.18	0.0008
Clayton	13,968	238	1,066	138,337	130	2.39	0.0009
Clinton	17,597	288	991	168,651	170	1.01	0.0007
Crawford	22,204	316	1,218	87,703	72	2.06	0.0010
Dallas	14,955	122	899	163,385	182	0.36	0.0005
Davis	15,958	221	808	58,217	72	0.85	0.0020
Decatur	18,501	183	756	51,337	68	1.67	0.0020
Delaware	17,539	245	906	154,914	171	0.79	0.0007
Des Moines	7,267	104	611	96,758	158	0.40	0.0005
Dickinson	4,675	67	656	116,319	177	0.32	0.0005
Dubuque	12,171	227	769	170,550	222	1.66	0.0004
Emmet	4,530	67	644	67,001	104	0.19	0.0008
Fayette	18,906	286	1,133	148,401	131	0.97	0.0008
Floyd	12,371	172	872	116,369	133	0.14	0.0009
Franklin	16,257	193	996	122,162	123	0.24	0.0008
Fremont	13,065	137	747	65,542	88	1.73	0.0008
Greene	12,208	146	959	82,384	86	0.21	0.0009
Grundy	14,626	216	822	148,384	180	0.18	0.0007
Guthrie	19,685	260	934	68,626	73	2.00	0.0009
Hamilton	10,433	129	916	109,762	120	0.13	0.0007
Hancock	9,888	154	1,014	119,596	118	0.11	0.0007
Hardin	14,081	185	974	116,232	119	0.41	0.0008
Harrison	16,554	151	1,092	77,095	71	1.80	0.0010
Henry	13,121	129	743	117,760	159	0.78	0.0009
Howard	11,569	197	755	80,446	107	0.17	0.0010
Humboldt	6,489	112	714	91,141	128	0.06	0.0007
Ida	10,258	170	728	56,156	77	2.07	0.0009
Iowa	15,396	224	938	139,667	149	1.49	0.0007
Jackson	15,307	192	828	95,687	116	1.54	0.0009
Jasper	22,031	365	1,215	182,932	151	1.68	0.0008

Secondary road data, 1994 (continued)

County	Bridge and culvert length in feet	Bridge and culvert structures	Secondary road miles	Average daily VMT	Average daily VMT per road mile	Terrain index value	Inverse of maximum property tax potential
Jefferson	10,458	141	749	88,394	118	0.85	0.0010
Johnson	19,702	242	919	236,701	258	1.30	0.0004
Jones	12,747	189	842	113,545	135	1.17	0.0008
Keokuk	15,922	251	929	68,453	74	1.57	0.0009
Kossuth	21,648	306	1,656	178,886	108	0.03	0.0008
Lee	11,105	131	695	118,236	170	0.69	0.0007
Linn	24,335	257	1,170	430,454	368	0.68	0.0004
Louisa	8,835	115	570	80,854	142	0.47	0.0006
Lucas	13,650	186	629	45,567	72	2.17	0.0016
Lyon	17,304	233	997	105,871	106	0.50	0.0010
Madison	18,610	218	906	96,757	107	1.31	0.0010
Mahaska	18,606	217	972	80,497	83	1.05	0.0009
Marion	16,740	204	855	143,353	168	2.25	0.0008
Marshall	17,937	247	929	167,864	181	0.84	0.0007
Mills	14,506	149	651	64,108	98	2.29	0.0006
Mitchell	11,079	159	785	99,780	127	0.02	0.0009
Monona	15,626	136	1,063	100,264	94	1.18	0.0011
Monroe	10,780	139	602	37,963	63	1.53	0.0007
Montgomery	17,923	190	723	58,693	81	2.45	0.0009
Muscatine	9,436	114	610	128,454	211	0.36	0.0004
O'Brien	15,283	263	1,016	112,002	110	0.04	0.0008
Osceola	11,576	162	724	73,129	101	0.14	0.0009
Page	23,840	229	920	71,142	77	1.88	0.0012
Palo Alto	8,110	127	939	82,310	88	0.14	0.0009
Plymouth	29,507	480	1,424	171,540	120	1.22	0.0008
Pocahontas	13,920	212	1,001	100,111	100	0.09	0.0009
Polk	20,863	163	770	408,856	531	0.40	0.0002
Pottawattamie	35,855	368	1,427	144,744	101	2.37	0.0005
Poweshiek	15,165	262	973	82,062	84	1.42	0.0008
Ringgold	17,561	305	872	49,683	57	1.95	0.0019
Sac	14,153	218	1,019	105,918	104	0.40	0.0009
Scott	10,937	123	553	190,397	344	0.57	0.0003
Shelby	24,692	274	962	82,890	86	2.94	0.0009
Sioux	27,767	359	1,361	168,046	123	0.92	0.0008
Story	14,351	210	944	233,630	247	0.19	0.0006
Tama	21,089	321	1,154	114,552	99	1.39	0.0009
Taylor	18,775	248	908	44,290	49	1.49	0.0019
Union	11,683	176	702	56,004	80	1.82	0.0013
Van Buren	15,251	169	737	62,163	84	1.01	0.0018
Wapello	13,434	152	689	104,308	151	1.37	0.0007
Warren	22,333	232	878	157,212	179	1.64	0.0006
Washington	13,500	173	897	112,447	125	0.83	0.0008
Wayne	9,118	150	824	52,296	63	1.36	0.0017
Webster	14,064	220	1,173	261,031	223	0.12	0.0006
Winnebago	7,120	133	716	71,354	100	0.22	0.0009
Winneshiek	19,976	320	1,042	140,776	135	0.27	0.0009
Woodbury	29,257	352	1,316	155,453	118	2.08	0.0005
Worth	6,614	91	688	80,392	117	0.08	0.0009
Wright	13,092	179	967	112,612	116	0.10	0.0007
Total	1,527,181	20,462	89,455	11,670,780	—	—	0.0868
Average	15,426	207	904	117,887	131	1.00	0.0009

APPENDIX D

A HOLD HARMLESS EXAMPLE

In this appendix we present an example of how a hold harmless provision would operate. This particular example is based on an annual RUTF growth rate of three percent and a 98 percent floor. A county with a decreasing allocation would thus receive 98 percent of the previous year's allocation until its allocation represents the appropriate percentage of the total statewide secondary road fund. At that time the county would begin to increase at the same rate as the overall RUTF.

Allocations with a hold harmless provision: Three percent revenue growth and minimum of 98 percent of previous year's allocation, FY 1997–2003

County	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
Adair	$1,945,409	$2,045,423	$2,136,405	$2,215,980	$2,288,561	$2,359,375	$2,430,364
Adams	1,306,343	1,431,058	1,517,687	1,579,399	1,631,640	1,682,143	1,732,755
Allamakee	1,797,871	1,831,355	1,889,285	1,954,348	2,017,837	2,080,257	2,142,848
Appanoose	1,577,970	1,590,189	1,633,416	1,688,052	1,742,730	1,796,635	1,850,692
Audubon	1,526,124	1,648,198	1,738,921	1,807,619	1,867,211	1,924,999	1,982,919
Benton	2,468,782	2,548,693	2,643,295	2,737,518	2,826,763	2,914,217	3,001,900
Black Hawk	2,412,691	2,421,285	2,482,902	2,564,989	2,647,976	2,729,879	2,812,016
Boone	1,709,506	1,797,199	1,877,062	1,946,960	2,010,728	2,072,945	2,135,315
Bremer	1,546,326	1,621,168	1,691,420	1,754,002	1,811,410	1,867,458	1,923,646
Buchanan	1,799,629	1,927,690	2,027,622	2,106,346	2,175,651	2,242,981	2,310,468
Buena Vista	1,699,310	1,801,678	1,887,808	1,959,475	2,023,788	2,086,413	2,149,189
Butler	1,890,100	1,965,891	2,044,800	2,119,038	2,188,254	2,255,958	2,323,836
Calhoun	1,592,671	1,730,064	1,829,178	1,902,308	1,965,108	2,025,929	2,086,885
Carroll	1,886,861	2,029,086	2,137,392	2,221,076	2,294,225	2,365,226	2,436,391
Cass	1,712,888	1,809,982	1,894,097	1,965,460	2,029,915	2,092,728	2,155,695
Cedar	2,023,412	2,084,145	2,159,569	2,236,109	2,308,964	2,380,397	2,452,019
Cerro Gordo	1,641,876	1,861,635	1,998,470	2,085,095	2,154,589	2,221,295	2,288,130
Cherokee	1,707,419	1,811,458	1,898,524	1,970,703	2,035,394	2,098,379	2,161,515
Chickasaw	1,574,424	1,721,738	1,824,816	1,898,762	1,961,541	2,022,255	2,083,101
Clark	1,308,582	1,380,976	1,444,446	1,498,709	1,547,842	1,595,738	1,643,750
Clay	1,761,060	1,828,954	1,901,268	1,970,046	2,034,371	2,097,313	2,160,417
Clayton	2,648,724	2,595,749	2,543,834	2,492,958	2,492,958	2,547,651	2,624,241
Clinton	2,273,720	2,275,378	2,330,588	2,407,020	2,484,835	2,561,690	2,638,766
Crawford	2,292,914	2,373,363	2,463,990	2,552,396	2,635,664	2,717,207	2,798,963
Dallas	1,954,987	1,915,888	1,955,180	2,017,645	2,082,709	2,147,121	2,211,724
Davis	1,670,144	1,674,292	1,716,148	1,772,712	1,830,049	1,886,652	1,943,418
Decatur	1,576,433	1,637,252	1,702,004	1,763,578	1,821,161	1,877,507	1,933,997
Delaware	2,121,738	2,121,738	2,147,306	2,211,766	2,282,679	2,353,263	2,424,068
Des Moines	1,412,734	1,384,479	1,385,648	1,423,632	1,468,918	1,514,328	1,559,891
Dickinson	1,316,666	1,397,067	1,464,283	1,519,969	1,569,865	1,618,444	1,667,140
Dubuque	2,425,898	2,377,380	2,329,832	2,283,236	2,237,571	2,285,027	2,353,717
Emmet	1,173,041	1,182,099	1,214,222	1,254,834	1,295,480	1,335,551	1,375,735
Fayette	2,214,963	2,300,900	2,392,094	2,478,678	2,559,615	2,638,808	2,718,204
Floyd	1,554,472	1,668,675	1,756,586	1,825,101	1,885,184	1,943,525	2,002,002
Franklin	1,693,565	1,837,822	1,942,399	2,019,897	2,086,563	2,151,142	2,215,866
Fremont	1,461,080	1,489,607	1,537,268	1,590,333	1,642,008	1,692,803	1,743,736
Greene	1,588,402	1,622,568	1,675,782	1,733,924	1,790,295	1,845,677	1,901,210
Grundy	2,088,506	2,046,736	2,005,801	2,005,801	2,053,702	2,116,690	2,180,376
Guthrie	1,867,330	1,908,148	1,970,995	2,039,441	2,105,749	2,170,891	2,236,209
Hamilton	1,573,700	1,632,336	1,696,054	1,757,223	1,814,580	1,870,721	1,927,007
Hancock	1,822,689	1,822,689	1,847,755	1,903,946	1,965,061	2,025,826	2,086,779
Hardin	1,791,042	1,830,471	1,890,875	1,956,564	2,020,181	2,082,675	2,145,339
Harrison	2,279,807	2,234,211	2,189,527	2,145,736	2,145,736	2,189,472	2,255,285
Henry	1,517,898	1,621,160	1,703,340	1,769,056	1,827,222	1,883,768	1,940,447
Howard	1,341,103	1,437,378	1,512,223	1,571,010	1,622,709	1,672,927	1,723,262
Humboldt	1,217,477	1,319,428	1,393,828	1,449,289	1,497,107	1,543,442	1,589,881
Ida	1,259,865	1,406,756	1,502,111	1,565,455	1,617,458	1,667,529	1,717,701
Iowa	1,849,195	1,989,652	2,096,271	2,178,438	2,250,192	2,319,831	2,389,631
Jackson	2,228,865	2,184,288	2,140,602	2,097,790	2,055,835	2,014,718	2,056,725
Jasper	2,745,174	2,764,707	2,839,143	2,933,945	3,028,962	3,122,652	3,216,606
Jefferson	1,387,479	1,485,432	1,562,133	1,622,715	1,676,101	1,727,971	1,779,962

Allocations with a hold harmless provision: Three percent revenue growth and minimum of 98 percent of previous year's allocation, FY 1997–2003 (continued)

County	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
Johnson	2,452,335	2,482,306	2,554,357	2,640,846	2,726,490	2,810,827	2,895,400
Jones	2,031,381	1,990,754	1,950,938	1,911,920	1,952,516	2,012,241	2,072,783
Keokuk	1,694,822	1,775,853	1,852,409	1,920,857	1,983,717	2,045,096	2,106,630
Kossuth	3,152,005	3,088,965	3,027,186	3,094,295	3,191,145	3,289,745	3,388,727
Lee	1,733,679	1,699,005	1,665,025	1,685,069	1,736,124	1,789,714	1,843,563
Linn	3,613,380	3,541,112	3,550,588	3,649,445	3,765,686	3,882,102	3,998,907
Louisa	1,222,632	1,245,458	1,284,878	1,329,132	1,372,310	1,414,761	1,457,329
Lucas	1,387,162	1,442,721	1,500,605	1,555,080	1,605,874	1,655,559	1,705,372
Lyon	1,637,518	1,843,085	1,973,519	2,057,957	2,126,439	2,192,270	2,258,231
Madison	1,986,929	1,947,190	1,963,339	2,020,574	2,085,188	2,149,660	2,214,339
Mahaska	1,982,753	1,943,098	1,943,098	1,964,176	2,023,453	2,085,905	2,148,666
Marion	2,072,883	2,092,647	2,151,079	2,223,385	2,295,438	2,366,440	2,437,642
Marshall	2,023,634	2,127,017	2,221,368	2,304,049	2,379,508	2,453,136	2,526,946
Mills	1,629,579	1,596,987	1,565,047	1,565,242	1,610,783	1,660,445	1,710,404
Mitchell	1,555,491	1,555,491	1,583,797	1,633,567	1,686,163	1,738,309	1,790,611
Monona	1,922,818	1,936,785	1,989,050	2,055,494	2,122,065	2,187,703	2,253,527
Monroe	1,432,238	1,403,594	1,375,522	1,348,011	1,321,051	1,340,733	1,381,012
Montgomery	1,519,907	1,594,956	1,664,667	1,726,393	1,782,911	1,838,078	1,893,382
Muscative	1,456,215	1,497,002	1,549,987	1,604,652	1,656,907	1,708,166	1,759,562
O'Brien	1,635,421	1,826,531	1,950,501	2,032,790	2,100,320	2,165,339	2,230,490
Osceola	1,215,035	1,328,354	1,407,740	1,464,753	1,513,180	1,560,016	1,606,954
Page	1,812,739	1,917,200	2,006,976	2,082,745	2,151,061	2,217,624	2,284,348
Palo Alto	1,457,007	1,526,700	1,592,528	1,651,376	1,705,417	1,758,186	1,811,086
Plymouth	3,167,266	3,221,211	3,321,028	3,434,923	3,546,462	3,656,168	3,766,175
Pocahontas	1,604,056	1,737,722	1,835,455	1,908,431	1,971,393	2,032,407	2,093,559
Polk	2,991,294	3,040,258	3,133,648	3,240,930	3,346,151	3,449,660	3,553,454
Pottawattamie	3,485,440	3,415,731	3,347,416	3,367,255	3,467,211	3,574,171	3,681,710
Powesheik	1,850,717	1,877,360	1,933,520	1,999,370	2,064,249	2,128,102	2,192,133
Ringgold	1,667,863	1,825,475	1,935,362	2,013,920	2,080,520	2,144,916	2,209,453
Sac	1,776,689	1,850,943	1,926,454	1,996,671	2,061,917	2,125,713	2,189,671
Scott	1,668,619	1,806,629	1,907,837	1,983,601	2,049,034	2,112,451	2,176,010
Shelby	2,068,202	2,158,292	2,247,813	2,330,076	2,406,250	2,480,700	2,555,340
Sioux	2,416,029	2,730,331	2,927,660	3,053,824	3,155,534	3,253,226	3,351,110
Story	2,241,678	2,284,888	2,357,766	2,439,100	2,518,349	2,596,253	2,674,369
Tama	2,520,907	2,470,489	2,470,489	2,501,464	2,577,380	2,656,941	2,736,883
Taylor	1,636,326	1,764,300	1,860,281	1,933,519	1,997,238	2,059,049	2,121,002
Union	1,373,713	1,456,627	1,526,325	1,584,283	1,636,283	1,686,917	1,737,673
Van Buren	1,520,693	1,551,875	1,602,143	1,657,587	1,711,461	1,764,405	1,817,492
Wapello	1,697,911	1,663,953	1,667,316	1,713,483	1,768,034	1,822,692	1,877,534
Warren	2,131,785	2,183,641	2,257,723	2,336,618	2,412,637	2,487,274	2,562,111
Washington	1,805,980	1,805,980	1,842,119	1,900,765	1,962,039	2,022,718	2,083,578
Wayne	1,409,982	1,501,977	1,576,573	1,637,052	1,690,844	1,743,168	1,795,617
Webster	2,502,357	2,552,508	2,634,711	2,725,779	2,814,361	2,901,422	2,988,721
Winnebago	1,177,839	1,270,907	1,340,418	1,393,272	1,439,195	1,483,736	1,528,379
Winnesheik	2,467,114	2,417,771	2,369,416	2,375,822	2,445,572	2,520,991	2,596,842
Woodbury	2,835,604	2,883,637	2,972,884	3,074,815	3,174,658	3,272,862	3,371,337
Worth	1,156,009	1,257,693	1,330,502	1,383,864	1,429,565	1,473,811	1,518,155
Wright	1,741,506	1,766,947	1,819,958	1,881,976	1,943,048	2,003,153	2,063,424
Total	$184,782,006	$190,325,466	$196,035,230	$201,916,287	$207,973,776	$214,212,989	$220,639,379
Counties with increases	67	80	87	93	96	98	99