

A STUDY OF THE TYPES OF FIRES OCCURRING IN AREAS
OUTSIDE THE CITY LIMITS IN PAYNE COUNTY,
OKLAHOMA, WITH RECOMMENDATIONS TO
IMPROVE THE EXISTING FIRE
DEPARTMENT PROTECTION

By

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CHAPTER I

INTRODUCTION

The problem of fire in America is not new. Fire has been causing problems for people ever since its discovery. In controlled situations, fire heats our homes, cooks our food, gives people enjoyment in a fireplace, helps industry make products for our pleasure, homes, businesses and industries. Fire in an uncontrolled state causes death, property damage, pain, scars, and terrible suffering. During the next hour there is a statistical likelihood that more than 300 destructive fires will rage somewhere in this nation (9). As indicated in Table I every year fire kills nearly 12,000 people in the United States (13).

Among causes of accidental death, only motor vehicle accidents and falls rank higher than fire. Most of fire's victims die by inhaling smoke or toxic gases well before the flames have reached them. The price of destructive fires in the United States, by conservative estimates, amounts to at least \$11.4 billion a year as shown in Table II. Beyond calculation are the losses from businesses that must close and from jobs that are interrupted or destroyed. The scars and terrifying memories live on with the 3,000,000 Americans who are injured by fire every year. Of these, nearly 50,000 lie in hospitals for a period ranging from six weeks to two years. Many of them must return; over and over again, for plastic and reconstructive surgery. Many never resume normal lives (9).

TABLE I
YEARLY REPORTED FIRE DEATHS

Year	Deaths
1974	11,600
1973	11,700
1972	11,900
1971	11,850
1970	12,200

Source: "Fires and Fire Losses Classified, 1971." Fire Journal, Vol. 66, (1972), p. 65. "Fires and Fire Losses Classified, 1973." Fire Journal, Vol. 68, (1974), p. 33. "Fires and Fire Losses Classified, 1974." Fire Journal, Vol. 69, (1975), p. 43.

TABLE II
ESTIMATED ANNUAL UNITED STATES FIRE COSTS

	Dollars
Property Loss	2,700,000,000
Fire Department Operations	2,500,000,000
Burn Injury Treatment	1,000,000,000
Operating Cost of Insurance Industry	1,900,000,000
Productivity Loss	<u>3,300,000,000</u>
Total	11,400,000,000

Source: Report of the National Commission on Fire Prevention and Control. America Burning. Washington: United States Printing Office, 1973.

In Payne County, Oklahoma, every year a number of homes and businesses are destroyed by fire. It would be hard to calculate a total dollar figure from losses due to fire. Most property can be replaced and a dollar loss eventually set for insurance purposes but for a life loss due to fire no dollar amount can ever be set. Most of the time insurance settlements never cover the entire loss. Payne County has been very fortunate to have an extremely low number of deaths due to fire. In 1975, three deaths were recorded in Payne County due to fire. In 1974, two fire deaths were reported; and in 1973, one fire death was reported. Oklahoma fire deaths are reported each year to the State Fire Marshal's Office (13). These low numbers are both good, and bad, even one fire death is too many.

Nature of the Problem

Payne County like many counties may not have adequate fire protection for the residents who live outside the incorporated limits of a city. Fire protection for these residents is usually handled by the fire department that is the closest, although many times this is not true. The six organized fire departments in Payne County are in: Stillwater, Cushing, Perkins, Yale, Glencoe and Ripley. Under a fire situation the fire department that gets the fire call first, usually responds to the fire. Many times causing long delays due to response distances. Quite often fire department units from more than one city respond to fire calls outside their city limits. Most of these fire departments charge approximately \$100 per fire call to the owner of the property or resident of the home or business to extinguish the fire. Unfortunately, residences or businesses outside the city limits are

often totally destroyed even though fire department units responded to the call. Rural fire fighting efforts are hampered by many problems such as response distances, delayed alarms, lack of water, limited numbers of fire fighters, lack of effectiveness of city fire apparatus with rural fire fighting procedures and lack of fire fighting equipment.

One factor that greatly reduces the effectiveness of fire department apparatus is the lack of two way radios. The coordination between fire fighting units, the chiefs, and the dispatching center is lost due to not being able to communicate with each other during response to the fire scene or while at the fire scene. Coordination of mutual aid efforts are also lost when two way radios are not in the fire apparatus. Many small departments do have radios, but these radios do not have common frequency capabilities with other fire departments in the area.

Statement of the Problem

To lower the dollar and property fire loss in Payne County some type of fire districts might be set up and a common system for reporting fire alarms could be established. Appropriate rural fire fighting apparatus could be located strategically to lower response distances and times. A common radio network could be established for all fire departments in the county, a tax system could be set up so that residents outside of incorporated cities share the expense required to provide better fire protection, and obtain more and better equipment. Rural water sources could be increased and present water supplies and hydrants could be marked for easier locating.

Purpose of the Study

The purpose of this study is to analyze the types and locations of fires occurring and the responses of fire departments involved in providing rural fire protection in Payne County, Oklahoma. The existing level of fire protection provided by the six organized fire departments in Payne County, Oklahoma, will be studied for possible general recommendations.

Research Objectives

These research objectives are to be studied so that recommendations can be made:

1. To identify the areas where fires are occurring in Payne County outside of incorporated city limits.
2. To propose fire protection districts so that fire departments will know what areas they are responsible for in Payne County.
3. To propose a fire call reporting system to lower dispatching time delays for fire departments.
4. To examine the feasibility of a common radio network for all fire departments in Payne County.
5. To identify the cost of providing adequate rural fire protection in Payne County.

Need for the Study

This study can provide a way to achieve more effective use of fire apparatus in Payne County and provide a more acceptable level of fire protection for residents in Payne County.

Definitions

Rural - For the purposes of this study describes all areas outside the incorporated limits of a city.

Fire Suppression - The act of fire extinguishment by fire fighters.

Fire apparatus - Trucks built and equipped by a commercial firm or the fire department itself to carry a small supply of water, ladders, pumps, hose and other fire fighting equipment to the scene of a fire. Fire fighters may or may not ride the apparatus to the fire depending on whether it is a fulltime or volunteer fire department.

Turnout Gear - Protective clothing worn by fire fighters during fire suppression.

Protective Breathing Equipment - Self contained air breathing units used to protect the fire fighter from toxic smoke and fire gases.

Communication System - A central dispatching area and two way radios on the same frequency in all fire apparatus.

Fire District - An area of land within which a fire department agrees to provide an acceptable level of fire protection. The Fire District may or may not contain a portion of a city.

Residence - One or two story dwellings including mobile homes or other types of structures that persons live in.

Business - Structures that are classified as places of work such as factories, restaurants, stores and gas stations.

Grass - Pastureland, unused fields, timber, brush, and fields where crops are grown.

Vehicle - Any type of car, truck, bus or recreation vehicle.

Service Calls - Examples of service calls are gasoline spill wash downs, standby at various types of situations, assisting persons who require non-fire suppression assistance.

Mutual Aid - These types of calls occur when a fire department makes a request to another fire department for assistance at a fire or other emergency by sending a piece of fire apparatus to the requesting department.

First Aid - This type of call usually occurs when help is needed at auto accidents and a piece of fire apparatus is sent.

False Alarms - This is the reporting of a situation where fire apparatus is needed but upon the arrival of the fire apparatus at the scene, no such situation exists.

Miscellaneous - A type of call that can not fit into one of the afore mentioned categories.

CHAPTER II

REVIEW OF LITERATURE

The problem of fire does exist in Payne County. Along with this problem are other problems that plague the ability of fire departments to perform their duties or services in Payne County. Examples of the problems are: long response time, lack of water, lack of manpower, lack of proper equipment to do a complete and safe job of fire suppression and delayed alarms. These problems are common to all areas of the country where rural fire suppression occurs.

The problem of fire can be determined by studying the yearly response reports of the two major fire departments in Payne County: Stillwater and Cushing. These reports would be a study in themselves of what kinds of fires are occurring, what are the causes, problems associated with each fire, and other important data.

In an article entitled "Needs of the Rural Fire Service as Automation Reaches the Farm," A. Morrison Ennis (4) discusses the problems of suppressing farm fires. Ennis cites some of the problem areas concerning his fire department and farm fires; such as early detection of fires, notification of the fire fighter, response time to the fire scene, inadequate water supplies, methods of fire suppression, and design of fire apparatus for rural fire fighting. He stresses the need for planning to overcome these problems. His recommendations offer possibilities for improving Payne County rural fire protection and could assist local fire departments in similar situations in Payne County.

The study of America's fire problem entitled America Burning (10), submitted to President Nixon by the Commission on Fire Prevention and Control, describes many of the problems associated with fire protection in rural areas. Problems such as lack of water supplies, fire apparatus, response distances, insufficient funds to purchase adequate fire apparatus and equipment, limited fire prevention efforts, etc., are common to all areas of the country. Because many volunteer departments keep scanty records or no records at all, the seriousness of the fire problem outside of metropolitan areas is difficult to gauge. The study strongly supports the idea that fire departments need to do some master planning so that they can provide better, more efficient fire suppression and protection. Considering the fact that no real master plan has been prepared for fire protection in Payne County, this study will make recommendations that could improve the fire protection level provided by fire departments in the county. America Burning suggests that all areas need to be protected in some way by a fire department. This can be taken to mean that the land in Payne County should be under the responsibility of a fire department. The dividing of land into fire protection districts for better fire protection is often done in the United States, according to America Burning. The planning of fire protection districts can provide a way for fire departments to know how far their apparatus would respond and which departments' apparatus would be responding first, second, third or not at all. Instead of having fire department "A" respond 18 miles to a fire scene a mile or two from fire department "B", department "B" would respond first and department "A" would respond second or not at all depending on the location of the fire. This method for reducing response times and distances could reduce property loss

from fire and possibly save lives, two goals that the America Burning Committee found to be very important and that needed more attention. America Burning also stresses the use of early fire warning devices by all families, especially those that are some distance from a fire department or wherever fire protection is not well organized. America Burning strongly supports studies to plan fire department responsibility and to assist fire departments in providing a more acceptable level of fire protection in areas across the United States.

A study done by Childs, Doeksen and Frye on *The Economics of Rural Fire Protection in the Great Plains* (2) illustrates that many fire protection problems occur in the ten northwestern Oklahoma counties covered by their research. This study developed a way of fairly accurately predicting the number of fires each area could anticipate having in the future. The study on Great Plains fire protection concluded that the costs of providing better or more acceptable levels of fire protection requested by the residents outside the incorporated limits of cities was constantly increasing. The fire departments concerned are becoming extremely aware of the problem of leaving their cities unprotected or with a lower level of protection to provide protection for rural residents who in most cases do not pay directly for the protection. This study provides recommendations for ways of calculating the cost of various types of fire apparatus, a fire station to house apparatus, various forms of communications equipment, the cost of upkeep on all communications, fire apparatus and equipment, the cost of manpower to fight fires, the cost of providing fire fighter protective clothing and ways of obtaining money to assist fire departments.

The method of obtaining data from the 42 fire departments in the Great Plains study area was very basic. The fire records for each year studied were separated into town and rural and then placed on forms as to the types of reported fires and as to the number occurring each month. Childs, Doeksen and Frye found in their study area that many small fire departments keep poor or no records at all of their fire response activities. Out of 42 fire departments in the study area, 29 had records with complete information that could be used in the study, of this 29, 25 were volunteer fire departments and 4 were fully paid departments.

The years that the study centered around were 1969 through 1974 with a major emphasis on the 1974 fire response records.

The method used to predict future fire frequency centered around two forms; one by way of the number of fires per unit population, the other by the number of fires per acre, home, vehicle, population, business in an area and then adding up the total.

The study also included in it a model project which gave the costs of fire protection for Ames, Oklahoma. The city of Ames is a real city in one of the ten counties covered by this study. The example follows the guidelines listed by Childs, Doeksen and Frye. The authors predicted the number of fires that would occur in the Ames fire department's area of responsibility in the future. The authors then calculated the cost for fire apparatus and equipment, manpower and a communication system to provide an acceptable level of fire protection. The example provided that the fire department would respond to any fire within a predetermined area surrounding Ames, Oklahoma. By following their calculations, the operating costs were determined for a one year period.

This study by Childs, Doeksen and Frye shows the need for studies of this type due to the problems and costs of providing rural fire protection.

A book entitled Fighting Rural Fires by the National Fire Protection Association (11) strongly supports the need for organized fire protection for rural areas. This book describes various methods to improve the existing condition of fire protection in an area. The various problems that rural fire protection must contend with are considered in Fighting Rural Fires. The recommendations offered are not directed principally at any one area of the United States but are general recommendations that can be used by any fire department whether involved with rural fire problems or not.

The committee offers a number of suggestions on setting up a better communications system; a type of communications system involving an entire county. This is handled through the Sheriff's office in many places. The use of response cards by all residents in rural areas is also proposed. Response cards usually have the following types of information listed: the route for apparatus to respond to the reported fire, a small map of the area, water supply information, hazardous conditions, number of occupants at the location and other information that would be essential for fire departments responding to the location. Each residence, business or property would be assigned a number. A party reporting a fire would still give the dispatcher as much information about the fire as possible but would also give a location number. The dispatcher would then pull that card from the file and dispatch the appropriate apparatus for that district location. While the apparatus is responding the dispatcher could then give important information about the location to the

fire fighters before they arrive. Fighting Rural Fires makes recommendations on what equipment fire departments would need to effectively suppress a fire situation or other type of problem a fire department might respond to. Apparatus recommendations are made as to what specifications for rural fire fighting apparatus. Basic standards for rural pumpers, tankers and other rural fire fighting apparatus are discussed so that the apparatus is well suited to protect rural areas. Many times apparatus that was designed for use inside city limits and does an excellent job will do a very poor job when it is used in a rural fire fighting situation. Information is given to improve rural water supplies. Water for rural fire fighting comes from the following sources: water carried on fire apparatus, farm ponds, small rural pipelines with hydrants, lakes and streams, swimming pools, wells and sometimes even animal watering troughs. Any water supply needs to be listed on maps and response cards. The chapter on public water supplies offers recommendations on how to best use various supplies, number of gallons available and how many gallons a minute will flow from a given water source. The area of fire suppression tactics and procedures is covered so that rural fire departments will properly go about the process of fire suppression. The information recommended, if practiced by rural fire departments through training, could improve many departments fire suppression ability. The importance of inspections and prefire planning by rural fire departments of buildings and areas within their districts is covered giving recommendations to fire departments as to what to look for, examples of forms to record information and what to do with the information gathered during an inspection.

The various areas covered by this book in fighting rural fires and recommendations offered could be of use to many fire departments to improve the level of fire protection being offered to rural residents.

A study done by Doeksen, Frye and Green, "The Economics of Rural Ambulance Service in the Great Plains" (3) stresses the importance of emergency services needed for residents who live outside the limits of incorporated cities. In this study the authors collected data on the various types of calls ambulance attendants were making and the services provided by existing ambulance services. From this data the authors were able to develop a system of formulas for estimating the number of calls, mileage, and receipts for future ambulance services for a particular area. This study, conducted in eight counties in northwestern Oklahoma, provided a system for estimating the costs and identified various ways human resources could be used to provide ambulance services. Fully volunteer systems with attendants on special call and fully paid 24 hour on call service were examples of types of ambulance systems.

This ambulance service study, although not about rural fire protection investigates problems that are common to both types of emergency services. Examples of areas of concern for both services include areas of coverage, types of apparatus, manpower, special equipment and finances.

In summary, these studies, books and articles propose recommendations, give statistics on the fire problem, give methods of predicting future fire problems and describe guidelines in the economics of providing fire protection.

CHAPTER III

METHODOLOGY

Assumptions

The assumption is made for this study that the fire response records were accurate as to the number of fires occurring in each year. It was further assumed that all serious fires occurring in Payne County were reported to some fire department. The information obtained on fire responses from the six fire departments must be assumed to be a fairly accurate account of the total number of fires occurring in Payne County. And finally it is assumed that a very small number of fires occurred within the county that were controlled without the assistance of a fire department and were not reported.

Subjects of Study

The subjects for this study are the six organized fire departments in Payne County. These six departments are Stillwater, Cushing, Perkins, Yale, Glencoe, and Ripley. The number of fire responses made by each fire department into rural Payne County was determined by studying the annual fire response report of each fire department. From these reports each of the responses was divided into categories according to the type of fire that the fire department responded to. The categories were listed as residences, businesses, grass, vehicle, service, miscellaneous, mutual aid, first aid, and false alarms.

Development of an Instrument

The information form used to record the fire department response data on is very similar to the monthly response report that the Stillwater Fire Department uses. This form was chosen because both the Stillwater and Cushing Fire Departments group their fires into the same type of categories. Also, these two departments are the largest ones in Payne County and respond to the most rural emergency situations. It was thought to be easier to work with categories that were already being used in Payne County. By examining the existing records for the other fire departments in Payne County responding to rural fire calls it would be fairly easy to categorize their responses into the categories used by the Stillwater and Cushing Fire Departments. The selected report form also gave the needed breakdown as to the type of rural fires that the departments were responding to and the number of each type of fire occurring during each year that the study deals with. An example of the response form is included in Appendix A.

The form used for the collection of information on fire apparatus responding to reported fires in rural Payne County was developed by the investigator. The form was used to determine what basic equipment each department's rural fire apparatus carried. The form possesses space for recording the basic equipment needed for fighting fires whether in a rural area or the center of the city, but would be especially needed if only one piece of fire apparatus would be responding to a fire.

A form was designed to record the fees charged by fire departments for rural fire responses. Included were spaces to record the three basic ways fees are charged by the fire departments. These ways were

listed as per call, per hour or per fire apparatus unit. Space was included for other fees that might be charged for rural fire responses by the fire departments.

Collection of Data

The collection of fire department data was all done by personal interview. On March 10, 1976, each fire department in Payne County was visited and their fire response records were examined. During the visit responses were categorized as to the type of each fire responded to and the number of each type of fire was recorded. Information was also obtained from each fire chief about the type of apparatus that would be dispatched to rural fires. The type of fire fighting equipment the units carried and amount of water carried was also recorded. Information was also obtained from the fire chief as to the amount of the fees charged by the fire department to the residences or property owners when a fire unit made a rural fire response.

Analysis of Data

An analysis of the fire response data was performed to determine the total number of each type of fire reported, trends in the numbers and types of fires being reported during the years studied. The data was examined for correlation among the different fire reports from the fire departments. From existing information predictions are made as to the future number of fires that will occur in Payne County. This prediction comes from one of the formulas used by Childs, Doeksen and Frye in the "Economics of Rural Fire Protection in the Great Plains" (2) study, using data from Payne County.

The method used to identify possible fire protection districts is based on the capabilities of the rural fire department apparatus in the six departments. By studying each piece of apparatus as to its ability to perform as a pumper or water tanker, assignments will be made for each department as to the area it is first responsible for and areas in which it backs up another department's apparatus.

A proposed fire reporting system will be developed using the style offered in the book Fighting Rural Fires (11). This system has been proven to be effective in many states.

The beginning of a common radio network for fire departments already exists in Payne County. An improved system requiring that departments not on that common frequency begin working towards that goal will be proposed. Information about radios and frequencies are available on the apparatus forms.

The resource funds needed to assist fire departments in Payne County, Oklahoma must come from the fees charged to residents who have had fires. By studying the total amount charged for fires during the last two years and the amount of money received by the departments from the County Commissioners for fire protection a total amount can be determined as the amount of money received for rural fire protection in Payne County. More funds for fire departments would mean that departments could improve their services.

Limitations

It must be remembered that the total number of fires reported in this study are only as accurate as the fire department records. It is felt that the records reflect a fairly accurate report of the total number

of fires occurring in rural Payne County but it is assumed that some fires occurred which were extinguished without the help of a fire department, therefore, a fire department was not notified of the fire and did not make a response.

CHAPTER IV

RESULTS

The fire department data was collected on March 10, 1976. The investigator visited each of the six fire departments in Payne County to obtain fire response data. During the visit information on the type of fire apparatus each department responds with outside the limits of their community was also collected. At the time, data was taken from each departments' records and categorized as to the type of responses. The information on apparatus for each department was recorded on the apparatus form including such things as equipment carried and amount of water carried. Fire fees were also recorded.

For three of the six fire departments the fire response data were not available for more than one or two years back. The reasons being, the fire departments were only recently organized and due to the very small number of actual fire responses, the departments did not feel it to be too significantly important to maintain such records. Several of the smaller departments felt that they were organized primarily to provide fire suppression services to their communities and due to limited funds, and since the time given to the department by the members was volunteered, record keeping was not considered to be important.

One category of reports that were omitted from the study were the number of fire runs listed by a fire department as responses where the apparatus was called back to the city before reaching its destination.

These responses were not listed as to the type of fire the apparatus was responding to so there was no way to categorize these responses in the study.

By studying the response data obtained from the six fire departments in Payne County (Appendix B) it becomes clear which departments are responding to the most rural fire calls. It might be stated by studying the response data that the Cushing and Stillwater Fire Departments are providing most of the rural fire protection and suppression in Payne County. This would seem to be confirmed by the size of the respective cities and fire departments. In this study only the Stillwater and Cushing fire response data is to be compared.

By comparing the five year total of responses for Cushing and Stillwater (Table III) a difference of only sixteen responses is calculated. This difference of sixteen responses from the total responses over the five year study period would indicate that the size of Stillwater and Cushing do not have too much effect on rural fire responses. By studying each category of response the size of the city does have an effect on certain types of fires.

In comparing each year's total responses for the Cushing and Stillwater Fire Department over the five year study period, a trend can be identified (Table III). In 1971, 1973, and 1975 the total responses were lower than in 1972 and 1974. This up and down trend occurs for both departments. This trend would appear to hold true for 1976 as Payne County has experienced its worst season of grass fires in ten years. (It may be of interest that many of these grass fires were set by arsonists. Had the arsonists been caught early in the year, it would have reduced the high number of fires occurring in 1976.) If fire responses continue

at the present pace, 1976 will have a high total rural fire response record. This will follow the up and down pattern of the previous fire records.

TABLE III
STILLWATER AND CUSHING TOTAL RURAL RESPONSES
PER YEAR DURING 1971 THROUGH 1975

Year	Stillwater	Cushing
1971	39	51
1972	64	64
1973	43	51
1974	96	84
1975	<u>87</u>	<u>55</u>
Total	329	305*

* Does not include 38 incomplete responses during 1971 through 1975.

The average number of fire responses per month were higher for Cushing than for Stillwater in 1971 and 1973 but were lower for 1974 and 1975. The average number was the same for the year of 1972. These averages are shown in Table IV. These averages agree with the yearly totals for Stillwater and Cushing in Table III. Each department in 1972 had 64 rural responses but had different totals in the various categories of responses.

TABLE IV
 STILLWATER AND CUSHING AVERAGE NUMBER OF RESPONSES
 PER MONTH DURING 1971 THROUGH 1975

Year	Stillwater	Cushing
1971	3.25	4.25
1972	5.33	5.33
1973	3.58	4.08
1974	8.00	7.17
1975	7.25	5.25

TABLE V
 STILLWATER AND CUSHING RURAL RESIDENCE
 FIRE RESPONSES DURING 1971 THROUGH
 1975

Year	Stillwater	Cushing
1971	8	7
1972	12	6
1973	13	4
1974	18	8
1975	<u>9</u>	<u>5</u>
Total	60	30

Table V presents comparative data of rural fire responses to residential fires. Stillwater had a higher number of residence fires each year than Cushing during 1971 through 1975. In the overall total,

Stillwater had twice the number of responses to residence fires than did Cushing. The records show sixty for Stillwater and thirty for Cushing. Stillwater being a larger city would provide a larger number of residences in and out of the city limits for possible fires. Also because Stillwater has the largest fire department, residents of rural Payne County appear to call Stillwater when there is a fire. The result of this is that the Stillwater Fire Department responds to a large number of fire calls in rural Payne County. This also would help explain the higher number of residence fire responses for Stillwater over Cushing.

A comparison of Cushing and Stillwater fire responses to businesses in the rural area is shown in Table VI. The larger number for Cushing is possibly due to the oil and gas production centered in the Cushing area. With the vast amount of different type buildings associated with the oil and gas business surrounding Cushing, a greater chance of fire exists in these businesses compared to the types of small general businesses surrounding Stillwater. This could cause Cushing to have more rural business responses.

Table VII compares grass fires responses for Cushing and Stillwater. The number of total grass fire responses shifts back and forth between Cushing and Stillwater. The number of grass fires each year can be very dependent on the amount of rainfall an area receives (8) and the carelessness of people. Cigarettes and matches thrown from cars or dropped by people working in fields, careless burning of trash are all common causes of a large number of grass fires during seasons when the grass is very dry due to lack of rainfall. It is usually fairly common to find that if one department in the county is responding to a large number of

grass fires that nearby departments will also be experiencing a larger number of grass fires. This is true in Payne County. The total number of grass fires over the five year study period for each department is very close as shown in Table VII.

TABLE VI
STILLWATER AND CUSHING RURAL BUSINESS FIRE
RESPONSES DURING 1971 THROUGH 1975

Year	Stillwater	Cushing
1971	2	4
1972	3	7
1973	1	5
1974	1	7
1975	<u>1</u>	<u>6</u>
Total	8	29

TABLE VII
STILLWATER AND CUSHING RURAL GRASS FIRE
RESPONSES DURING 1971 THROUGH 1975

Year	Stillwater	Cushing
1971	17	23
1972	34	30
1973	9	16
1974	38	42
1975	<u>37</u>	<u>17</u>
Total	135	128

Table VIII compares the responses to rural vehicle fires. This category covers everything from farm tractors and hay balors to cars motor homes and trucks. The size of a city and the number of vehicles traveling on roads nearby and on roads to and from the city would be a determining factor for predicting the number of potential vehicle fires that fire apparatus would respond to. Stillwater being a larger city than Cushing, the home of Oklahoma State University, the county seat, and situated on several major roads in Payne County would account for a large amount of vehicles traveling in the area along with commuter traffic, thus causing the larger amount of potential vehicle fires for the Stillwater Fire Department to respond to in the rural areas.

TABLE VIII
STILLWATER AND CUSHING RURAL VEHICLE FIRE
RESPONSES DURING 1971 THROUGH 1975

Year	Stillwater	Cushing
1971	7	0
1972	7	3
1973	7	2
1974	15	7
1975	<u>9</u>	<u>6</u>
Total	45	18

In studying the information presented in Table IX it was found that in the last five emergency response categories the total difference in

responses between the two departments was nineteen responses. Cushing's higher total of emergency responses over Stillwater was found to be from the areas classified as miscellaneous and false alarms. As stated in the definition section, the miscellaneous column contained responses that would not fit in any of the other categories. It appears Cushing also has a greater problem with false alarm responses in the rural area than does Stillwater.

TABLE IX
COMPARISON OF THE FIVE OTHER TYPES OF RURAL EMERGENCY
RESPONSES OF STILLWATER AND CUSHING DURING
1971 THROUGH 1975

	Stillwater	Cushing
Service	22	14
Miscellaneous	27	40
Mutual Aid	17	19
First Aid	10	13
False Alarms	<u>5</u>	<u>14</u>
Total	81	100

Analysis of Results

According to the study by Childs, Doeksen and Frye (2), the approximate future fire frequency rate can be calculated for a rural area with limited population from the following formula.

$$\text{Future Fire Frequency} = \frac{\text{Future Population}}{\text{Fire Frequency Coefficient for Populations}}$$

The fire frequency coefficient is calculated by dividing the rural population of a preselected average year by the total number of rural fires for that same average year.

$$\text{Fire Frequency Coefficient} = \frac{\text{Rural Population}}{\text{Total Rural Responses for One Year}}$$

The rural population for Payne County in 1970 was 16,532 residents. Adding an expected population in growth of 200 people for each year, a total of approximately 17,332 residents was predicted for 1974. In interviewing a representative of the Stillwater Planning Department in regard to population increases for the county, he agreed that a 200 person increase each year in the rural area would be a liberal estimate. With this estimate the fire frequency coefficient can be determined by the following formula for 1974.

$$\frac{17,332}{193} = 89.80 \text{ (Fire Frequency Coefficient)}$$

The calculated number of fires for 1975 would be as follows.

$$\frac{17,532}{89.80} = 195.23 \text{ (Future Fire Frequency)}$$

The 17,532 gives a population increase for 1975. By adding up total calls for all departments listed in Appendix B a total of 179 actual emergency calls were reported. The figure of 195.23 is very close to this actual number of rural responses.

Estimating the rural emergency responses for 1980, including the predicted population increase in future population, would calculate out to the following formula.

$$\frac{18,532}{89.80} = 206.37 \text{ (Rural Emergency Responses)}$$

This figure of 206.37 would only be an estimate for planning. If residents were careful or the year was extremely wet, which would lower the number of grass fires, this estimate could be high or the estimate could be low if residents are careless with fire or if it is a very dry year with an excessive number of grass fires.

TABLE X
FEES CHARGED FOR RURAL FIRE RESPONSES
AS OF MARCH, 1976

City	Charge
Cushing	Unit 16 - \$150 per hour Unit 18 - \$100 per hour
	Maximum charge shall be \$450 except for commercial structures. See appendix B
Glencoe	\$100 per fire call
Perkins	\$200 per fire call
Ripley	\$150 per fire call
Stillwater	\$100 per fire call or property owner
Yale	\$100 per fire call

The fees charged by each department are listed in Table X. The only department charging by the hour for each piece of apparatus sent to a fire call is Cushing. The other fire departments charge a certain amount of money per fire call or in some cases per property owner for

each piece of property the fire department does fire suppression work on. The Cushing Fire Department operated under this type of system up until June, 1975, when they changed over to their present system. The persons charged in most cases by all fire departments are the ones living on or owning the property where the fire originated.

A representative of the Payne County Commission and a representative of the Payne County Civil Defense were interviewed to determine the amount of money the County Commissioners had funded to the fire departments in Payne County. It was found that the county spends very little on fire protection for its rural residents. The reasons being that when the county laws were written, the funding of rural fire protection was not included in these laws. Since the residents in the rural areas are not being directly taxed for fire protection, the county does not fund the fire departments directly. The money, when it is funded to a fire department comes out of left over highway funds or from civil defense funds. When civil defense funds are used for purchasing equipment, the equipment must then be made available for use when the Civil Defense Director requests the fire department's assistance such as during natural or man made disasters. The actual amount of money being spent by the commission cannot accurately be determined as the funds are not clearly earmarked for fire protection but come to the departments as left over funds or through various county departments such as civil defense.

The Civil Defense Director can requisition surplus governmental equipment. Some of this equipment in the form of six by six military trucks have been acquired and converted into working pieces of rural fire apparatus. Most of this equipment after being rebuilt is used for

controlling grass fires in the county. These pieces of equipment as they are acquired are placed around the county in various fire departments.

At the time the data was collected for this study the communications of the various fire departments in Payne County consisted of the following. The Stillwater Fire Department had all of its rural apparatus equipped with two way radios on the 154.13 mhz state mutual aid frequency. Stillwater also had a completely manned twenty four a day alarm receiving and dispatching center at the headquarters fire station. The Cushing Fire Department had all of its rural apparatus equipped with two way radios on the state mutual aid frequency and had a twenty four hour a day dispatching center in its fire station. The Perkins Fire Department had a twenty four hour a day fire alarm answering service and had its piece of rural apparatus equipped with a two way radio on the state mutual aid frequency. The Yale Fire Department had its piece of apparatus for rural fire protection equipped with a citizens band (27 mhz) radio. The Yale Department had someone to answer the fire alarm telephone twenty four hours a day. The Glencoe Fire Department had one piece of rural apparatus equipped with a citizens band (27 mhz) radio and the other piece of rural apparatus had no radio of any type. The Ripley Fire Department had a two way radio on the state mutual aid frequency in its piece of fire apparatus. Table XI shows the type of radios each department had in their rural apparatus.

As shown in the table the number of units that did not have any radio or were using citizens band radios is very small. Still this small number of units can be very troublesome when different fire departments are trying to work together in a fire suppression operation.

TABLE XI
NUMBER OF RURAL APPARATUS WITH RADIOS

Department	Number of Rural Apparatus	Number of Radios	State Frequency	C.B.	No Radio
Stillwater	4	4	4	0	0
Cushing	2	2	2	0	0
Perkins	1	1	1	0	0
Glencoe	2	2	0	1	1
Yale	1	1	0	1	0
Ripley	1	1	1	0	0

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study investigated the types and number of rural fires occurring in the areas outside the incorporated limits of communities in Payne County, Oklahoma with major emphasis on the Stillwater and Cushing records. This study also examined the six organized fire departments in Payne County that had rural fire fighting apparatus and how well this apparatus is equipped to perform rural fire suppression and protection. In studying Payne County, it can be pointed out that the problems occurring are problems that are common to most areas providing rural fire protection. Examples of problems affecting rural fire suppression are long response distances, delayed alarms, lack of water, limited human resources, performance of city fire apparatus for rural fire fighting, lack of fire fighting equipment, and lack of radios.

The purpose of this study was to offer recommendations that could improve the level of fire protection offered by the six fire departments in Payne County, Oklahoma. By analyzing the types and areas where fires occur and studying the fire departments involved, the author felt that general recommendations could be made.

To achieve the purposes of this study the following research objectives were proposed:

1. To identify the areas where fires are occurring in Payne County outside of incorporated city limits.
2. To propose fire protection districts so that fire departments will know what areas they are responsible for in Payne County.
3. To propose a better fire call reporting system to lower dispatching time delays for fire departments.
4. To determine the possibility of a common radio network for all fire departments in Payne County.
5. To identify the cost of providing adequate rural fire protection in Payne County.

The methodology used in this study was to visit each fire department in Payne County and record the number and types of rural fire responses made by each department during 1971 through 1975. Complete records from 1971 through 1975 were only available from three of the fire departments. An apparatus information form was also filled out on each piece of fire apparatus making responses to rural emergencies. During this visit, information was obtained on the amount of money charged by each fire department for rural responses.

The fire response data was analyzed for trends between the Cushing and Stillwater Fire Departments over the five year study period. From existing information, predictions were made using a formula described in a study by Childs, Doeksen, and Frye (2).

By analyzing the apparatus information, decisions were made to organize the six departments into rural fire protection districts. This would help use the existing apparatus to its best advantage. Recommendations were also made from this information as to equipment that was needed on the apparatus by studying what was not being carried on the apparatus.

From the information on fire fees it could not be determined the approximate amount of money being charged for rural fire protection.

In analyzing the fire response data, trends were found in the number of rural fire response totals per year. Also rural fire problem areas were determined by examining the residence, business, grass, and vehicle fires from the Stillwater and Cushing fire response records.

Conclusions

This study indicated that rural fires are occurring in Payne County, Oklahoma. The fire records of the six fire departments in Payne County revealed that the Stillwater and Cushing Fire Departments are responding to the largest majority of the reported rural fires. In studying the apparatus and equipment used in responding to rural fires, it was found this equipment needed to be updated, additional equipment should be purchased, and new apparatus should be purchased in some instances. It was also concluded that very little money was being spent on rural fire protection by either the County or the residents of the rural areas. It also was noted that many problems were occurring with rural emergency calls but these problems occur in most areas of the country where rural fire protection is being provided.

It was concluded that the problem of fire protection in Payne County could be reduced by careful reorganization and planning by the six fire departments along with the assistance of the Payne County Commissioners. Perhaps a county-wide fire protection commission and a county fire chief could be appointed or elected. Such an organization and a chief administration along with these findings could make recommendations that could improve rural fire protection and reduce property loss.

Recommendations

Objective number one was to identify the areas that fires are occurring in Payne County. It was found by studying the fire records of the six fire departments in Payne County (Appendix B) that most of the rural fires are occurring in the Stillwater and Cushing areas. Stillwater and Cushing had the only paid fire departments in the County and most people in need of rural fire apparatus for an emergency situation called one or both of these departments. Stillwater and Cushing Fire Departments responded to nearly all places within the county where fire apparatus was requested but many times the emergency existed close to one of the small communities that had a volunteer department. By organizing the fire department protection in Payne County so that the small departments could respond to areas close to their communities, it would free some of the responsibilities of the two larger departments. This would allow Stillwater and Cushing to be available for fire protection closer to their surrounding areas where so many of the fires have been occurring.

Objective number two was to propose fire protection districts so that fire departments will know what areas they are responsible for in Payne County. By dividing Payne County into districts so that each department would have a specific area it is responsible for, better fire protection coverage would be available. Each fire department would know exactly what its first response area would be and what areas it should respond to to assist or back up another fire department. For all of the districts, either Stillwater or Cushing's tanker would respond to provide a supply of water. By using a method like this, and say a fire call came in just east of Glencoe, the Glencoe Fire Department would be notified

first and they could respond almost immediately since they have the closest fire fighting apparatus. Stillwater would then dispatch its tanker to back up the Glencoe unit. At the present time, Stillwater would most likely receive the call and respond to the alarm with its apparatus and Glencoe may never be notified of the fire. This present type of operation causes long response times due to the distance that apparatus has been having to respond. Figure 1 shows one type of system of first alarm or first response districts for each fire department. Figure 2 shows the areas that Stillwater's and Cushing's tankers would be dispatched to. As new apparatus becomes available in the smaller departments, other arrangements for districts could be made.

Table XII displays the numbered districts and shows first alarm fire department response assignments and tanker assignments for the Payne County Districts.

TABLE XII
PROPOSED FIRE PROTECTION DISTRICTS

District	Responding Apparatus	Responding Tanker
1	Stillwater	Stillwater (Area A)
2	Perkins	Stillwater, (Area A) or Cushing (Area B)
3	Glencoe	Stillwater (Area A)
4	Ripley	Cushing (Area B)
5	Cushing	Cushing (Area B)
6	Yale	Cushing (Area B)

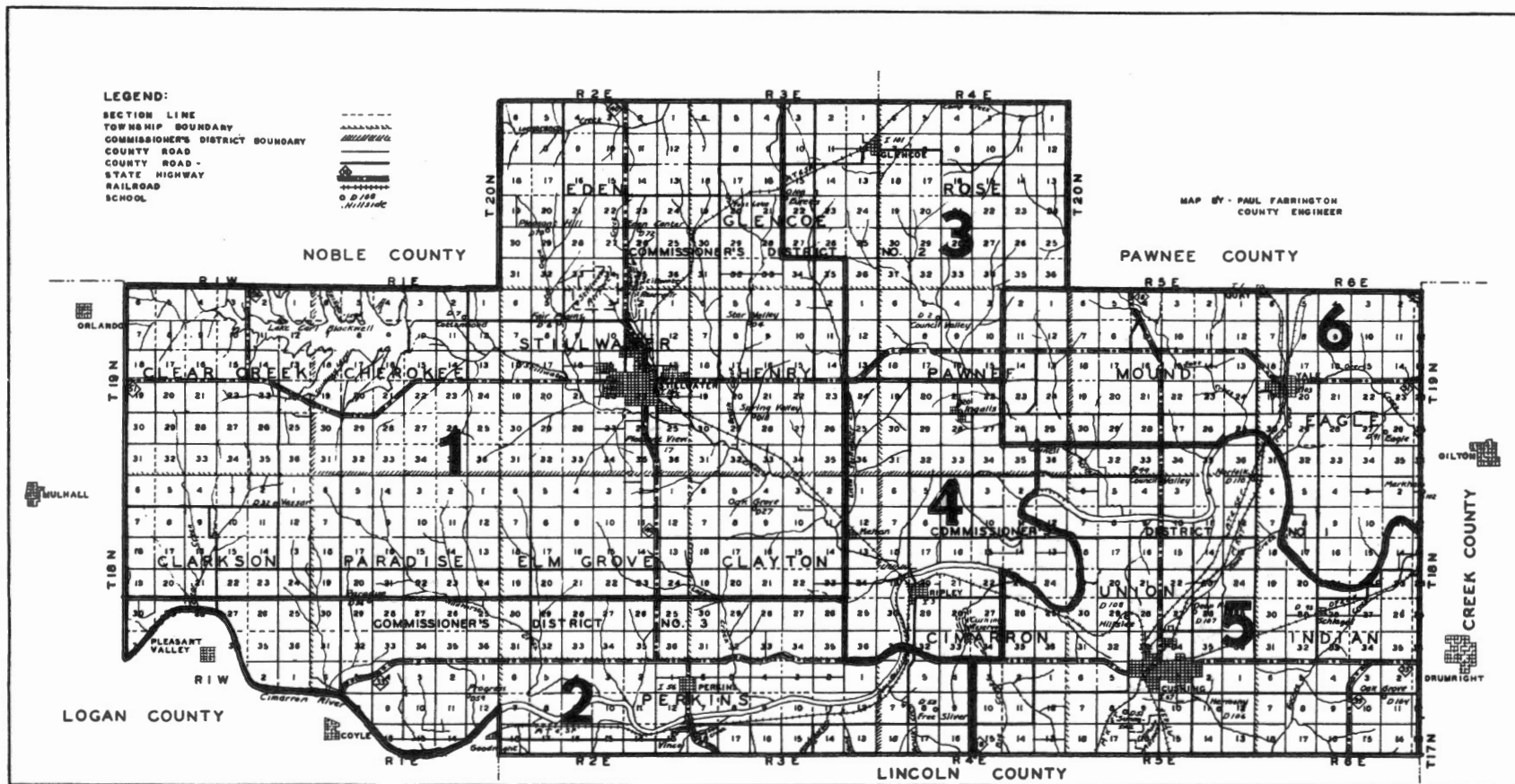


Figure 1. Proposed Payne County Fire Department Protection Districts

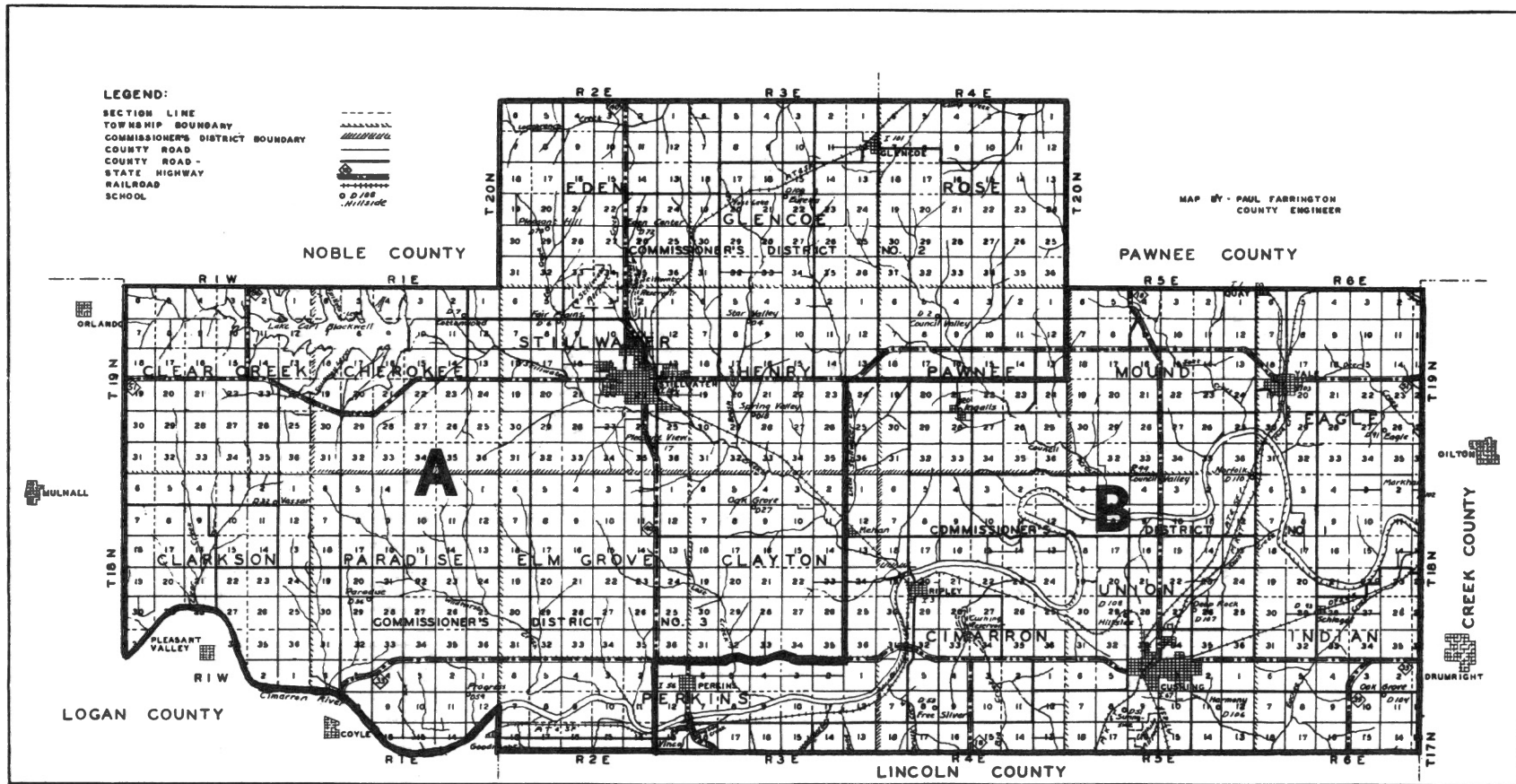


Figure 2. Proposed Payne County Fire Department Tanker Response Districts

The system of fire protection districts is used in many parts of the country. In states such as California and Kansas every acre of the state is in a fire protection district. This means that some fire department has the responsibility of protecting that acre of land. Other states have similar protection districts. The East Coast uses extensive volunteer fire companies to protect all areas of their counties and states. The organization of county-wide fire departments is not new and could be implemented in Payne County.

Objective three was to propose a better fire call reporting system to lower dispatching time delays for fire departments. At the present time when a person reports a fire, the person most often gives the location in miles, in a certain direction from a certain point. Sometimes this point is only familiar to the local resident. If two places in the county have the same nickname, the fire department is given directions from one of these places but does not know which one the caller was talking about, a dispatching delay would occur, or apparatus could be dispatched to the wrong location.

By using a card system as displayed in Figure 3 all important information about an area could be placed on a response card. Each residence in the rural area of the county would be given a number and card. In an emergency situation, the caller will give the dispatcher all the information available as presently done but will also give his number. The dispatcher would then go to the card file, find that numbered card, pull it out, and dispatch the proper fire department. The dispatcher would be able to give the responding department information on the best response route, the buildings, life hazards, or on special information about the scene of the emergency that the fire department could use as

they are responding. This card system could work well in Payne County reducing problems that occur in dispatching apparatus to rural locations and fighting rural fires.

Owner of Property	Property No.	Tenant
Phone		
Address	Township and Section	Phone
Fire Dept. Units to Respond	Location of buildings and exposure map	
First Alarm		
Second Alarm		
Response route to fire		
Nearest water supply, G.P.M. flow or gallons available	Insured: Yes \$ _____ bldgs.	
Hydrant _____	No \$ _____ content	
Pond _____		
Stream _____		
Swimming Pool _____		
Stock Tank _____		
Other _____		

Figure 3. Proposed Response Card

Objective number four was to determine the feasibility of a common radio network for all fire departments in Payne County. As shown in Table XII, most of the small fire departments have some radios on the common frequency of 154.13 mhz since the large departments are on this frequency. This is the direction the smaller departments should be

moving to. If all rural apparatus were on the same frequency coordination between fire departments would be easier. Fire departments operating with the fire protection district system would then be feasible. To dispatch county wide rural apparatus and to answer the fire alarm telephone an agency that could provide twenty four a day service should be set up. In many counties across the United States this is handled by the County Sheriff's Department. A deputy or another individual would be on duty all of the time to answer the alarm telephone, determine the type and location of the emergency, and dispatch the appropriate fire department apparatus. Another possible method would be to handle the dispatching and other operations through the Payne County Civil Defense Office. If a twenty four hour a day dispatcher were available, this set up could work. One of these systems could be the answer to the county wide communications dispatch system. As the county grows, it could be to the advantage of all the county fire departments to have a second common radio frequency for operations and dispatching for all rural fire apparatus. This would reduce operations on the common state mutual aid frequency.

Objective number five was to identify the cost of providing adequate rural fire protection in Payne County. This objective could not be completely accomplished because some needed information was not available. The fire fees were obtained but actual money spent on rural fire protection was not known. A taxable amount of money could not accurately be determined from the limited information available. As stated earlier very little money is being spent to improve rural fire protection in Payne County. The County Commissioners spend very little money on fire protection because they are not taxing the people for providing rural

fire protection. Most of the people in the rural areas are getting a good deal on fire protection until they call the fire department in a time of emergency. After the fire they are sent a bill charging a fee for the response of rural fire apparatus to their location. If the bill is paid, the money assists the fire department for salaries, up-keep and maintenance of equipment and purchase of new equipment.

Most of the fire departments do not do the billing of fees for emergency responses nor do the departments collect the money. This is usually handled through another city department. All of the fire departments said that their percent of collections was not very good. It is also difficult to determine how many people have been charged and how much during a fire where more than one fire department responds or even if a bill was sent at all.

The County Commissioners need to bring to the attention of the people that if all of the property owners would pay a tax each year to assist the rural fire protection being provided by the six departments in Payne County, the service and equipment could be up-graded, and needed equipment could be purchased after the money was distributed to each department.

To establish a tax on the property owners for better fire protection, the people must first vote if they want this tax and the amount of money that the tax will be. The County Commissioners need to impress the people with the importance of assisting the fire departments in the rural area.

Another method that is used to generate money for rural fire departments is to organize a rural fire association. This organization is similar to a club where each property owner pays dues each year which

would go directly to the fire department. If member has a fire the department will respond and no fire fee is charged. If a non-member has a fire, the fire department does not have to respond, but if it does for humanitarian reasons, the fire fee might be for a larger amount of money than a member pays so that the property owner will join the association. This system is a very good way to raise money and each year the department will know approximately how much operating money it would have for manpower, apparatus, and equipment. Presently each department has no idea how much rural money it will receive as it depends upon the number of rural calls, how many fees were charged, what percent of the fees were collected, how much left over money the County Commissioners can find in other accounts to pass on to the rural departments. This fire association system is being used in many parts of the country and in Oklahoma by the communities of Morrison and Billings.

For a fire department to do the job it was designated to do it takes operating money. The residents of Payne County can not expect the best possible rural fire protection if only a limited amount of money is being spent on the fire departments that are providing their emergency services to them. The people themselves need to help fund the departments in the way of rural taxes, rural fire associations, or if the people can devise a better way of raising the money it would be to the property owners advantage. Since the rural people really are not directly paying for the rural fire protection provided for them, it is really being paid for by the residents living in each of the communities through their city taxes.

It is recommended that another study be done to determine the actual cost of having apparatus and fire fighters respond to a rural fire. Items

such as apparatus depreciation, salaries, cost of extinguishing materials and other costs would need to be determined. An entire study of the economics of providing rural fire protection in Payne County, Oklahoma would make a very good addition to be used along with this study on the entire rural fire protection problem.

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APPENDIXES

APPENDIX A

THE INSTRUMENTS

Name of Fire Department _____

	71	72	73	74	75	Total
Residence						
Business						
Grass						
Vehicle						
Service						
Miscellaneous						
Mutual Aid						
First Aid						
False Alarms						
Total						

Average Number of Fire Runs Per Month:

71 _____

72 _____

73 _____

74 _____

75 _____

Name of Fire Department _____

FEEES FOR RURAL FIRE RESPONSES

Fee Per Call _____

Fee Per Hour _____

Fee Per Fire Apparatus Unit _____

Other Fees _____

Name of Fire Department _____

RURAL FIRE FIGHTING APPARATUS

Unit Number _____

Type _____

Type of Pump _____ GPM _____

Water Tank Capacity _____ Gals.

Number of Booster Reels _____ Hose Size _____

Feet of 1½" Hose _____ Preconnected _____

Feet of 2½" Hose _____

Hard Suction Yes _____ No _____ Diameter _____

Full Compliment of Pamphlet 19 Firefighting equipment

Yes _____ No _____

Radio Yes _____ No _____ Frequency _____

Self Contained Breathing Equipment Yes _____ No _____

Number of Breathing Equipment _____ Time Limit _____

Number of Spare Bottles _____ Time Limit _____

Ladders Yes _____ No _____

Lengths and Number of _____

Portable Pump Yes _____ No _____

APPENDIX B

RAW DATA

Name of Fire Department Cushing

	71	72	73	74	75	Total
Residence	7	6	4	8	5	30
Business	4	7	5	7	6	29
Grass	23	30	16	42	17	128
Vehicle		3	2	7	6	18
Service		2	5	6	1	14
Miscellaneous	9	6	8	5	12	40
Mutual Aid	2	2	4	6	5	19
First Aid	2	5	4	2		13
False Alarms	4	3	3	1	3	14
Total	51	64	49	86	63	305
Incomplete Runs	4	10	3	13	8	38

Average Number of Fire Runs Per Month:

71 4.2572 5.3373 4.0874 7.1775 5.25

Name of Fire Department Glencoe

	71	72	73	74	75	Total
Residence						
Business					2	2
Grass					5	5
Vehicle					1	1
Service					1	1
Miscellaneous						
Mutual Aid						
First Aid						
False Alarms					1	1
Total					10	10

Average Number of Fire Runs Per Month:

71 _____

72 _____

73 _____

74 _____

75 .83

Name of Fire Department Perkins

	71	72	73	74	75	Total
Residence					1	1
Business					2	2
Grass					7	7
Vehicle						
Service						
Miscellaneous						
Mutual Aid						
First Aid						
False Alarms						
Total					10	10

Average Number of Fire Runs Per Month:

71 _____

72 _____

73 _____

74 _____

75 .83

Name of Fire Department Ripley

	71	72	73	74	75	Total
Residence					2	2
Business					3	3
Grass				3	2	5
Vehicle					2	2
Service						
Miscellaneous						
Mutual Aid						
First Aid						
False Alarms						
Total				3	9	12

Average Number of Fire Runs Per Month:

71 _____

72 _____

73 _____

74 .2575 .75

Name of Fire Department Stillwater

	71	72	73	74	75	Total
Residence	8	12	13	18	9	60
Business	2	3	1	1	1	8
Grass	17	34	9	38	37	135
Vehicle	7	7	7	15	9	45
Service	0	3	3	4	12	22
Miscellaneous	1	1	5	6	14	27
Mutual Aid	2	3	3	7	2	17
First Aid	1	1	1	5	2	10
False Alarms	1	0	1	2	1	5
Total	39	64	43	96	87	329

Average Number of Fire Runs Per Month:

71 3.2572 5.3373 3.5874 8.0075 7.25

Name of Fire Department Yale

	71	72	73	74	75	Total
Residence	1	2		3	1	7
Business	4	2	1	2	2	12
Grass	21	10	8	10	4	53
Vehicle	1			2	3	6
Service	2	1	1			4
Miscellaneous						
Mutual Aid						
First Aid						
False Alarms						
Total	30	15	10	17	10	82

Average Number of Fire Runs Per Month:

71 2.50

72 1.25

73 .83

74 1.42

75 .83

Name of Fire Department Cushing

FEES FOR RURAL FIRE RESPONSES

Fee Per Call Prior to 6/75 \$150 per call
6/75 to present Unit 16 \$150 per hour
Unit 18 \$100 per hour

Fee Per Hour _____

Fee Per Fire Apparatus Unit _____

Other Fees _____

Name of Fire Department Glencoe

FEES FOR RURAL FIRE RESPONSES

Fee Per Call \$100

Fee Per Hour _____

Fee Per Fire Apparatus Unit _____

Other Fees _____

Name of Fire Department Perkins

FEEES FOR RURAL FIRE RESPONSES

Fee Per Call \$200

Fee Per Hour _____

Fee Per Fire Apparatus Unit _____

Other Fees _____

Name of Fire Department Ripley

FEES FOR RURAL FIRE RESPONSES

Fee Per Call \$150

Fee Per Hour _____

Fee Per Fire Apparatus Unit _____

Other Fees _____

Name of Fire Department Stillwater

FEES FOR RURAL FIRE RESPONSES

Fee Per Call \$100 for each property owner that
fire occurs on per call

Fee Per Hour _____

Fee Per Fire Apparatus Unit _____

Other Fees _____

Name of Fire Department Yale

FEEES FOR RURAL FIRE RESPONSES

Fee Per Call \$100

Fee Per Hour _____

Fee Per Fire Apparatus Unit _____

Other Fees _____

Name of Fire Department Cushing

RURAL FIRE FIGHTING APPARATUS

Unit Number 16Type Tanker (six by six)Type of Pump _____ GPM 500Water Tank Capacity 1,000 Gals.Number of Booster Reels 1 Hose Size 1" and 3/4"Feet of 1½" Hose 300 Preconnected _____Feet of 2½" Hose 0Hard Suction Yes X No _____ Diameter 4½" and 2½"

Full Compliment of Pamphlet 19 Firefighting equipment

Yes _____ No XRadio Yes X No _____ Frequency 154.13 mhzSelf Contained Breathing Equipment Yes _____ No X

Number of Breathing Equipment _____ Time Limit _____

Number of Spare Bottles _____ Time Limit _____

Ladders Yes X No _____Lengths and Number of _____ Attic _____ 10'Portable Pump Yes _____ No X

Name of Fire Department Cushing

RURAL FIRE FIGHTING APPARATUS

Unit Number 18Type Grass Rig (Four wheel drive)Type of Pump _____ GPM 200Water Tank Capacity 250 Gals.Number of Booster Reels 1 Hose Size 1" and 3/4"Feet of 1½" Hose 250 Preconnected _____Feet of 2½" Hose 0Hard Suction Yes No _____ Diameter 3"

Full Compliment of Pamphlet 19 Firefighting equipment

Yes _____ No Radio Yes No _____ Frequency 154.13 mhzSelf Contained Breathing Equipment Yes _____ No

Number of Breathing Equipment _____ Time Limit _____

Number of Spare Bottles _____ Time Limit _____

Ladders Yes _____ No Lengths and Number of

_____Portable Pump Yes _____ No

Name of Fire Department Perkins

RURAL FIRE FIGHTING APPARATUS

Unit Number 60Type TankerType of Pump _____ GPM 500Water Tank Capacity 1,000 Gals.Number of Booster Reels 2 Hose Size 1"Feet of 1½" Hose 300 Preconnected _____Feet of 2½" Hose 100Hard Suction Yes No _____ Diameter 2½"

Full Compliment of Pamphlet 19 Firefighting equipment

Yes _____ No Radio Yes No _____ Frequency 154.13 mhz, CBSelf Contained Breathing Equipment Yes No _____Number of Breathing Equipment 2 Time Limit 30 minutesNumber of Spare Bottles 0 Time Limit _____Ladders Yes No _____Lengths and Number of Roof 20'Attic 8'Extension 20'Portable Pump Yes No _____

Name of Fire Department Ripley

RURAL FIRE FIGHTING APPARATUS

Unit Number _____

Type Pumper/TankerType of Pump _____ GPM 250Water Tank Capacity 1,600 Gals.Number of Booster Reels 1 Hose Size 1"Feet of 1½" Hose 200 Preconnected _____Feet of 2½" Hose 0Hard Suction Yes X No _____ Diameter 1½"

Full Compliment of Pamphlet 19 Firefighting equipment

Yes _____ No XRadio Yes X No _____ Frequency 154.13 mhzSelf Contained Breathing Equipment Yes X No _____Number of Breathing Equipment 1 Time Limit 30 minutes

Number of Spare Bottles _____ Time Limit _____

Ladders Yes X No _____Lengths and Number of _____ Extension 24'Portable Pump Yes _____ No X

Name of Fire Department Stillwater

RURAL FIRE FIGHTING APPARATUS

Unit Number 51

Type Tanker (Six by Six)

Type of Pump _____ GPM 250

Water Tank Capacity 850 _____ Gals.

Number of Booster Reels 2 _____ Hose Size 1"

Feet of 1½" Hose 100 _____ Preconnected _____

Feet of 2½" Hose 50 _____

Hard Suction Yes _____ No X _____ Diameter _____

Full Compliment of Pamphlet 19 Firefighting equipment
 Yes _____ No X _____

Radio Yes X _____ No _____ Frequency 154.13 mhz

Self Contained Breathing Equipment Yes _____ No X _____

Number of Breathing Equipment _____ Time Limit _____

Number of Spare Bottles _____ Time Limit _____

Ladders Yes _____ No X _____

Lengths and Number of _____

Portable Pump Yes _____ No X _____

Name of Fire Department Stillwater

RURAL FIRE FIGHTING APPARATUS

Unit Number 52Type Grass Rig (Four wheel drive)Type of Pump _____ GPM 90Water Tank Capacity 190 _____ Gals.Number of Booster Reels 1 _____ Hose Size 1"Feet of 1½" Hose 0 _____ Preconnected _____Feet of 2½" Hose 50 _____Hard Suction Yes _____ No X _____ Diameter _____

Full Compliment of Pamphlet 19 Firefighting equipment

Yes _____ No X _____Radio Yes X _____ No _____ Frequency 154.13 mhzSelf Contained Breathing Equipment Yes _____ No X _____

Number of Breathing Equipment _____ Time Limit _____

Number of Spare Bottles _____ Time Limit _____

Ladders Yes _____ No X _____

Lengths and Number of _____

Portable Pump Yes _____ No X _____

Name of Fire Department Stillwater

RURAL FIRE FIGHTING APPARATUS

Unit Number 55

Type Pumper

Type of Pump _____ GPM 500

Water Tank Capacity 500 Gals.

Number of Booster Reels 2 Hose Size 1"

Feet of 1½" Hose 400 Preconnected Yes

Feet of 2½" Hose 1,000

Hard Suction Yes X No _____ Diameter 4½" and 2½"

Full Compliment of Pamphlet 19 Firefighting equipment
 Yes _____ No X

Radio Yes X No _____ Frequency 154.13 mhz

Self Contained Breathing Equipment Yes X No _____

Number of Breathing Equipment 3 Time Limit 15 & 30 min.

Number of Spare Bottles _____ Time Limit _____

Ladders Yes X No _____

Lengths and Number of _____

Extension	<u>24'</u>
Roof	<u>12'</u>
Attic	<u>10'</u>

Portable Pump Yes X No _____

Name of Fire Department Stillwater

RURAL FIRE FIGHTING APPARATUS

Unit Number Big RedType TankerType of Pump _____ GPM 250Water Tank Capacity 1000 Gals.Number of Booster Reels 1 Hose Size 1"Feet of 1½" Hose 50 Preconnected _____Feet of 2½" Hose 0Hard Suction Yes _____ No X Diameter _____

Full Compliment of Pamphlet 19 Firefighting equipment

Yes _____ No XRadio Yes X No _____ Frequency 154.13 mhzSelf Contained Breathing Equipment Yes _____ No X

Number of Breathing Equipment _____ Time Limit _____

Number of Spare Bottles _____ Time Limit _____

Ladders Yes _____ No X

Lengths and Number of _____

Portable Pump Yes _____ No X

Name of Fire Department Yale

RURAL FIRE FIGHTING APPARATUS

Unit Number _____

Type PumperType of Pump _____ GPM 500

Water Tank Capacity _____ Gals.

Number of Booster Reels 1 Hose Size 1"Feet of 1½" Hose 100 Preconnected _____Feet of 2½" Hose 1,000Hard Suction Yes X No _____ Diameter 4"

Full Compliment of Pamphlet 19 Firefighting equipment

Yes _____ No XRadio Yes X No _____ Frequency CBSelf Contained Breathing Equipment Yes _____ No X

Number of Breathing Equipment _____ Time Limit _____

Number of Spare Bottles _____ Time Limit _____

Ladders Yes X No _____Lengths and Number of _____ Extension _____ 20'_____ Roof _____ 10'Portable Pump Yes _____ No X

VITA

Richard Cornelius Mahaney

Candidate for the Degree of

Master of Science

Thesis: A STUDY OF THE TYPES OF FIRES OCCURRING IN AREAS OUTSIDE THE CITY LIMITS IN PAYNE COUNTY, OKLAHOMA, WITH RECOMMENDATIONS TO IMPROVE THE EXISTING FIRE DEPARTMENT PROTECTION

Major Field: Technical Education

Biographical:

Personal Data: Born in Lansing, Michigan, January 3, 1952, the son of Dr. and Mrs. Robert C. Mahaney

Education: Graduated from Holland High School, Holland, Michigan, in June, 1970; received an Associate Degree in Electronics Technology from Grand Rapids Junior College, Grand Rapids, in December, 1972; received an Associate Degree in Fire Protection Technology from Oklahoma State University in December, 1974; received a Bachelor of Science degree in Technical Education from Oklahoma State University in December, 1975; completed requirements for Master of Science degree in Technical Education at Oklahoma State University, Stillwater, Oklahoma, in July, 1976.

Professional Experience: Fire extinguisher sales and serviceman, Coleman Fire Equipment and Safety Supply, Holland, Michigan, May, 1972 to May, 1973; undergraduate laboratory instructor, Fire Protection and Safety Engineering Technology, Oklahoma State University, Stillwater, Oklahoma, August, 1974 to December, 1974 and August, 1975 to December, 1975; student fire fighter, Stillwater Fire Department, Stillwater, Oklahoma, August, 1973 to July, 1976; technician, Fire Service Training, November, 1974 to December, 1975; graduate research assistant, Fire Service Training, January, 1976 to July, 1976, Stillwater, Oklahoma.