ASSET MANAGEMENT FOR KANSAS COUNTIES: THE STATE OF PRACTICE

by

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Abstract

Asset Management is a relatively new term in the transportation world. It involves a systematic approach to maintaining, upgrading and operating all transportation assets (including infrastructure) cost-effectively. With the Government Accounting Standards Board's Statement 34 (GASB 34) requiring all transportation entities to report all capital assets on their annual reports as well as the development of new software and technologies, Asset Management is becoming easier to implement and quickly becoming an important part of the transportation industry.

In Kansas the Department of Transportation has developed and successfully utilized an Asset Management system for all assets including bridges, roadways, drainage structures and signs. Kansas counties however, do not have the funds and personnel to implement and maintain an Asset Management system similar to that of the KDOT. Asset Management systems have only been developed by counties with large populations, but even they have not reached the full potential of the system.

This thesis discusses the importance of creating and maintaining an effective Asset Management system. Kansas counties were surveyed and asked a series of questions about their asset management systems, or lack thereof, as well as the successes and failures of these systems. The counties were asked how they prioritize maintenance, what software they are using, and what assets they have inventoried.

The results of the questionnaire show that counties with large populations have shown interest in implementing Asset Management systems and many have worked to implement such a system. Conversely, counties with small populations that do not have the resources or personnel available have not implemented Asset Management systems. Recommendations for implementing Asset Management systems are made to counties in three population ranges: Less than 5,000, between 5,000 and 50,000, and greater than 50,000. These include software recommendations and creating inventories of all county assets including culverts, signs and pavements.

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CHAPTER 1 - Introduction

1.1 Overview

Asset Management is a systematic process of maintaining, upgrading and operating transportation assets cost-effectively. Asset Management in transportation involves creating an asset inventory, assessing current conditions and performance, determining and evaluating future system needs, evaluating and selecting appropriate strategies to address those needs and evaluating the effectiveness of each strategy.

Asset Management is a relatively new term in the transportation world. In the past and even today, transportation entities have used traditional methods of managing their assets. These methods are based either on a yearly rotation for maintenance and rehabilitation or on the "fix it when it's broke" principle.

Today transportation entities are feeling the pressure to maintain their transportation infrastructure at a high level of service. This along with an increasingly restricted transportation budget makes the reality of reaching a higher level of service seem impossible. Using traditional methods may cause transportation entities to perform deferred maintenance rather than preventative maintenance. In most cases, preventative maintenance is much more cost-effective than deferred maintenance. Transportation entities that use a yearly rotation for maintenance or rehabilitation may cause transportation entities to spend money on projects that may not be a priority.

1.2 Problem Statement

The transportation entities that are discussed in this thesis are Kansas Counties. There are 105 counties that range in population from 1,500 people to over 450,000 people. Each of these counties has a transportation network to maintain and require different approaches to implementing and maintaining a successful Asset Management system. The goal of this research is to determine the current state of practice of Kansas counties considering Asset Management by sending every county a questionnaire. These questionnaires asked the county about their Asset Management systems, or lack thereof, as well as the successes and failures the counties have experienced in implementing and maintaining their Asset Management systems.

Counties were broken up into three distinct population groups. Recommendations were made for counties with a population less than 5,000, counties with a population between 5,000 and 50,000 and counties with a population greater than 50,000. These recommendations discuss the possibility of creating an inventory database, making cost-effective decisions and choosing available Cost Accounting and Asset Management Software programs.

1.3 Format of Thesis

This thesis is divided into 5 chapters. Chapter 1 gives a brief introduction about the research conducted in this thesis. Chapter 2 is a detailed review of the pertinent literature on the subject of Asset Management. It discusses the facets of Asset Management including Life-Cycle Cost Analysis, Benefit/Cost Analysis, Risk Analysis and Economic Impact Analysis. It also discusses the GASB 34 and how it ties into Asset Management. Chapter 3 is an overview of the questionnaire conducted and the associated results. Each question asked is discussed and its results are analyzed. Chapter 4 provides specific recommendations in order to implement a successful Asset Management system. The recommendations are categorized according to county population ranges. Chapter 5 presents the summary of the research conducted herein as well as the conclusions and recommendations obtained.

CHAPTER 2 - Asset Management: Literature Review

2.1 Asset Management (AM)

Asset Management can be interpreted and defined in many ways. In transportation it is defined as: "a systematic process of maintaining, upgrading, and operating physical assets cost-effectively. It combines engineering principles with sound business practices and economic theory, and provides tools to facilitate a more organized, logical approach to decision-making. Thus, asset management provides a framework for handling both short- and long-range planning" (FHWA, 1999).

There are five key components to any comprehensive Asset Management system (FHWA, 1999):

1. An asset inventory
2. Methods of assessing current conditions and/or performance
3. A process to determine and evaluate future system needs
4. Tools to evaluate and select appropriate strategies to address current and future needs
5. Methods to evaluate the effectiveness of each strategy

A generic Asset Management framework can be seen in Figure 2.1[1].

Asset Management is not a new concept, but in the past few decades it has become more and more prominent in the transportation industry. In the 60's, 70's and early 80's, the transportation agencies of the United States were focused on the construction and expansion of the interstate highway system. Now with the system complete, it was up to the transportation agencies to preserve, manage and maintain the $1 trillion investment (FHWA, 1999).

Until recently investment decisions were project driven. Maintenance, asset preservation and upgrading were simply by products of facility expansion and new construction. Transportation investment decisions were based on tradition, intuition, personal experience, resource availability, and political considerations. With the expansion and application of computer technology, it has become much easier to make better investment decisions while

[1] All Figures and Tables can be found at the end of the chapter.

taking into account current roadway conditions, traffic volumes, and historical roadway data. Pavement Management Systems (PMS) and Bridge Management Systems (BMS) are being widely adopted in order to catalog historical construction and maintenance data, predict future conditions and prioritize alternative reconstruction, rehabilitation and maintenance strategies. This strategy helps the government create a steady state system in which a predetermined level of performance is preserved (FHWA, 1999).

The fundamental objective of asset management is to maximize the benefits for the users while minimizing agency costs. There are several analytical tools that can be used to achieve this objective. They include Life-Cycle Cost Analysis (LCCA), Benefit/Cost Analysis (BCA), Risk Analysis, and Economic Impact Analysis (EIA) (FHWA, 1999).

2.1.1 Life-Cycle Cost Analysis

The LCCA is a widely accepted project evaluation tool. It allows government agencies to evaluate different options while taking into consideration the costs incurred over the life span of a project. This means that not only are the initial costs of the project options considered, but also the costs of future maintenance, rehabilitation, operation expenditures and salvage value (FHWA, 2002).

For a more comprehensive LCCA, user costs can also be considered, including delay and safety costs associated with maintenance and rehabilitation projects, agency capital cost and life-cycle maintenance costs. Most state agencies incorporate LCCA in some capacity, however it is primarily used for a pavement-type selection and design specification (FHWA, 2002).

There are five major steps in life-cycle cost analysis:

1. Establish design alternatives
2. Determine activity timing
3. Estimate costs
4. Compute life-cycle costs
5. Analyze the results

The first step in LCCA is to establish design alternatives by addressing the objectives of the project. At least two mutually exclusive options should be considered and the economic difference between alternatives is assumed to be attributable to the total cost of each. The component activities for each alternative should also be defined and should include the initial construction, major rehabilitation, maintenance and other activities based on a specified level of performance. The maintenance and rehabilitation activities should be based on historical practice, research and agency policies (FHWA, 2002).

Then a schedule of initial and future activities is defined and laid out for each design alternative. This schedule should show the occurrences of future maintenance and rehabilitation activities, when agency funds will be expended, and when and for how long work zones will be established (FHWA, 2002).

Next the costs of these activities are estimated. It is not necessary to estimate all costs associated with each alternative. LCCA only requires that the costs that demonstrate the differences between alternatives be explored. This means that rehabilitation or maintenance costs must be estimated for each alternative if they differ but expenses that are common to each alternative, such as land, can be removed from the analysis (FHWA, 2002).

When future costs are estimated for LCCA, it is appropriate to determine the costs in terms of constant dollars. Constant dollars should not include an inflation component, but should be based on the price of that activity in base year of the analysis. This means that the value of the same material and labor today will have the same value as in the future (FHWA, 2002).

There are two types of costs to consider when estimating costs: agency costs and user costs. Agency costs are the costs of the agencies activities over the lifespan of the project. They can also include the salvage value of the project if the roadway is to be recycled, or the remaining service life (RSL) when the service life extends beyond the analysis period. User costs are the costs ensued by the traveling public. These costs are due to construction and include vehicle operating costs, travel time costs, and crash costs. These costs are directly connected to the timing, duration, scope, and number of work zones characterized in each design alternative. User costs need not include the costs during normal roadway operation, if these costs are similar in all of the design alternatives (FHWA, 2002).

The next step is to compute the life-cycle costs of each alternative. In the previous steps the costs and timing of different rehabilitation and maintenance activities were set and in order to directly compare the alternatives, these costs must be converted to a present value. Expenditure stream diagrams are helpful in visualizing the expenditures by displaying the activities, costs and timing of the project alternative (FHWA, 2002).

There are two approaches used in computing the life-cycle costs. These approaches are the Deterministic Approach and the Probabilistic Approach. The Deterministic Approach assigns each LCCA input variable a fixed value. This approach has been most traditionally used and can be easily calculated and analyzed giving a single present value of the alternative. This approach however, does not convey the uncertainties within the project alternative and can be misleading. The Probabilistic Approach allows the value of individual analysis inputs to be defined by a probability distribution. The analyst must first identify all of the uncertain parameters and create a sampling distribution for each. Simulation programming randomly draws values from these distributions and runs thousands of iterations generating a probability distribution of present values. From this distribution a present value can be found for a certain risk level (FHWA, 2002).

The final step in the LCCA is to analyze the results. When using the Deterministic Approach the present values can be easily compared for each alternative. In most cases the agency costs are used to make the decision on the best alternative, but if two alternatives have similar present values, the user costs can be taken into consideration or a further analysis should be undertaken. When the Probabilistic Approach is used the analyst has an array of information to consider when making a decision on an alternative. Each present value will have a likelihood of occurrence and other statistical information to consider and a decision can be made based on a predetermined level of risk (FHWA, 2002).

One of the issues with LCCA is that it is a data-intensive analysis technique. The value of this analysis tool depends greatly on the quality of the input data. Data collection is crucial to the success of LCCA and most transportation agencies do not have the resources or the means to compile the necessary data (FHWA, 2002).

2.1.2 Benefit/Cost Analysis

While LCCA compares alternatives in which the benefits are essentially identical, Benefit/Cost Analysis (BCA) compares alternatives in which the benefits are completely different. For example, an agency may have alternatives in which a roadway is either reconstructed as is or reconstructed with additional lanes. In both cases the roadway is reconstructed, but the benefit of a larger traffic capacity is considered as well as the extra cost of the additional lanes. BCA can also be used to decide whether or not a project should be undertaken now or sometime in the future. In some cases it may be necessary to consider the "do nothing" option along with the other alternatives. If an alternative is not feasible at this time it may be very feasible in the future if regional traffic volumes are predicted to increase (FHWA, 2003).

BCA attempts to capture all the benefits and costs accruing to society from a certain course of action regardless of which particular party realizes the benefits or costs. If used properly, BCA will enable an agency to maximize the net benefits of a project while efficiently allocating its resources (FHWA, 2003).

There are 10 major steps in a BCA:

1. Establish Objectives
2. Identify constraints and specify assumptions
3. Define base case and identify alternatives
4. Set analysis period
5. Define level of effort for screening alternatives
6. Analyze traffic effects
7. Estimate benefits and costs relative to base case
8. Evaluate risk
9. Compare net benefits and rank alternatives
10. Make Recommendations

The first step in BCA is to establish the objectives or goals of a project. It may be possible to eliminate some alternatives that do not meet these objectives. For example, if one of the main objectives of a project is to increase the highway capacity, then an alternative in which the roadway is reconstructed with no additional lanes may be discarded (FHWA, 2003).

The next step is to identify constraints including legal, natural or policy constraints. Assumptions about the future, such as traffic growth and projected lifespan of the improvement are also identified (FHWA, 2003).

Next the base case is to be defined and alternatives are identified. The base case is the same as the "do nothing" alternative where the continued operation of the facility is maintained under good management practices. Other alternatives can also be identified as long as these alternatives meet the objectives while staying within the constraints from the first two steps (FHWA, 2003).

In order to ensure that the alternatives are compared on the same grounds, an analysis period must be set. The analysis period should be set long enough to include at least one major rehabilitation activity for each alternative. That way the BCA analysis reflects all of the major costs of a project throughout a certain period of time (FHWA, 2003).

The next step is to define the level of effort for screening alternatives. This will change given the complexity, expense and controversy of the project. For example, larger more expensive and complex projects will require a higher level of effort than a cheaper, smaller project (FHWA, 2003).

When a project alternative is expected to generate significant benefits to users, particularly in the form of congestion relief, the future traffic levels will need to be analyzed as compared to the base case. In this case the benefits that come from a higher highway capacity as well as the cost of the improvements need to be taken into account when comparing to the "do nothing" alternative (FHWA, 2003).

The next step is to estimate the benefits and costs relative to the base case. All the costs accrued over the analysis period including the cost of investment, the hours of delay, crash rates and other effects need to be measured in monetary terms, discounted to present day and compared to the base case. The same goes for the benefits realized by the alternative (FHWA, 2003).

The risk associated with uncertain costs, traffic levels, and economic values must also be assessed. This step is discussed extensively in subsection 2.1.3 Risk Analysis.

The next step of the BCA process is to compare net benefits and rank alternatives. Any alternative in which the value of the discounted benefits exceeds the value of the discounted costs is worth pursuing. However, only one alternative can be selected and this should be the one that is the most economically efficient (FHWA, 2003).

The final step is to make recommendations based on the analysis. It is good practice to not only include the alternative that is most economically efficient, but all alternatives that were pursued as well as the BCA process leading to the recommendation (FHWA, 2003).

One of the issues with BCA is that it is often underutilized due to misconceptions about its accuracy. The uncertainties in measuring the value of the benefit or cost in a project may seem intangible. However, there is much more substance to BCA and where uncertainties do exist, they can be effectively measured and managed (FHWA, 2003).

Another issue with BCA is that the workload involved with an analysis may be excessive given the resources of an agency. Small transportation agencies may find it hard to implement the resources necessary to manage such an analysis. BCA level of effort should reflect the project cost and be minimized for routine projects (FHWA, 2003).

2.1.3 Risk Analysis

Uncertainty can be a factor in transportation investments; fortunately most of this uncertainty can be evaluated and managed. Measured uncertainty is known as risk and can be understood by answering three questions:

1. What can happen?
2. How likely is it to happen?
3. What are the consequences of an event occurring?

Risk analysis will help to answer these questions and determine if efforts to mitigate some or all of this risk would be cost-effective.

Sensitivity analysis can be used in conjunction with the BCA. When there is an input variable with significant uncertainty in the analysis, the likelihood that an event will occur can be measured and managed in the analysis. When it is decided that changing the uncertain variables according to risk will not change the ranking of the project alternatives, then the BCA results are robust and reliable. However, when risk changes the ranking of the project alternatives and that risk cannot be mitigated, the analyst may recommend against that particular project design (FHWA, 2003).

Once the risks associated with a project have been identified and quantified, the next step is to evaluate possible actions to mitigate that risk. These actions would include increasing engineering, conducting additional quality testing, applying value engineering, and using various contractual methods such as design/build (FHWA, 2003).

When considering possible mitigation actions, the projected effectiveness of the action must be weighted against the cost of the action. The range of potential economic outcomes for the project should be calculated with and without the risk mitigation in place. The agency can then choose the best balance of cost and risk that they are willing to take on (FHWA, 2003).

2.1.4 Economic Impact Analysis

Economic Impact Analysis (EIA) is the study of the way in which the direct benefits and costs of a highway project affect the local, regional, or national economy. EIA attempts to evaluate the consequences that an action will have on local or regional employment patterns, wage levels, business activity, tourism, housing and even migration patterns (FHWA, 2003).

While BCA only measures the direct benefits and costs of a project to the highway agencies, users and nonusers that are affected, EIA attempts to measure the indirect benefits and costs realized by the economy. These indirect effects on the economy can include employment, wages, business sales or land use (FHWA, 2003).

Sometimes it is necessary to conduct an EIA based on the results of the BCA. The information obtained from this analysis would be of great interest to the decision makers, planners and the public, especially in cases where there is a very large project that will affect many people. Projects that are undertaken will have an indirect affect on people whether it is good or bad. If it can be shown that the good indirect affects outweigh the bad indirect affects, then it may be easier to build public support for the project (FHWA, 2003).

The methods and tools of conducting an EIA depend on the level of sophistication of the analysis. Some of the basic methods of EIA include survey studies, market studies and comparable case studies. Survey studies can be conducted as expert interviews, vehicle origin-destination logs, collection of shopper origin-destination data, and corridor inventory methods. Market studies consider the supply and demand of business activity and attempt to quantify the effects on the market due to a change in transportation costs caused by a project. Comparable case studies are used to evaluate the impacts of a project on the local economy, i.e. neighborhoods, downtowns, or small towns. This can be applied in cases where a bypass of a small town is part of the project (FHWA, 2003).

The issue with EIA is that it is only worthwhile and practical if it is used on a large project that will affect many people. This analysis requires resources that many small transportation agencies may not have. If a project undertaken by a small agency is large enough to report a BCA, it may be necessary to conduct an EIA (FHWA, 2003).

2.2 GASB 34

The public has undergone a change of view of effective governance over the last decade in that the government should be more accountable and should be managed more like a business operation. Many states have created legislation modeled after the Federal Government's Government Performance and Results Act. Such legislation calls for the states to report what is bought with public funds, how the decisions in spending are made and what is accomplished. The Government Accounting Standards Board (GASB) takes this a step further by issuing Statement 34 in 1999. The statement was developed in order to make annual reports easier to understand and more useful to those who use governmental financial information. The GASB 34 requires state and local agencies create financial statements using an accrual-based accounting practice. This means that not only will the current assets and liabilities be reported, but also the long-term assets and liabilities including infrastructure (FHWA, 2000).

GASB 34 affects governmental reporting of more than 84,000 state and local government agencies in the United States, including numerous special service districts (Dewan and Smith, 2003). In order to meet the requirements of this new standard, these governments will need to determine the costs of their current infrastructure assets. This includes initial construction costs and the subsequent costs of improvements or expansion of the assets. Also included are the costs associated with using the assets. For the first time governments will account for all of the capital resources they use in delivering services. This means they will be able to provide the full cost of servicing the public (FHWA, 2000).

With GASB Statement 34, there are new basic financial statements required as a part of the state and local financial reports. These include a statement of net assets and a statement of activities. A statement of net assets accounts for the entity's assets and liabilities at a given point in time. The net assets are simply the difference between assets and liabilities. These assets include depreciated infrastructure assets as well as other financial and capital assets. A statement of activities reports government operating revenues and expenses. Expenses and revenues (excluding taxes) should be reported with the function or program and the net expense or revenue presented. This statement will show which programs contribute and which programs draw from the general revenues (FHWA, 2000).

The GASB 34 requires all state, city and county government agencies include all long-lived capital assets in their asset base. Long-lived capital assets are assets that have initial useful lives that go beyond one reporting period. These assets include land, buildings, equipment and infrastructure. Infrastructure assets such as roadways, bridges and tunnels are different than most assets in that they are stationary and can be preserved for an indefinite period of time (FHWA, 2000).

Another requirement of the GASB 34 is that infrastructure assets will be capitalized at historical cost. This means that the amount expended to acquire the asset should be reported as such, rather than being reported as an expense. The preference of the GASB is that the initial capitalization amount represents the historical cost. However, if the reporting entity has difficulty finding historical costs, estimated historical costs or deflated current replacement costs can be used to determine historical costs of infrastructure assets (FHWA, 2000)

Statement 34 also requires that infrastructure assets be reported at the network, subsystem, or individual asset level. A network is defined as a group of assets in which the individual members provide similar services or all members work together to provide a service. For example, a transportation network would include the roadways, signs, bridges, etc. Similarly, a subsystem is a distinct part of a network of assets, in this case the subsystem would be the roadways (FHWA, 2000).

The GASB 34 also requires that these assets are depreciated using the straight-line depreciation method or a modified condition based depreciation method (FHWA, 2000). These methods are explained in the following subsections.

2.2.1 Straight-Line Depreciation

Straight-line depreciation is the traditional approach and the most commonly used depreciation method. It assumes that an asset will lose its value in a linear fashion over time. The depreciation expense is determined by estimating an assets “useful life” which is the amount of time the asset will be in use. The useful life estimate assumes a given maintenance and repair schedule that will not extend the useful life of the roadway but ensure that the asset reaches its useful life and provides acceptable service during that time (FHWA, 2000).

To determine the depreciation expense, the net acquisition cost is divided by the estimated useful life of the asset, where the net acquisition cost is the total acquisition cost minus the salvage value of the asset at the end of its useful life. Depreciation expense also includes an allocation of the costs of any improvements or additions that take place following the initial acquisition and benefit more than one time period. This means that the net acquisition cost will be adjusted over time if the quality or quantity of the asset is improved beyond the prior reported estimate. However, routine operating maintenance that only benefit the current period are not capitalized and are shown as expenses in the financial statements (FHWA, 2000).

The benefit of straight-line depreciation is the ease of reporting and tracking the assets. Once the initial database is developed, it is easy to maintain since the asset depreciates at a rate established at the onset. The major drawback of this method is that it requires a lot of effort to set up, but requires no maintenance. This means that the database will not end up helping the transportation officials make maintenance and funding decisions (Yarnell, 2004).

2.2.2 Modified Depreciation Approach

When agencies use a modified approach to depreciation, they recognize that their assets are typically maintained a specified level. Transportation agencies constantly renew their assets thereby extending the useful life of the asset. This means that rather than reporting a depreciation expense, a preservation expense may be considered an appropriate measure for the cost of use. Similar to the traditional approach, improvements or additions that increase capacity or efficiency are capitalized, however, they are not depreciated (FHWA, 2000).

There are four requirements asked of governments using the modified approach. First, the government must establish condition goals for the assets on which they are reporting. Second, the government must set a budget estimate that will be necessary to achieve or maintain the condition goals. Third, the amount actually spent to maintain the condition goals must be compared to the estimated amount. Fourth, the government must show that the assets are being preserved at or above the condition goal that it pre-selected (FHWA, 2000).

In order for a government to use the modified approach, it must also have a system of managing assets that will produce a current inventory, asses the condition of that inventory, calculate the maintenance and preservation levels associated with the alternative condition goals and estimate the budget required to achieve those goals (FHWA, 2000).

A drawback of the modified approach is the continuous effort needed to maintain the database. However, a well-maintained database can be used to make justifiable maintenance decisions. Thus a major benefit of the modified approach is that it reflects the actual state of the asset by taking into account the actual wear and tear, the cost of its upkeep and major improvements of that asset (Yarnell, 2004).

2.3 Asset Management and GASB 34

Asset Management is a strategic approach to managing transportation infrastructure. It allows governments to make cost-effective decisions based on a wide, systems view of all transportation assets. The GASB 34 makes it possible to observe the state and cost of all of these assets by requiring agencies to keep an up to date inventory of their assets when they utilize the modified approach. Therefore, the GASB 34 is a major driving force in establishing Asset Management systems in all government agencies (FHWA, 2000).

Using a modified approach to depreciate infrastructure assets requires a comprehensive Asset Management system. Asset Management requires a well-maintained database that displays the current condition of assets. Using a modified approach allows the government to keep the database up to date while meeting the requirements of the GASB 34 (Dewan and Smith, 2003).

A few decades ago "accountability" was an unfamiliar term in the transportation community. Today transportation officials realize that citizens expect them to be responsible stewards of their investments. This means that transportation agencies are increasingly aware of the possibility of having to defend their management approach and results. Since the GASB 34 will make transportation decisions public, demands for accountability will intensify (FHWA, 2000).

The GASB 34 makes an exception for those government agencies that have an Asset Management system in place. For those governments, it is not necessary to depreciate infrastructure assets if the Asset Management system meets certain requirements. The system must have an up to date inventory of assets, perform condition assessment of the infrastructure assets at least once every three years, summarize the results using a measurement scale, and estimate the annual amount required to maintain and preserve the infrastructure assets at the condition level originally established for those assets (FHWA, 2000).

2.4 Software Programs

With the technology available today, transportation entities now have the ability to manage their network with ease. Using software will allow transportation entities to keep track of all assets simultaneously while also tracking the state of the assets. This section discusses several different software programs that may be beneficial to transportation entities.

2.4.1 Highway Economic Requirement System (HERS)

FHWA is sponsoring the use of a new programming tool called the Highway Economic Requirements System (HERS). This tool is currently used at the national level to identify and evaluate the costs, benefits and national economic implications associated with highway investment options. FHWA is currently instigating the use of HERS in the state DOT's (FHWA, 2000).

HERS uses incremental benefits vs. cost analysis to optimize highway investment. The model quantifies the agency and user costs of various types of improvements and considers travel time, safety, and vehicle operating and emissions costs to address the roadway deficiencies. It then selects the best set of improvements to satisfy the economically sound highway performance objectives. When funding is not available to achieve the optimal level of performance, HERS prioritizes potential improvements and selects the best set of projects (FHWA, 2000).

Given the capabilities of this programming tool, HERS will not only benefit the state DOT's, but also benefit smaller transportation agencies. An integrated data system is an essential component of the Asset Management framework and HERS has the capability to be a significant part of such a framework (FHWA, 2000).

2.4.2 Cost Accounting Software Programs

Cost Accounting Software is used to organize and manage everyday operating costs in a transportation department. This software uses a database to keep track of assets including personnel, equipment, and even infrastructure-related assets.

In Kansas, there are several types of Cost Accounting software currently being used by local governments to manage everyday expenses. STAR Programming and NexTech are both local companies that have created cost accounting software for local governments in Kansas.

STAR Programming created the "STAR County Public Works" program. STAR Programming is located in Danville, Kansas and has centered its business around the County Public Works program. This program keeps track of expenses involved with time sheets, roadways, equipment, signs, road materials and parts. The program has a user-friendly interface that is easy to understand and utilize (STAR, 2007).

NexTech created similar software called the "County Works" program. NexTech is a rural telephone company located in Hays, Kansas. This software manages expenses much like the STAR program and is also very user-friendly (NexTech, 2007).

Both of the software programs utilize the Microsoft Access database. It is possible to create a customized database using Access if one is familiar with the program. STAR and NexTech have stated that they will work with their clients to mold the software in order to accommodate the particular needs of their client(s). Both companies also offer round the clock tech support for their software.

2.4.3 Asset Management Software Programs

Asset Management software has all of the capabilities of cost accounting software but also incorporates tools that help evaluate the current needs and predict future infrastructure needs for transportation departments. There are several different types of Asset Management software programs available on the market today. Each has unique capabilities and characteristics that make implementing an Asset Management system simple and successful.

In Kansas, one of the most popular Asset Management software used is Cartegraph. Cartegraph began creating software for local governments in 1994 and has since been able to expand the capabilities of the software as well as the clientele. They are based in Dubuque, Iowa and they have over 1000 clients all over the United States.

Cartegraph has several different modules that can be purchased individually or as a package. There are modules that manage workflow as well as modules for every type of asset that a local government may encounter. There is even a GIS module that gives a great visual overview of all assets. These modules are designed to work together with one another, or work independently. With flex technology these modules can even work with client' existing cost accounting or GIS systems (Cartegraph, 2007).

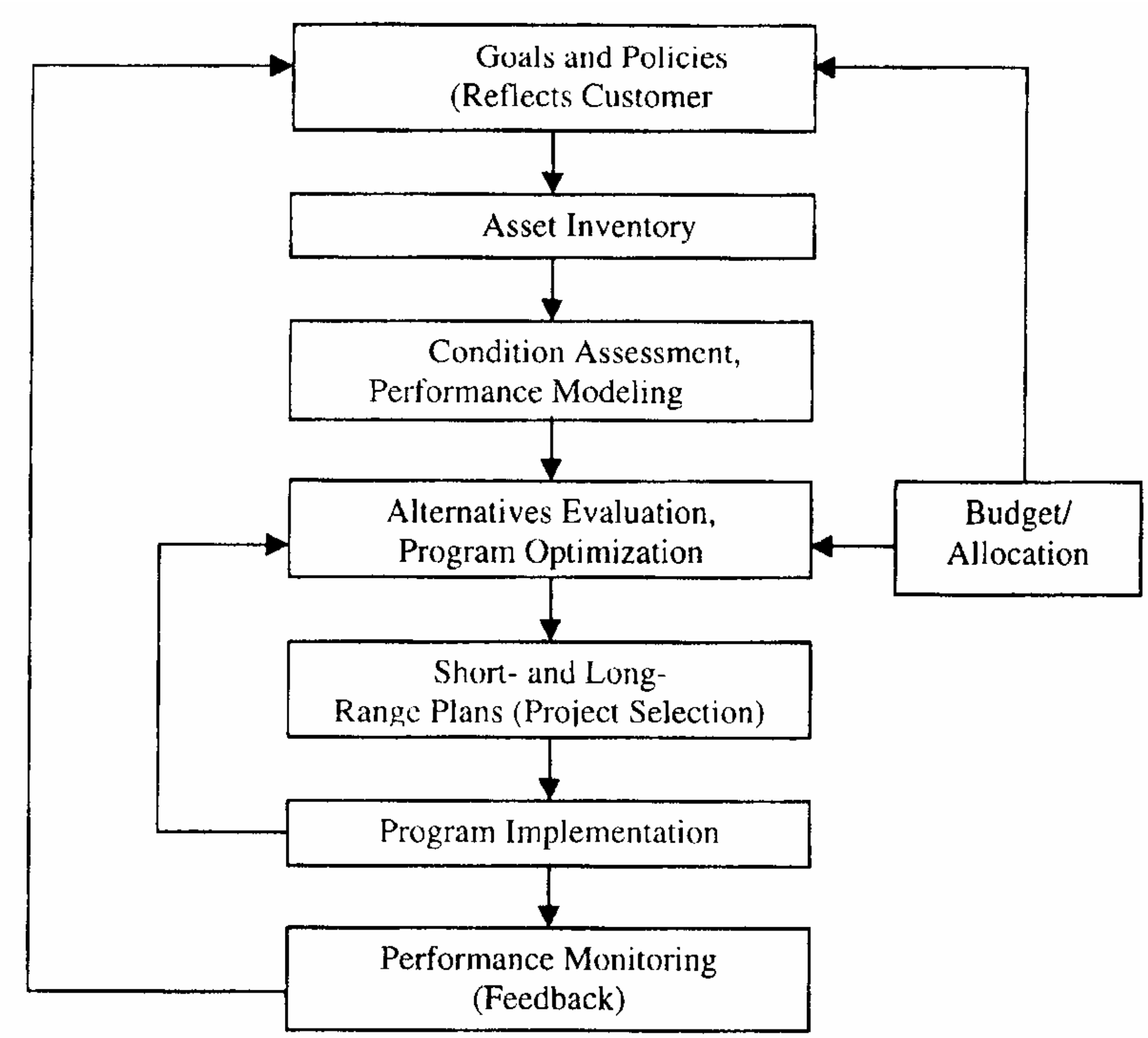

Figure 2.1: Generic Framework of an Asset Management System (FHWA, 1999).

CHAPTER 3 - Current State of Practice

3.1 Introduction

The major objective of this research was to determine the current state of practice for Asset Management in Kansas counties. In order to best determine the current state of practice, a questionnaire was created and sent to each of the 105 counties in Kansas. This questionnaire consisted of several questions that addressed certain issues and concerns that were discussed with Norm Bowers of the Kansas Association of Counties (KAC). One of the issues discussed was the fact that most counties did not have an Asset Management system in place (Bowers, 2007). Riley County has had an asset management system for several years and Rod Meredith has been there for most of those years. He has indicated/identified the problems they encountered early in the process and what they did to overcome these problems (Meredith, 2007). With this help it was possible to draft some questions that would not only help in identifying the current state of practice, but also determine if the county is ready to implement an Asset Management system.

3.2 The Questionnaire

There were two sections of the questionnaire. The first section was for counties that currently have some form of an Asset Management system and the second section had questions for counties that did not have an Asset Management system (See Figure 3.1).

The questionnaire was made short and to the point. If the questionnaire seemed to be too long, there would be little response and if it was too short there would be little information gathered. The questions were simplified to make it easy for anyone that works in the county office to answer the question with a high degree of confidence.

The questionnaire was sent twice via email. It was decided to send the questionnaire by email to keep costs to a minimum and to maximize the response. One problem encountered while sending the questionnaires was that only 101 of the 105 Kansas counties had a working email address. Even so, the questionnaire was sent to 101 counties, first with an explanation of the research and second as a reminder with the deadline for response. After giving the counties one month to respond, only 33 responded.

In Kansas, based on the 2000 census there were 10 counties with a population above 50,000 people, 61 counties with a population between 5,000 and 50,000 people and 34 counties with a population below 5,000 people (See Figure 3.2). The total percent responding to the questionnaire was 31.4%. Counties with a population above 50,000 had a 60% response rate, while counties with a population between 5,000 and 50,000 had a 31.2% response rate and counties with a population below 5,000 had a 23.5% response rate (See Figure 3.4 and 3.5).

3.2.1 Does Your County have an Asset Management (AM) System?

The first question, the questionnaire asked the county representative, whether or not their county had an Asset Management System. The idea of this question was to immediately group the responses based on whether or not the county had an Asset Management system. All 33 counties that responded to the survey answered this question (See Figure 3.5).

Based on this questionnaire it was found that about 24.2% of the counties surveyed have some sort of an Asset Management system in place (See Figure 3.6). It can also be concluded that counties with a large population have more resources. Therefore they are more likely to have an Asset Management system. Counties with a small population have limited resources and therefore are less likely to have an Asset Management system. This can be expected since counties with large populations have the monetary and personnel resources to implement a cost effective Asset Management system. In Figure 3.6 we see that 50% of counties with a population above 50,000 people have an Asset Management system, while a mere 12.5% of counties with a population below 5,000 have an Asset Management system.

3.2.2 How Many Hours per Week does your staff spend on the AM System?

Once it was known how many counties actually had a structured Asset Management system the county representatives for those counties were asked if the county had any staff devoted to maintaining their Asset Management system and how many hours per week was spent on this task. Only six of the 33 counties that responded answered this question. Figure 3.7 shows the six responses graphed according to county population. Most of the counties had at least one person maintaining and updating their Asset Management system. Some counties also included hours of their inspection crews so this data could be a little misleading. One county in particular had a very small population with 40 hours per week spent maintaining their Asset Management System. Another county with a large population claimed to spend the same amount of time. In order to further study the trends the data was normalized to hours per week per 1000 people to see if there was a relationship (Figure 3.8).

When the outliers are removed from the scatter plot, one can start to see a slight trend in the data. When looking at Figure 3.8 it becomes apparent that counties spend around 1 hour per 1000 people. In counties with population below 5,000 people, however, it may be necessary to spend 2 or even 3 hours per 1000 people. Since most Kansas Counties are similar in land area, population density is an issue. A county with 20,000 people may have the same county road mileage as a county with 3,000 people. In this case more time would be required to maintain an Asset Management system.

3.2.3 What AM Software Does Your County Use?

The counties with an Asset Management system were then asked what software their county uses to manage their transportation assets. The goal was to find a few of the most popular software packages according to county population. For example, a county with a large population needs software with more capacity and capabilities than a county with a small population. Out of the 33 counties that responded to the survey, only 26 answered this question. Note that additional information related to this question was extracted from a recent survey by the KAC. There were several different software packages that were used by the counties and they were grouped according to their capabilities. Star, NexTech and Baker are all similar in price and capabilities and are primarily cost accounting software, while Cartegraph is more complete Asset Management software. This software has the capability to analyze data and make maintenance decisions based on user input. The costs, benefits and shortfalls of these software programs were discussed in Chapter 2.

Based on the results obtained, it can be concluded that Cartegraph is mostly used by counties with the larger populations, while Star, NexTech and Baker are popular software packages among counties with smaller populations. Other software programs included Microsoft Excel/Access (Custom Program), SAP, Infinitech, Citi-Tech, and Compulink. Figures 3.9 through 3.12 show the use of these software packages by county population.

3.2.4 Who Makes the Final Decision on Maintenance Projects?

All counties were then asked who makes the final decision on maintenance and rehabilitation projects. This question was listed to get an idea of how the county handles its maintenance and rehabilitation projects and who gets the final say in how the money is used. Every county that filled out the questionnaire answered this question. The responses were organized into 3 different categories.

The first category was the county commissioners make the final decision. Also grouped in this category is public input and political pressure, since the county commissioners represent the voice of the people.

Another common response was that the public works director or county engineer makes the final decision. This does not necessarily mean that the county commissioners' advice is not taken into account, but that the person in charge of the department makes the final decision on maintenance projects.

The third category was that the final decision is based on a joint effort between the county commissioners and the person in charge of the maintenance department. This response indicates that there is a working partnership between the two and that all input is taken into account. Figure 3.13 through 3.16 display these responses by county population.

In order for an Asset Management system to work effectively, it is necessary to collaborate when making a final decision. A good system will combine politics with sound engineering judgment. It is good to see that most of the counties in Kansas (who have AM systems) are basing their final decisions on this combination of politics and engineering judgment.

3.2.5 How does your County Prioritize Maintenance?

In this case, counties without an Asset Management system were asked how they go about prioritizing maintenance. Although this question was aimed at counties without an Asset Management system, it was answered by counties with an Asset Management system in place. The responses varied, but they were grouped into three specific categories. One response was that the county based their maintenance priority on inspections. These responses include not only the county road and bridge crew going out and physically inspecting pavements and bridges, but also public inspection. In smaller counties it is not uncommon to schedule maintenance based on a phone call from a property owner that notices a clogged culvert or a missing sign.

Another response was to base maintenance on a yearly rotation. This is most common for maintaining pavements. For example, if a county has 90 miles of pavement to maintain, they may overlay or chip seal 30 miles of pavement a year for 3 years on rotation. This is most common in counties with many miles of pavement and low traffic volumes.

The third category of responses was that counties base their maintenance schedule on a combination of inspection, software and public input. This response was mostly noted for counties with an Asset Management system that is used to its full potential. They keep their database up to date by updating the condition of the county assets based on physical inspection, public input and political input from the county commissioners and base maintenance priorities on the software output. Figure 3.17 through 3.20 display the resulting responses to this question.

While traditional methods of prioritization work well in some places, there is an increasing need to effectively allocate funds to areas that need it most. The best way to effectively allocate these funds is to use software to analyze data based on input from field inspection. The software takes the guess work out of prioritization and allows the county to get the most from its money. Since most counties in Kansas currently have no form of Asset Management, most counties still base their prioritization on inspections alone.

3.2.6 Does Your County Have an Inventory?

Another question asked was aimed at those counties without an Asset Management system. The counties were asked if they have inventories for bridges, culverts and signs. This was an important question since an updated inventory is a key component of an asset management system. It is a law in the state of Kansas that all counties keep an inventory of all bridges spanning 20' or more. Culverts are any crossroad structures that are not classified as bridges.

Although this question was aimed at counties without an Asset Management system, it was answered by counties with a system. This did not affect the analysis because even if the county had an Asset Management system, it did not necessarily mean they had inventory of every sign or culvert in the county. There were a few comments in the questionnaire that said the county did not have inventory of signs or culverts but that they were working to make it happen. These counties were given a yes response to simplify the analysis since eventually they will have inventories of these assets.

The results show that all counties have inventories of their bridges, but most counties have not created inventories for culverts or signs. Figure 3.21 through 3.24 display the counties responses by population.

3.2.7 Does Your County Have a Cost Accounting System?

Another question asked of the counties without an Asset Management system was whether or not they had a cost accounting system. This is another key component to the development of a functioning asset management system. Out of 30 counties that answered this question, only one county said they did not have a cost accounting system. This was in a county with population below 5,000 people. Figure 3.25 shows how the counties responded to this question.

3.3 Conclusions

The purpose of the questionnaire was to determine the current state of practice in Kansas counties regarding their Asset Management system, or lack thereof. Kansas counties are mostly in a transition phase between using traditional methods of Asset Management and using software based Asset Management system. Therefore, it is hard to come up with a general state of practice for the average Kansas County. Since there are a few counties who have successfully implemented an Asset Management system, they become an invaluable resource in implementing Asset Management systems for other counties. Based on results obtained from this questionnaire, it became possible to see what the first steps in implementing an Asset Management system were, what software were used successfully and how these systems were maintained.

Most counties have yet to implement an Asset Management system. From the results of the questionnaire it becomes clear that some counties are ready to implement an Asset Management system. These are the counties that have a working cost accounting system in place and an up to date inventory of all bridges, culverts and signs. Once a county has these main factors, they should be ready to implement an Asset Management System.

Asset Management Practices in Kansas County Transportation Agencies

1. Does your agency have an Asset Management System?
   __yes __no If no, please skip to question 7.
2. Does your agency have any full or part time staff devoted to Asset Management?
   __yes __no If yes, how many hours per week do they work? __
   If no, please explain the situation.

For agencies with an Asset Management system in place, please answer the following questions: (if no Asset Management system, skip to question 7)

3. What type(s) of software is your agency using to manage the transportation infrastructure?

4. Who makes the final decision on maintenance and reconstruction projects? Explain.

5. In what ways (if any) do you feel that your agencies Asset Management system can be improved?

6. Please give any comments, ideas or recommendations you may have for this research project.

If your agency has no Asset Management system in place:

7. How does your agency prioritize the roadways that need rehabilitation or maintenance?

8. Does your agency have an inventory of all of the bridges and culverts in your county? Roadway signs? Explain.

9. Does your agency have some sort of cost accounting system in place? Explain.

10. Who makes the final decision on maintenance and reconstruction projects? Explain.

11. Please give any comments, ideas or recommendations you may have for this research project.

Figure 3.1: Asset Management questionnaire sent to all Kansas Counties

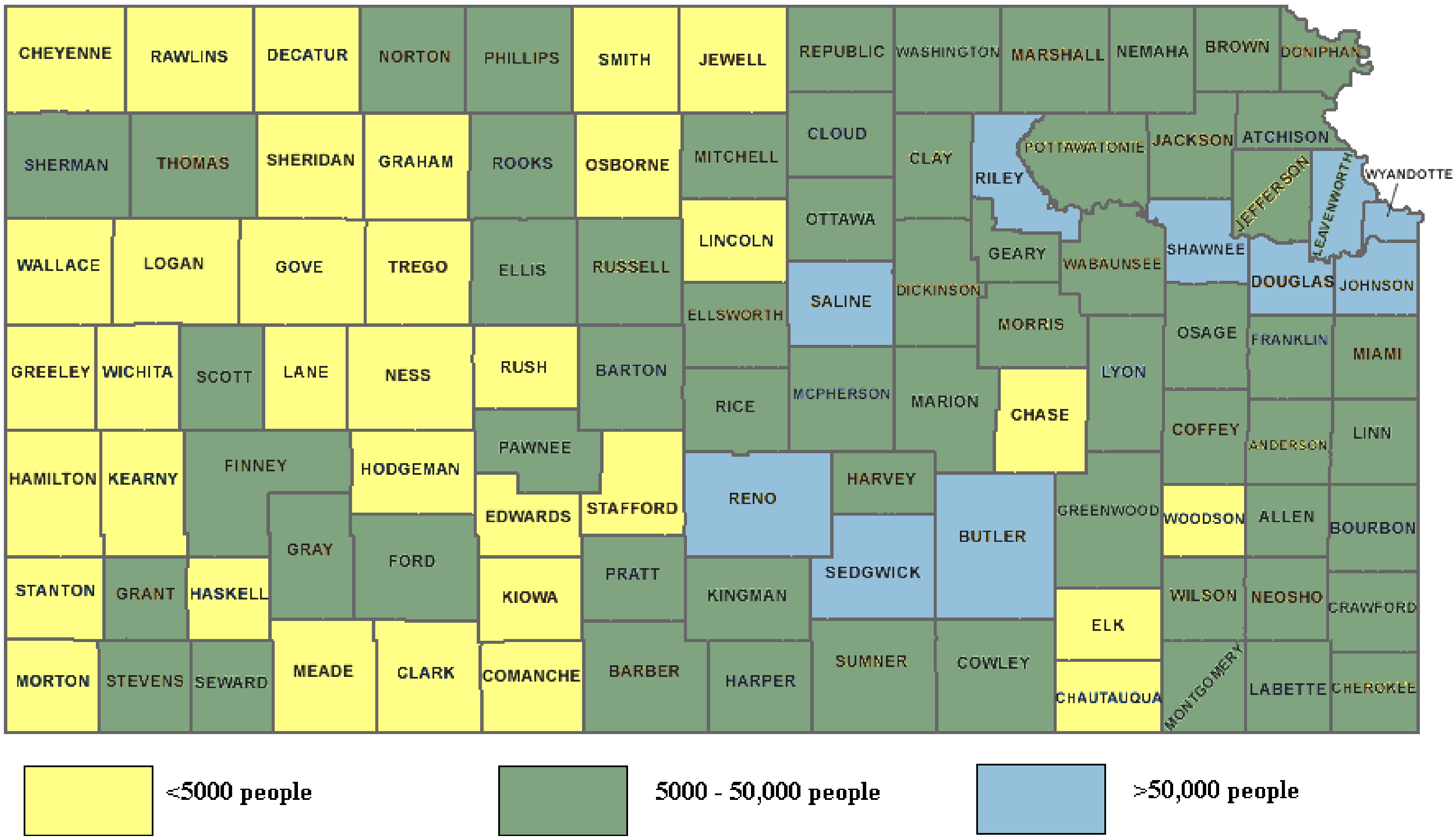

Figure 3.2: Kansas County population distribution (2000 census)

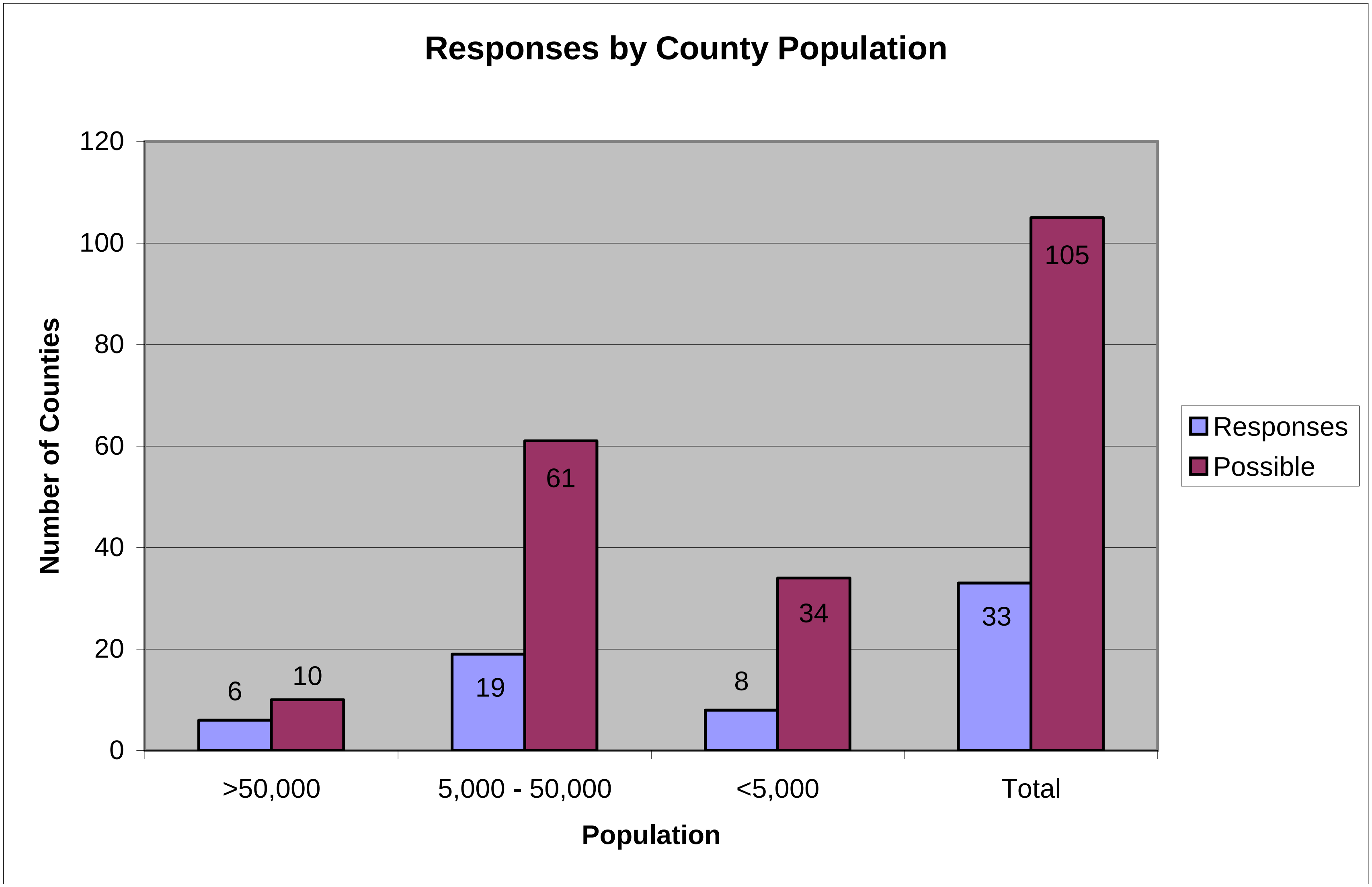

Figure 3.3: Responses by County population

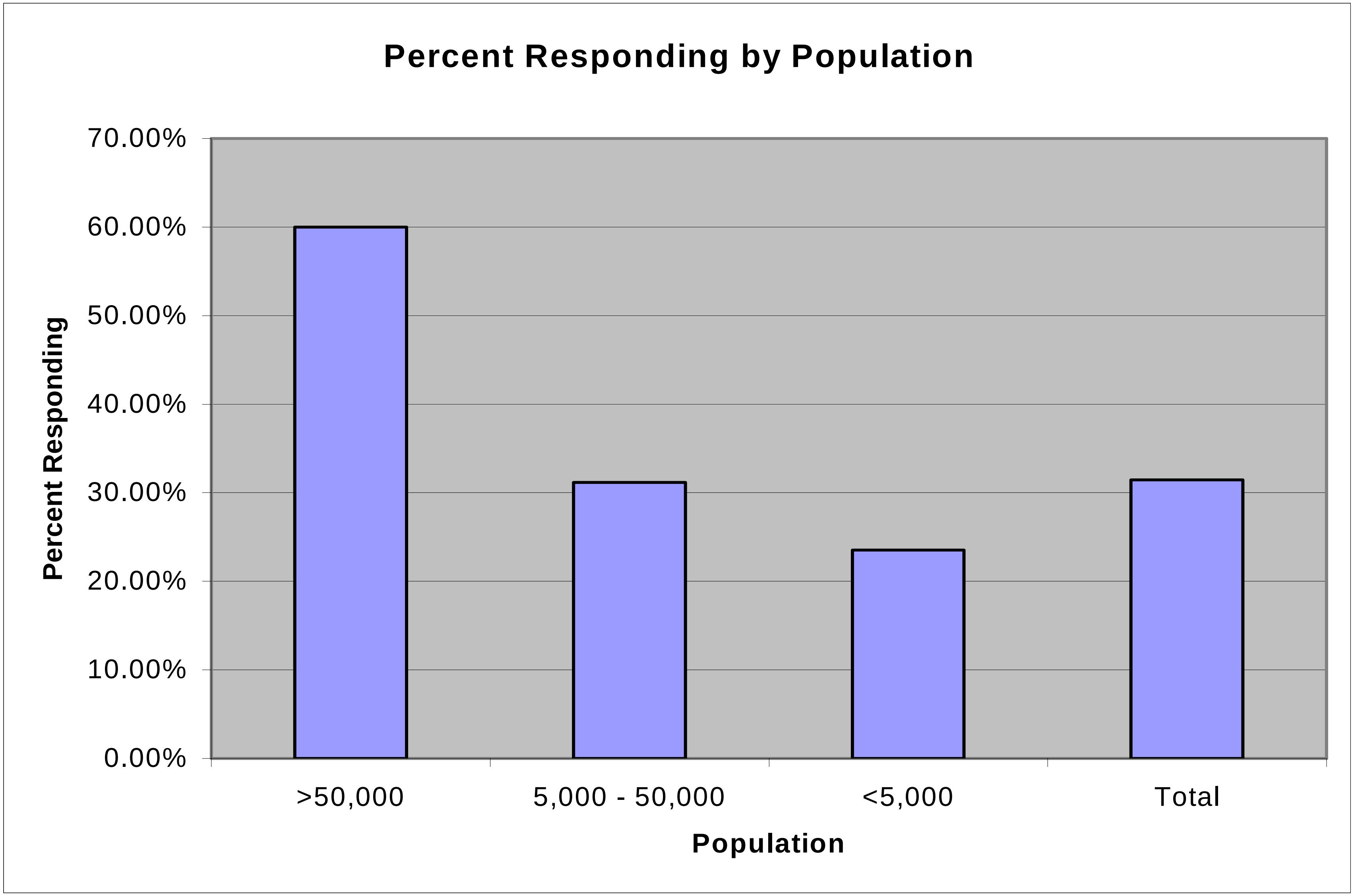

Figure 3.4: Percent Responding by County population

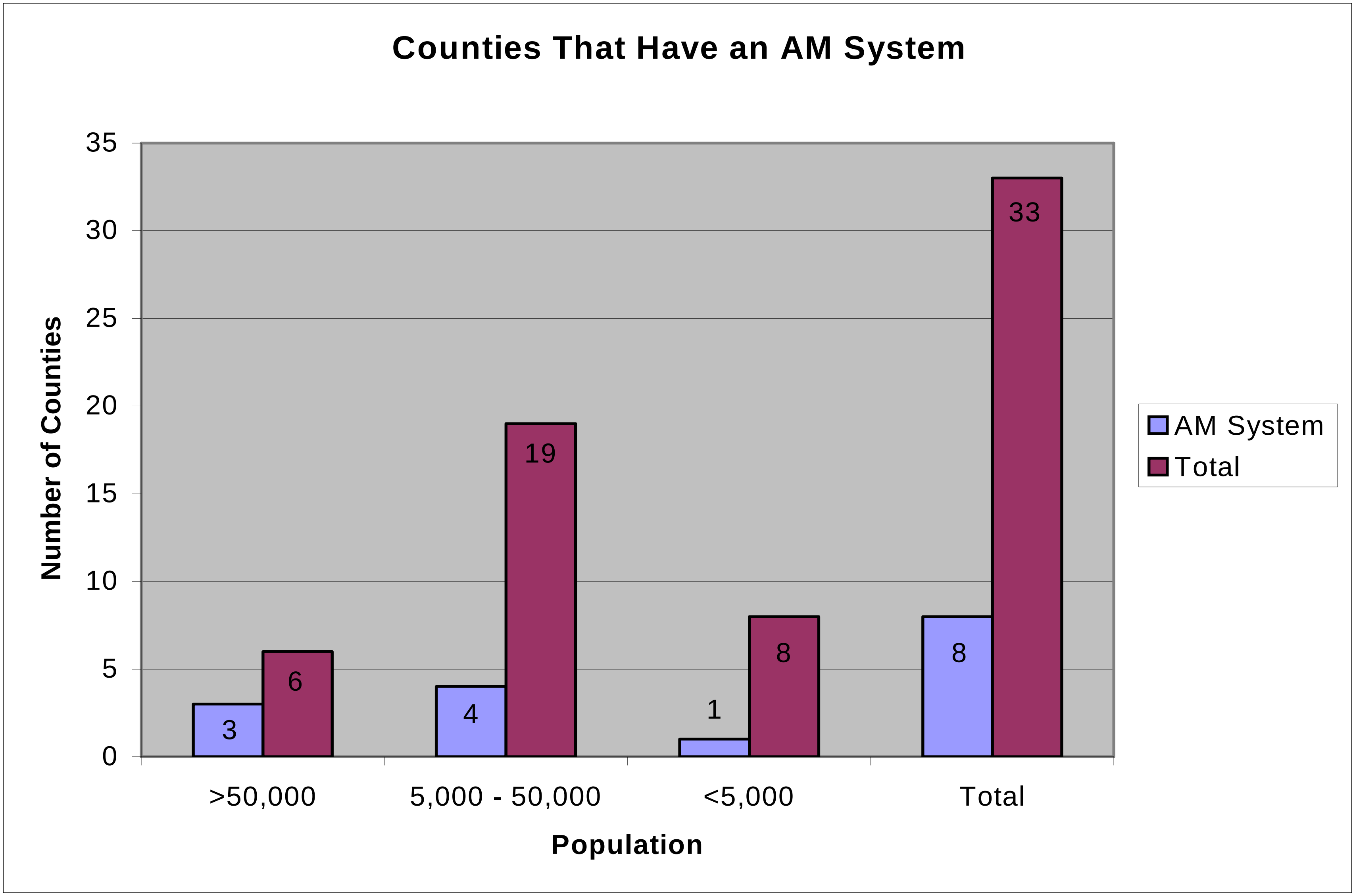

Figure 3.5: Counties that have an Asset Management (AM) system

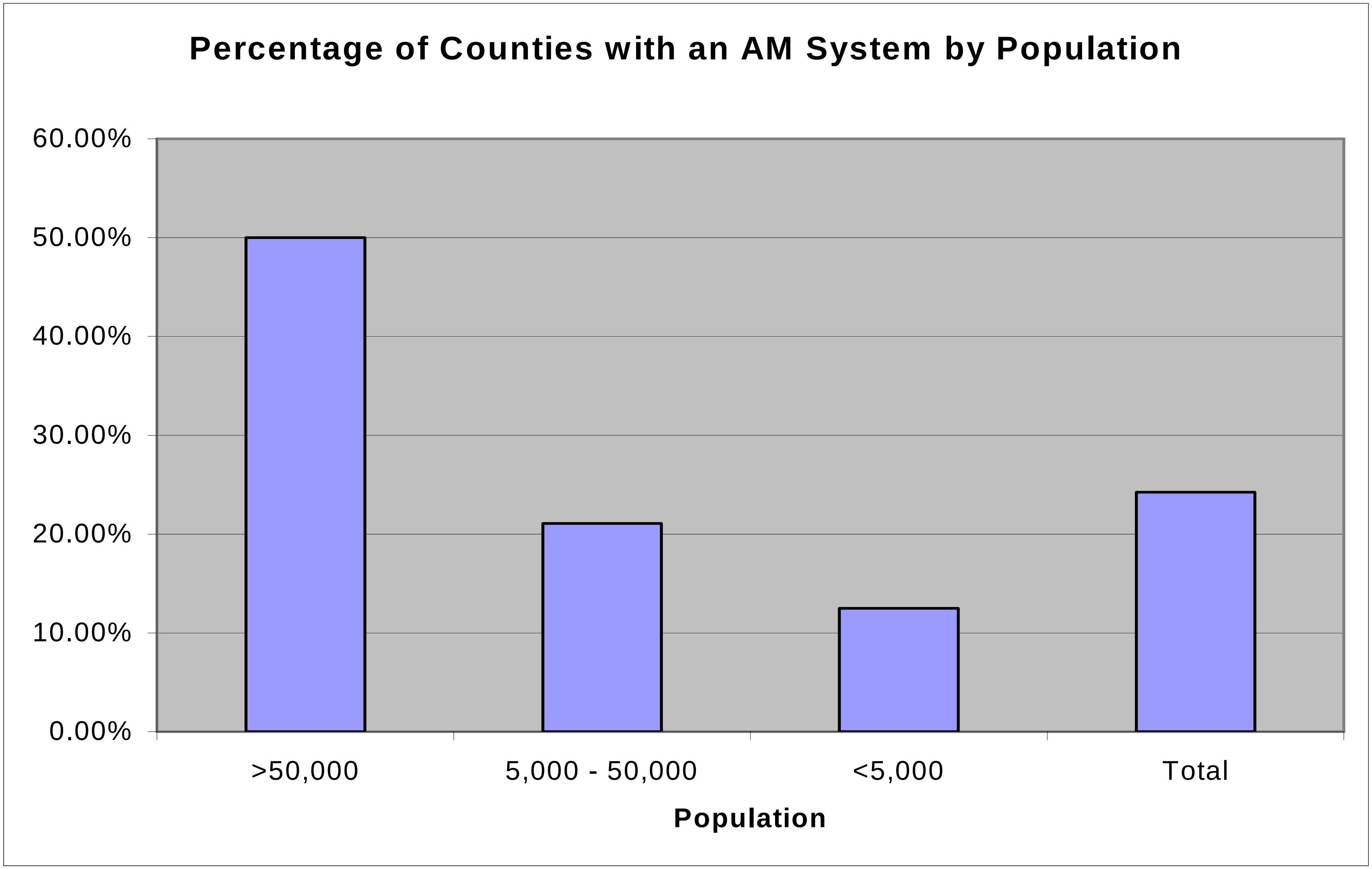

Figure 3.6: Percentage of Counties with an Asset Management (AM) system

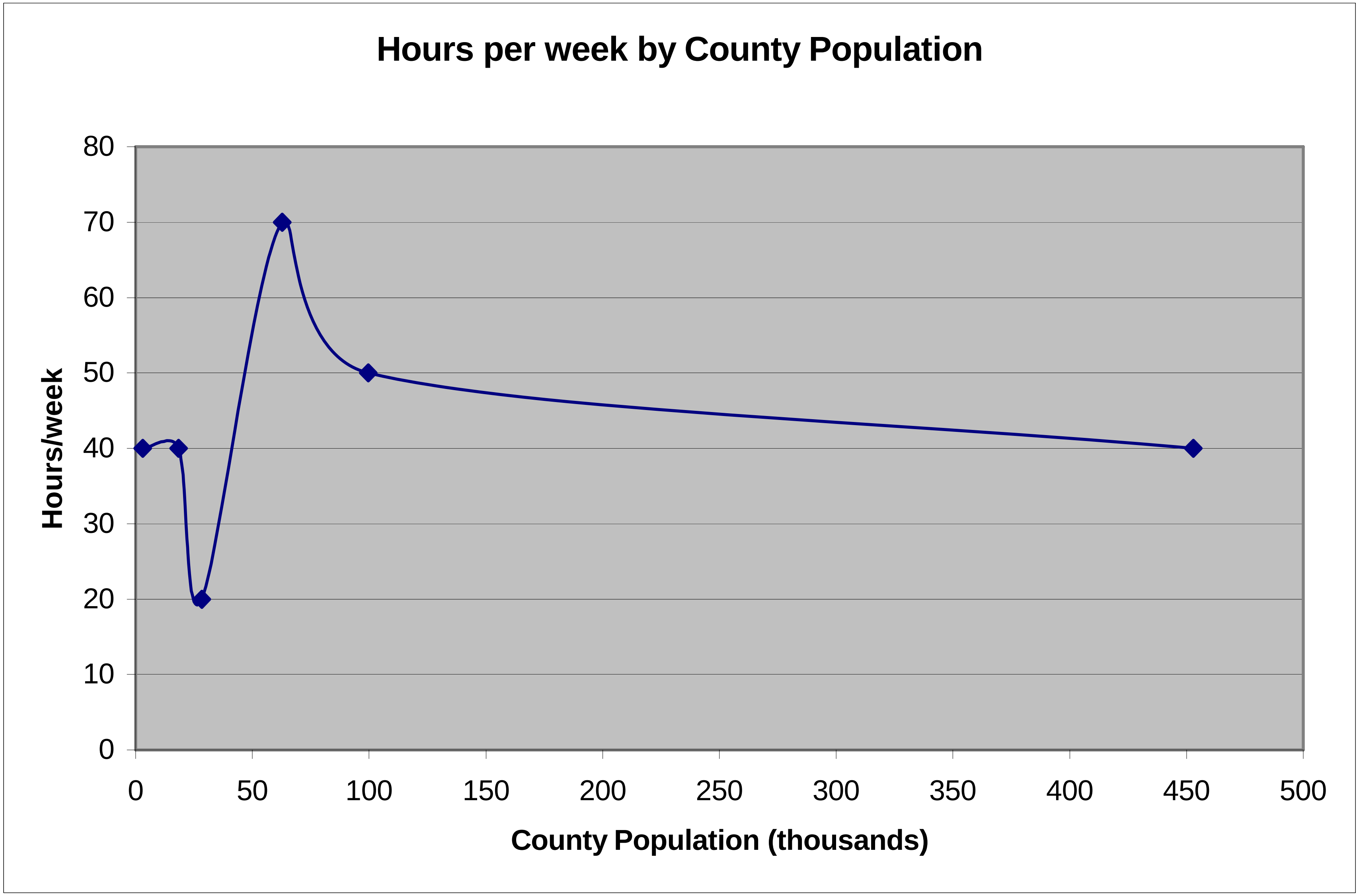

Figure 3.7: Hours per week spent maintaining an AM system by County population

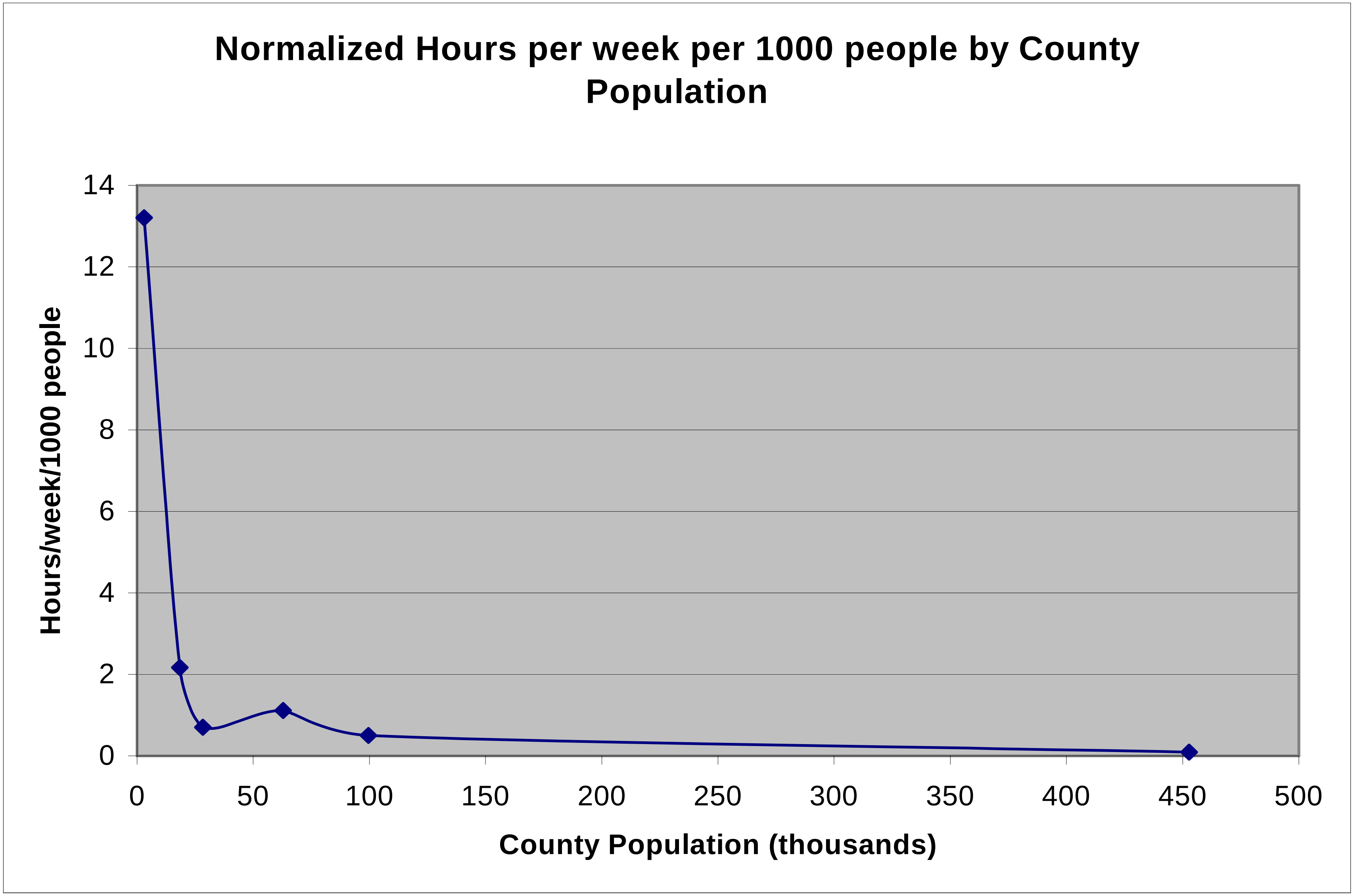

Figure 3.8: Normalized hours per week per 1000 people by County population

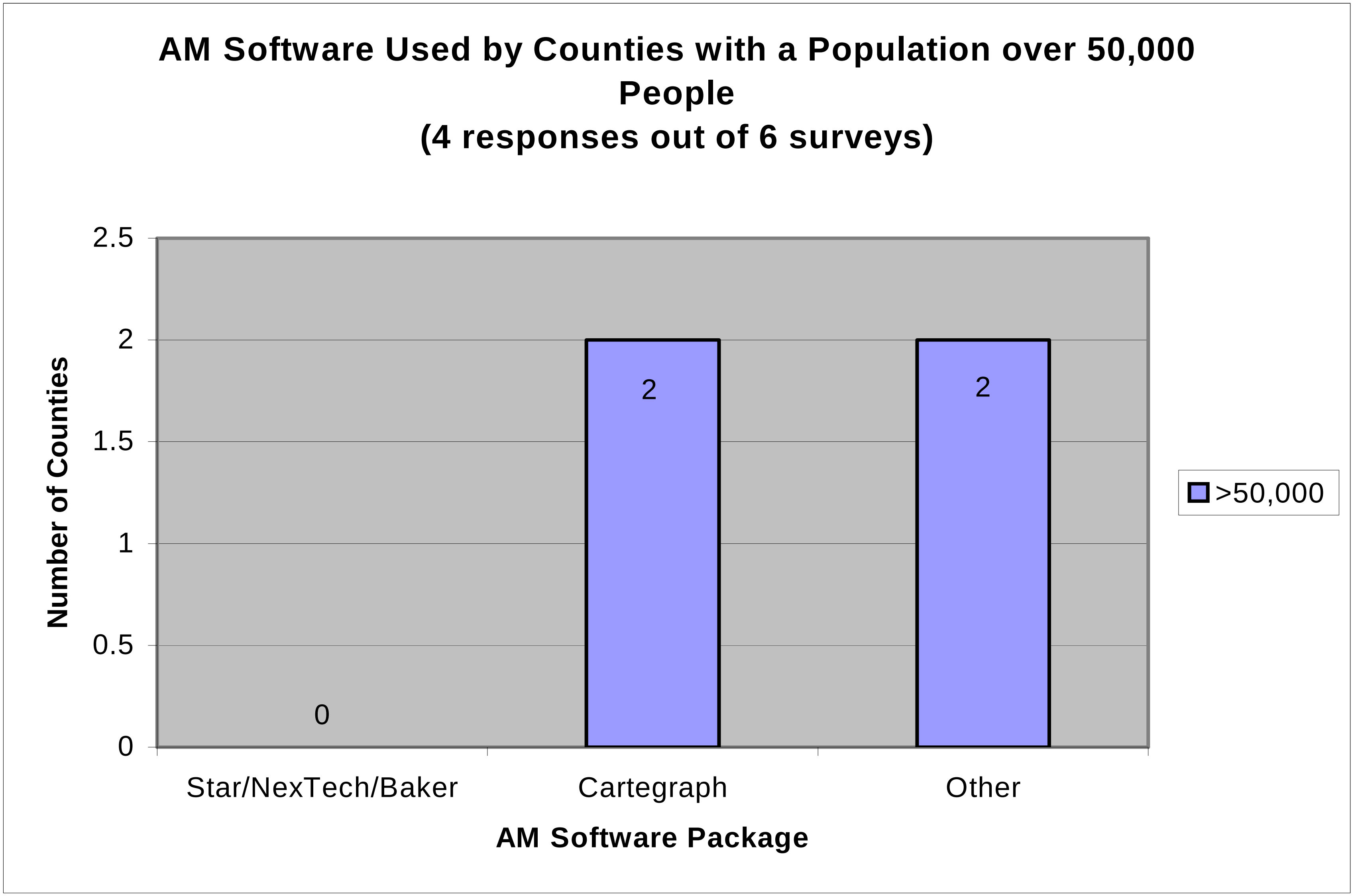

Figure 3.9: AM Software used by counties with pop. greater than 50,000 people

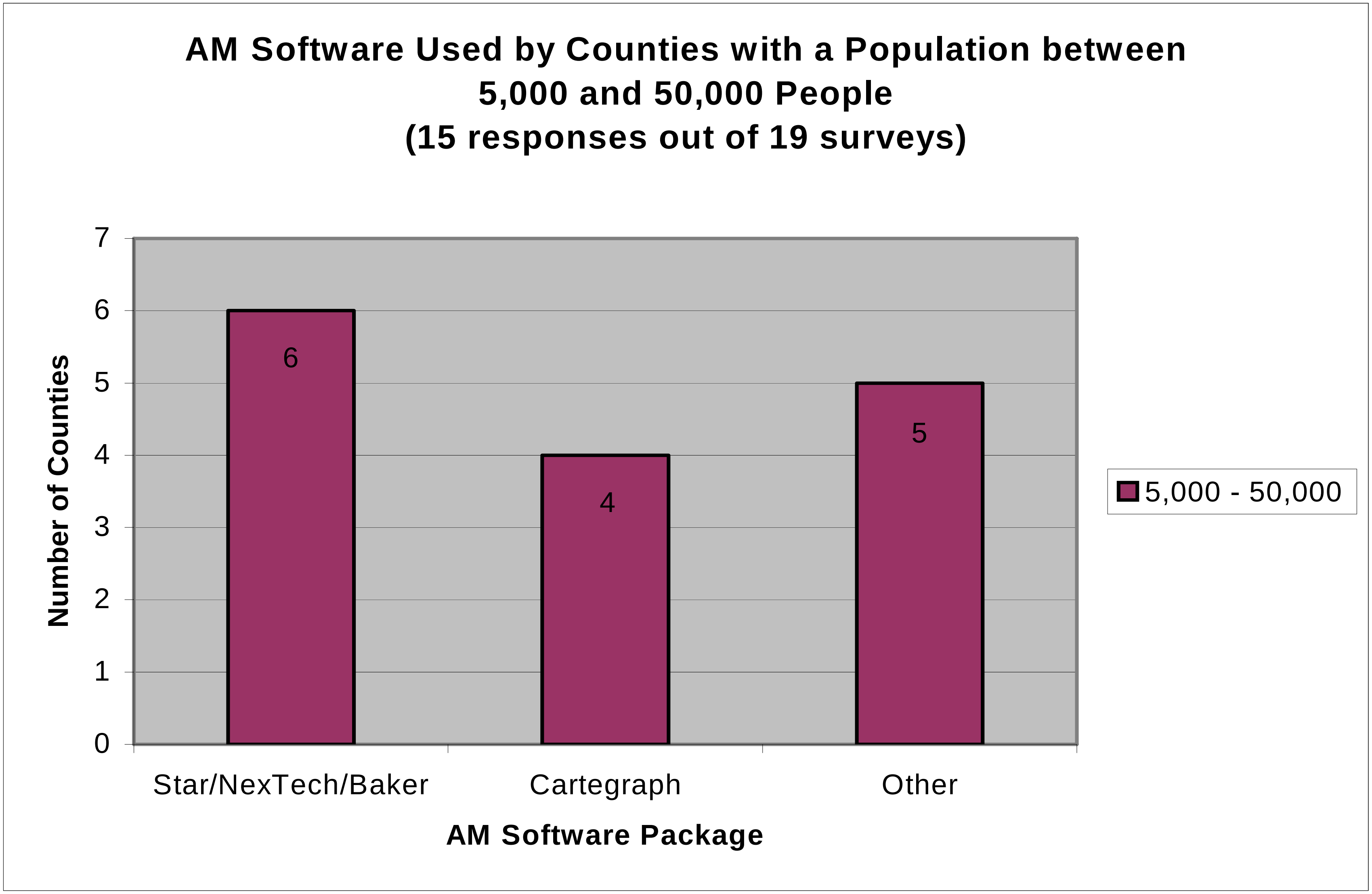

Figure 3.10: AM Software used by counties with pop. between 5,000 and 50,000 people

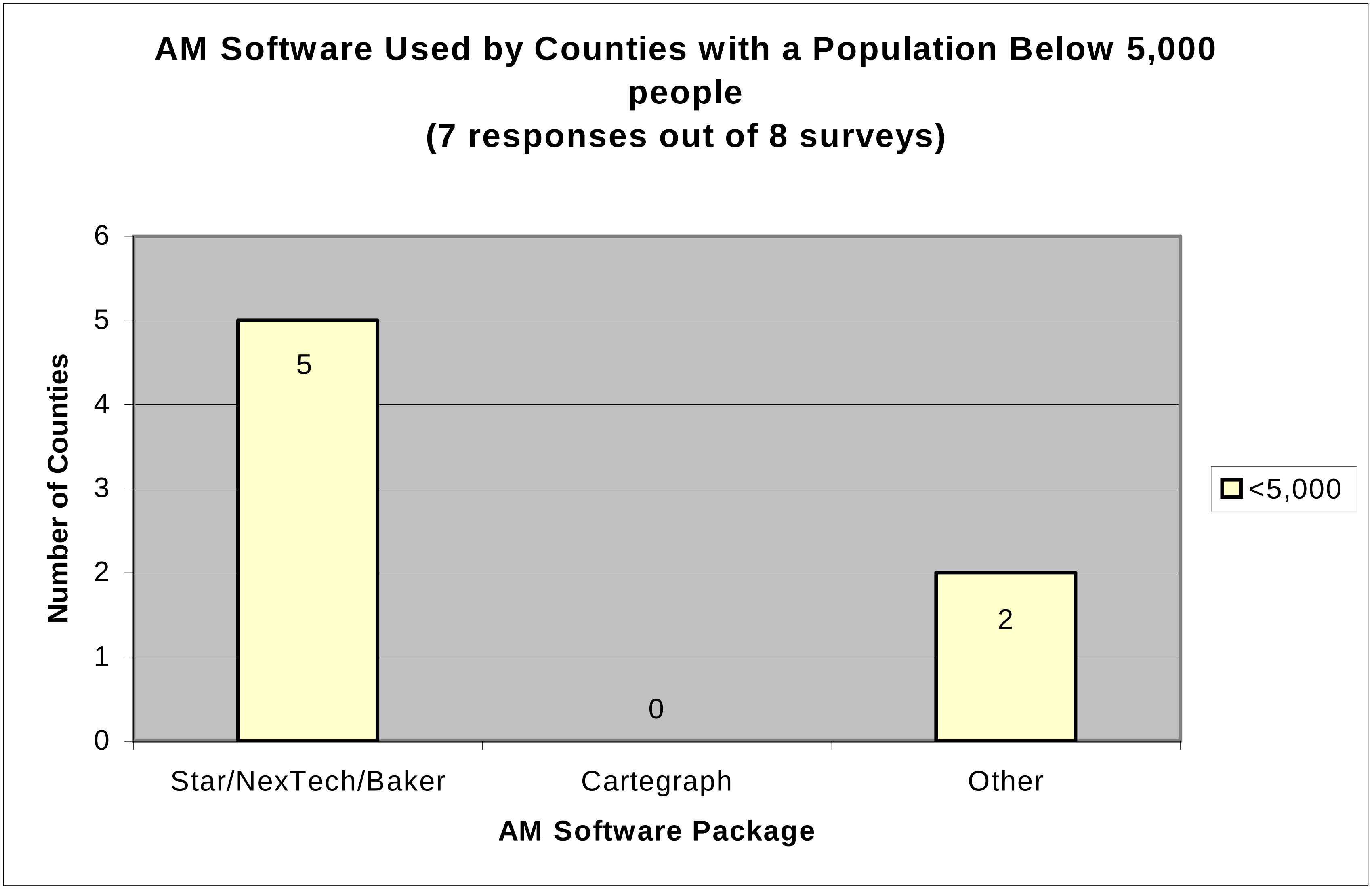

Figure 3.11: AM Software used by counties with pop. below 5,000 people

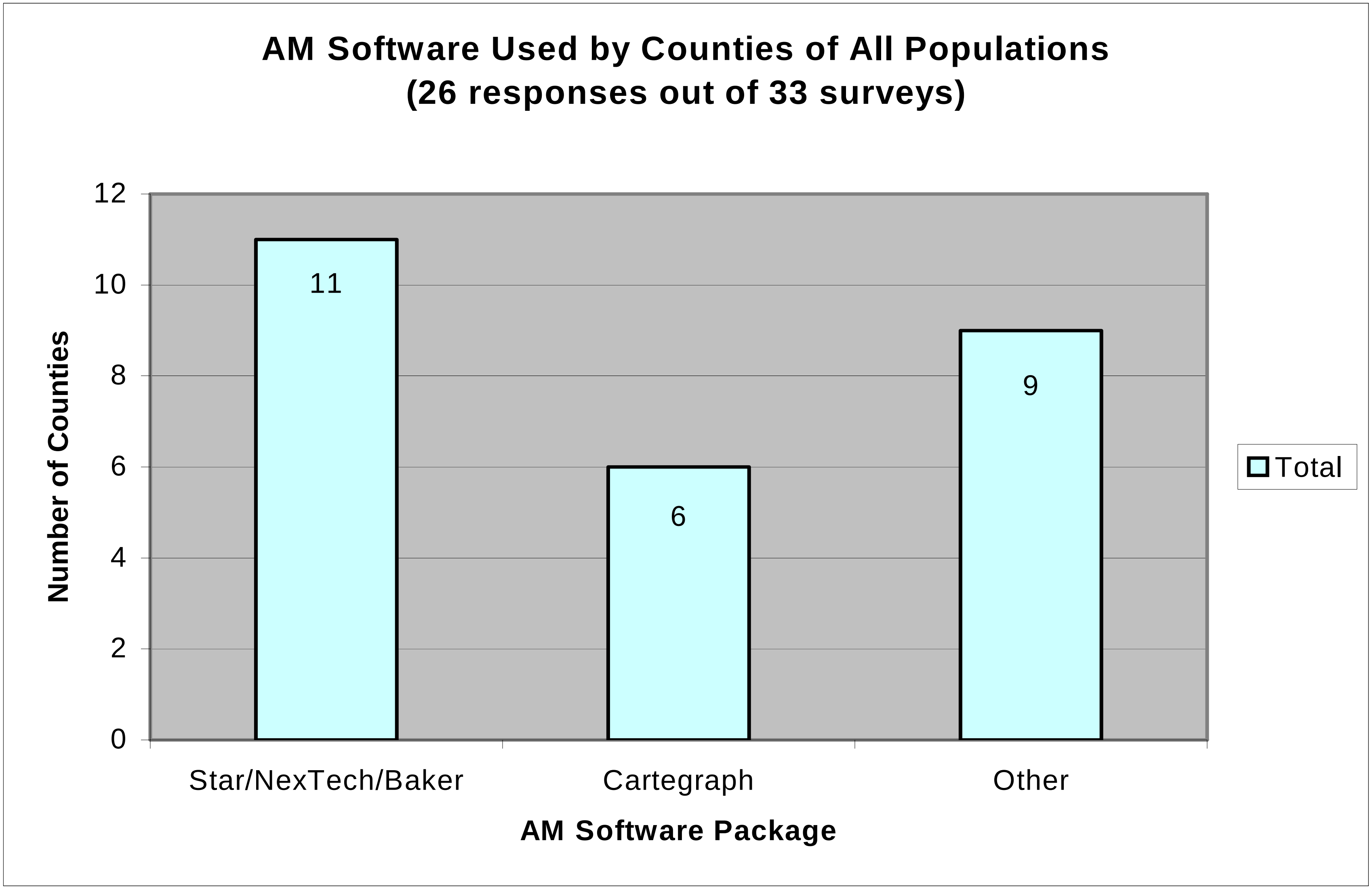

Figure 3.12: AM Software used by Kansas Counties

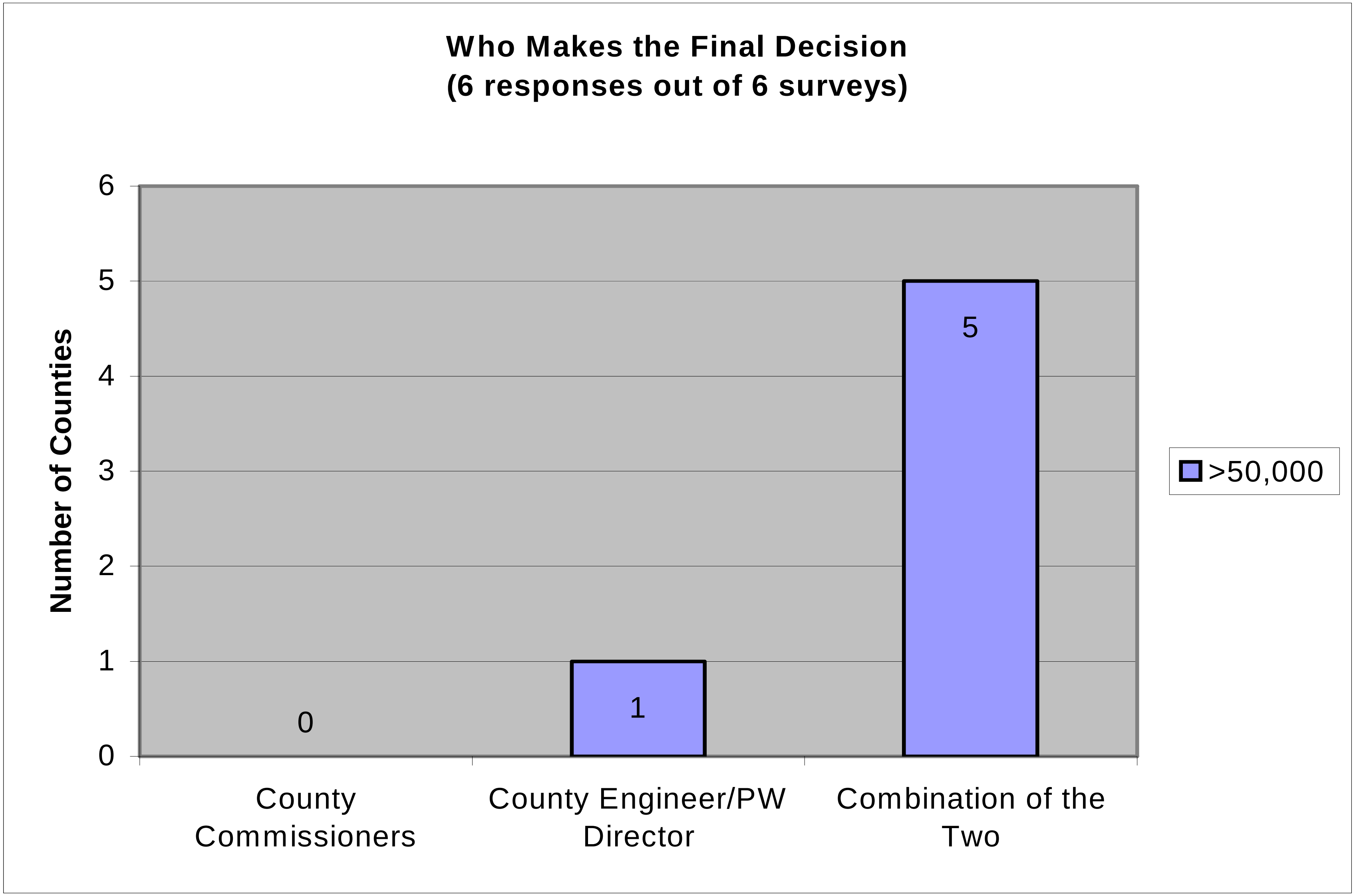

Figure 3.13: Making the final decision in counties with pop. greater than 50,000 people

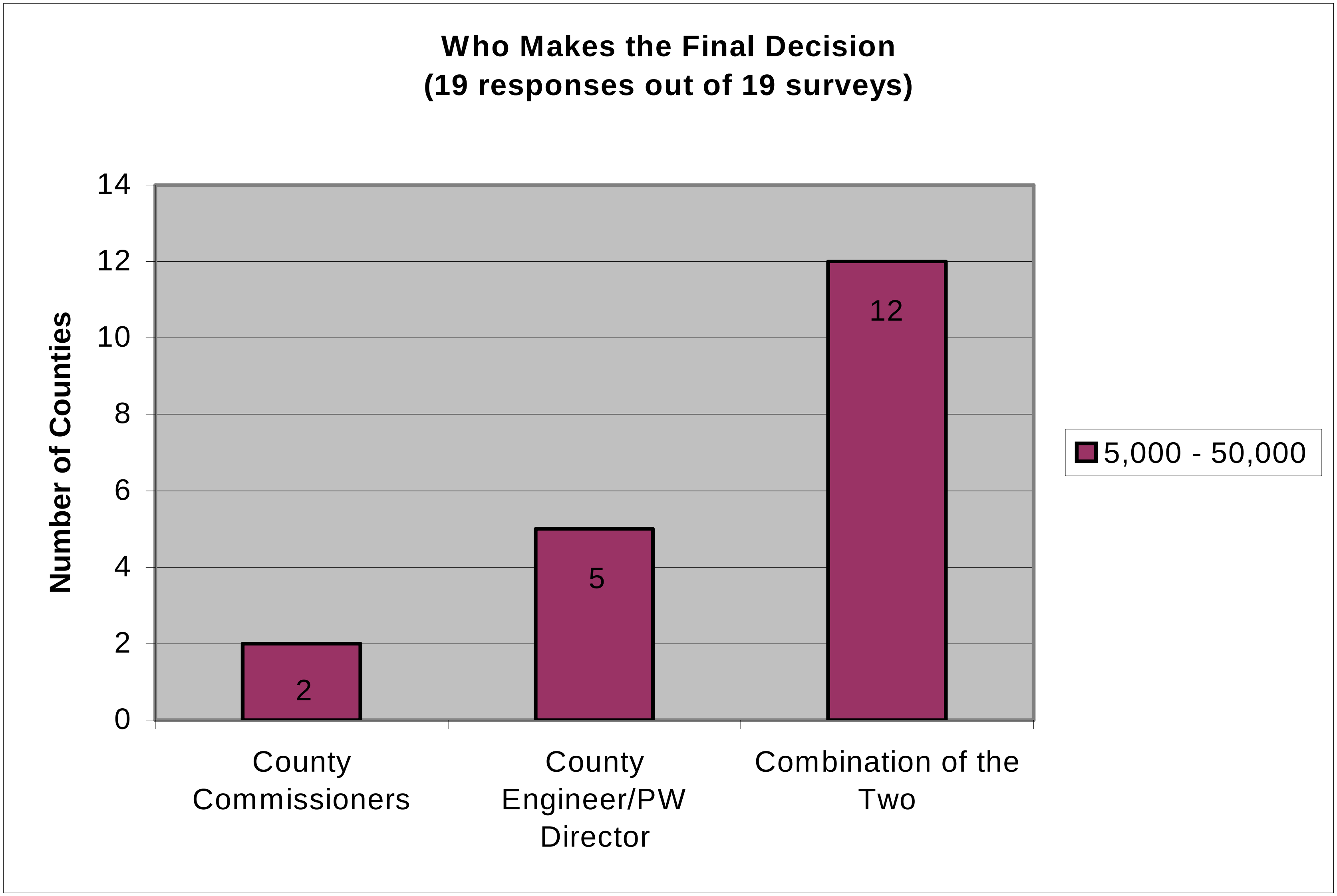

Figure 3.14: Making the final decision in counties with pop. between 5,000 and 50,000 people

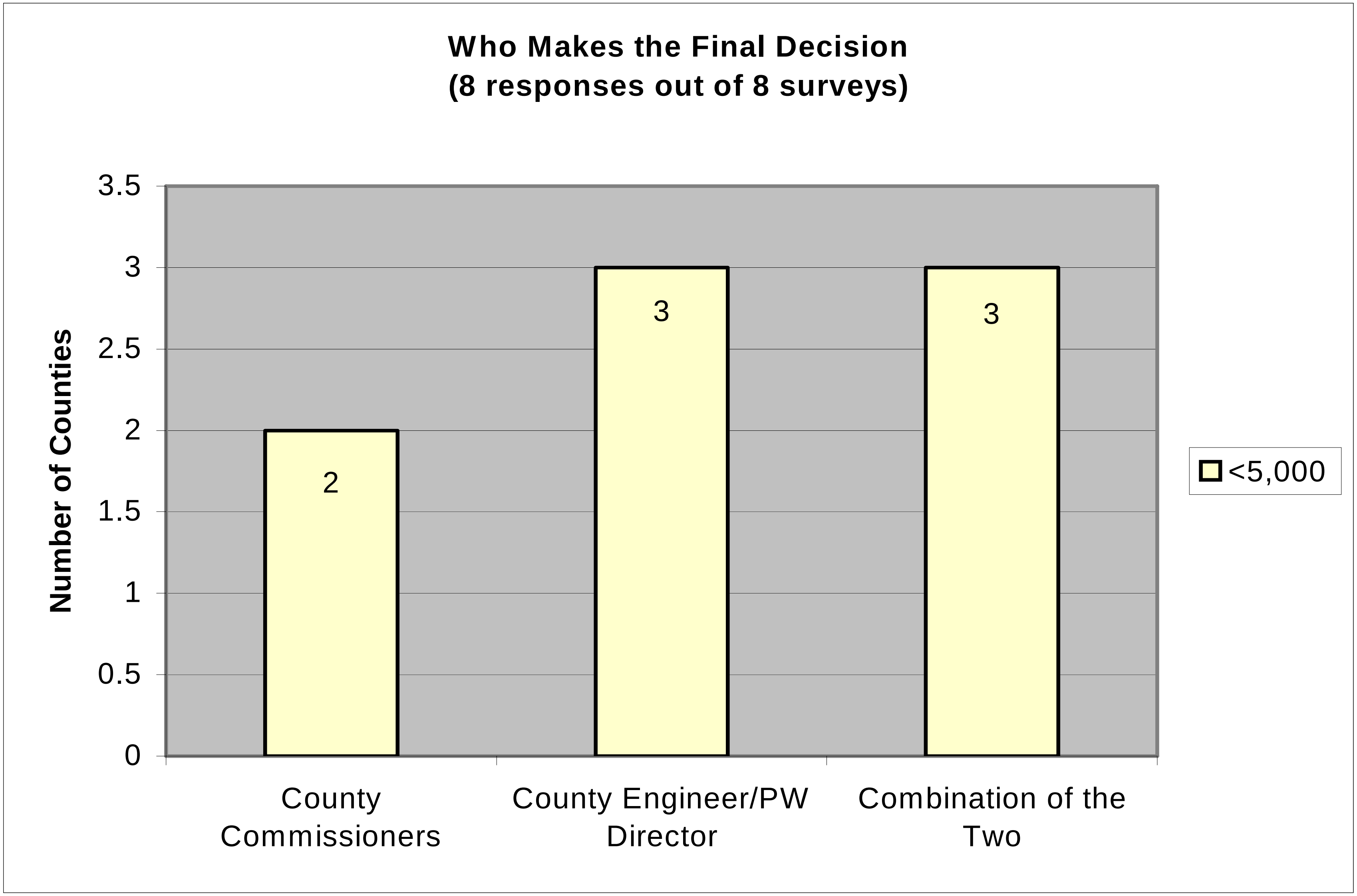

Figure 3.15: Making the final decision in counties with pop. below 5,000 people

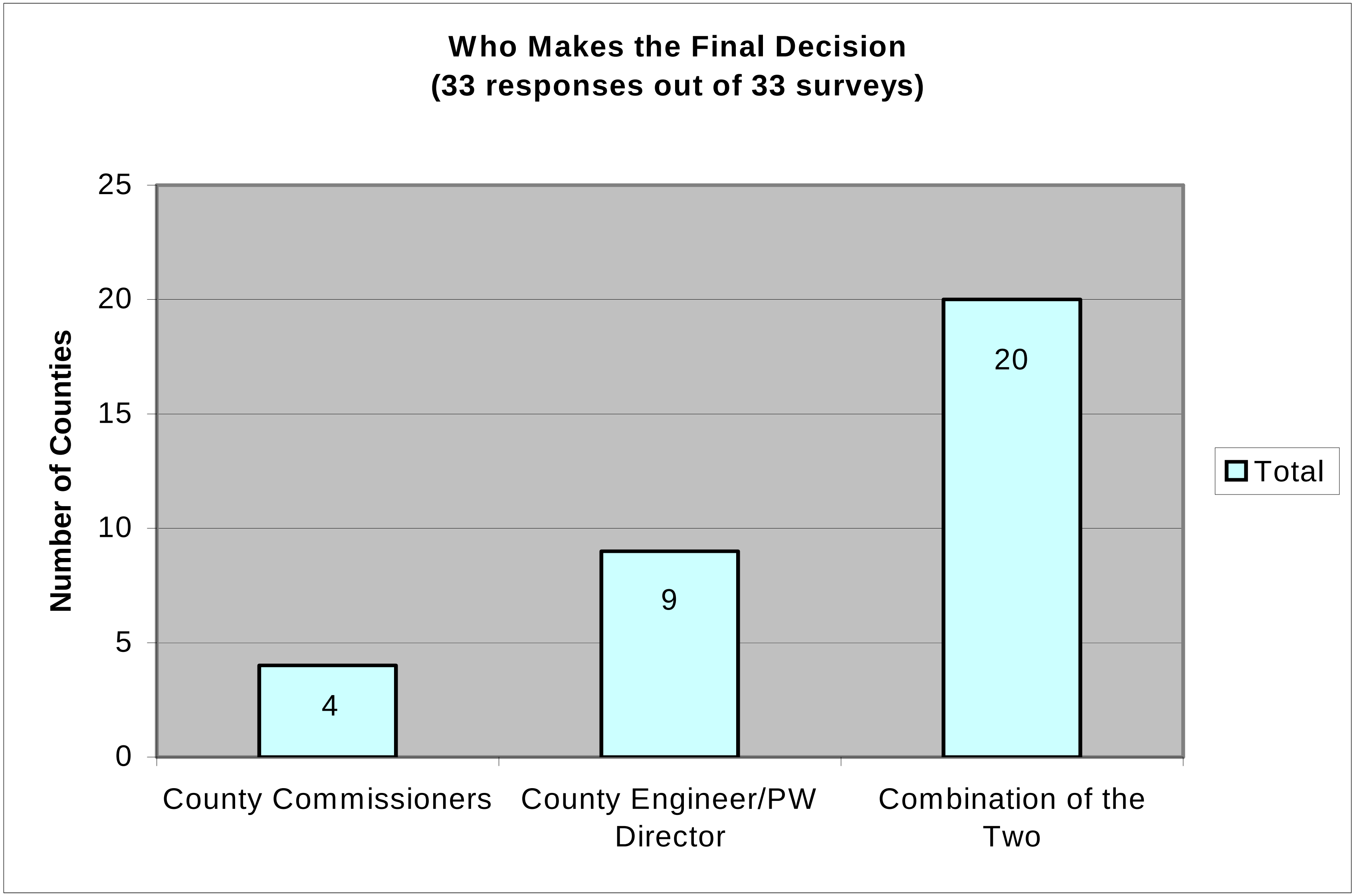

Figure 3.16: Making the final decision in all Kansas Counties

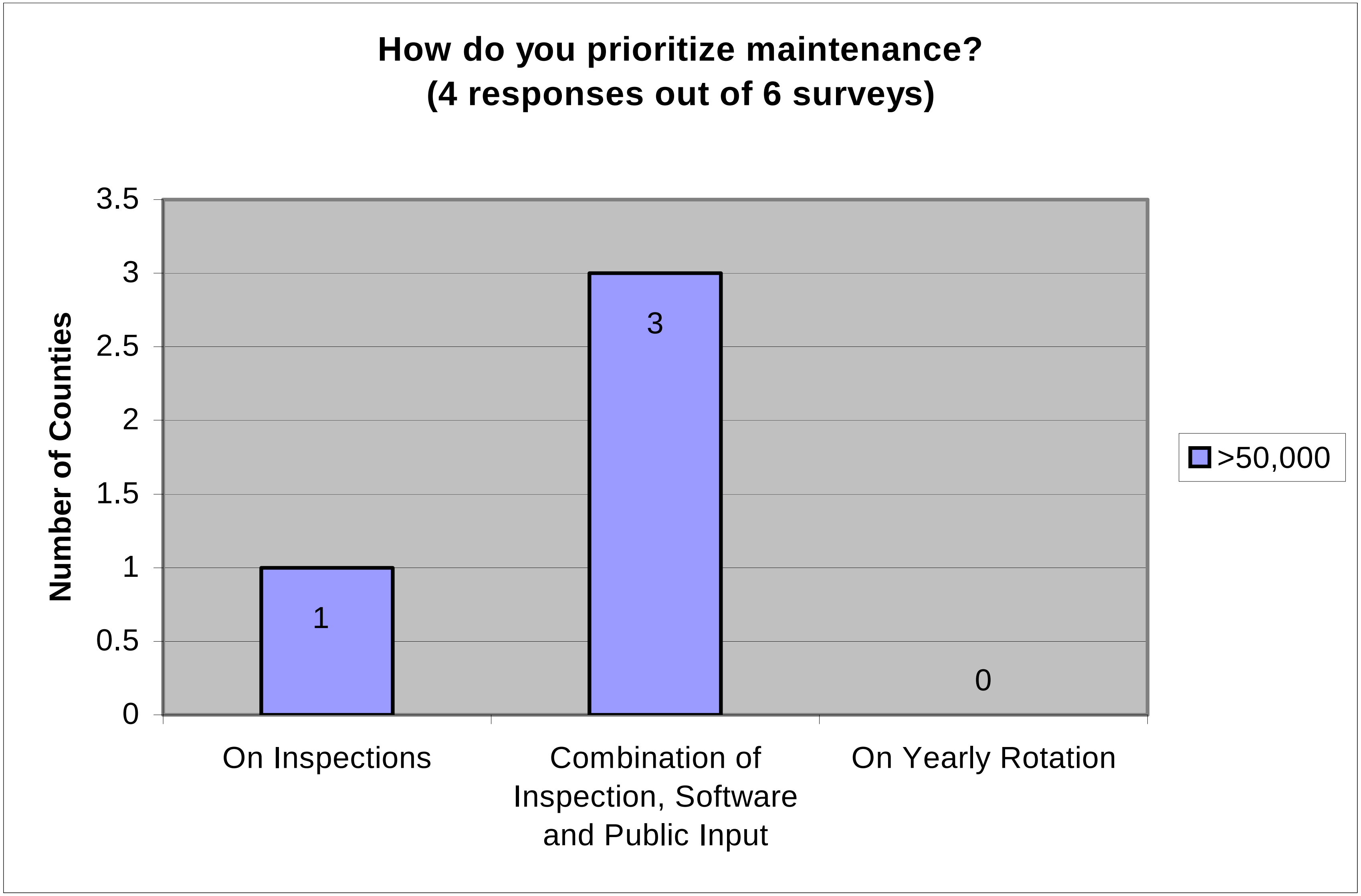

Figure 3.17: Prioritizing maintenance in counties with pop. above 50,000 people

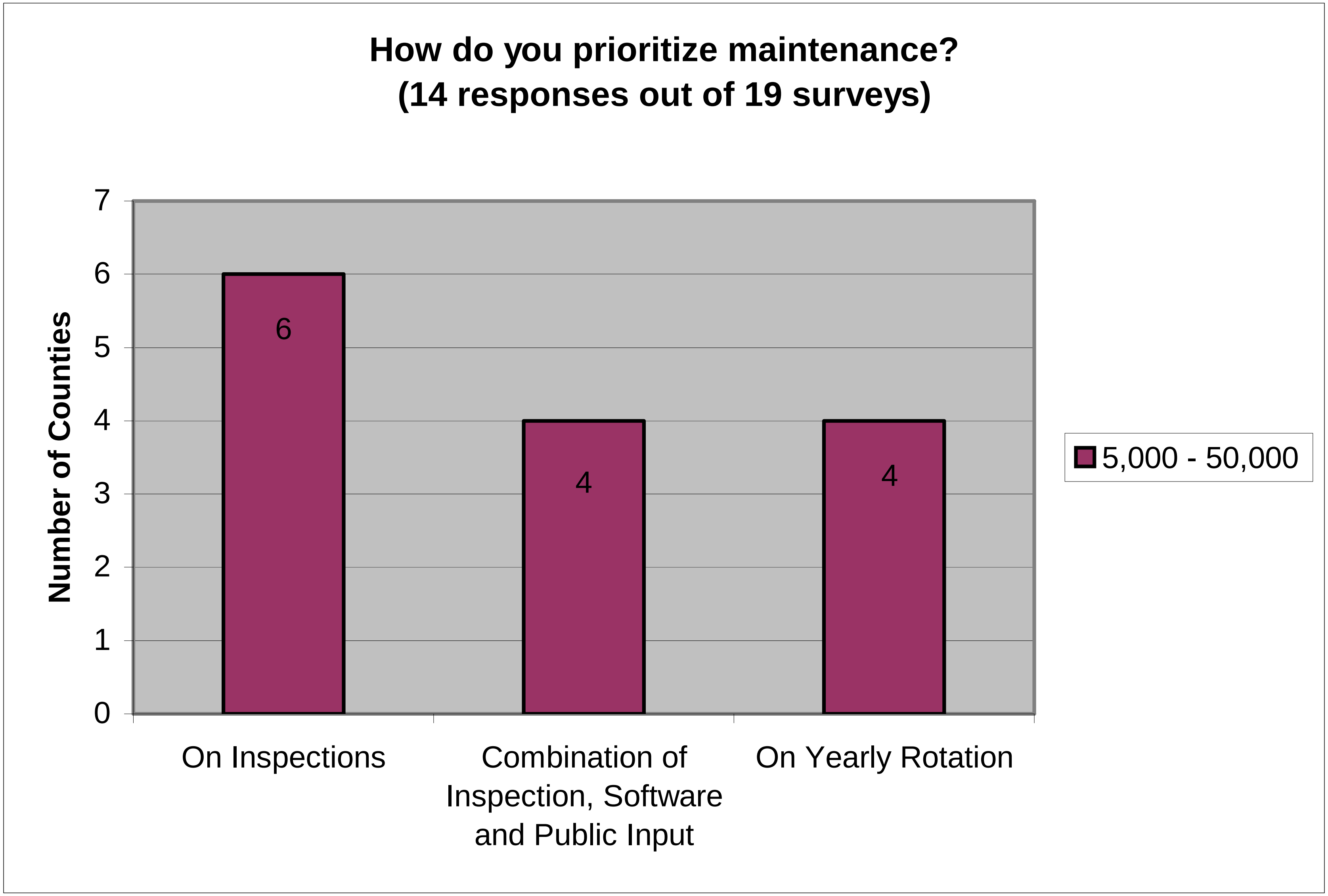

Figure 3.18: Prioritizing maintenance in counties with pop. between 5,000 and 50,000 people

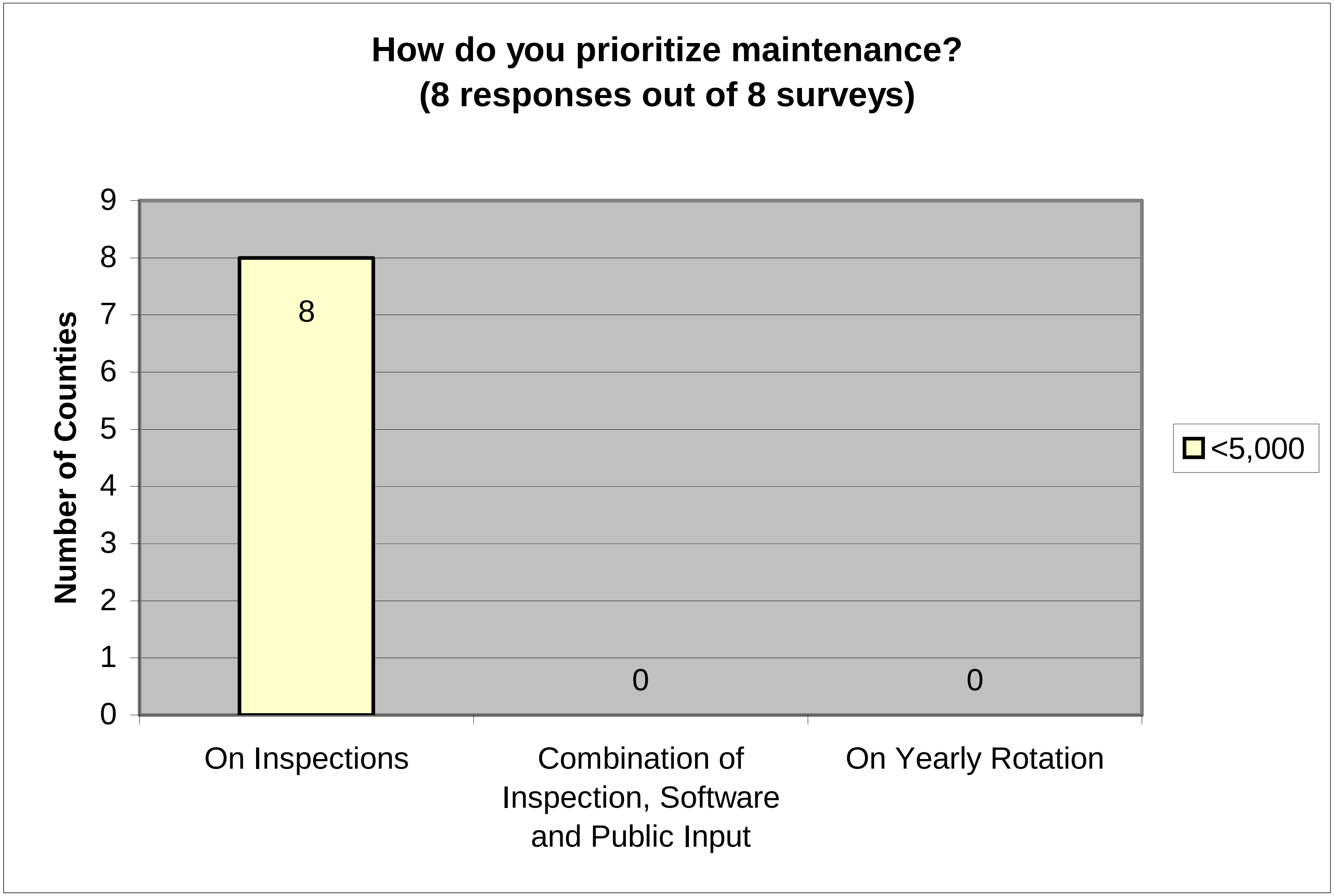

Figure 3.19: Prioritizing maintenance in counties with pop. below 5,000 people

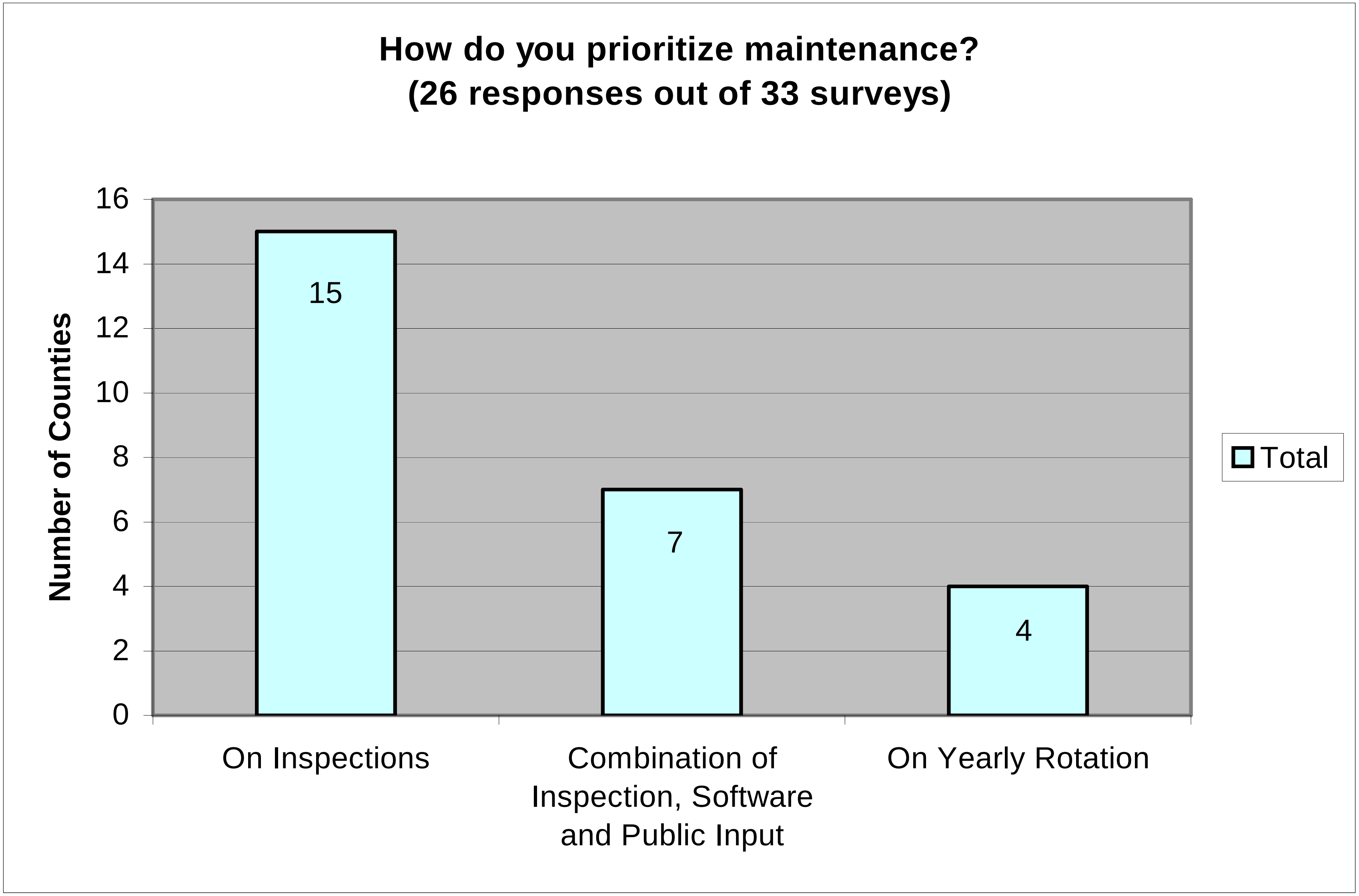

Figure 3.20: Prioritizing Maintenance in Kansas Counties

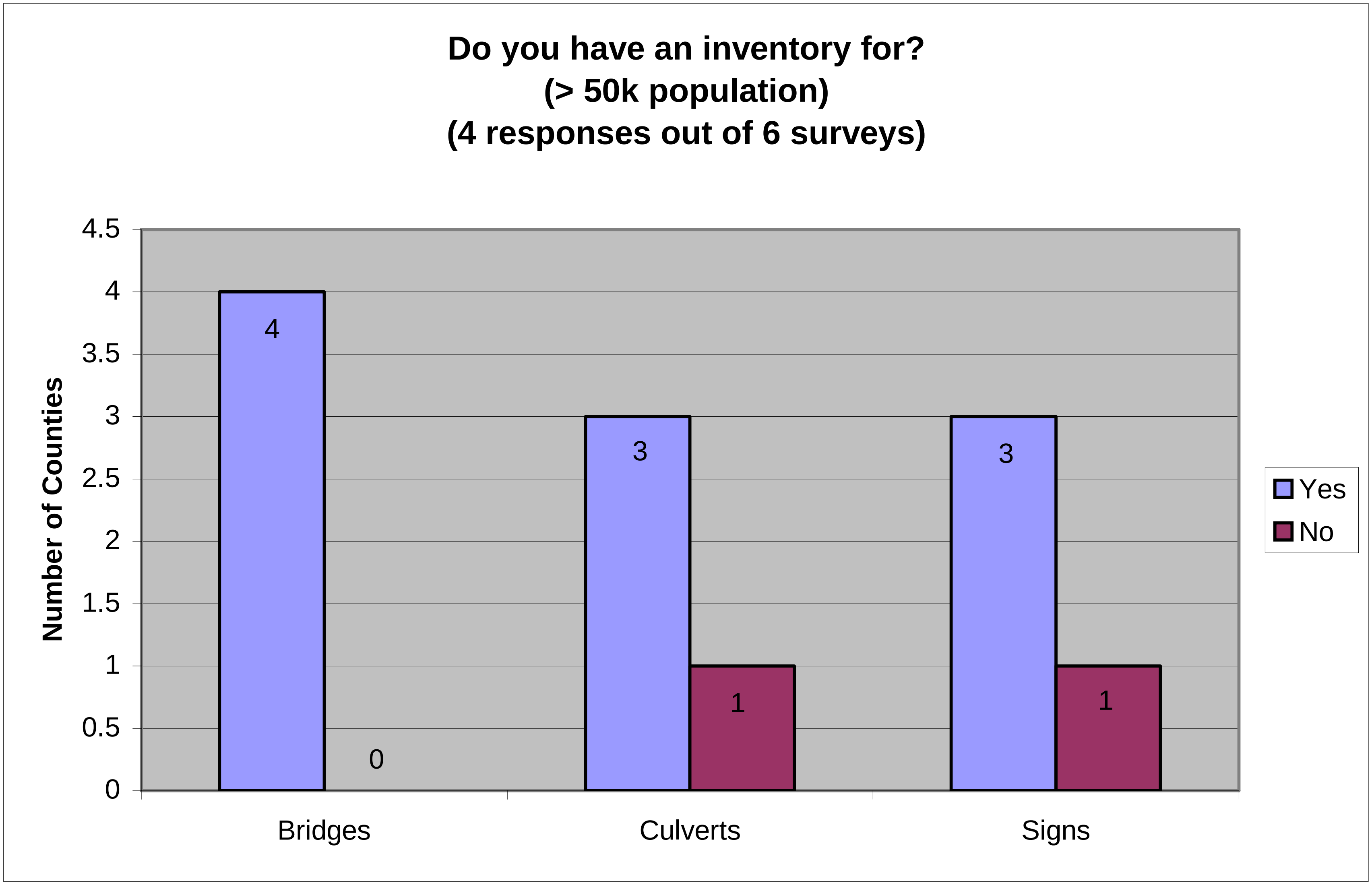

Figure 3.21: Inventories for counties with pop. greater than 50,000 people

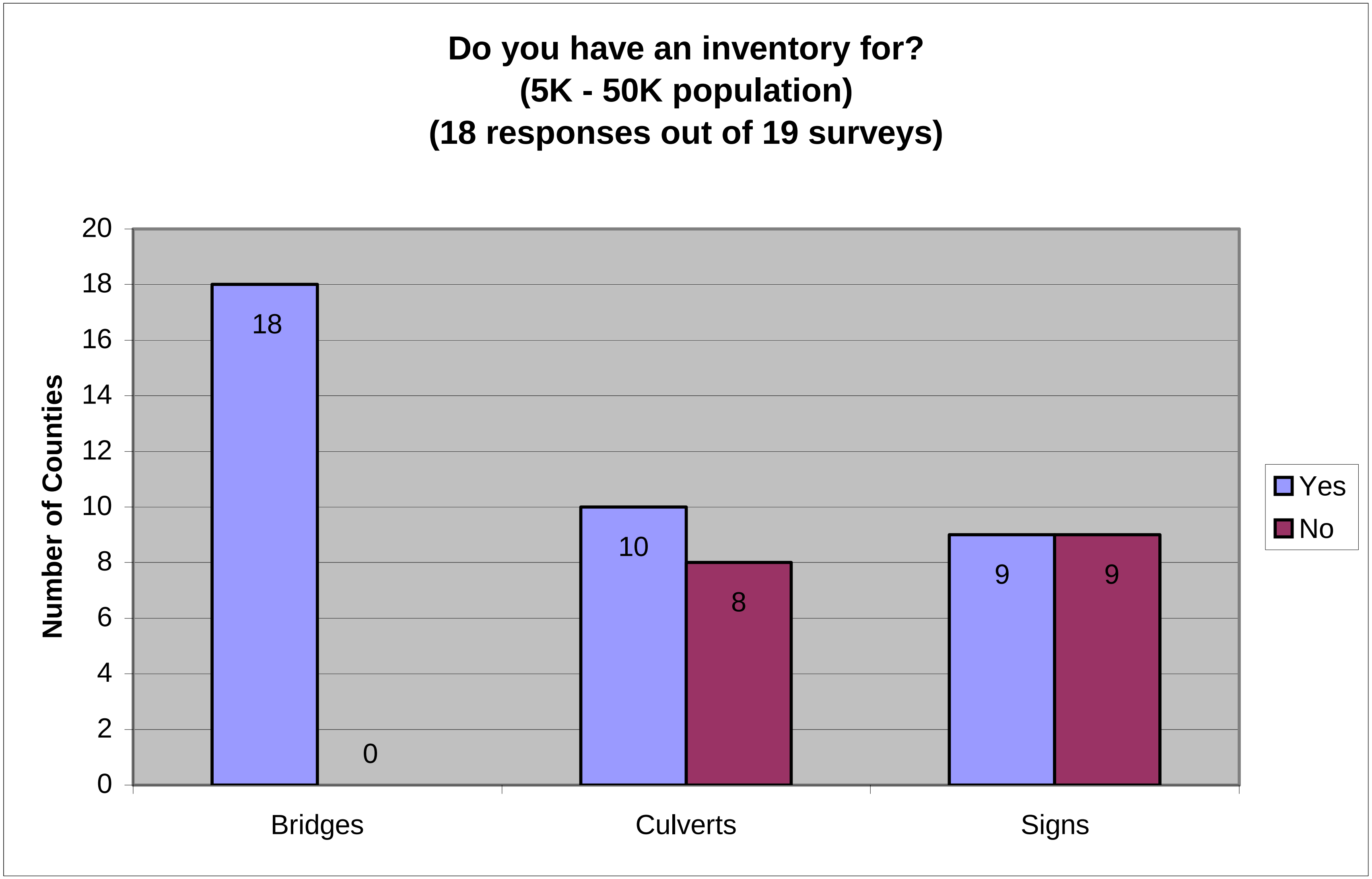

Figure 3.22: Inventories for counties with pop. between 5,000 and 50,000 people

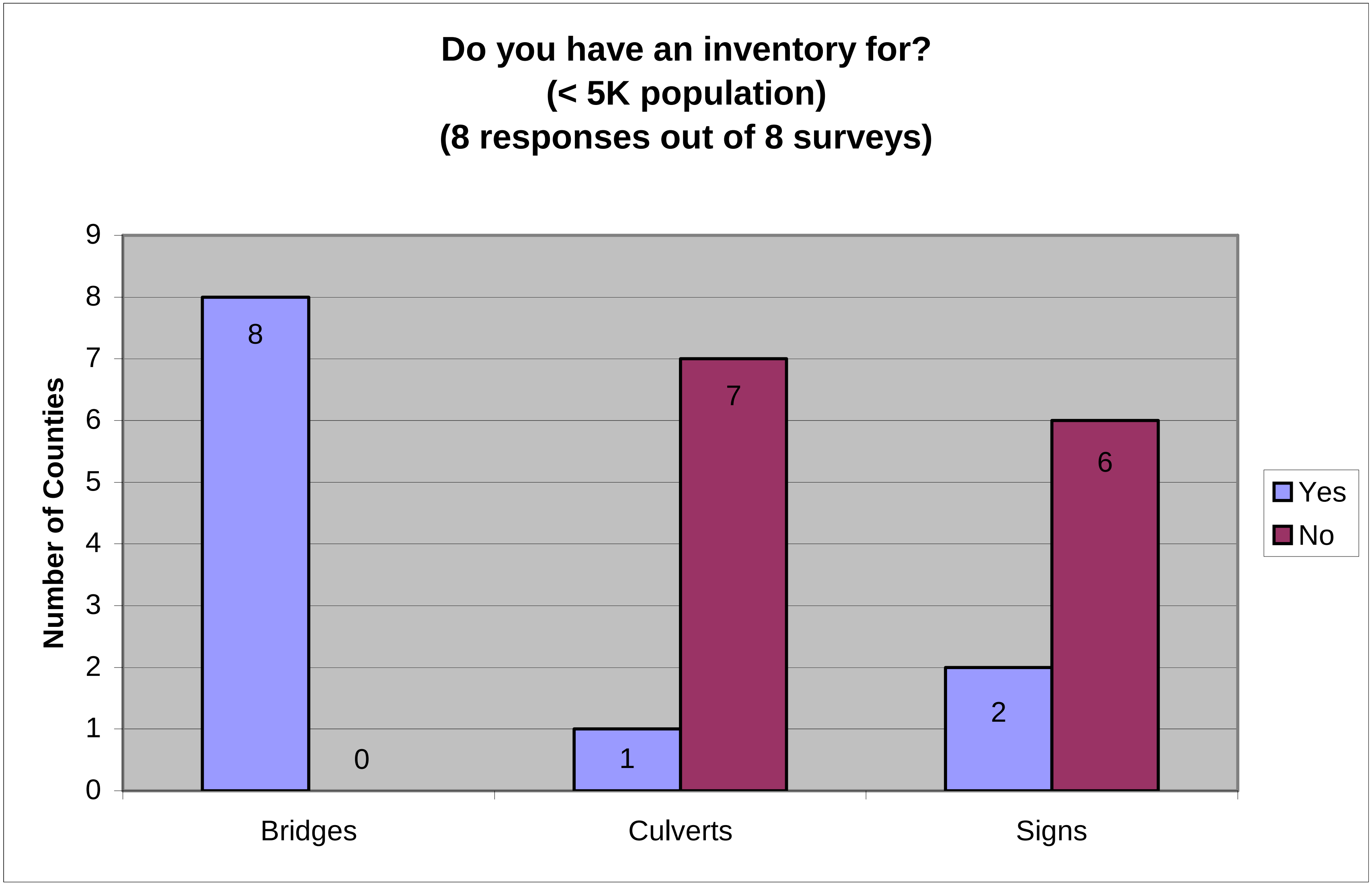

Figure 3.23: Inventories for counties with pop. below 5,000 people

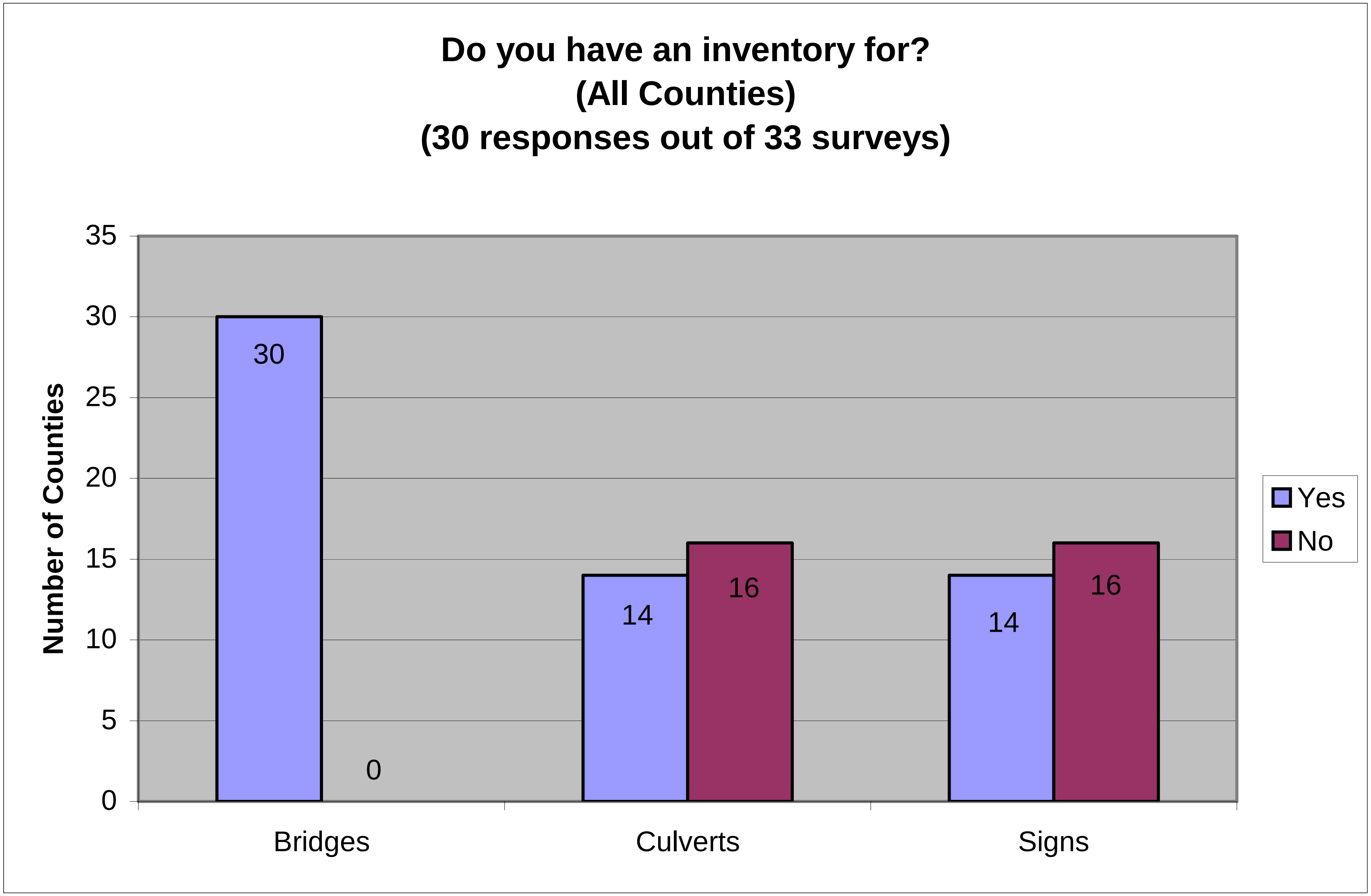

Figure 3.24: Inventories for all Kansas Counties

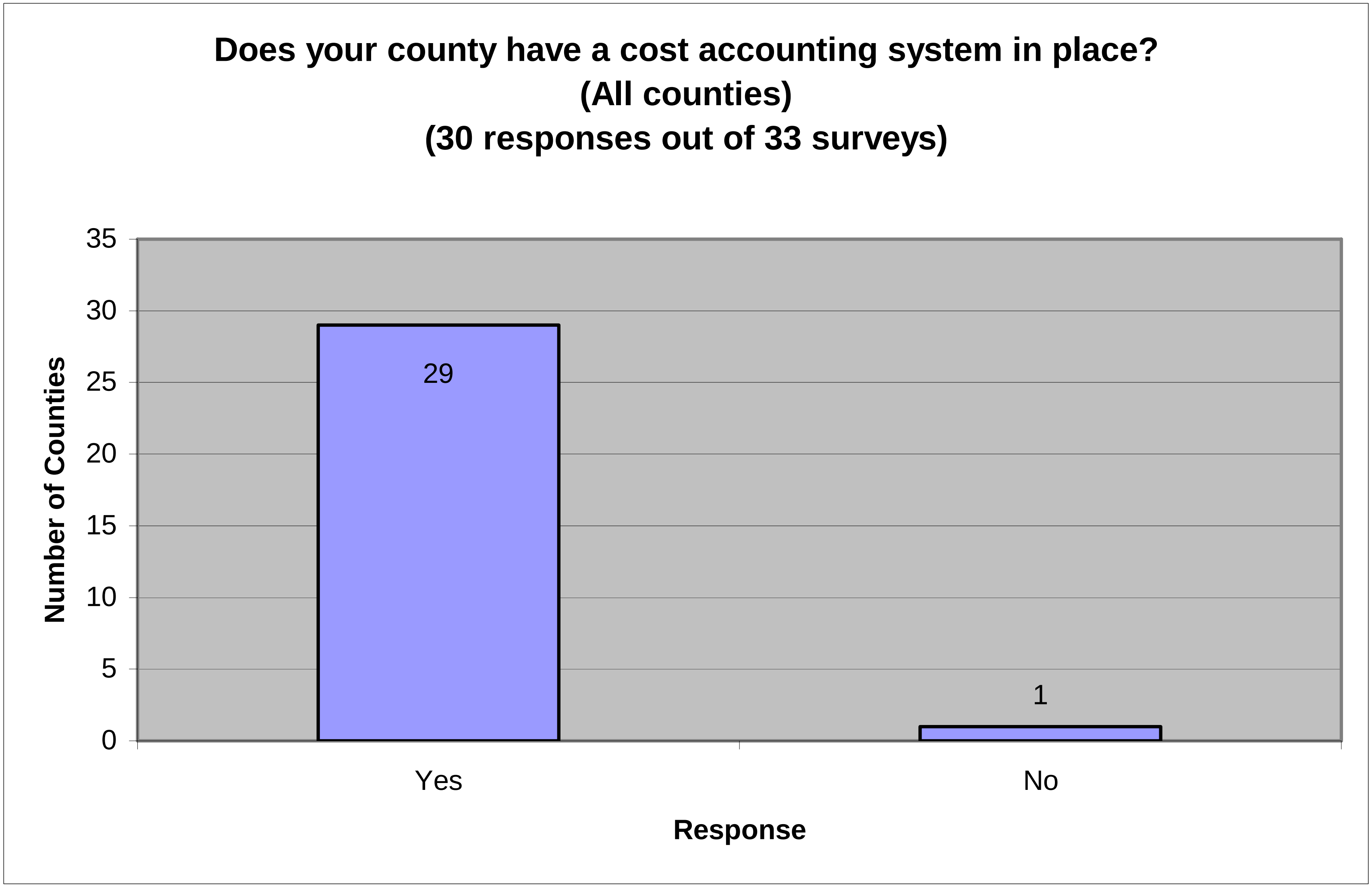

Figure 3.25: Cost Accounting system in Kansas Counties

CHAPTER 4 - County Asset Management System

4.1 Recommended Asset Management Systems

Currently in Kansas, most counties use traditional methods of Asset Management. These methods may have been successful in the past, but as county populations fluctuate there is an increased need to stretch each tax dollar to its full benefit. Using the technology that is available today will not only help counties keep track of their assets, but will also give them the ability to keep track of the state of the assets. This information can be used to help the counties make smarter financial decisions by maintaining the assets that are in the worst shape. Over time the county will be able to maintain their assets at a higher level of service, giving the tax payer more for their tax dollar.

There are five key components to any comprehensive Asset Management system (FHWA, 1999):

1. An asset inventory
2. Methods of assessing current conditions and/or performance
3. A process to determine and evaluate future system needs
4. Tools to evaluate and select appropriate strategies to address current and future needs
5. Methods to evaluate the effectiveness of each strategy

Many counties in Kansas do not have any of these components. In fact in the previous chapter it was discovered that only about 25% of Kansas counties claimed to have a working Asset Management system. County population has an important role in deciding to what degree an Asset Management system will be implemented.

In this chapter, recommendations for Asset Management systems will be made for Kansas counties based on the population of the county. These recommendations are intended as guidelines and may not apply to every county within the set population range. Section 4.2 discusses and lists county assets that should be considered by all counties when creating an inventory.

4.1.1 Counties with Less Than 5,000 People

Today Kansas is undergoing a population shift from the countryside to the city. Most of the 34 counties that have a population below 5,000 people have seen a decrease in population over the last 20 years (KOTN, 2004). This means that there are fewer tax payers to maintain the current infrastructure. In these counties it is crucial to get the most from the limited budget to keep the infrastructure in a good condition.

For small counties with population below 5,000 people, it is not feasible to create a fully integrated Asset Management system. These systems are costly and take a great deal of time and personnel to maintain. The first and most important step for these counties is to create an inventory of the county assets. These assets are listed in section 4.2. This is not an easy process to begin since it requires county workers to locate and log every asset in the county, but once the assets are in the system they can be updated as they are repaired or replaced.

The inventory would be best kept using a cost accounting system like Star, NexTech or Baker. These cost accounting systems use an access database to keep track of different inventory items such as maintenance data, physical dimensions and other important information about the asset. This data could be used simultaneously with a complaint system that would create work orders and service requests based on input from a supervisor and from the public.

It is extremely important to keep the inventory up to date once the database is operational in order to maintain a working and successful cost accounting system. Updated information should be entered into the database as the work is completed. Counties in this population range should have the road crew complete paperwork immediately after they finish a work order. This paperwork can then be turned in to the front office at the end of the day to enter the information into the database.

Routine maintenance decisions should be made primarily on a complaint system in counties with a population under 5,000 people. This is mostly based on public input and inspections by a road crew. Routine maintenance would include replacing a roadway sign, placing gravel on a road, removing debris from a culvert or bridge, etc. Major maintenance decisions should involve the county commissioners, the pubic works director or county engineer and possibly a consultant depending on the situation. Major maintenance would include resurfacing a roadway or replacing a bridge.

4.1.2 Counties 5,000 to 50,000 People

In 2000 there were 61 counties in this population range. Most of these counties have seen a steady decrease in population over the past 20 years while others have seen a growth in population. Finney County saw the largest population growth out of all counties from 1980 to 2000 with a 70% increase in population (KOTN, 2004). Since there are so many counties in varying stages of growth, there will be different stages of implementation for creating an Asset Management system. For example, the need for an Asset Management system in Finney County is a more urgent matter than in a county where the population is stagnant or declining.

The first and most important step for implementing an Asset Management system is to create and maintain an inventory of all county assets. These assets are listed and discussed in Section 4.2. Most counties in this range can manage this inventory using Star, NexTech or Baker cost accounting software. However, counties with a higher population base and/or an increasing population should consider investing in a complete Asset Management software like Cartegraph or another comparable software.

For counties in this population range there should be a working complaint system in place, however, with a large population there will be many more complaints to sort through. It is recommended that counties in this population range invest in some form of work order software or work order software module. For example, Cartegraph's Work-Director module keeps track of complaints and automatically writes work orders. These complaint systems work well when making routine maintenance decisions. Every time a maintenance project is completed, the workers should fill out the necessary paperwork and turn it into the front office at the end of every day.

The advantage of using a system like Cartegraph or comparable software is the ability to asses the current conditions while predicting future system needs. This helps the county come up with the most cost-effective maintenance, rehabilitation or reconstruction strategy for major county projects. The software can even evaluate the performance of the strategy that was undertaken.

Counties can also use this software to determine the best time to initiate preventative maintenance. By fixing a problem early on, the county is able to save money since preventative maintenance is a much cheaper alternative than deferred maintenance. Overtime, this will allow the county to upkeep their transportation infrastructure at a higher level of service.

4.1.3 Counties with More Than 50,000 People

There are currently only 10 counties in Kansas that fall in the category of more than 50,000 people. With more and more people moving from the country to the city, these counties have seen about a 19% growth in population over the past 20 years (KOTN, 2004). With this increased growth, roads and bridges that used to be sufficient for the traffic loads are being pushed to their limits. Counties in this population range have the money and personnel to create an Asset Management system and will realize the advantages of the system more than a smaller county will.

Counties in this population should have a computerized database of most of their assets already. Section 4.2 lists and discusses the assets that should be considered for inventories in all counties. If the county doesn't have inventories of these assets, they should make the necessary steps to create these inventories. Using simple cost accounting software to track county assets may not be feasible for counties in this population range due to the large amount of data that will be kept. Instead the inventory could be kept using a complete Asset Management software like Cartegraph or another comparable Asset Management software.

Routine maintenance decisions, such as replacing a sign or patching a pothole, should be made using a work order system or the Work-Director module of Cartegraph. Complaints from the public, the county commissioners and from road crew inspections can all be compiled in this system and work orders can be easily created.

Decisions for major projects should rely heavily on output from Asset Management software. The final decision should come after recommendations from the county commissioners and county engineer are taken into account. Major maintenance decisions include replacing a bridge or reconstructing a pavement or roadway.

It is also recommended that counties in this population range conform to the requirements of the Government Accounting Standards Board (GASB) statement 34. This requires that the county record the depreciated value of all assets. These assets are not only the trucks and maintenance equipment, but also the roadways, bridges, culverts and roadway signs. There are two options in depreciating these assets. They include the straight-line depreciation method or a modified depreciation approach. The requirements of the GASB 34 are discussed in further details in chapter 2.

4.2 County Assets

There are many assets to consider when creating an inventory. There are six general categories of transportation assets (AASHTO, 2006):

1. Pavements
2. Roadside Assets
3. Drainage Structures
4. Traffic Assets
5. Structures and Bridges
6. Special Facilities

These assets can be described as either point assets or linear assets. Point assets are defined by a single point of location, while a linear asset is defined by a start and end point.

When creating an inventory of these assets, it is necessary to include pertinent information about each asset inventoried. This information includes type of asset, linear dimensions, size or area, material, number, depth of cover, install date or history, direction and traffic. For example, when a county encounters a culvert, the following questions should be answered and tabulated in the database: What type of culvert is it? What is the diameter and length of the culvert? What is the culvert made of? Is there one culvert or several side by side? What is the depth of cover? When was this culvert installed or last repaired? What is the AADT of the roadway above the culvert? Table 4.1 shows the inventory attributes that should be included for each type of county asset.

The following sub-sections discuss the general asset categories encountered by counties and make suggestions on how to inventory these assets.

4.2.1 Pavements

Pavements include flexible pavements (HMA), PCC pavements, unpaved roads and paved and unpaved shoulders (AASHTO, 2006). This may be the hardest asset to inventory due to the complexity of the roadway network in a county.

Pavements are considered a linear asset, meaning they have a start and end point. They can be inventoried in several different ways. Four lane county roads can be broken up into lanes and sections can be from crossroad to crossroad or from milepost to milepost. It is recommended that heavily traveled roadways be broken up into one mile sections. Roadways must be broken up in this manner due to traffic variations from lane to lane or section to section.

Two lane roads should be split into lanes and sections as well. Since mileposts are not normally used on two-lane county roads it is recommended to use crossroads or bridges as section borders. Heavily traveled two-lane roadways should be broken into one mile sections, while other roadways with less traffic can be broken into longer sections.

Unpaved gravel roads do not need to be broken up into lanes, but it is recommended to break them up into sections. Bridges and crossroads can be used as section borders. Sections can be as long or as short as preferred by the county engineer.

Creating a pavement inventory is a costly and time consuming process and should be left to those counties that have the means to take on such a task. It is recommended that counties with a population over 50,000 people work to create a pavement inventory. Counties in this range should have the means to create the inventory and will benefit the most from having the inventory.

Counties in the 5,000 to 50,000 population range can also consider creating a pavement database. This is only recommended if the county has a small road network or a rapidly growing population. Before a county undertakes a pavement inventory they should have all other county assets inventoried.

4.2.2 Roadside Assets

Roadside assets include vegetation and aesthetics, trees, shrubs and brush, historic markers and right-of-way fence (AASHTO, 2006). The most likely of these assets that a county would encounter are the historic markers and right-of-way fence.

Historic markers are considered a point asset, so they can be entered into the database individually with a location. Right-of-way fence on the other hand, is considered a linear asset and should be entered in a similar manner as pavements.

An inventory of roadside assets should be fairly easy to create and maintain. The state of these assets can be easily monitored based on an arbitrary number system, i.e. a score of 1 means the asset is in poor shape, while a score of 5 means the asset is in good shape.

4.2.3 Drainage Structures

Drainage structures include cross pipes, box culverts, entrance pipes, curb and gutter, paved and unpaved ditches, edgedrains, underdrains, detention ponds and drop inlets (AASHTO, 2006). These often overlooked assets are not currently tracked by most counties in Kansas resulting in old and neglected drainage structures.

Cross pipes, box culverts and entrance pipes are considered a point asset, meaning the can be defined by a single point of location. In most counties if the diameter or span of a culvert or cross pipe exceeds 10 foot, it is considered a bridge. This means that everything that falls below the 10 foot mark should be considered a box culvert or cross pipe. It is important for every county, regardless of population or size to create and maintain an inventory of these structures. Once the inventory has been created it is important to have the system inspected on a yearly rotation.

Curb and Gutter, paved ditches, edgedrains and underdrains are considered linear assets. These assets should be tracked in the same manner as a pavement or right-of-way fence. Detention ponds and drop inlets are considered point assets. These assets should only be tracked if the are encountered by the county.

4.2.4 Traffic Assets

Traffic assets include guardrail, pavement striping, pavement markings, raised pavement markers, signs, and highway lighting (AASHTO, 2006). These assets are found all over the transportation network and should be kept track of in the same manner as drainage structures.

It is recommended that every county in Kansas create and maintain an inventory of signs. Signs are considered a point asset and should be entered into the database individually with a point of location. Once the inventory has been created it is important to have the signs inspected on a yearly rotation.

Guardrail, pavement striping, pavement markings are likely to be encountered by some counties in Kansas. These assets are considered linear assets and can be tracked using a start and end point. Pavement striping can be listed by length of passing and no passing zones. This will make it possible to know exactly how much paint to purchase when re-striping the roadway.

4.2.5 Structures and Bridges

Structures and bridges include overhead sign structures, structural culverts, overall bridge, sound barriers, and retaining walls (AASHTO, 2006). The most important of these structural assets are bridges.

It is currently state law in Kansas to have all bridges over 10 foot inventoried and inspected every two years. All bridges or culverts with a span less than 10 foot should be inventoried as explained in the drainage structure section.

Other structural assets are often overlooked and not inspected often. Retaining walls may be the only other structure that most counties may encounter. Retaining walls can either be considered point assets or linear assets depending on the size of the retaining wall. If the county encounters a retaining wall or any other structure, it should be inventoried and inspected on a yearly rotation.

4.2.6 Special Facilities

Special facilities include moveable bridges, rest areas, weigh stations, tunnels and traffic monitoring systems (AASHTO, 2006). These facilities may not be found in most counties, but should be included in county inventories.

These special facilities may only be found in counties with a population above 50,000 people. Special facilities are not limited to those listed and should include all other assets that do not fall in any of the other categories.

Table 4.1: Basic Inventory Attributes for Transportation Assets (AASHSTO, 2006)

Asset Group	Asset Type	Inventory Attributes										
		Point asset	Linear asset	Type	Linear dimensions	Size/area	Material	Number	Depth of cover	Install date/history	Direction	Traffic
Drainage	Culvert	*		*	*	*	*	*	*	*		*
	Curb & Gutter		*	*	*					*		*
	Sidewalk		*		*		*			*	*	*
	Ditch		*	*	*					*	*	*
	Drop Inlet	*					*	*				*
	Stormwater Pond	*									*	
	Underdrain &	*					*					
Roadside	Fence		*		*		*			*	*	
	Grass Mowing		*	*		*						
	Brush		*	*		*						
	Slope (Erosion Control)		*									
	Litter			*		*					*	
	Landscaping	*		*		*					*	
	Sound Barrier		*		*		*			*	*	*
Pavement	Shoulders		*	*	*	*	*			*	*	*
	Paved Surfaces		*	*	*	*	*	*		*	*	*
	Unpaved Surfaces		*		*		*			*		*
Bridge	Bridge	*		*	*	*	*			*	*	*
	Paint	*				*				*		
	Joint	*						*		*		
	Retaining Wall	*			*	*	*			*		*
Traffic Items	Signal	*								*		*
	Sign	*		*		*		*		*	*	*
	Pavement Marking	*			*	*	*			*	*	*
	Pavement Marker	*						*		*		*
	Guardrail (End	*			*		*			*	*	*
	Guardrail	*			*		*			*	*	*
	Overhead Sign	*		*						*	*	*
	Impact Attenuator	*		*						*		*
	Traffic Barriers		*		*		*			*	*	*
	Highway Lighting	*		*						*	*	*
Special Facilities	Movable Bridges	*		*	*	*	*			*	*	*
	Rest Areas	*		*		*				*	*	*
	Tunnels	*		*						*	*	*
	Weigh Stations	*								*	*	*
	Traffic Monitoring Systems	*	*							*	*	*

CHAPTER 5 - Summary, Conclusions and Recommendations

Asset Management is quickly becoming an important part of the transportation industry. All of the necessary tools to create and maintain an effective Asset Management system are available and easy to use. Early on it may be difficult to see the advantages and benefits of an Asset Management system, but in time the system will pay for itself and the transportation entity will begin to see successful results.

Kansas counties can benefit immensely from implementing an Asset Management system. The major obstacle of implementing an Asset Management system however, is creating and maintaining an asset database. The process can be costly and requires many personnel hours to generate. Another obstacle is the fear of change. When traditional methods have been used for many years with little or no problems, it is hard to convince an agency that there is a better way. Once Kansas counties are able to get past these obstacles however, they will reap the benefits of an Asset Management for years to come.

In this thesis, the Kansas counties were split into groups by population. These groups were for counties with a population less than 5,000, counties with a population between 5,000 and 50,000, and counties with a population greater than 50,000.

For counties with a population less than 5,000 people it is recommended that they do the following:

1. Create an asset inventory database for signs, culverts, and other roadway assets
2. Maintain this inventory using a simple Cost Accounting Software
3. Keep this inventory up to date by inspecting these assets periodically
4. Use traditional methods for routine maintenance
5. Use software and consultant input for major construction projects
6. Work to create an inventory of all paved and unpaved county roads

Counties in this population range should focus mainly on creating and maintaining a working inventory of infrastructure assets. Once this system is operational, it is recommended that the county begins cataloging and maintaining an inventory of county roads. Though this may not be a full-fledged Asset Management system, these represent the first steps in creating a successful AM system.

For counties with a population between 5,000 and 50,000 people it is recommended that they do the following:

1. Create an asset inventory database for signs, culverts, and other roadway assets
2. Maintain this inventory using an Asset Management Software (Use a Cost Accounting Software only if it can handle your inventory)
3. Keep this inventory up to date by inspecting these assets periodically
4. Use software and a complaint system for routine maintenance
5. Use software and consultant input for major construction projects
6. Work to create an inventory of all paved and unpaved county roads as well as a pavement management system
7. Fulfill the requirements of the GASB 34 (if applicable)

Counties in this population range can be very different from one another. Some counties populations are growing quickly while others are stagnant or declining. It is recommended that growing counties at the high end of this population range consider following the recommendations of counties greater than 50,000 people, while counties with declining population at the lower end of this population range should at least follow the minimum recommendations for counties with a population less than 5,000 people.

For counties with a population greater than 50,000 people it is recommended that they do the following:

1. Create an asset inventory database for all pavements, signs, culverts and other roadway assets.
2. Maintain this inventory using an Asset Management Software
3. Keep this inventory up to date by inspecting these assets periodically
4. Use software (such as pavement or bridge management software programs)and a complaint system for routine maintenance
5. Use software (such as pavement or bridge management software programs) and consultant input for major construction projects
6. Fulfill the requirements of the GASB 34

Counties in this population range may already have a well established Asset Management system. They should however, make sure that they have a complete inventory of all assets as well as the conditions of these assets. It is also important that these counties meet the requirements of the GASB statement 34.

Asset Management is a powerful tool that can be used to benefit transportation agencies. Implementing an Asset Management system should be the main goal of all transportation agencies. The sooner a system is implemented the sooner the agency can begin to reap its benefits.

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