

AD-A092 944 INSTITUTE FOR WATER RESOURCES (ARMY) FORT BELVOIR VA F/B 19/3
A STUDY OF THE IMPACT OF THE HUGO RESERVOIR ON CHOCTAW AND PUSH--ETC
APR 80 R E EVANS
UNCLASSIFIED IWR-RR-80-R1

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**A STUDY OF THE IMPACT OF THE
HUGO RESERVOIR ON CHOCTAW AND
PUSHMATAHA COUNTIES:
A VIEW FOUR YEARS AFTER COMPLETION**

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SECTION I

INTRODUCTION

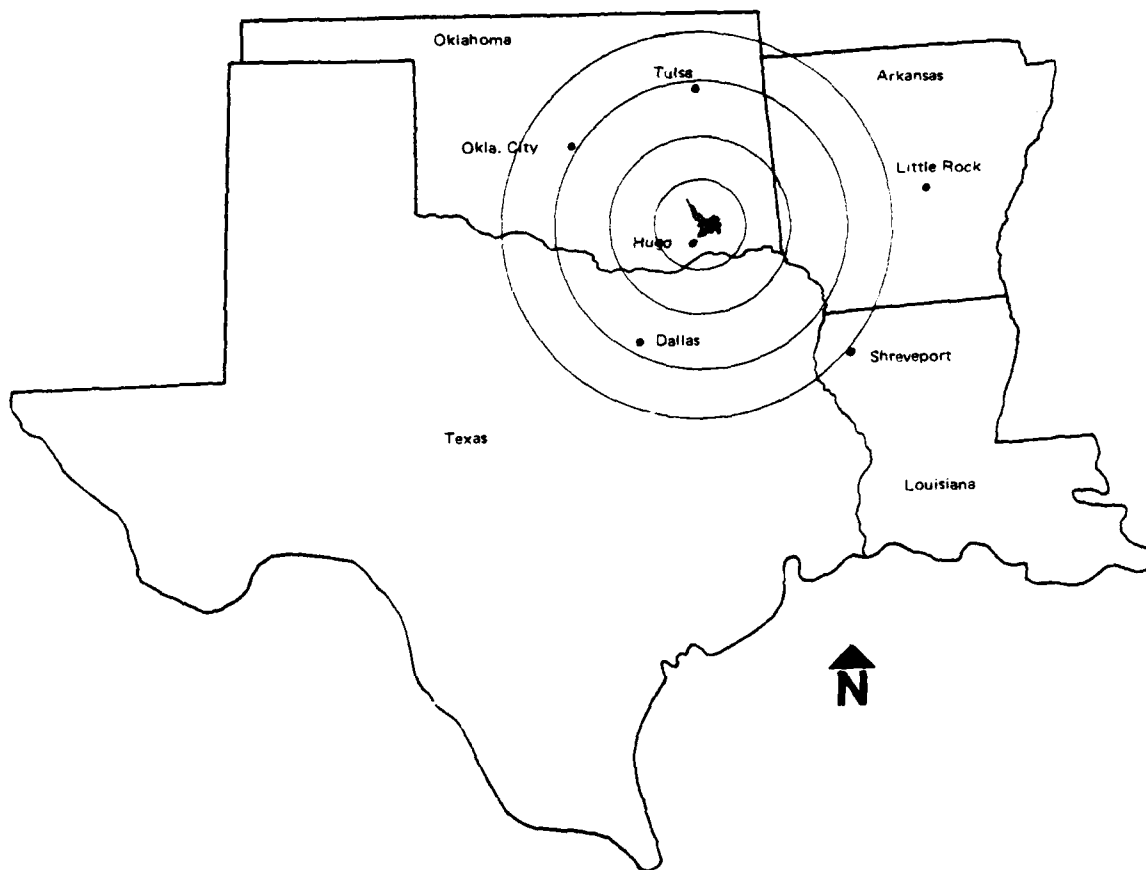
In 1967, recognizing the fact that reservoirs as well as other man-made structures impact in varying degrees upon the social and economic well-being of society, the Corps of Engineers, United States Army, commissioned a pro-forma study of the impact of the Hugo Reservoir on two Southeastern Oklahoma Counties.¹ The purpose of that study was to attempt to acquire some advance knowledge of the degree to which this reservoir would influence and direct the social and economic life of the two counties. Such knowledge could, in turn, help the counties prepare to meet the problems arising from the construction of the reservoir.

Purpose

More than ten years have passed since the first study (and the construction of the reservoir) was begun and more than four years have elapsed since water impoundment in the reservoir began. During this period the two counties in the study area have experienced many of the changes which were expected to occur as a result of the construction and operation of the reservoir. The primary purpose of this study is to compare the actual effects of the reservoir upon the study area with the effects forecast by the earlier study. In addition, this study will reevaluate earlier long range forecasts of changes in the economy

¹ A Study of the Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, January 1969.

Figure 1
Location of Hugo Reservoir



and prepare new forecasts based on the effects of the reservoir thus far. Finally, this study will include the attitudes of a sample of Study Area residents toward the reservoir and its effects on the area.

Scope

The geographic scope of this study is the area in Southeastern Oklahoma consisting of Choctaw County and Pushmataha County. Throughout the remainder of this report these counties will be referred to as the "Study Area."

Chronologically, this study embraces three time frames. The first of these is the immediate past which includes the period 1967 through 1977. The second time frame is termed the short run period which is approximately seven years in length and includes the period between 1978 and 1985. The third or long-term time period extends to the year 2050.

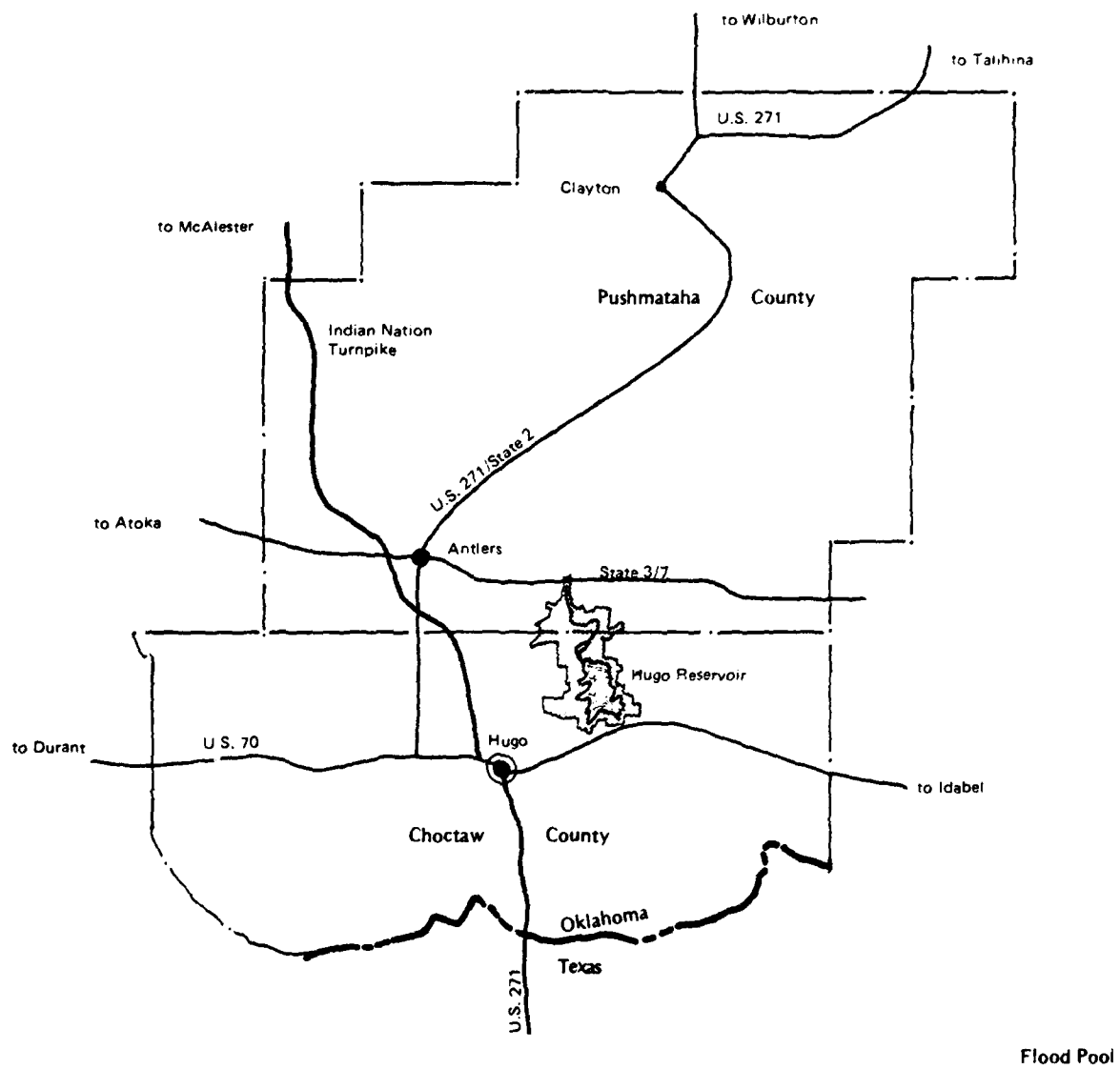
The economic scope of this project includes all factors which affect population, income and the general well-being of residents of the Study Area. Among the economic activities to be examined during the course of the study are transportation, finance, trade, manufacturing and agriculture.

Methodology

The analytical methods used in this study range from the relatively unsophisticated time series and regression techniques employed in the earlier study to more complex multiple regression models designed to estimate long-term growth. In addition to these modeling devices, an input-output model has been employed to assist in the measurement of economic impacts.

The data utilized throughout this study were obtained primarily from valid secondary sources. Only in those instances in which secondary data were not

Figure 2
The Study Area



available did the research team resort to gathering primary data. Each table in the study is fully documented as to source. In addition, all data sources are summarized in the Bibliography which is included in Appendix A to this report.

SECTION II

EXECUTIVE SUMMARY

The purpose of this study was to examine the extent to which the construction of the Hugo Reservoir had affected the economies of Choctaw and Pushmataha Counties. Secondly, the study had as a goal a comparison of its impact forecast a priori in 1967 with actual occurrences and revised forecasts based on later data now available. The impacts measured in this study were for the short-term period (1967-1977) and the forecasts extended, in most cases to 2050.

That the reservoir has been beneficial to the Study Area in the short-term and will provide even further growth in the future is pointed out in this report. Some of the effects of the reservoir between its inception and 1977 along with estimated effects by 1980 are summarized below.

- The population of the area increased by nearly three thousand persons between 1967 and 1977. Further gains are expected in the ensuing three years which will increase the population by another 2,000 persons by 1980.
- The labor force of the Study Area in 1977 was 1,154 persons higher than in 1967 and estimates suggest that employment in the area will increase by an additional 1,500 jobs by 1980.
- Per capita income in the Study Area in 1977 was more than \$2,000 higher than in 1967. By 1980, the level is forecast to reach \$3,681 which represents an increase of nearly \$250 per person over the 1977 level.

- Farm output in the Study Area had reached \$12.5 million by 1977. This is more than double the output of 1967. By 1980, the dollar volume of farm production should exceed \$15.4 million.
- In 1967, the value added by manufacture in the area totaled \$3.1 million. Estimates for 1977 suggest that this value exceeded \$5.1 million. Forecasts for 1980 indicate that area manufacturers will enhance the value of their product by an additional \$300 thousand.
- Bank deposits (in 1967 dollar equivalents) in the Study Area have increased rapidly during the past decade so that by 1977, the total was \$18 million higher than 10 years earlier. A continuation of this trend through 1980 will raise the total to \$43.7 million which is more than \$4 million higher than in 1977.
- Loans and Discounts by banks in the Study Area are projected to follow the same trends as bank deposits thereby increasing the dollar value of these instruments to \$21.5 million which is more than double the 1967 level. Forecasts of loan demand indicate that the total value of loans will be nearly \$30 million (in 1967 dollar equivalents) by 1980.
- Total construction activity in the area by 1977 exceeded the level of 1967 by \$11 million.
- Rapid increase in construction is projected for the period between 1980 and 2000. This increase will be due in large measure to the construction of a new coal fired generating plant near Hugo. This plant will be located downstream from

the reservoir on the Kiamichi River and will take water from the river directly. This plant will require 14 years to complete in its planned configuration. It should be noted that by insuring a continuous flow of water in the river, the reservoir was directly responsible for the selection of this location for the facility.

- The creation of the Hugo Reservoir resulted in the emergence of the recreation industry as a major economic activity in the area. Since 1974, this industry has contributed \$7.4 million to the area's economy. By 1980, this industry is expected to contribute an additional \$5 million (in 1967 dollar equivalents) to the businesses in the area.
- The general economy of the area has improved significantly since the beginning of construction of the reservoir. The index of the general economy rose from 105 in 1967 (1957-59=100) to 223 by 1977. Forecasts of activity through 1980 indicate that further increases will raise the level of this index to 241 by 1980.
- The use of land changed little between 1967 and 1978 although residential uses near the lake increased by 24 acres as a result of households seeking homes nearer this important recreational facility.

SECTION III

THE STUDY AREA

The two counties included in the Study Area are located in Southeast Oklahoma and depend largely upon agriculture and forest industries for their sources of income. Until recently, both counties have been characterized by declining populations although the general downward trend reversed itself and slight gains were noted in subsequent years.

The soil associations in the area vary widely. Most of Choctaw County consists of soils suitable for agriculture while very little of Pushmataha can be classed as good farming land. On the other hand, Pushmataha contains extensive forested land which provides it with several viable industries.

A wide variety of public services are available to the residents of the Study Area including most modes of transportation, ample supplies of energy and water and a complete communications system. In addition, a comprehensive highway network connects the area with the remainder of the nation.

The Economy

As pointed out earlier, the study area depends in large degree on agriculture, forestry and trades and services for its income. There is little mining in the area on a regular basis. When active, however, sand, gravel and stone comprise most, if not all, of the output produced by mines.

Manufacturing activity in the area consists primarily of food processing, apparel manufacturing and operations associated with the timber industry such

as sawmills etc. At the end of 1978, there were approximately 20 manufacturing establishments in the study area. These plants employ 1,544 workers most of which live in or near the area.

Among the non-manufacturing industries in the area trades and services are the largest employers followed by government, construction and the transportation, communications and public utility sector. These employers provide approximately 60 percent of the jobs in the Study Area.

The financial community serving the Study Area consists of six banks and one savings and loan association. This latter institution is of recent origin having been chartered in 1977. It provides the area with a long needed, local source of long-term mortgage money which, in prior years, was obtained from thrift institutions in other areas.

Since 1974 when water impoundment began in the Hugo Reservoir, the recreation industry has grown rapidly and is largely responsible for the increased employment in trades and services. In 1977, it is estimated that visitors to the reservoir spent nearly \$2 million in the area largely on retail items and on such services as filling stations, lodging and repairs. In addition to their expenditures, visitors to the area contribute considerable revenue to the area in the form of taxes on their purchases.

The farm sector of the economy of this study area has been characterized by a steady decline in the number of farms and in the acreage devoted to farming. From more than 700 thousand acres of farmland in 2,046 farms in 1967, the total for the area in 1977 was only 600 thousand acres in 1,564 farms. The decline in the number of farms was more rapid than the acreage decline thus increasing the average size of farm in the area from 342 acres to 384 acres. Farming in the two-county study area traditionally accounts for 7 percent of the area's income.

The Tax Structure

The two counties in the Study Area have local tax structures which are standard insofar as Oklahoma is concerned. This is to say that property taxes are levied for the operations of cities, counties and schools. In addition, Choctaw County pays local taxes in support of a Vocational-Technical Training School.

The tax structures and levies of these counties appear in Tables 1 and 2.

Public Utilities

Significant progress has been made during the past decade towards providing necessary public utilities to all area residents. The efforts of the various utility suppliers have been particularly evident in rural areas where central water systems and electrical systems have been developed.

Water Supply and Distribution

In 1967, much of the water supply in the Study Area depended on wells and independent (i.e. individual) water distribution systems. Since that time, however, three rural water districts have been established to provide water to rural farm and non-farm areas. In addition, the water supply system of Hugo, which formerly depended on wells, now utilizes Hugo Reservoir as its primary source of water. Antlers likewise has altered its water supply from direct utilization of the Kiamichi River to use of the reservoir thereby providing a more consistent and dependable water source. The water systems now operating in the area are summarized in Table 3.

TABLE 1
Tax Structure
Choctaw County
1971-1977
(Mills per \$1,000 Assessed Valuation)

Year	Tax Rates				
	City	County	School	Other	Total
1977	7.12	22.44	44.30	5.20	78.16
1976	8.70	20.50	50.26	5.60	84.67
1975	6.40	20.50	51.50	5.27	83.67
1974	8.10	20.53	51.50	5.35	85.48
1973	8.50	20.30	53.50	3.94	86.24
1972	5.00	21.12	54.35	3.94	84.41
1971	6.30	20.05	54.85	3.99	85.19

Source: KEDDO Industrial Base Study, 1978, Kiamichi Economic Development District of Oklahoma, Wilburton, Oklahoma, 1978.

TABLE 2
Tax Structure
Pushmataha County
1971-1977
(Mills per \$1,000 Assessed Valuation)

Year	Tax Rates				
	City	County	School	Other	Total
1977	8.56	16.50	53.02	0	78.08
1976	0	17.10	57.46	0	74.56
1975	0	17.09	57.89	0	74.98
1974	0	17.12	45.21	0	62.33
1973	0	17.18	45.85	0	63.03
1972	0	17.28	45.90	0	63.18
1971	0	17.42	47.00	0	64.42

Source: KEDDO Industrial Base Study, 1978, Kiamichi Economic Development District of Oklahoma, Wilburton, Oklahoma, 1978.

TABLE 3
Water Systems in
Choctaw and Pushmataha Counties

System	Population Served	Average Daily Use (000 Gallons)	Safe Yield (000 Gallons)	Treatment Capacity (000 Gallons)
Choctaw:				
Hugo	6,585	1,000	2,500	2,500
Rural	100	-	-	-
Ft. Towson	430	112	na	648
Rural	200	-	-	-
Boswell	1,452	36	na	na
Rural Water District 1	1,272	53	na	na
Swink	228	8	na	na
Pushmataha:				
Antlers	5,299	400	675	2,000
Clayton	1,316	160	na	na
Rural Water District 1	1,064	36	na	na
Rural Water District 2	2,600	126	na	na
Rattan-Moyers	1,904	52	na	750

na = not available.

Source: KEDDO Industrial Base Study, 1978, Kiamichi Economic Development District of Oklahoma, Wilburton, Oklahoma, 1978.

The rates applicable to water usage in Hugo and Antlers have increased appreciably since 1968. The minimum cost in Hugo rose from \$2.00 in 1968 to \$5.00 in 1978 while it increased from \$2.50 to \$4.50 over the same period in Antlers. These rates are detailed in Tables 4 and 5.

TABLE 4
Water Rates
Charged in Hugo, Oklahoma
1967 and 1978

Basis	Rate	
	1967	1978
First 2000 gal	\$2.000	\$5.000
Next 5000 gal (Per 100 gal)	0.045	0.1000
Next 5000 gal (Per 100 gal)	0.033	0.0900
Next 5000 gal (Per 100 gal)	0.033	0.0800
Next 5000 gal (Per 100 gal)	0.030	0.0700
All additional (Per 100 gal)	0.027	0.0500

Source: 1978 Files of the Oklahoma Water Resources Board. 1967 - City Clerk, City of Hugo.

TABLE 5
Water Rates
Charged in Antlers, Oklahoma
1967 and 1978

Basis	Rate	
	1967	1978
First 2000 gal	\$2.50	\$4.50
Next 3000 gal (Per 100 gal)	0.09	0.15
Next 5000 gal (Per 100 gal)	0.07	0.10
Next 10,000 gal (Per 100 gal)	0.05	0.08
All over 20,000 gal (Per 100 gal)	0.03	0.04

Source: 1978 Files of the Oklahoma Water Resources Board. 1967 - City Clerk, City of Antlers.

Electricity Distribution

The electric service in the Study Area has improved significantly during the past ten years. As a result of this enhanced service, consumption of electricity has risen even more rapidly than the suppliers had hoped in spite of the moderate growth in the population and industry in the area.

The area is served by the Public Service Company of Oklahoma, the Choctaw Rural Electric Cooperative and, in the northern portion of Pushmataha County, by the Kiamichi Rural Electric Cooperative. It is of note that the Western Farmers Electric Cooperative will begin construction of a coal fired generating plant near Hugo in 1980. The completion of this plant should supplement the already extensive generating capacity available to the area from present suppliers and thereby encourage further increases in the use of electricity.

The rates charged for electricity vary somewhat between the two major suppliers. These rates for the past 10 years are listed in Tables 6-9.

Natural Gas Consumption, Distribution, and Rates

The Lone Star Gas Company is currently the only supplier of natural gas in the Two-County Area. Natural gas is distributed to the area through a six-inch pipeline which extends from Paris, Texas, to a terminal point in or near Antlers, Oklahoma. The principal cities served by this source include Hugo, Grant and Antlers. The volume of gas transmitted by the Lone Star Gas Company in the counties of Choctaw and Pushmataha is shown in Table 10.

Natural gas rates are standard throughout the area and have changed only twice since 1959. These rates are shown in Table 11.

Those rural portions of the two county area not served by Lone Star Gas Company rely either on electricity or bottled gas for heat.

TABLE 6
Electricity Rates
Charged by
The Public Service Company of Oklahoma
in Hugo and Antlers, Oklahoma
1968

Type and Basis	Hugo		Antlers
Residential			
1st 16 Kwh	\$1.0000	1st 15 Kwh	\$1.0000
Next 34 Kwh (Per Kwh)	0.0350	Next 35 Kwh	0.0370
Next 100 Kwh (Per Kwh)	0.0300	Next 100 Kwh	0.0300
Next 350 Kwh (Per Kwh)	0.0250	Next 350 Kwh	0.0250
Next 250 Kwh (Per Kwh)	0.0225	Next 250 Kwh	0.0225
All additional (Per Kwh)	0.0200	All additional	0.0200
Rural			
1st 30 Kwh	\$2.5000		\$2.5000
Next 270 Kwh (Per Kwh)	0.0400		0.0400
Next 2,200 Kwh (Per Kwh)	0.0300		0.0300
Next 2,500 Kwh (Per Kwh)	0.0275		0.0275
Next 2,500 Kwh (Per Kwh)	0.0250		0.0250
All additional (Per Kwh)	0.0225		0.0225
Commercial & Industrial			
1st 300 Kwh (Per Kwh)	\$0.0400		\$0.0420
Next 2,200 Kwh (Per Kwh)	0.0300		0.0300
Next 2,500 Kwh (Per Kwh)	0.0275		0.0275
Next 2,500 Kwh (Per Kwh)	0.0250		0.0250
All additional (Per Kwh)	0.0225		0.0225

Note: Above rates do not include fuel adjustment costs.

Source: Oklahoma Corporation Commission.

TABLE 7
Electricity Rates
Charged by
The Public Service Company of Oklahoma
in Hugo and Antlers, Oklahoma
1974

Type and Basis	Hugo		Antlers
Residential			
1st 15 Kwh (Per Kwh)	\$1.0000	1st 14 Kwh	\$1.0000
Next 35 Kwh (Per Kwh)	0.0370	Next 36 Kwh (Per Kwh)	0.0470
Next 100 Kwh (Per Kwh)	0.0300		0.0300
Next 350 Kwh (Per Kwh)	0.0250		0.0250
Next 250 Kwh (Per Kwh)	0.0225		0.0225
All additional (Per Kwh)	0.0200		0.0200
Commercial & Industrial			
1st 300 Kwh (Per Kwh)	0.0400		0.0420
Next 2,200 Kwh (Per Kwh)	0.0300		0.0300
Next 2,500 Kwh (Per Kwh)	0.0275		0.0275
Next 2,500 Kwh (Per Kwh)	0.0250		0.0250
All additional (Per Kwh)	0.0200		0.0200

Note: Above rates do not include Fuel Adjustment Cost.

Source: Oklahoma Corporation Commission.

TABLE 8
Electricity Rates
Charged by
The Public Service Company of Oklahoma
in Hugo and Antlers, Oklahoma
1978

Type and Basis	Rate ¹	
	On Peak	Off Peak
Residential		
1st 50 Kwh (Per Kwh)	\$0.06498	\$0.06498
Next 150 Kwh (Per Kwh)	0.04278	0.04278
Next 400 Kwh (Per Kwh)	0.03578	0.03578
All additional (Per Kwh)	0.03418	0.02108
General		
1st 50 Kwh (Per Kwh)	\$0.06498	\$0.06498
Next 250 Kwh (Per Kwh)	0.05088	0.05088
Next 2,200 Kwh (Per Kwh)	0.04708	0.03588
Next 2,500 Kwh (Per Kwh)	0.04158	0.03038
Next 2,500 Kwh (Per Kwh)	0.04158	0.03038
All additional (Per Kwh)	0.03878	0.02768
Commercial & Industrial (Small) Capacity Charges		
1st 100 Kw (Per Kw)	\$2.65	\$1.85
2nd 100 Kw (Per Kw)	2.40	1.55
All over 200 Kw (Per Kw)	2.10	1.30
Energy Charges		
1st 2,000 Kwh (Per Kwh)	\$0.03398	\$0.03398
Next 8,000 Kwh (Per Kwh)	0.03038	0.03038
Next 90,000 Kwh (Per Kwh)	0.01938	0.01938
All over 100,000 Kwh (Per Kwh)	0.01638	0.01638
Commercial & Industrial (Large) Capacity Charges		
1st 500 Kw (per Kw)	\$8.00	\$8.00
2nd 500 Kw (Per Kw)	1.50	1.50
Next 3,000 Kw (Per Kw)	1.40	1.40
All over 4,000 Kw (Per Kw)	1.35	1.35
Energy Charges		
1st 250,000 Kwh (Per Kwh)	0.01893	0.01893
Next 750,000 Kwh (Per Kwh)	0.01666	0.01666
All additional (Per Kwh)	0.01516	0.01516

¹Does not include Fuel Adjustment Costs.

Source: Oklahoma Corporation Commission.

TABLE 9
Electric Rates
Charged By
The Choctaw Electric Cooperative, Inc
in the Study Area
1968, 1973 and 1978

Type and Basis	1968	1973	1978
Residential			
1st 30 Kwh (Per Kwh)	\$0.1000	\$0.1000	\$0.1080
Next 50 Kwh (Per Kwh)	0.0600	0.0600	0.0610
Next 150 Kwh (Per Kwh)	0.0250	0.0250	0.0260
Over 200 Kwh (Per Kwh)	0.0190	0.0190	0.0205
Commercial & Industrial (Small)			
1st 30 Kwh (Per Kwh)	\$0.1000	\$0.1000	\$0.1080
Next 50 Kwh (Per Kwh)	0.0600	0.0600	0.0610
Next 1,920 Kwh (Per Kwh) ¹		0.0225	0.0245
All over 2,000 Kwh (Per Kwh) ¹		0.0190	0.0205

¹In 1968 the following rates applied,

Next 2,920 Kwh - \$0.025 per Kwh
Over 3,000 Kwh - 0.019 per Kwh

Note: Above rates do not include fuel cost adjustments.

Source: Oklahoma Corporation Commission.

TABLE 10
Natural Gas Transmitted by
The Lone Star Gas Company
Choctaw and Pushmataha Counties

Year	Volume (Million cf)
1960	462,450
1965	474,441
1967	501,108
1968	645,208
1970	689,397
1971	704,770
1972	740,480
1973	759,225
1974	765,222
1975	782,544
1976	783,360
1977	785,984

Source: Lone Star Gas Company.

TABLE 11
Natural Gas Rates
Charged by
The Lone Star Gas Company
in Hugo and Antlers, Oklahoma

Basis	1959- 1973	1973- 1975	1975- 1978
1st 600 cu. ft.	\$1.380	\$1.440	\$1.580
All additional (per mcf)	0.642	0.702	0.956

Source: Files of the Oklahoma Corporation Commission.

Telephone Communications

The Impact Study Area is served by two communication companies. The Southwestern Bell Telephone Company serves the communities of Hugo, Boswell, Ft. Towson, Soper, Rattan and Antlers.

The telephone system in Albion and Clayton is operated independently by the Oklahoma Western Telephone Company

Existing Land Use and External Structure Condition Survey

A detailed land use and structure condition survey was conducted within a one-mile radius of the proposed Hugo Reservoir. The purpose of the survey was to determine the existing land use, physical features, and the quantity and quality of the existing structures. Throughout this chapter, the term "Study Area" will be frequently used. This will refer to that area within a one-mile radius of the reservoir perimeter as distinguished from the two-county Impact Study Area as referred to in preceding chapters.

Physical Features

The Study Area is in the extreme northern part of the Gulf Coastal Plain which is generally characterized as a forested, rolling, sandy area, with small prairies. The Study Area, as a whole, consists of a high, southeasterly, sloping plain. The features of relief owe their characteristics to normal erosion which is incident to an intricate drainage system. The Study Area lies in a drainage basin of the Kiamichi River. Several deep and many shallow valleys have been cut by drainage and water runoff leaving a number of comparatively small areas with relatively smooth surfaces.

Climate and Flooding

The Study Area lies in a warm temperate, humid, continental climate. The summers are comparatively long and warm, with a mean temperature of 81.1 degrees fahrenheit. The winters are comparatively short and mild, although periods of subfreezing weather frequently occur. The mean winter temperature is 45.4 degrees. Minimum temperature of -3 degrees and maximum temperatures of 109 degrees fahrenheit have occurred, but normally the temperature is rarely below 20 degrees in winter or above 105 degrees in the summer.

An average frost-free period of 230 days extends from March 23 to November 8. Annual rainfall, recorded at the Hugo gauge, averages 47 inches per year. Monthly precipitation ranges from 1.38 inches per month to 6.90 inches per month. Approximately 60 percent of the annual rainfall occurs during the months of April, May, and June.

Most of the Study Area is well-drained; however, some of the bottom land surrounding the larger streams are low and flat and, therefore, remain wet for long periods. The low-land along the Kiamichi River, although occasionally subject to flooding, has sufficient natural drainage to prevent major inundation.

Soil Conditions

There are several general soil categories in the Study Area; however, sandy to very fine sandy loams of medium textured subsoil tend to dominate the Area.¹ Sandy loam soils with clay particles, such as those present in the Study Area, are generally free from overflow. They have a high bearing

¹KEDDO Industrial Base Study, 1978, the Kiamichi Economic Development District of Oklahoma, Wilburton, Oklahoma, 1978.

strength and do not normally require extensive foundations. The permeability of sandy loam soils allows for the development of septic tank fields.

Transportation Facilities

Transportation facilities comprise some of the Area's strongest assets and, therefore, may be used to attract future development. The Study Area is served by nearly all types of transportation facilities. U.S. Highway 70, a major east-west traffic route, serves as the southern boundary of the Study Area. State Highway 93 bisects the Area in north-south direction from the point of its intersection with U.S. Highway 70 to its intersection with State Highway 7 on the northern boundary of the Study Area. State Highways 7 and 3 cross the Study Area in a southeasterly direction from Antlers to Rattan. The east side of the Study Area is served by State Highway 147 while the west side is served by the Indian Nations Turnpike which travels in a north-south direction. In addition to these major hard surfaced highways, the Area is also served by numerous state and county roads which are normally in good condition.

Three communities within the Study Area are served by rail transportation; however, these same facilities are available to the other urban communities located in the general Impact Study Area of the Hugo Dam and Reservoir. The St. Louis-San Francisco Railway bisects the city of Sawyer and also serves both Hugo and Antlers.

Although no commercially scheduled air transportation services currently exist within the Study area, air transportation facilities are available in the cities of Hugo and Antlers, where private airline services and charter flights are available.

Land Use Analysis

The classification assigned to a parcel of land, and structures thereon, is determined by use. Homes, businesses, manufacturing operations, agricultural operations, and public facilities are, therefore, placed into different "land use" categories.

The Study Area which has been previously identified was surveyed in detail as to the quantity and quality of the structures as well as the use of existing parcels of land. Land parcels were placed into different "land use" categories on the basis of their use as observed through a field survey (see Table 12).

TABLE 12
Existing Land Use
in the Land Use Study Area¹
by Major Use Category
November, 1978

Type of Use	Area (Acres)	Percent
Residential	480	0.8
Commercial	42	0.1
Industrial	338	1.0
Public	2,358	7.2
Quasi-Public	6	*
Agriculture and Forests ²	28,737	87.7
Roads and Right-of-Way	<u>797</u>	<u>3.2</u>
Total	32,758	100.0

¹ Includes an area of 1 mile from the boundaries of the flood control pool.

² Includes some woodland open for hunting and other recreation.

* Less than .1 of 1 percent.

Source: Field Survey, R.E. Evans and Associates.

Land Use Categories

The categories used for the purpose of this analysis were: residential, commercial, industrial, public, quasi-public, agricultural, and roads and rights-of-way. These categories are general in nature and a need for specifics often arises; therefore, three of the general major use categories were divided into subcategories. Industrial land use was subdivided into heavy and light industry, commercial land use was subdivided into general and highway-oriented businesses, and agricultural land use was divided into row crops, open wooded pasture, and heavy wooded pastureland.

Residential

Residential uses presently account for 480 acres, or 1.4 percent of the total land within the Study Area. Since the Area surveyed was not, for the most part, platted, one-fourth acre of land was allocated to each residential structure in existence. As is the case in most rural Oklahoma areas of similar size, the majority of these residential uses are devoted to single-family dwellings.

Commercial

For the purpose of determining the area of land use for commercial buildings, one acre was allocated to each commercial structure. The commercial category was then subdivided into general commercial and highway-oriented commercial use (see Table 13).

General commercial use is distinguished from highway-oriented commercial use in that it encompasses all retail commercial, wholesale commercial, personal services, and professional services that are not dependent upon a highway location and transit customers for the majority of their trade.

The highway-oriented commercial uses are those which are peculiar to the highway location and rely heavily upon transit traffic for trade. Motels, service stations, and other related services are placed in this category.

The land use Survey Area revealed a total of 37 general-commercial properties. This category constituted 90.5 percent of the commercial use. The four highway-oriented uses accounted for the remaining 9.5 percent of commercial use. Currently, 41 acres are being used for commercial enterprise. This represents almost .1 percent of the total land used in the Study Area.

TABLE 13
Existing Land Use
in the Land Use Study Area
by Sub-Category of Use
November, 1978

Type of Use	Area (Acres)	Percent
Commercial		
General	38	90.5
Highway-Oriented	<u>4</u>	<u>9.5</u>
Total	42	100.0
Industrial		
Light	6	1.8
Heavy	<u>332</u>	<u>98.2</u>
Total	338	100.0
Agricultural		
Cropland	220	0.7
Open and Wooded Pasture	16,575 ¹	57.7
Heavy Woodland	<u>11,942¹</u>	<u>41.6</u>
Total	28,737	100.0

¹Includes some land also used for recreation.

Source: Field Survey, R.E. Evans and Associates.

Industrial

Industrial use is divided into light and heavy categories. Those establishments of non-manufacturing and non-extractive nature, such as warehouses and wholesale houses, are categorized as light industry. Heavy industry includes extractive and manufacturing establishments. Mines and lumber mills are found in the heavy industrial category.

The land use within the Study Area indicated that 338 acres were devoted to industrial uses representing nearly 1.0 percent of the total area. Of the 338 acres devoted to industrial use, all but 6 acres was classified as being used for heavy industry.

Public

There are four main types of public facilities and land uses in the Study Area. These are educational, recreational, public buildings, and public utilities. This section will discuss the four types of public facilities as they exist in this Area.

The majority of public land use is devoted to public camping and recreational land around the proposed damsite of the Hugo Reservoir. There is one public school located within the land use Study Area.

A total of 2,358 acres is devoted to public land use in the Study Area. This represents 7.2 percent of the total land use in the Area.

Quasi-Public

Quasi-Public uses include churches, lodges, and other organizations attended by the general public but not owned and operated by public funds, nor of a commercial nature. The majority of quasi-public structures in the Study

Area are religious institutions. The six acres of land which have been developed for quasi-public use, comprise less than .1 of 1 percent of the total land use area.

Lake

The lake itself usually requires 13,250 acres for water storage. This area is in addition to the land for which specific uses have been described.

Structure Condition Analysis

An analysis of the housing in the Study Area was made following the land use survey. The housing analysis is intended to provide an insight into the general condition of each dwelling unit through an exterior examination of all dwellings within the Study Area. Certain criteria were used to evaluate each structure. These consisted of, but were not necessarily limited to, an appraisal of 1) the building materials used, 2) the approximate age of the structure, 3) the general condition of the structure, and 4) the evaluation of the general neighborhood.

There are several terms related to the condition of structures used throughout this report which should be defined in order to avoid confusion.

Sound: A sound structure is one which has no apparent external defects, is structurally sound, and is in good state of repair.

Deteriorating: A deteriorating structure is one in need of repair; however, the cost of repairs should not exceed the fair market value of the property.

Dilapidated: A dilapidated structure is unfit for human habitation. The number of defects may be such that repair would exceed the original cost of construction.

The area surveyed in this study was a combination of semiurban and rural areas within the Study Area. For the purpose of this study, the areas have been selected primarily on similar developmental and locational factors within the boundaries of the land use study. These areas are designated A, B, and C.

It is difficult to delineate areas which are internally homogeneous and distinct from others in all ways, but an attempt was made to delineate areas in a manner with which the residents of the areas could identify and generally agree.

Area A

As noted earlier, the total area was divided into three subareas. Area A encompasses the entire city of Sawyer which is located approximately seven miles east of Hugo on U.S. Highway 70. U.S. Highway 70 bisects the city from southwest to the point of its intersection with State Highway 147 in the northeastern corner of the city. The St. Louis and San Francisco Railroad parallels U.S. Highway 70 and serves to divide the community physically.

Existing Land Use

The community of Sawyer consists of approximately 235 acres of land. It should be noted, however, that only a small portion of this land that has been platted is developed. This becomes important when determining the concentration of dwellings in Area A. The predominant land use in this Area consists of single family residences. As is common in many communities, there is a mixture of uses within the Area. In Area A there is a combination of residential, commercial, public, and quasi-public land use. As discussed earlier, two highways, State Highway 147 and U.S. Highway 70, penetrate the neighborhood. With the exception of these two traffic routes the traffic flow is normally very light.

One outstanding characteristic of Area A is the amount of vacant land that has been previously platted and is available for development.

Housing Conditions

Substandard structures, inadequate and unkept yards, are the most obvious symptoms of blight within an area. In this particular Area, there exists a tremendous amount of blight and substandard dwellings. Blighted conditions are not highly concentrated but are scattered throughout the entire Area. An analysis of the Structural Conditions Map and the Summary of Structural Conditions (see Table 14), indicates that 40 percent of the total number of structures are either dilapidated or in a deteriorating condition. Nine structures, are classified as being deteriorated, 16 structures, are considered to be dilapidated and 33 structures, or the equivalent of 57 percent of the dwellings, are in standard condition. Specifically, there is a total of 65 structures in Area A of which 55 are residential, five commercial, and two quasi-public.

Area B

Area B is located approximately 11 miles southeast of Antlers, Oklahoma, in Pushmataha County. This Area is known as the community of Rattan and consists of approximately 72 acres. Its development is chiefly along State Highways 7 and 93. The north boundary of this Area was arbitrarily established as 150 feet north and paralleling Highway 7 to the east and west, extending along the highway for one mile in each direction. The southern boundary of Area B is arbitrarily defined as being 150 feet on both sides of Highway 93, extending one-half mile south from the point where it intersects with State Highway 7.

Existing Land Use

Area B is characterized by high percentage of residential structures. There are a total of 67 structures in the Area, of which 48 are residential dwellings. This constitutes 72 percent of the total number of structures. Also, in relation to the entire land use Study Area, Area B has the largest percentage of commercial land use. There are 14 commercial buildings in Area B with some of the structures housing three or more businesses. The 14 commercial structures in Area B comprise 21 percent of the total land use Area. Quasi-Public uses, such as churches and community centers, constitute 4 percent of the total, and public facilities constitute 2 percent of the total land use Area.

Housing Conditions

The majority of the housing in Area B is standard. Numerically, 18 housing units, or about 38 percent of the total, are standard. There are 18 structures representing also 38 percent, which are in need of repair and are considered to be deteriorating. Twelve structures were determined to be dilapidated. This constitutes 24 percent of the total number of houses.

The same pattern is apparent in the commercial classification where only 15 percent of the commercial structures are considered to be substandard.

Community Facilities

Area B has adequate educational and recreational facilities. The primary facility in this Area is the Rattan Public School System. The school has recreational facilities adjacent to and included in its physical surroundings. These facilities offer an excellent opportunity for both active and passive recreation.

Area B is located at the intersection of two State Highways. This provides access for the area for residents of the surrounding rural area.

Area C

Area C is the largest area surveyed. It encompasses all the land within a one-mile radius of the perimeter of the Hugo Reservoir with the exception of Area A and Area B. Area C covers 32,387 acres of land, or approximately 50.6 square miles. This area includes all land within one mile of the flood pool limits of the reservoir and contains forest land, pasture and the reservoir project.

Existing Land Use

This Area is predominantly rural. A large portion of the developed land in Area C excluding the lake is put either to some form of agricultural use or to recreational activities. There are scattered commercial and industrial uses in the Area; however, they constitute only a small percentage of the total area as does residential use. Residential dwellings account for less than 1 percent of the land use in Area C.

Housing Conditions

Compared with other areas, Area C ranks highest in structural condition ratings. Comparatively few of the structures within the Area are considered to be dilapidated. Of the 260 residential structures in Area C, only 28 are dilapidated, which represent 11 percent of the total. Conversely, 167 dwellings in this Area are presently in a sound condition representing 64 percent of the total number of Area dwellings. Approximately 25 percent of the houses are in need of some type of repair; however, of the 65 houses in a deteriorating

TABLE 14
General Area Analysis
Structural Condition Summary
Choctaw and Pushmataha Counties
by Area
November, 1978

Area	<u>All Structures</u>		<u>Standard</u>		<u>Deteriorating</u>		<u>Dilapidated</u>	
	No.	%	No.	%	No.	%	No.	%
"A"								
Residential	58	100	33	57	9	16	16	27
*Nonresidential	7	100	7	100	--	--	--	--
Subtotal	65	100	40	62	9	14	16	24
"B"								
Residential	48	100	18	38	18	38	12	24
Nonresidential	19	100	10	53	6	32	3	15
Subtotal	67	100	28	42	24	36	15	22
"C"								
Residential	260	100	167	64	65	25	28	11
Nonresidential	30	100	17	57	5	17	8	26
Subtotal	290	100	184	63	70	24	36	13
Total All Structures	422	100	252	60	103	24	67	16

Source: Field Survey, R.E. Evans and Associates, Norman, Oklahoma, 1978.

*Nonresidential includes: public, commercial, industrial, and quasi-public structures.

condition surveyed in Area C, the degree of repair needed appeared to be less than either in Areas A and B.

Community Facilities

One significant factor found in Area C is the lack of community facilities or a focal point for community activity. This is due in part to the vastness and low concentration of population in the area; however, the survey disclosed three abandoned public school buildings of sound structural condition which could be used for community facilities.

Flood Control

The flood plain area on the Kiamichi River protected by the Hugo dam and reservoir consist of approximately 5,000 acres. In 1965 the annual benefits expected to accrue from this area was projected to be \$51,300. These benefits were \$27,500 for flood losses prevented and \$23,800 for increased land utilization.

Choctaw County has followed the state trend in agriculture increased cattle numbers and land devoted to pasture.⁶ In 1949 the country reported 21,864 acres in corn, 10,137 acres in cotton and no acres devoted to soybeans or improved pasture. In 1974 cotton was grown on 125 acres, corn 377, soybeans 1,467 and improved pasture 45,945.

The protected flood plain has followed the county trend. Cropland has not increased due to flood protection. However the area has been converted to improved pasture there by being used more intensely. A benefit analysis was made using present land use and 1978 normalized agricultural prices. Based on this analysis average annual benefits are expected to be \$38,500 for damages prevented and \$37,000 for land utilization.

⁶The Agricultural Census reported a decrease in cropland acres from 35,234 acres in 1949 to 25,305 in 1974. However this can be misleading since some of the cropland acres were planted to crops used for hay and grazing.

Changes in Land Use

The utilization of land in the Study Area experienced little change between 1968 and 1978. The basic alterations in use were an increase of 24 acres devoted to residential development - largely summer or lakeshore homes; an additional 67 acres for industrial purposes; an increase of 139 acres for public facilities and an added 110 acres for roads and right-of-way. These gains were offset by a decrease of 346 acres in land formerly used for agricultural purposes. The changes in major land use between 1968 and 1978 are shown in Table 15.

TABLE 15
Changes in Land Use
in the Study Area
by Major Use Category
1968-1978

Type of Use	1968		1978		Difference	
	Area (Acres)	Percent	Area (Acres)	Percent	Area (Acres)	Percent
Residential	456	1.4	480	1.4	24	0
Commercial	36	0.1	42	0.1	6	0
Industrial	271	0.8	338	1.0	67	0.2
Public	2,219	6.8	2,358	7.2	139	0.4
Quasi-Public	6	*	6	*	0	0
Agriculture	29,083	88.8	28,737	87.7	-346	-1.1
Roads and Right-of-Way	<u>687</u>	<u>2.1</u>	<u>797</u>	<u>2.6</u>	<u>110</u>	<u>0.5</u>
Total	32,758	100.0	32,758	100.0	0	0

* Less than .1 of 1 percent.

Source: Table 12 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Economic and Demographic Indicators

The foregoing provide the background of the study area and the basis on which any future growth must be built. It should be noted that prior to 1967 there were no apparent forces at work through which an infusion of "new" money could occur. In order to turn this declining economy around, large expenditures of money were needed if the area was to be rejuvenated. Moreover, the needed expenditures should result in some form of permanent facilities which would, in turn, generate other "new" money (i.e. expenditures of money in the area from outside sources).

The construction of the Hugo Reservoir provided the temporary infusion of new funds in the area. The lake and its varied attractions and uses have given the area the facilities it has needed to generate further income. The discussions which follow will attempt to evaluate the extent to which the reservoir affected the economy of the area during the period 1967-1977.

Population

The population of the study area declined steadily between 1950 and 1970 with the sharpest decreases occurring between 1950 and 1960. Following 1970, the downward trend in the population of the study area was reversed with slight gains occurring each year to 1976 when the total population remained at the 1975 level. The growth pattern resumed, however, in 1977 when the population of the area reached an estimated 27,600 persons (see Figure 3).

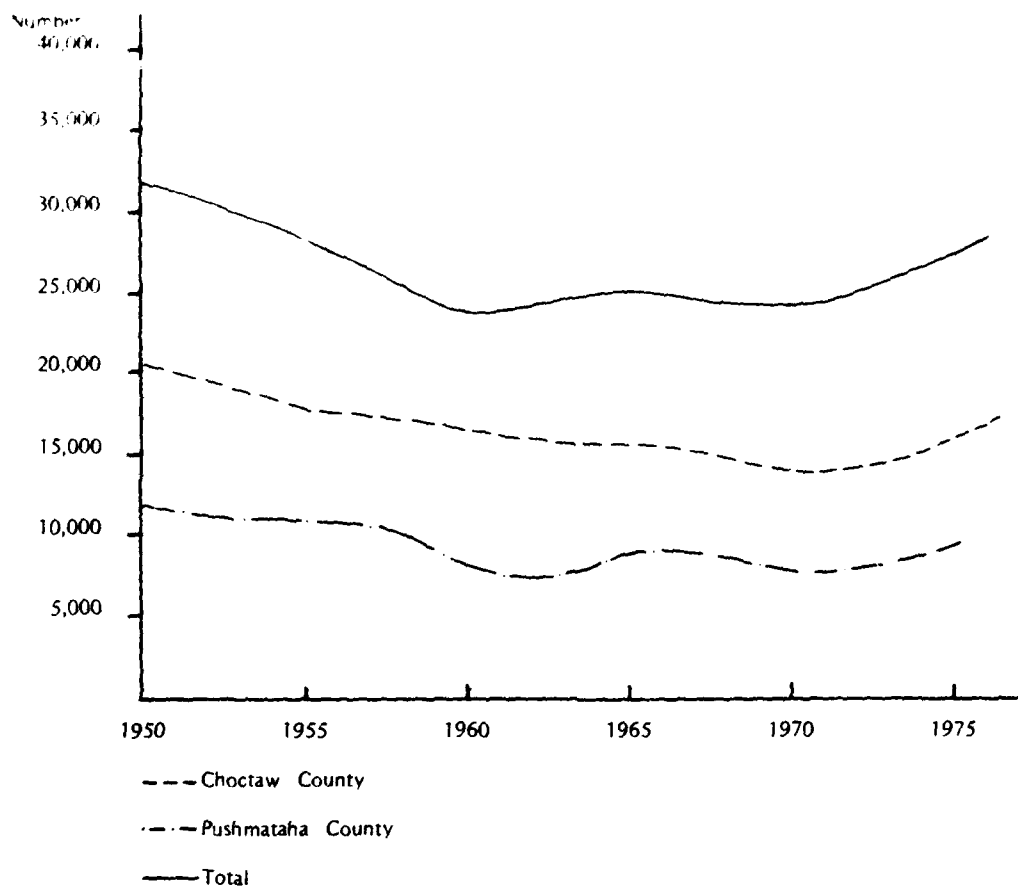
The increases noted in the population between 1970 and 1977 were attributable to small but consistent increases in the population of Pushmataha County and more erratic changes in the population of Choctaw County where the upward pattern was interrupted slightly by decreases in both 1974 and 1976. Table 16 traces the population changes in the two counties and the study area from 1950 through 1977.

TABLE 16
Actual and Estimated Annual Population
of Choctaw and Pushmataha Counties
1950-1977

Year	Choctaw	Pushmataha	Total
1950	20,405	12,001	32,406
1960	15,637	9,088	24,725
1967	14,740	10,000	24,740
1970	15,141	9,385	24,526
1971	15,500	9,400	24,900
1972	16,400	9,600	26,000
1973	16,700	9,800	26,500
1974	16,600	10,100	26,700
1975	16,900	10,300	27,200
1976	16,700	10,500	27,200
1977	17,000	10,600	27,600

Source: Census of Population, Oklahoma, 1950, 1960 and 1970, U.S. Bureau of the Census; Oklahoma Population Estimates 1967, 1971-1977, Oklahoma Employment Security Commission.

FIGURE 3
Population Trends in
Choctaw and Pushmataha Counties
1950-1975



Impact on Population

Prior short-term forecasts indicated that between 1967 and 1977, the Hugo Reservoir would stimulate the population growth of the study area to the extent that by 1977, the population of the study area would increase by 6,330 persons over the 1960 level. This assumed that the Hugo Reservoir would have the same effects on these counties that other similar facilities exerted on their impact areas. Based on this assumption and forecasting method the population of the area in 1977 would have been nearly 31,100 persons. However, the population of the area rose to only 27,600 persons. Thus, the actual effects of the Hugo Reservoir on the study area population between 1960 and 1977 amounted to an increase of 2,875 persons as shown in Table 17.

It is of note that in the early years of construction, population in the study area actually was less than the forecasts of population assuming that the reservoir would not be built. However after 1971, the effects of the construction activity became more apparent in Pushmataha County so that the population of the study area evidenced regular gains over the forecasts based on no reservoir activity.

TABLE 17
Actual Impact of the Hugo Reservoir
on the Population of Choctaw and Pushmataha Counties
1960-1977

Year	Population Forecast Without Reservoir ¹			Actual Population			Actual Impact		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1960	15,637	9,088	24,725	15,637	9,088	24,725	0	0	0
1967	16,575	8,810	25,385	14,740	10,000	24,740	-1,835	1,190	-645
1970	16,990	8,700	25,690	15,141	9,385	24,526	-1,849	685	-1,164
1971	17,060	8,720	25,780	15,500	9,400	24,900	-1,560	680	- 880
1972	17,140	8,740	25,880	16,400	9,600	26,000	- 740	860	120
1973	17,220	8,770	25,990	16,700	9,800	26,500	- 520	1,030	510
1974	17,300	8,790	26,090	16,600	10,100	26,700	- 700	1,310	610
1975	17,400	8,820	26,220	16,900	10,300	27,200	- 500	1,480	980
1976	17,480	8,850	26,330	16,700	10,500	27,200	- 780	1,650	870
1977	17,570	8,870	26,440	17,000	10,600	27,600	- 570	1,730	1,160

¹ Assuming no reservoirs.

Source: Table 16 and A Study of the Economic Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, January 1969.

Age Distribution

It is of note that the age characteristics of the population of the study area changed somewhat significantly during the period 1960-1970. With both counties showing increases in older population groups and losses in the 15-30 age category. However, Pushmataha County, which experienced a population gain during the decade also had increases in the age categories from 5 years to 34 years while Choctaw County lost population in the 3-40 age brackets. The age distribution of the population of the two county study area is shown in Table 13.

TABLE 18

Age Distribution of the Population
Choctaw and Pushmataha Counties
1950, 1960 and 1970

Age Categories	1950		1960		1970	
	Choctaw	Pushmataha	Choctaw	Pushmataha	Choctaw	Pushmataha
Under 5	2,332	1,266	1,345	805	1,113	695
5 to 9	2,154	1,306	1,516	878	1,433	883
10 to 14	2,161	1,290	1,697	964	1,534	982
15 to 19	1,848	1,115	1,257	738	1,339	790
20 to 24	1,119	662	536	327	760	390
25 to 29	1,103	652	577	334	624	440
30 to 34	1,068	599	664	371	649	412
40 to 44	1,207	767	826	465	746	454
45 to 49	1,113	705	953	572	775	520
50 to 54	956	610	993	596	837	495
60 to 64	886	471	873	529	1,016	636
65 to 69	881	474	914	503	903	591
70 to 74	603	330	731	368	726	443
75 to 84	619	344	806	456	834	482
85 & Over	100	48	194	98	207	128
All Ages	20,405	12,001	15,637	9,088	15,141	9,385
Under 18	7,894	4,624	5,491	3,185	5,006	3,139
65 & Over	2,203	1,196	2,645	1,425	2,670	1,644
Median Age	26.5	27.8	36.5	36.4	35.9	36.2

Source: Census of Population, General Characteristics of the Population, Oklahoma, U. S. Bureau of the Census.

Labor Force and Employment

One of the principal factors affecting the level of population in an area is its job opportunity potential. During the two decades between 1940 and 1960, when the population of the study area declined from 47,824 to 24,725, the employment totals of the area likewise dropped from 10,972 jobs to 6,501. Concurrently, the age distribution of the population shifted from one which was predominantly young to a middle-aged and aging population.

The period from 1960 to 1970 represented a continuation of the downward trend in population, labor force and employment although the annual rate of decrease in population which was 3.2 percent between 1940 and 1960 was reduced to less than 0.1 percent by 1970. This suggested that some factors had been introduced to the study area between 1960 and 1970 which were exerting a braking effect on the declining population. This factor proved to be the creation of new job opportunities in the two county area.

Employment

Employment in the study area declined consistently from 1960 through 1965 when the total reached a low of 5,792 jobs. The major factor influencing this downward trend were decreases in the commodity producing industries particularly agriculture (see Tables 19 and 20). During this five-year period, manufacturing employment rose slightly however these gains were not sufficient to offset the losses in farm jobs. The decline in commodity producing jobs was accompanied by a slight loss in non-commodity producing jobs. Since non-commodity producing jobs are supported in large measure by commodity producing workers, this parallel pattern of decline in the two job categories was not unexpected.

Following 1965, however, the long-term decline in employment in the study area was halted after which it began an upturn so that by 1968 a total of 6,059

persons were employed in the area. Further gains were noted during the ensuing years and in 1977, a total of 8,129 persons were employed in the study area.

The increases in employment noted since 1968 have been due primarily to increases in non-commodity producing industries although jobs in commodity producing industries also rose but to a lesser degree. New employment opportunities in trades, services and government provided much of the impetus for the non-commodity job increases while manufacturing job gains contributed heavily to increases in commodity producing jobs.

TABLE 19
Employment Characteristics
Choctaw County
1940-1977

Industry	1940	1950	1960	1965	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Total Employment	6,633	5,719	4,264	3,780	3,870	4,026	4,397	4,440	4,700	4,719	4,583	4,665	4,851	5,119
Commodity Prod.	4,265	2,809	1,572	1,142	1,171	1,217	1,196	1,220	1,297	1,407	1,307	1,298	1,388	1,509
Agriculture	3,928	2,417	908	430	375	380	367	390	400	420	340	370	390	426
Mining	16	14	29	35	50	53	39	30	17	37	17	18	20	21
Manufacturing	321	378	635	677	746	784	790	800	880	950	950	910	978	1,062
Food	86	79	112	164	186	198	210	213	244	262	270	240	260	275
Apparel	0	0	227	230	262	270	274	278	280	279	277	270	279	280
Lumber Prod.	163	218	215	189	175	170	168	148	170	188	181	203	204	246
Print-Publish.	26	29	39	30	26	26	25	25	27	28	29	28	30	30
Chemicals	11	14	4	9	9	9	9	9	9	9	9	9	9	9
Transport														
Equip.	1	0	0	5	7	9	9	10	10	12	12	13	14	14
Fab. Metals	0	1	8	14	24	33	34	36	46	60	64	47	60	70
Other Durables	0	7	17	20	36	45	35	54	65	67	66	60	70	83
Other Non Dur.	18	6	0	9	14	17	19	20	22	38	35	33	45	48
Miscellaneous	16	24	13	7	7	7	7	7	7	7	7	7	7	7
Non-Commodity	2,368	2,910	2,692	2,638	2,699	2,809	3,201	3,220	3,403	3,312	3,276	3,367	3,463	3,630
Construction	143	281	319	237	297	275	475	430	520	347	301	386	405	458
Trans, Comm, Util.	260	414	294	240	260	280	356	380	370	380	390	420	460	495
Trade	736	814	811	880	920	940	977	980	1,010	1,060	1,070	1,051	1,060	1,108
Services	946	921	850	893	758	765	774	790	813	823	808	795	815	830
Government	168	204	238	270	345	430	500	520	570	582	586	594	601	617
Fin., Ins. & R.E.	53	83	118	118	119	119	119	120	120	120	121	121	122	122
Ind. Not Reported	62	193	62	0	0	0	0	0	0	0	0	0	0	0

Source: Oklahoma Employment Security Commission.

TABLE 20
Employment Characteristics
Pushmataha County
1940-1977

Industry	1940	1950	1960	1965	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Total Employment	4,339	3,481	2,237	2,011	2,189	2,346	2,370	2,220	2,264	2,368	2,450	2,482	2,717	2,990
Commodity Prod.	2,896	1,992	754	530	553	523	530	524	580	605	565	610	682	870
Agriculture	2,383	1,621	469	255	237	202	210	200	210	220	180	190	218	388
Mining	9	6	16	0	13	15	10	0	0	0	5	0	0	0
Manufacturing	504	365	269	275	303	306	310	324	370	385	380	420	464	482
Food	5	13	16	14	12	11	10	12	13	13	12	14	16	20
Apparel	2	0	8	15	17	19	21	24	71	82	87	90	93	96
Lumber & Wood	486	312	223	209	211	214	215	218	220	227	241	260	281	286
Print.-Publish.	6	10	18	12	11	10	9	10	10	11	9	11	12	14
Electrical	1	7	0	7	4	6	4	4	5	5	6	7	7	7
Other Durables	2	16	0	17	42	40	45	52	48	40	18	29	43	46
Other Non Dur.	2	7	4	5	6	6	6	4	3	7	7	9	12	13
Non-Commodity	1,443	1,489	1,483	1,481	1,636	1,823	1,840	1,696	1,684	1,763	1,885	1,872	2,035	2,120
Construction	128	219	250	44	158	346	317	236	182	222	285	262	277	278
Trans., Comm., Util	119	123	59	112	115	110	109	108	126	111	135	138	139	141
Trade	439	443	419	465	441	441	454	424	440	453	478	530	580	601
Services	557	518	531	575	578	579	595	557	558	596	598	547	609	640
Government	82	127	130	245	314	317	333	338	344	346	353	360	394	422
Fin., Ins. & R.E.	23	31	50	40	30	30	32	33	34	35	36	35	36	38
Ind. Not Reported	95	28	44	0	0	0	0	0	0	0	0	0	0	0

Source: Oklahoma Employment Security Commission.

Impact on Employment 1970-1977

Assuming that the forecasts of employment and labor force in the study area without the reservoir as shown in the original study are a fair representation of the outlook for the area, the true short-term impact of the reservoir based on the actual experience was negative until about 1971. Except for non-commodity producing jobs, both employment and labor force levels in 1970 were below those projected for the area if the reservoir were not built. However, it should be noted that, by 1975, the actual employment and labor force levels in the area exceeded those if the reservoir were absent. Only in the case of commodity producing employment in Choctaw County was the forecast above the attained level, but the gap was narrowing each year so that by 1977 the attained level was only 127 jobs below the forecast. (See Table 21). In total, by 1977, the actual level of the labor force was 1,154 persons higher than might have been expected had the reservoir not been built. In a like manner, the level of employment exceeded the forecast by 1,201 jobs but unemployment was 47 below the forecast.

Labor Force

As was noted in employment, the labor force in the study area also declined sharply between 1940 and 1960 but the rate of decrease slowed appreciably between 1960 and 1965. By 1968, the downward trend in the labor force was reversed so that by 1970, it totaled 7,407 - an increase of more than 400 over the 1960 level. The pattern of growth begun in 1968 was interrupted slightly in 1971 and again in 1974. These interruptions were minor in nature as the labor force total reached 8,639 during 1977 (see Table 22).

TABLE 21

Actual Impact of the Hugo Reservoir
on the Labor Force and Employment of
Choctaw and Pushmataha Counties
1968, 1970, 1975 and 1977

Item	1968				1970				1975				1977			
	Forecast Without Reservoir	Actual Experience	Actual Impact	Forecast Without Reservoir	Actual Experience	Actual Impact	Forecast Without Reservoir	Actual Experience	Actual Impact	Forecast Without Reservoir	Actual Experience	Actual Impact	Forecast Without Reservoir	Actual Experience	Actual Impact	Forecast Without Reservoir
Labor Force, Study Area	7,306	6,589	-717	7,430	7,407	-23	7,480	8,347	867	7,485	8,639	1,154				
Choctaw County	5,007	4,240	-767	5,140	4,947	-193	5,161	5,445	284	5,156	5,449	293				
Pushmataha County	2,299	2,349	50	2,290	2,460	170	2,319	2,902	583	2,329	3,190	861				
Unemployment, Study Area	518	530	12	530	640	110	558	1,200	642	557	510	-47				
Choctaw County	368	370	2	380	550	170	403	780	377	400	310	-90				
Pushmataha County	150	160	10	150	90	-60	155	420	265	157	200	43				
Employment, Study Area	6,788	6,059	-729	6,900	6,767	-133	6,922	7,147	225	6,928	8,129	1,201				
Choctaw County	4,639	3,870	-769	4,760	4,397	-363	4,758	4,665	-93	4,756	5,139	383				
Pushmataha County	2,149	2,189	40	2,140	2,370	230	2,164	2,482	318	2,172	2,990	818				
Commodity Prod., Study Area	2,308	1,724	-584	2,323	1,726	-597	2,255	1,908	-347	2,228	2,379	151				
Choctaw County	1,672	1,171	-501	1,704	1,196	-508	1,656	1,298	-358	1,636	1,509	-127				
Pushmataha County	636	553	-83	619	530	-89	599	610	11	592	870	278				
Non-Commodity Prod. Study Area	4,480	4,335	-145	4,577	5,041	464	4,667	5,239	572	4,700	5,750	1,050				
Choctaw County	2,967	2,699	-268	3,056	3,201	145	3,102	3,367	265	3,120	3,630	510				
Pushmataha County	1,513	1,636	123	1,521	1,840	319	1,565	1,872	307	1,580	2,120	540				

Source: Oklahoma Employment Security Commission and A Study of the Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, January 1969.

TABLE 22

Labor Force and Employment
Choctaw and Pushmataha Counties
1960-1977
(Number of People)

Item	1960	1968	1970	1971	1972	1973	1974	1975	1976	1977
Labor Force:										
Choctaw County	4,591	4,240	4,947	4,920	5,220	5,229	5,053	5,445	5,411	5,449
Pushmataha County	2,386	2,349	2,460	2,430	2,484	2,508	2,610	2,902	2,957	3,190
Total Study Area	6,983	6,589	7,407	7,350	7,704	7,737	7,663	8,347	8,368	8,639
Unemployment:										
Choctaw County	333	370	550	480	520	510	470	780	560	310
Pushmataha County	149	160	90	210	220	140	210	420	240	200
Total Study Area	482	530	640	690	740	650	680	1,200	800	510
Employment:										
Commodity Production										
Choctaw County	1,572	1,171	1,196	1,120	1,297	1,407	1,307	1,298	1,388	1,509
Pushmataha County	754	553	530	524	580	605	565	610	682	870
Total Study Area	2,326	1,724	1,726	1,644	1,877	2,012	1,872	1,908	2,070	2,379
Non Commodity Producing										
Choctaw County	2,692	2,699	3,201	3,220	3,403	3,312	3,276	3,367	3,463	3,630
Pushmataha County	1,483	1,636	1,840	1,696	1,684	1,763	1,885	1,872	2,035	2,120
Total Study Area	4,175	4,335	5,041	4,916	5,087	5,075	5,161	5,239	5,498	5,750
Total Employment										
Choctaw County	4,264	3,870	4,397	4,440	4,700	4,719	4,583	4,665	4,851	5,119
Pushmataha County	2,237	2,189	2,370	2,220	2,264	2,368	2,450	2,482	2,717	2,990
Total Study Area	6,501	6,059	6,767	6,660	6,964	7,087	7,033	7,147	7,568	8,109

Source: Oklahoma Employment Security Commission.

Personal Income

The Hugo Reservoir, as is the case with similar facilities located elsewhere, was expected to cause increases in personal income because of the increased number of jobs resulting from the establishment of the reservoir. The increases were expected to substantially raise the level of per capita income in the study area thereby improving the living standards in that portion of the state.

Per Capita Income

Per capita income in the study area has risen consistently since 1960 when the average for the study area was \$785. The continual increases over the ensuing years raised this average to \$3,459 by 1977 - a four-fold increase and one which averaged more than 9 percent per year.

Because it began from a lower base, gains registered in the per capita incomes received by Pushmataha County residents were relatively larger than those received in Choctaw County. This more rapid rate of increase in the former county narrowed the margin between the per capita incomes of the two counties in 1977 to approximately \$200 whereas in 1967 the per capita income of Choctaw County was \$353 higher than in Pushmataha County. These per capita income data are shown in Table 23.

FIGURE 4
Trends in Per Capita Income
in Choctaw and Pushmataha Counties
1960-1977

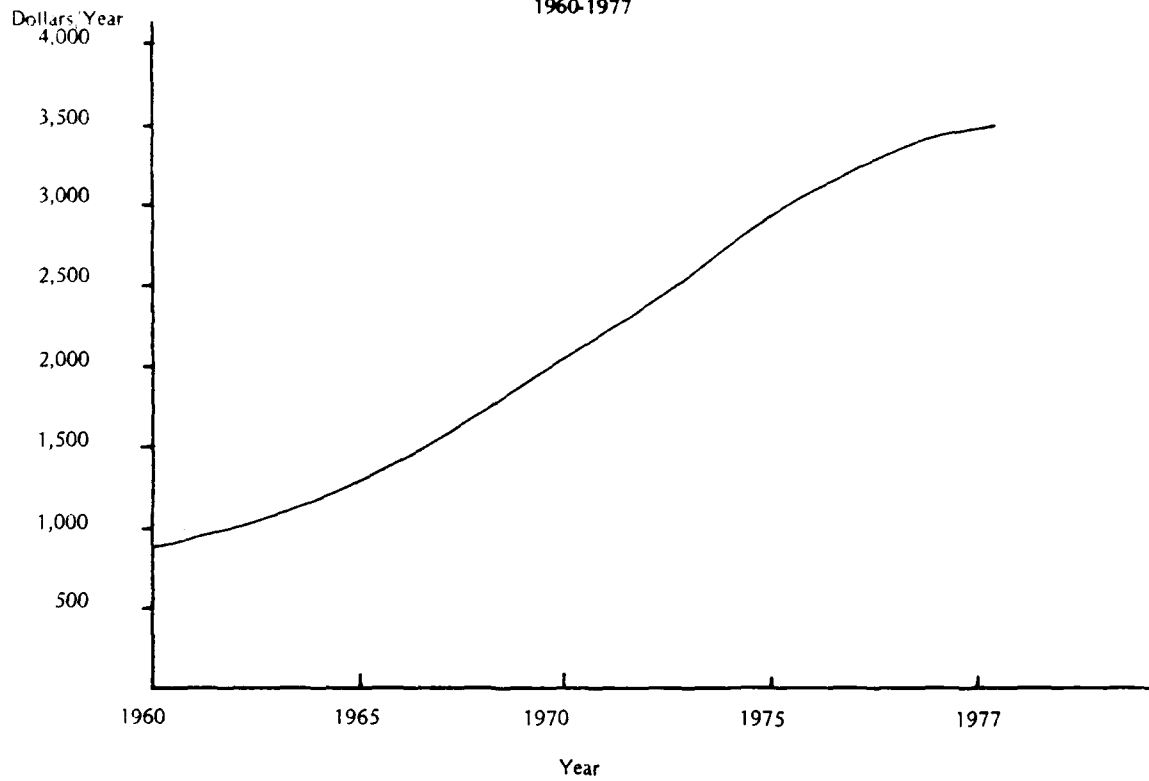


TABLE 23
Per Capita Personal Income¹
of Choctaw and Pushmataha Counties
1960-1977
(Dollars Per Year)

Year	Per Capita Income		
	Choctaw	Pushmataha	Average
1960	956	894	936
1967	1,567	1,214	1,424
1968	1,770	1,354	1,603
1969	2,048	1,624	1,882
1970	2,226	1,842	2,079
1971	2,297	1,967	2,170
1972	2,329	2,064	2,231
1973	2,640	2,536	2,602
1974	2,831	2,740	2,797
1975	3,018	2,930	2,984
1976	3,310	3,110	3,232
1977	3,531	3,332	3,459

¹Based on Residence Adjusted Personal Income.

Source: Bureau of Economic Analysis, U.S. Department of Commerce.

Other Adjustments to Per Capita Income

Concurrent with the early portions of the construction phase of the reservoir, the Oklahoma Turnpike Authority was constructing Phase B of the Indian Nations Turnpike. This section of the turnpike goes from McAlester to Hugo, a distance of 64.1 miles of which 25 miles are in Pushmataha County and 14 miles are in Choctaw County. The total cost of this construction was \$40.8 million. Also, toward the latter phases of the reservoir construction project, the Oklahoma State Highway Department was renovating about 52 miles of U.S. Highway 70 in Choctaw County. The construction efforts on these two major projects tended to obscure the net impact of the construction phases of the reservoir on the study area.

Forecasts and projections presented in the earlier study did not include estimates for the possibility of other major construction projects in the study area. Therefore, if the actual experience of the area is to be made comparable with previous forecasts, the effects of highway construction on income data must be removed.

Contacts with area realtors and persons in the construction industry indicated that the highway construction projects employed about 93 residents of the study area in 1967. This level of employment declined steadily through 1973 so as to total 15 workers who lived in the area during that year. It was assumed that these workers received prevailing wage rates which would result in salaries and wages as shown in Table 24.

In addition to salaries and wages, the Oklahoma Turnpike Authority spent \$1,594,000 for right-of-way property on which to construct the portion of Indian Nations Turnpike included in the study area. It was assumed that this expenditure was made in 1967 and 1968. This expenditure is aggregated with wage and salary incomes paid to highway workers residing in the area in Table 24.

TABLE 24

Year	Salaries and Wages ¹ (\$000)		Property ¹ (\$000)		Total Income ¹ (\$000)		Per Capita Income ¹ (\$)				
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total		
1967	464	86	550	348	650	998	812	736	55	74	63
1968	123	101	224	207	387	594	330	488	22	51	33
1969	143	87	230	0	0	0	143	87	9	9	9
1970	165	87	252	0	0	0	165	87	11	9	10
1971	141	88	229	0	0	0	141	88	9	9	9
1972	132	0	132	0	0	0	132	0	8	0	5
1973	133	0	133	0	0	0	133	0	8	0	5

¹In 1967 dollar equivalents.

Source: Members of the construction trades and the Oklahoma Turnpike Authority.

Impact on Per Capita Income

After adjustment for residential location of income recipients, inflation and the effects of highway construction, the actual impact of the reservoir was more noticeable on the economy of Choctaw County in the early period but by 1975 tended to have greater influence on Pushmataha County. On average, the per capita income of the entire study area between 1967 and 1977 was increased by approximately \$360 per year as a result of the reservoir. Table 25 details this impact.

Personal Income

Personal income has risen sharply and consistently in each of the two counties during the past four decades. Stated in current dollars, income in the area has risen from \$7.8 million in 1940 to an estimated \$95.8 million in 1977. This represents an annual rate of increase of 7 percent over the period.

Prior to 1965, the rate of increase in total income was somewhat slower, averaging only 6 percent per year. However, during the past 12 years, growth has accelerated to nearly 9 percent per year.

The private non farm sector of the economy of the area has remained the largest income generator over the years but since 1970, the government sector has tended to increase the proportion of income it provides, particularly Pushmataha County where, in 1970, it accounted for nearly 20 percent of all income received in that country.

The farm sector of the economy of the study area has tended to decline in total income provided to area residents over the years. In fact, in 1975, farm losses in both counties resulted in a negative farm income of \$1.1. million.

Details of personal income received by residents of Choctaw and Pushmataha Counties between 1960 and 1977 are shown in Tables 26 and 27.

TABLE 25
The Actual Impact of the Hugo Reservoir
on Per Capita Income Levels of
Choctaw and Pushmataha Counties
1967-1977
(Dollars Per Person)¹

Year	Forecast ²			Actual ³			Impact		
	Choctaw	Pushmataha	Average	Choctaw	Pushmataha	Average	Choctaw	Pushmataha	Average
1967	1,163	964	1,090	1,512	1,140	1,361	349	176	271
1968	1,205	1,008	1,113	1,673	1,245	1,502	468	237	389
1970	1,419	1,268	1,363	1,903	1,539	1,752	484	271	389
1975	1,595	1,345	1,504	1,936	1,818	1,894	341	473	390
1977	1,706	1,411	1,598	1,946	1,836	1,906	240	425	308

¹In 1967 dollar equivalents.

² Assuming the reservoir will not be built. Adjusted for place of residence.

3 Adjusted for highway construction activity.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969; Bureau of Economic Analysis, U.S. Department of Commerce and Table 24.

TABLE 26
Personal Income by Industrial Source¹
Choctaw County
(\$000)

Source	1940	1950	1960	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Farm	1,341	1,887	967	589	480	792	493	881	1,232	1,443	1,413	3,000	455	-(702)	109	360
Non Farm	2,837	5,958	8,541	10,666	11,362	12,202	15,062	18,299	18,900	18,396	20,390	23,274	25,362	27,624	29,064	30,490
Private	1,524	4,750	6,301	7,657	8,055	8,521	10,863	13,634	13,765	12,692	14,553	16,661	18,019	19,227	20,356	21,705
Mfg.	103	323	1,294	1,435	1,544	1,601	1,794	1,996	2,242	1,944	2,756	2,757	2,528	3,379	3,577	3,814
Mining	-	7	74	-	-	-	-	-	-	-	-	-	-	-	-	-
Constr.	-	235	421	406	420	432	1,584	2,940	2,940	1,668	1,805	1,752	1,385	1,749	1,840	1,962
W/R Trade	632	1,810	1,806	2,230	2,373	2,485	2,618	2,703	2,625	2,895	3,136	3,758	4,258	4,509	5,070	5,530
FIRE	-	162	305	424	462	504	603	611	665	749	806	889	1,030	1,077	1,168	1,253
TC, etc.	377	1,048	1,287	1,487	1,582	1,651	1,953	2,206	2,416	2,640	2,888	3,594	4,199	3,948	4,179	4,327
Services	309	1,066	1,052	1,447	1,439	1,587	2,020	2,830	2,877	2,796	3,162	3,400	3,823	4,065	4,303	4,456
Other	103	99	91	-	-	-	-	-	-	-	-	511	796	500	219	363
Govt.	1,313	1,208	2,229	3,009	3,307	3,681	4,195	4,665	5,225	5,704	5,837	6,613	7,343	8,397	8,708	9,285
Fed. Civ.	771	268	372	438	441	516	731	847	932	1,022	707	965	1,181	1,461	1,515	1,616
Fed. Mil.	10	94	190	181	205	212	230	263	271	267	304	331	358	376	390	416
S & L	532	846	1,667	2,390	2,661	2,953	3,234	3,555	4,017	4,415	4,826	5,317	5,804	6,560	6,803	7,253
Total	4,178	7,845	9,508	11,255	11,842	12,994	15,555	19,180	20,132	19,839	21,803	26,274	25,817	26,922	29,173	31,350
Soc. Sec.	30	138	261	359	426	526	647	787	794	840	872	1,137	1,282	1,384	1,478	1,588
Net	4,148	7,707	9,247	10,896	11,416	12,468	14,908	18,393	19,338	18,999	20,931	25,137	24,535	25,538	27,695	29,762
Res. Adj.	-	-	-	558	742	970	1,060	1,234	1,494	2,180	2,130	2,285	2,670	2,588	2,783	2,990
Total	4,148	7,707	9,247	11,454	12,158	13,438	15,968	19,627	20,832	21,179	23,061	27,422	27,205	28,126	30,478	32,752
+ Int. Div.	185	517	1,551	2,556	2,800	3,175	3,538	4,006	4,910	5,536	5,503	6,195	7,144	7,631	8,269	8,866
+ Transfer	554	2,761	4,256	5,503	5,809	6,484	6,965	7,198	8,002	8,939	9,637	10,474	12,603	15,246	16,520	18,512
Total	4,887	10,985	15,054	19,513	20,767	23,097	26,471	30,831	33,744	35,654	38,201	44,091	46,952	51,003	55,267	60,150

¹Adjusted for Place of Residence. Stated in current dollars.
Source: Bureau of Economic Analysis, U.S. Department of Commerce.

TABLE 27

Personal Income by Industrial Source¹
Pushmataha County
(\$000)

Source	1940	1950	1960	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Farm	722	1,489	1,056	(222)	(185)	(65)	(104)	151	343	1,020	1,249	1,864	617	-(305)	(21)	166
Non Farm	1,767	2,667	3,751	5,491	5,971	6,489	7,385	8,817	9,046	8,439	9,425	10,675	11,911	13,160	13,889	14,841
Private	787	1,716	2,137	3,001	3,224	3,465	4,098	5,247	5,051	4,145	4,759	5,490	6,310	6,897	7,310	7,811
Mfg.	239	281	280	243	265	273	284	269	274	301	361	494	657	862	914	976
Mining	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-
Constr.	-	104	138	267	296	302	860	2,046	1,572	377	298	483	508	529	560	599
W/R Trade	360	875	1,066	1,284	1,342	1,420	1,573	1,516	1,709	1,619	2,069	2,365	2,722	3,048	3,230	3,451
FIRE	-	86	141	205	215	226	260	241	251	292	340	372	378	414	440	469
TCPU	-	-	-	-	57	112	150	186	190	191	235	208	279	243	257	275
Services	188	320	512	650	696	777	943	959	990	1,260	1,301	1,417	1,620	1,716	1,818	1,943
Other	-	50	-	352	353	355	28	30	65	105	103	151	146	85	91	98
Govt.	980	951	1,710	2,490	2,747	3,024	3,287	3,570	3,995	4,294	4,666	5,185	5,601	6,263	6,579	7,010
Fed. Civ.	606	166	224	305	303	316	325	364	416	416	457	503	504	515	562	600
Fed. Mil.	7	56	103	113	129	133	144	167	168	157	173	194	210	221	232	249
S & L	367	729	1,383	2,072	2,315	2,575	2,818	3,039	3,411	3,721	4,036	4,488	4,887	5,507	5,785	6,181
Total	2,489	4,156	4,807	5,269	5,786	6,424	7,281	8,968	9,389	9,459	10,674	12,539	12,528	12,855	13,910	14,675
Soc. Sec.	17	71	112	177	229	278	312	397	401	380	390	471	569	625	677	714
Net	2,472	4,085	4,695	5,092	5,557	6,146	6,969	8,571	8,988	9,079	10,284	12,068	11,959	12,230	13,233	13,961
Res. Adj.	-	-	-	222	275	311	372	338	455	777	732	2,361	2,762	2,926	3,167	3,341
Total	2,472	4,085	4,695	5,314	5,832	6,457	7,341	8,909	9,443	9,856	11,016	14,429	14,721	15,156	16,400	17,302
+ Int. Div.	112	250	930	1,360	1,608	1,840	1,965	2,332	2,654	2,835	2,656	3,510	4,487	4,782	5,175	5,459
+ Transfer	344	1,491	2,169	3,065	3,296	3,843	4,231	4,511	5,195	5,800	6,143	6,918	8,469	10,239	11,080	12,572
Total	2,928	5,826	7,794	9,739	10,736	12,140	13,537	15,752	17,292	18,491	19,815	24,857	27,677	30,177	32,655	35,333

¹Adjusted for Place of Residence. Stated in current dollars.

Source: Bureau of Economic Analysis, U.S. Department of Commerce.

Impact on Personal Income

The construction of the Hugo Reservoir and other concurrent activities in the Study Area resulted in extensive increases in the income received by residents of the area. These increases came about essentially through higher wages and salaries paid to workers in the non-farm private sector and occurred despite only moderate increases in population and the work force.

In 1967, the first year of construction activity, total personal income in the Study Area exceeded the level forecast without the benefits of the reservoir by more than \$9.0 million and by 1977, actual personal income was \$10.4 million above the forecasted level.⁵ As noted in the discussion of per capita income, other construction projects were being worked on at the time when reservoir construction was underway. Wages and salaries paid the workers on these projects as well as expenditures for land on which these projects were built are included in the income reported for the Study Area and thus tend to obscure and lessen the real impact of the reservoir on the area's economy. In order to eliminate the effects of these non-reservoir projects, thereby allowing that the impact of the reservoir be more clearly defined, the income generated by these projects was removed from the actual income reported for these counties before comparing the actual experience with forecasts. This comparison appears in Table 28.

⁵Note that the 1967 personal income data used in the previous report was preliminary data which was estimated prior to beginning of construction of the reservoir and also was not residence adjusted.

TABLE 23
Actual Impact of the Reservoir on Personal Income
in Choctaw and Pushmataha Counties
1967-1977
(Thousands of Dollars)

Year	Impact ¹		
	Choctaw	Pushmataha	Total
1967	4,633	4,383	9,016
1968	5,581	4,608	10,189
1970	5,026	3,583	8,609
1975	4,256	6,862	11,118
1977	3,108	6,946	10,354

¹ Stated in 1967 dollar equivalents. Impact = Actual experience adjusted for other construction minus forecasts assuming no reservoir.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969 and Tables 26 and 27.

Agriculture

The development of the Hugo Reservoir was not forecast to impact the Study Area heavily at least through 1977 when water impoundment would have taken place for three years. In fact, however, the period 1969-1974 was marked by significant increases in the dollar volume of agricultural production to levels well above those expected in the area after completion of the reservoir.

Agriculture Production

Agriculture production in the study area moved unevenly during the ten-year period with an upward trend prevailing generally through 1973. During the period 1967-1973, the dollar value (before adjustment for inflation) of farm products rose from less than \$6 million in 1967 to more than \$33 million in 1973. After adjustment to 1967 dollar equivalents the 1973 peak was nearly \$25 million which was more than four times the 1967 level. Data contained in Table 29 reflect the actual output of the agriculture sector of the Study Area both in terms of current dollars and 1967 dollar equivalents.

Impact on Agriculture Production

As noted earlier, the trend in agriculture output between 1967 and 1977 varied erratically with decreases occurring in 1968 and 1975. However, in terms of current dollars, agricultural output was generally above that which was estimated if the reservoir was not built. The dollar value of the actual impact is shown in Table 30.

TABLE 29

Actual Agriculture Production in
Choctaw and Pushmataha Counties
for Selected Years 1967-1977
(Thousands of Dollars)

Year	Actual Production ¹			Adjusted Production ²		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	3,700	2,240	5,940	3,700	2,240	5,940
1968	2,583	2,170	4,753	2,474	2,078	4,552
1970	9,584	7,549	17,133	8,240	6,491	14,731
1975	4,608	3,383	7,991	2,859	2,099	4,958
1977	7,283	5,188	12,471	4,012	2,858	6,870

¹In current dollars.

²In 1967 dollar equivalents.

Source: U.S. Department of Agriculture and Bureau of Economic Analysis,
U.S. Department of Commerce.

TABLE 30

Impact of the Hugo Reservoir
on Agriculture Production in
Choctaw and Pushmataha Counties
for Selected Years, 1967-1977
(Thousands of Dollars)

Year	Actual Impact ¹		
	Choctaw	Pushmataha	Total
1967	0	0	0
1968	-1,307	-201	-1,508
1970	4,290	4,131	8,421
1975	-1,380	-429	-1,809
1977	-349	259	-90

¹In 1967 dollar equivalents.

Source: Table 29 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Value Added by Manufacture

One of the factors which was considered to be among the most important determinants to industrial location in the 1960's was the existence of an abundant supply of surface water. In fact, several water impoundment projects including the Lake of the Arbuckles (near Sulphur, Oklahoma) and the Beaver-Cow Creek project (near Waurika, Oklahoma) depended on the industrial benefits which would accrue to nearby towns for their approval. For this reason, the industrial growth which occurred in similar communities due to the existence of large bodies of fresh water was used to simulate the growth in manufacturing in the Study Area.

Shortly before the reservoir was closed and water impoundment began in 1974, the entire group of priorities relating to plant location was altered drastically and large supplies of surface water became a secondary consideration to energy supplies. This is to say that manufacturing plant location decisions were no longer based on water as a primary consideration but on long range supplies of "clean" energy sources such as natural gas. In addition, the possibility of an impending shortage of motor vehicle fuel deterred many manufacturers from considering towns which were not located near a diversity of transportation modes and/or dense markets as plant locations. Both of these considerations worked to the disadvantage of the study area as a forthcoming location of manufacturing plants of the sizes originally envisioned when the original forecasts were made. Without growth in the number of manufacturing firms, there became little basis for any appreciable growth in value added by manufacturing. In fact, the increases noted in value added by manufacturing in the Study Area between 1967 and 1977 increased by less than the rate of inflation during the same period.

Neither Choctaw nor Pushmataha Counties have or are heavily oriented toward the manufacturing industries. As pointed out earlier it was originally believed that by establishing the reservoir, new and expanded manufacturing activity would be encouraged in the area. However, thus far such has not been the case. After adjusting the value added by manufactures (reported in current dollars) to constant 1967 dollar equivalents (see Table 31) it is noted that the level of this measure of economic activity actually declined by \$250 thousand between 1967 and 1977.

TABLE 31
Trends in Value Added by Manufacture
in Choctaw and Pushmataha Counties¹
Stated in Current and Constant Dollars¹
1967-1977
(\$000)

Year	Current Dollars			Constant Dollars ¹		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	2,630	460	3,090	2,630	460	3,090
1972	3,100	400	3,500	2,480	320	2,800
1975	3,860	560	4,420	2,390	350	2,740
1977	4,570	580	5,150	2,520	320	2,840

¹Constant dollars are 1967 dollar equivalents. All data rounded to nearest \$10,000 dollars.

Source: 1967 and 1972, Census of Manufactures, Oklahoma, U.S. Department of Commerce. 1975 and 1977 estimates prepared by the Center for Economic and Management Research, University of Oklahoma.

The picture is somewhat more optimistic when the growth measured in current dollars is considered. In this case, manufacturing activities in the area grew by 66.7 percent during the decade with most of this increase occurring in Choctaw County.

Trends in value added by type of industry are shown in Table 32.

TABLE 32
Value Added by Manufacture
in Choctaw and Pushmataha Counties
by Type of Manufacturing Activity
Selected Years, 1963-1977
(Thousands of Dollars)¹

County/Activity	1963	1967	1972	1975	1977
Choctaw					
Food	227	291	289	243	227
Apparel	1,495	1,577	1,393	1,300	1,261
Lumber and Wood Products	944	636	662	610	708
Printing and Publishing	264	114	116	107	100
Chemicals	76	14	16	24	23
Electrical Machinery	0	0	0	0	0
Other Transportation	0	0	0	0	55
Fabricated Metals	0	0	0	28	38
Other Durable Goods	529	0	0	51	64
Other Non Durable Goods	0	0	0	25	34
Miscellaneous Manufac- turing	0	0	0	6	8
Total	3,535	2,632	2,476	2,394	2,518
Pushmataha					
Food	11	114	0	0	0
Apparel	0	0	0	134	123
Lumber and Wood Products	88	248	219	169	155
Printing and Publishing	22	38	43	35	33
Electrical Machinery	11	15	0	0	0
Other Durable Goods	0	42	54	0	0
Other Non Durable Goods	0	6	3	6	7
Total	132	463	319	345	318
Total Study Area	3,467	3,095	2,795	2,739	2,836

¹In 1967 dollar equivalents

Source: Census of Manufactures, Oklahoma, 1963, 1967 and 1972, U.S. Department of Commerce, and estimates based on County Business Patterns, U.S. Bureau of Labor Statistics. The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

An analysis of the data contained in Tables 31 and 32 indicates that in terms of current dollars, value added by manufactures increased by more than \$2 million over the decade ending in 1977. However, viewing the trends measured in 1967 dollar equivalents revealed that inflationary pressures during this period were such that the value added by manufactures in 1977 was actually \$250 thousand below that of 1967. (See Table 33)

TABLE 33
Actual and Forecast Value Added by Manufacture
in Choctaw and Pushmataha Counties
Selected Years, 1967-1977
(Thousands of Dollars)

Year	Actual ¹			Forecast		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	2,632	463	3,092	4,043	135	4,178
1972	2,476	319	2,795	4,843	200	5,043
1975	2,394	345	2,739	5,408	232	5,640
1977	2,518	318	2,836	5,820	272	6,092

¹In 1967 dollar equivalents.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University; The Census of Manufacturers, Oklahoma, 1967 and 1972, U.S. Bureau of the Census; and estimates by the Center for Economic and Management Research, University of Oklahoma.

Electric Power Consumption

One of the expected effects of the Hugo Reservoir was an increase in economic activity in the study area. The expanded economy of the area, in turn, was to result in sharp increases in population and employment. As population and a broader economic base developed, it was expected that the use of electrical energy - both by residents and by businesses in the area would experience significant gains throughout the short term. Despite the fact that neither the area's population nor its industrial activity have grown as rapidly as forecast, the consumption of electricity by all types of users has risen far in excess of future projections.

Records of utility companies and associations providing electric power to the Study Area indicate that the total consumption of electricity in the area increased four-fold between 1967 and 1977. This increase raised the amount used from 36.3 million kwh in 1967 to more than 155 million kwh by the end of 1977 (see Table 34). Most of this increase occurred in the residential sector which exceeded 94 million kwh in 1977 while industrial and commercial users accounted for nearly 61 million kwh.

The most rapid increase in electricity consumption during this period occurred in Pushmataha County but this was due to the fact that the gains noted in this county were from a lower base thus any increases would appear proportionately larger than if the base year consumption were higher. In absolute terms, the amount of consumption in Choctaw County exceeded that of Pushmataha County significantly.

TABLE 34
Actual Consumption of Electricity
in Choctaw and Pushmataha Counties
by Type of Consumption
1967-1977
(Thousands of Kwh)

Year	Total Consumption			Residential Consumption			Commercial & Industrial		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	27,185	9,136	36,321	12,709	6,378	19,087	14,476	2,758	17,234
1968	30,167	10,665	40,832	14,615	7,702	22,317	15,552	2,963	18,515
1970	39,187	14,642	53,829	19,912	10,970	30,882	19,275	3,672	22,947
1972	56,835	20,817	77,652	29,178	15,497	44,675	27,657	5,320	32,977
1975	87,434	35,184	122,618	46,752	27,357	74,109	40,682	7,827	48,509
1977	110,264	44,790	155,054	59,436	34,990	94,426	50,828	9,800	60,628

Source: Public Service Company of Oklahoma and Choctaw Rural Electric Association.

Impact on Electricity Consumption

As noted earlier, the consumption of electricity during the period 1967-1977 far exceeded any estimates of growth then available. In fact, the recent trend in consumption has been such as to exceed previous estimates of consumption in the area had the reservoir not been built by more than 120 million kwh. These data are shown in Table 35.

One method for examining the changes in electricity consumption which have occurred since the beginning of the construction of the reservoir is an analysis of actual consumption since 1967. This approach applied to data contained in Table 34 indicates that in the 10 year period 1967-1977, total use of electricity in the study area has risen by 326.9 percent. It further reveals that increases through 1972 were at an annual rate of 16.4 percent whereas between 1972 and 1977, the annual rate of increase was 14.8 percent. This suggests that during the actual construction period, the rate of electricity consumption was rising 1.6 percent per year faster than during the periods of dam closing, fill up and use. This form of analysis tends to mitigate some of the effects of changes in per capita consumption and thus, provides a somewhat cleaner picture of the impact of the reservoir.

TABLE 35
Impact of the Hugo Reservoir on Electricity
Consumption in Choctaw and Pushmataha Counties
1967-1977
(Thousands of Kwh)

Year	Actual Consumption	Forecast Consumption ¹	Impact
1967	36,321	18,894	17,427
1970	53,829	20,310	33,519
1972	77,652	21,620	56,032
1975	122,618	23,580	99,038
1977	155,054	24,900	120,154

¹ Assuming no reservoir is built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969 and Table 35.

Finance

Prior to 1967, the economy of the study area experienced considerable leakage of assets.⁶ This leakage took the form of purchases of goods and services in out of area stores as well as of savings in financial institutions located outside the service area. Thus, leakage affected the financial activities of the Study Area in a negative way and also tended to place constraints on forecasts of financial activities in future years.

Bank Deposits

It should be noted that the earlier study, in its assessment of financial activities, considered demand deposits and loans and discounts. In retrospect this restricted view limits the degree to which the full impact of the reservoir on the financial community can be viewed. The exclusion of savings deposits in banks from the analysis prevents a true assessment of the total effects of the reservoir on the financial affairs of the Study Area. This study has attempted to eliminate this problem by substituting total deposits for demand deposits both in the original study and in this study. Hence, the analyses of the impact of the reservoir on deposits will include both demand and savings deposits in banks.

Bank Deposits in the Study Area experienced a significant acceleration in their rate of growth during the 1967-1977 period compared with earlier growth rates. For example, deposits in Choctaw County banks increased nearly four fold (in current dollar terms) between 1967 and 1977 while those of Pushmataha banks (also in current dollars) more than tripled during the same period. Even after

⁶The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969. p. 20 ff.

adjustment for inflation, deposits in banks located in the study area during 1977 were nearly double the levels of 10 years earlier (see Table 36).

TABLE 36
Trends in Bank Deposits
in Choctaw and Pushmataha Counties¹
Stated in Current and Constant Dollars¹
1967-1977
(\$000)

Year	Current Dollars			Constant Dollars ¹		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	13,963	7,325	21,288	13,963	7,325	21,288
1970	25,097	9,500	34,597	21,580	8,169	29,748
1975	37,056	17,938	54,994	25,987	11,627	37,614
1977	47,977	22,661	70,638	26,434	12,685	39,118

¹in 1967 dollar equivalents.

Source: Oklahoma Bankers Association.

Based on earlier estimates of deposits in banks in these counties if no reservoir were built, it appears that the deposit levels have risen much more rapidly than would have occurred had the reservoir not been built. For example, deposits in the Study Area could have risen only to \$30.6 million under conditions which prevailed prior to the construction of the reservoir. This represents a gain of only \$9 million in deposits over the 10 year period. However, deposits in the area reached nearly \$71 million (or \$39.1 million in 1967 dollar equivalents) suggesting that accelerated activity in the area resulted in an increase of nearly \$50 million (or \$19 million in 1967 dollar equivalents) in area banks during the decade. These data are shown in Table 37.

FIGURE 5
Trends in Bank Deposits
in Choctaw and Pushmataha Counties
1960-1977
(Thousands of 1967 Dollar Equivalents)

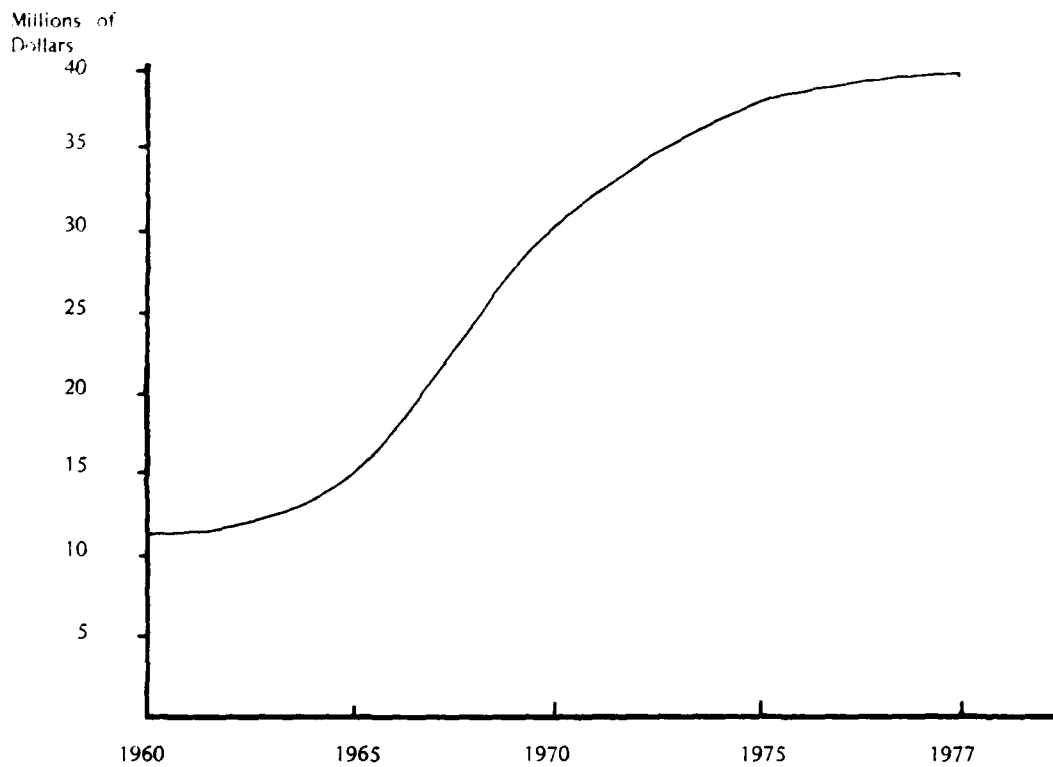


TABLE 37
Actual Impact of the Hugo Reservoir
on Bank Deposits in
Choctaw and Pushmataha Counties
1967-1977
(Thousands of Dollars)

Year	Impact		Total
	Choctaw	Pushmataha	
1967	0	0	0
1968	1,611	-579	1,032
1970	6,308	-1,058	5,250
1972	8,270	126	8,396
1975	8,251	265	8,516
1977	7,602	904	8,506

Actual - Forecast without reservoir; both in 1967 dollar equivalents. Negative sign denotes overestimation in forecast.

Source: Table 36 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Loans and Discounts

Loans and discounts made by banks represent a large element of the purchasing power in any area. Traditionally, most loans and discounts represent purchases of high priced merchandise (when made to individuals) or short-term capital requirements of area businesses. Thus, the volume of these types of borrowing is an excellent indicator of local consumption.

Trends in Loans and Discounts

Records indicate that the dollar volume of loans and discounts during the period 1967-1977, increased from \$10.5 million in 1967, to \$39.0 million (in current dollars) by 1977. Adjusting these totals to 1967 dollar equivalents reveals that in terms of constant dollars, the increase during the period was nearly \$10 million which almost doubled the loans and discounts made by area banks over the decade (see Table 38).

TABLE 38
Trends in Loans and Discounts in
Choctaw and Pushmataha Counties Stated in
Current and Constant Dollars¹
1967-1970
(\$000)

Year	Current			Constant		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	7,375	3,197	10,572	7,375	3,197	10,572
1970	11,580	4,379	15,959	9,957	3,765	13,722
1972	13,019	6,328	19,347	10,390	5,050	15,440
1975	21,156	7,857	29,013	13,124	5,174	18,298
1977	27,217	11,804	39,021	14,495	6,503	21,498

¹ Stated in 1967 dollar equivalents.

Source: The Oklahoma Bank Directory, Oklahoma Bankers Association.

Impact of the Reservoir

Comparing actual loans and discounts made by banks in the Study Area with forecasts of these instruments without the benefit of the reservoir indicated a vastly larger gain after the construction phase of the reservoir was underway and even more extensive gains after the reservoir was placed in operation. In 1967, for example, loans and discounts made by area banks were \$4.1 million greater than the level forecast without a reservoir. By 1977, this margin had increased three fold to \$12.4 million (see Table 39).

TABLE 39
Impact of the Hugo Reservoir on Loans and Discounts in
Choctaw and Pushmataha Counties Stated in
Current and Constant Dollars¹
1967-1977
(\$000)

Year	Current			Constant		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	2,521	2,345	4,866	2,559	1,482	4,081
1970	6,190	1,107	7,197	4,567	1,675	6,242
1972	7,399	4,118	11,517	4,788	2,863	7,651
1975	15,196	5,267	20,463	7,199	2,884	10,083
1977	21,029	9,007	30,036	8,338	4,049	12,387

¹Stated in 1967 dollar equivalents.

Source: Oklahoma Bank Directory, Oklahoma Bankers Association.

Transportation

It was expected that if the reservoir were built transportation activities - both in terms of rail and truck - would increase somewhat in the short term. Earlier forecasts indicated that the largest relative gain would be in out-bound shipments since manufacturing activity was expected to increase moderately thereby requiring additional transportation to markets. Additionally, the previous forecasts predicted a larger gain for truck shipments than for rail shipments. The extent to which these changes occurred will be explored in discussions which follow.

Rail Shipments

Rail facilities have historically been of extreme importance to the study area - particularly to Choctaw County - because this mode of transportation offers a low cost means for moving timber and timber products to saw and finishing mills outside the area. Rail's role in the economy of the area in this respect has not changed. However, an analysis of the changes in rail movements between 1967 and 1977 indicates that the completion of the reservoir has had little effect on the volume of freight moving into or out of the area by rail.

Total rail shipments in the study area generally declined between 1967 and 1975 when the low for the ten-year period was reached. After 1975, however, shipments have increased slightly but not to pre-1975 levels.

The major factor contributing to the decline in rail shipments was the sharp drop-off in inbound movements, particularly into the Choctaw County yards. Some of the decrease in inbound movements was attributable to the increased amount of freight being shipped into the area by trucks.

Outbound shipments by rail from the area remained relatively constant during the period 1967-1977. This stability in the use of rail to move products out of the area stems from the fact that a very major portion of outbound shipments consists of timber which is not as amenable to truck transportation as to rail.

Rail shipments by year for the period 1967-1977 are shown in Table 40.

TABLE 40
Freight Carloadings in
Choctaw and Pushmataha Counties
1967-1977
(Number of Carloadings)

Year	Choctaw			Pushmataha			Total		
	Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
1967	384	816	1,200	2	10	12	386	826	1,212
1968	382	731	1,113	2	9	11	384	740	1,124
1970	366	540	906	4	8	12	370	548	918
1975	62	334	396	1	3	4	63	337	400
1977	78	624	702	1	6	7	79	630	709

Source: St. Louis and San Francisco Railroad Co.

Impact of the Reservoir

Table 41 details the differences between forecasts of rail movements had the reservoir not been built and the actual rail movements between 1967 and 1977.

These data reflect the fact that the forecasts of rail shipments had no reservoir been built were somewhat indicative of trends which occurred in rail shipments and thus that the reservoir had little effect on this sector of the area's economy. The sharp drop in rail shipments which occurred in 1975 was due in part to general economic conditions throughout the state and thus cannot be attributed to a negative influence of the reservoir.

TABLE 41

¹Includes both inbound and outbound shipments.

²Assuming no reservoir is built.

Source: Table 40 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, 1967.

Truck Shipments

Shipments of freight by truck have grown rapidly in the Study Area particularly since 1970. Much of this growth has been at the expense of rail shipments. As noted earlier, the changes in truck shipments are due both to economic growth in the area as well as acquisition of a greater share of the transportation market.

During the period 1967-1977, truck shipments into and out of the area grew by more than 55 percent. During this period, the greatest growth was noted in inbound shipments as much of the raw materials and finished products consumed in the area and formerly shipped by rail, began to be moved in by truck. For the most part, these shipments were in less than truck load lots which accounts for the relatively large numbers of shipments.

The growth of inbound and outbound truck movements for the Study Area between 1967 and 1977 is shown in Table 42.

TABLE 42
Inbound and Outbound Truck Shipments
for Choctaw and Pushmataha Counties
1967-1977
(Number of Shipments)

Year	Choctaw			Pushmataha			Total		
	Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
1967	8,443	2,229	10,672	2,136	62	2,198	10,579	2,291	12,870
1968	8,399	1,997	10,396	2,050	56	2,106	10,449	2,053	12,502
1970	9,872	2,718	12,590	2,307	76	2,383	12,179	2,794	14,973
1975	12,265	3,038	15,303	2,051	56	2,107	14,316	3,094	17,410
1977	14,636	3,198	17,834	2,109	51	2,160	16,745	3,249	19,994

Source: Mistletoe Express, R and R Truck Lines, and Interstate Commerce Commission Reports of Truck Shipments.

Impact of the Reservoir

As noted earlier, truck shipments in the area have been influenced by the ability of the trucking industry to acquire more of the market and to a lesser extent by the completion of the reservoir. The data shown in Table 43 reflect the effects of both of these influences. It should be noted that, except for 1968, the joint effects of the reservoir and market penetration have resulted in a large growth in truck shipments in Choctaw County over what might have been expected had the reservoir not been built.

One possible way to isolate the influence of the reservoir from the market acquisition experience of the trucking industry between 1967 and 1977 is to compare the differences between actual truck movements and forecasts made under the assumption that the reservoir would be built with differences between actual truck movements and forecasts made under the assumption that the reservoir would not be built. These comparisons are shown in Table 43.

FIGURE 6
Trends in Truck Shipments
in Choctaw and Pushmataha Counties
by Type of Shipment
1960-1977

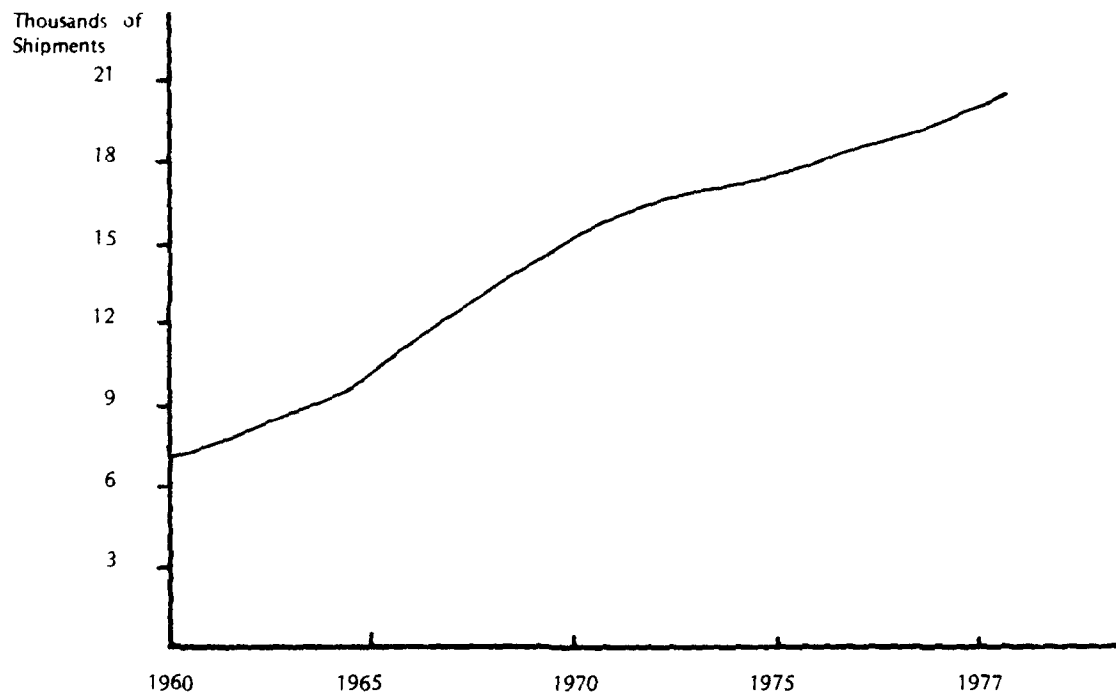


TABLE 43
Actual and Forecasted Truck Shipments¹
for Choctaw and Pushmataha Counties
1967-1977
(Number of Shipments)

Year	Forecast ²			Actual			Difference		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	10,672	2,198	12,870	10,672	2,198	12,870	0	0	0
1968	10,910	2,417	13,327	10,396	2,106	12,502	-514	-311	-825
1970	12,336	2,734	15,070	12,590	2,383	14,973	254	-351	-97
1975	14,129	2,958	17,087	14,636	3,198	17,834	507	240	747
1977	15,179	3,174	18,353	16,855	3,581	20,436	1,676	-407	2,083

¹Includes inbound and outbound shipments.

²Assuming the reservoir is built.

Source: Table 42 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties; Business Research Center, Oklahoma City University, 1969.

Construction

Construction activity was forecast, to have significant increases during the period 1967-1977 because this was the decade within which the reservoir would be built. During a portion of this time frame, i.e. 1967-1970, the southern section of the Indian Nations Turnpike was also being completed, therefore expenditures on two major construction projects were being made in the Study Area which, unless disaggregated, could overstate the influence of the reservoir on the economy of the area. Too, sharp increases in construction costs occurred following 1967 which must be removed to reduce the effects of this factor on the total impact picture.

Between 1967 and 1977, total construction activity in the area moved unevenly with sharp gains being evidenced through 1972 when the total for the area reached \$21.9 million (in current dollars or \$17.4 million in 1967 dollar equivalents). Of this total, \$13 million was spent for residential and commercial buildings and \$8.4 million represented reservoir expenditures, the highway having been completed in 1970. Following 1972, sharp decreases were noted through 1974 when the total reached \$9.2 million. However, subsequent years have been marked by consistent gains so that by 1977, total construction activity reached \$25.4 million (in current dollars or \$13.9 million in 1967 dollar equivalents). These data are detailed in Table 44.

Based on data contained in Table 44, it is clear that, even after adjustment for inflated building costs, and the highway construction program, the expenditures for reservoir construction did materially affect total construction activities in the Study Area.

TABLE 44

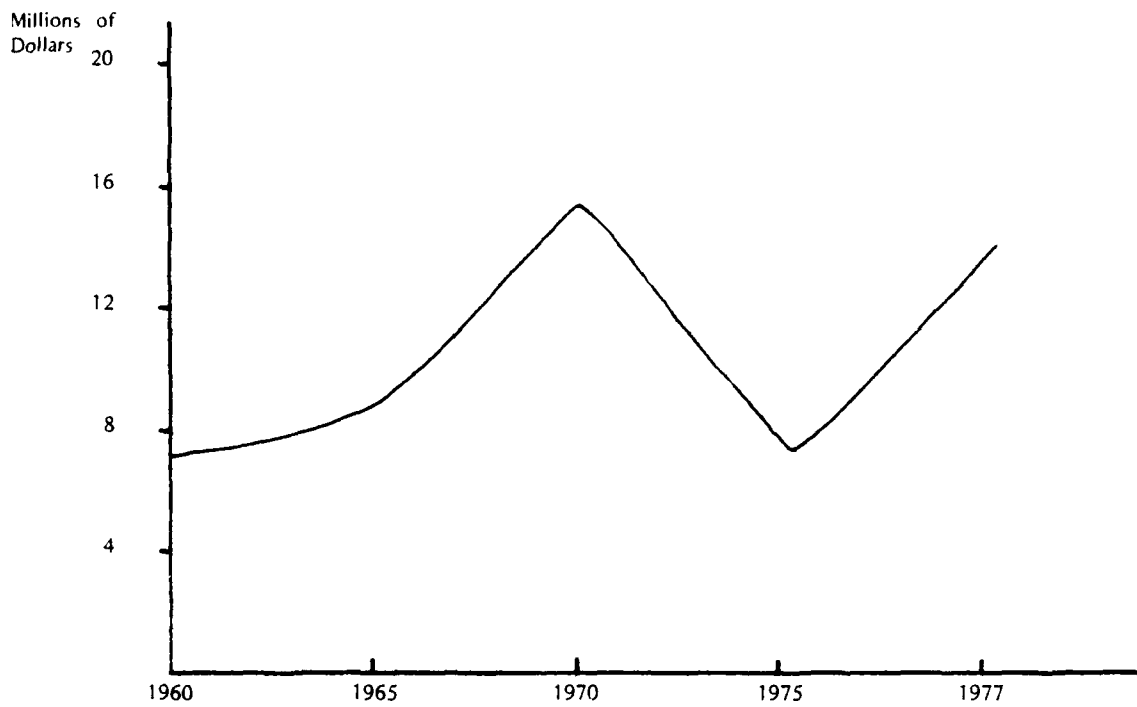
Trends in Construction Activities
in Choctaw and Pushmataha Counties
by Type of Construction
1967-1977
(Thousands of Dollars)

Year	Unadjusted ¹				Adjusted ²			
	Residential Commercial	Reservoir	Highway	Total	Residential Commercial	Reservoir	Highway	Total
1967	6,713	-0-	7,800	14,513	6,713	-0-	7,800	14,513
1968	7,210	-0-	6,800	14,010	6,906	-0-	6,513	13,419
1969	8,430	5,200	5,700	19,330	7,657	4,723	5,177	17,557
1970	5,963	8,200	3,100	17,263	5,127	7,050	2,665	14,842
1971	11,055	10,100	-0-	21,155	9,113	8,326	-0-	17,439
1972	13,570	8,400	-0-	21,970	10,830	6,703	-0-	17,533
1973	6,598	3,700	-0-	10,298	4,957	2,780	-0-	7,737
1974	7,464	1,800	-0-	9,264	5,053	1,219	-0-	6,272
1975	11,403	400	-0-	11,803	7,074	248	-0-	7,322
1976	14,135	100	-0-	14,235	8,290	59	-0-	8,349
1977	24,757	600	-0-	25,357	13,640	330	-0-	13,970

¹In current dollars²In 1967 dollar equivalents

Source: Construction Division, U.S. Department of Commerce, Oklahoma Turnpike Authority,
Oklahoma Department of Transportation, U.S. Army Corps of Engineers.

FIGURE 7
Trends in Total and Adjusted Construction Activity
in Choctaw and Pushmataha Counties
1960-1977
(Thousands of 1967 Dollar Equivalents)



Impact of the Reservoir

The short-term impact of the reservoir on construction activity in the study area is less than originally forecast but is, nonetheless significant. As mentioned earlier, the expenditures incurred in building the southern section of the Indian Nations Turnpike were removed from construction activities during the period 1967-1977 and the remaining expenditure data were adjusted for inflation. Comparing those adjusted data then with the activities forecast under the assumption that the reservoir were not built results in the differences shown in Table 45.

TABLE 45
The Impact of the Hugo Reservoir
on Construction Activities in
Choctaw and Pushmataha Counties
1967-1977
(Thousands of Dollars)

Year	Forecast ¹	Actual ²	Difference
1967	6,700	6,700	0
1968	7,030	6,896	-134
1970	8,990	12,178	3,188
1975	9,960	10,022	62
1977	10,370	13,805	3,435

¹ Assuming no reservoir is built.

² In 1967 dollar equivalents, excluding highway expenditures.

Source: Table 44 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties.

Tax Structure and Rates

Because of the vast amount of land which the construction of the reservoir would take out of production and off of the tax rolls, it was originally feared that the local property tax structures of the two counties might be severely damaged. However, a comparison of property valuations between 1968 and 1977 suggests that such has not been the case. As noted in Table 46, net property evaluations rose 42 percent in Choctaw County between 1968 and 1977 while in Pushmataha County, the increase for the same period was 48 percent. Increases of these magnitudes occurred after significant amounts of land were taken from the tax rolls for both the reservoir and the Indian Nations Turnpike.

While it might be argued that, had this land remained on the tax rolls, net property valuations might have increased as much as 63 percent (in keeping with the rate of inflation between 1968 and 1977), net valuations are not a function of amount of land alone but also depend on the County Assessor's considered opinion of land values and social needs. Apparently the needs of both counties have been well satisfied since both have reduced the ratio of bonded debt to property valuation by significant amounts. This is witnessed by the fact that Choctaw County has reduced their debt from a high of \$215,000 in 1973 (1.77 percent of valuation) to \$119,000 in 1977 (0.52 percent of valuation). During this period, Pushmataha County reduced their bonded debt from \$64,000 in 1969 (0.66 percent of valuation) to a debt free situation by 1977. It should be further noted that both counties have maintained healthy sinking funds.

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TABLE 46
Gross and Net Assessments and Bonded Indebtedness
1968-1977
Choctaw and Pushmataha Counties

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Choctaw County										
Gross Property Assessment	11,635,717	12,475,464	12,486,368	12,841,084	12,993,919	13,103,738	13,998,680	14,346,129	14,959,368	16,054,529
Less Homestead Exemption	2,674,580		2,772,267					3,079,178		3,287,437
Net Property Assessment	8,961,137	9,699,391	9,714,101	10,016,542	10,124,764	10,119,800	11,006,578	11,266,951	11,737,401	12,767,092
Bonded Indebtedness	183,300	140,000	120,000	175,000	155,000	215,000	119,000	179,000	159,000	119,000
Sinking Fund	29,880	22,823	24,382	22,772	30,745	36,244	53,184	60,509	64,950	53,218
Ratio Debt to Valuation (X)	1.57	1.21	0.98	1.52	1.23	1.77	1.32	1.05	0.80	0.52
Total Levy, Sinking Fund	19,181	25,834	25,218	23,437	40,688	26,546	18,215	23,343	22,435	22,887
Total Sinking Fund Collections	18,291	24,215	25,132	23,030	34,633	26,631	19,296	21,980	22,768	23,109
Pushmataha County										
Gross Property Assessment	10,570,790	10,885,467	11,305,534	11,584,440	12,820,256	13,061,884	13,831,299	14,101,016	14,462,331	15,217,702
Less Homestead Exemption	1,979,725		2,049,415					2,415,795		2,534,610
Net Property Assessment	8,591,065	8,880,972	9,256,119	9,449,080	10,636,021	10,805,699	11,495,854	11,685,221	12,009,626	12,683,092
Bonded Indebtedness	63,000	64,000	56,000	48,000	40,000	32,000	24,000	16,000	8,000	-0-
Sinking Fund	5,670	5,725	5,362	4,809	4,249	4,005	3,358	2,881	1,564	741
Ratio Debt to Valuation	0.67	0.66	0.55	0.45	0.34	0.26	0.18	0.11	0.05	0.01
Total Levy, Sinking Fund	7,920	9,226	9,608	9,048	8,707	8,349	7,354	7,127	6,887	7,205
Total Sinking Fund Collections	7,754	9,255	9,515	9,105	8,770	8,301	7,351	7,067	6,922	7,232

Source: Annual Reports, Oklahoma State Tax Commission.

Recreation Activity

The Hugo Reservoir is one of several multi-purpose reservoirs in Southeastern Oklahoma. For this reason, it was not expected to draw as many visitors as would be the case if it were the only one in the area. Furthermore, its attractiveness to persons seeking water-oriented recreation activities was expected to be less than others since it was not located near a large city offering a wide variety of shops and other amusements.

Construction on the reservoir began on October 16, 1967 and impoundment of water began in January 1974. Thus, measurement of visitation to the reservoir had little meaning until 1975 when the water level was sufficiently high to allow full use of the lake.

The earlier study estimated that, the attendance at the lake would be 314,500 visitor days during the first year of full operation (i.e. 1975) and would reach 464,700 visitor days by 1977. These visitors were expected to spend an estimated \$155 thousand in the area during the first year (1975) which was projected to increase to \$258 thousand by 1977.

Actual counts of visitor days at the reservoir differ significantly from the forecasts presented earlier. Only in 1975 did forecasts exceed actual levels of visitor days at the lake (see Table 47).

TABLE 47
Actual and Forecast Recreation Visitation
at the Hugo Reservoir
1975-1977

Year	Forecast Visitor Days	Actual Visitor Days
1975	314,500	91,800
1976	382,300	638,100
1977	464,700	832,100

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties; Business Research Center, Oklahoma City University, 1969; the U.S. Army Corps of Engineers.

Further analysis of visitors to the lake and their activities during their stay indicates that the heaviest visitations occur between May and September after which the number of visitor days decline until January when visitor days once again begin to increase. Activities of lake visitors during these periods vary also with sight-seeing representing the most frequent activity followed by fishing and boating in the summer months. Winter activities in the area are predominantly for sight-seeing although boating and fishing also contribute significantly to the lake's winter attractions.

It is of note that the visitor activities of camping, boating, and fishing represent those for which visitors spend money locally. Such activities as picnicking and sight-seeing contribute little in the way of visitor expenditures. Applying the proportions of visitors participating in the various activities by season for the period 1975-1977 and the average expenditure per season results in the data shown in Table 48.

TABLE 48
Visitations and Visitor Expenditures at
the Hugo Reservoir by Type of Activity and Year
1975-1978

Year	Type of Activity (Visitor days)					Estimated Expenditures
	Boating	Fishing	Camping	All Other	Total	
1975	0	44,980	0	46,820	91,800	\$ 499,170
1976	76,570	293,520	19,140	248,890	638,100	1,754,780
1977	116,490	357,800	49,930	307,880	832,100	2,288,270
1978	143,500	481,750	51,250	348,500	1,020,000	2,818,750

Source: Reports of the U.S. Army Corps of Engineers and Visitor Preferences and Expenditures at Hugo Lake, 1977, Vanessa Lenard and Daniel D. Badger, Department of Agricultural Economics, Oklahoma State University, Stillwater, 1978.

The actual expenditures noted in Table 48 were based on visitor expenditure data developed for the Corps of Engineers in 1978 and include both trip expenditures as well as annual expenditures prorated to a per visitor day basis. As pointed out earlier an extensive study of visitor expenditures revealed that, on average, the persons involved in such activities as boating and fishing spend an average of \$6.25 per visitor day.

Impact of the Reservoir

The recreation impact of the reservoir on the Study Area, then, is far greater in terms of cash income to local merchants than was originally forecast. Since most of these expenditures are made at the retail level, the money goes almost immediately into the local economy thereby creating new trade and service employment and income.

The lake has additional impacts on the economy of the Study Area. One of these is that it has created a seasonal market in the vicinity of the lake for such products as bait, fast foods, boating and fishing supplies and equipment and automobile services. Approximately nine seasonal suppliers of these products and services have been established in the area and employ approximately 20 persons during their periods of operation. In addition, the lake has created nine full time U.S. Army Corps of Engineers positions for operation and maintenance of the lake and its environs. During the five summer months, this latter work force is increased by 10 temporary jobs.

Commercial Activities

One final measure of the reservoirs impact on the business activities of the Study Area utilizes the concept of the "location quotient."⁷ Briefly, the location quotient provides a means for determining the extent to which retail sales in a county reflect some purchases by out-of-county residents. The procedure involves relating the ratio of per capita retail sales of an area to the per capita income of that area for a given period. This ratio is then divided by the ratio of per capita retail sales in the state to the per capita income in the state for the same period. This method provides controls for differences in per capita income which occur from area to area and thus helps identify the degree to which stores in one area service residents in other areas. A location quotient of 1.00 indicates that the area stores serve only customers in the area. A location quotient of less than 1.00 indicates that area residents are making purchases outside the area while a location quotient in excess of 1.00 indicates that residents from outside the area are making purchases in area stores.

The location quotient computed for the Study Area for 1967 - prior to the existence of the reservoir - was .92. This indicates that a moderate amount of retail buying by area residents occurred outside the area. A second location quotient was computed for the area in 1972 which was during the construction phase of the reservoir and the southern portion of the Indian Nations Turnpike. At this time (i.e. 1972) the location quotient for the Study Area proved to be 1.17. Thus, between 1967 and 1972, a considerable change occurred in the locations of consumer purchases to the extent that the Study Area no longer "exported" retail sales but, in fact "imported" retail sales.⁷

⁷See Appendix A for a discussion and method of computing the location quotient.

Finally, an area location quotient was developed for 1977. The value of this quotient was 1.14 which suggests that a slight decline occurred in the volume of purchases made by out-of-area residents. Most of this decrease is probably due to the decline in construction workers in the area who lived elsewhere. This latter decline occurred as a result of the completion of all major projects in the area.

Impact on Commercial Activities

The reservoir and its obvious attractions to out-of-area residents helped raise the dollar volume of purchases in Study Area stores by amounts sufficient to change the area from an "exporter" of retail sales to an "importer" of retail sales. Much of the gain between 1967 and 1972 was attributable to construction activities. However, it is of note that purchases by visitors to the area succeeded in holding out-of-area sales as measured by the location quotient well above pre-reservoir levels.

General Economic Impact

The divergent trends and varied impacts of the reservoir on the various sectors of the Study Area's economy makes an overall evaluation of the reservoir and its value difficult. However, by developing an overall economic index of the area and tracing its changes since the completion of the reservoir, a general assessment of the total effect of the reservoir on the community is possible.

The experience in the study area during the decade ending in 1977 indicates that economic activity more than doubled between 1960 and 1970 which encompassed much of the construction phase of the reservoir. Following 1970, economic activity in the area continued to grow but at a somewhat slower pace as construction expenditures began to decline.

Impact of the Reservoir

Despite the apparent slowdown in the rate of economic growth between 1970 and 1977 occasioned for the most part by the decline in construction expenditures, the effects of the reservoir and its attractions did contribute significantly to the continued growth. This is evidenced by the fact that had additional sources of income not been created, the economic index for 1977 should have returned to near 1960 or 1967 levels. In fact, however, the level of economic activity in the study area was 34 percent greater than it would have been had the reservoir not been built (see Table 49).

Further emphasis on the positive impact of the reservoir is provided by comments of residents of the area concerning its value. An unstructured personal interview with twenty local merchants and residents indicated generally, that until the reservoir was developed, there was little local optimism for the economy of the area. This consensus was based on the fact that the population

TABLE 49
The Impact of the Hugo Reservoir
on the General Economy of
Choctaw and Pushmataha Counties
1960-1977
(1957-59=100)

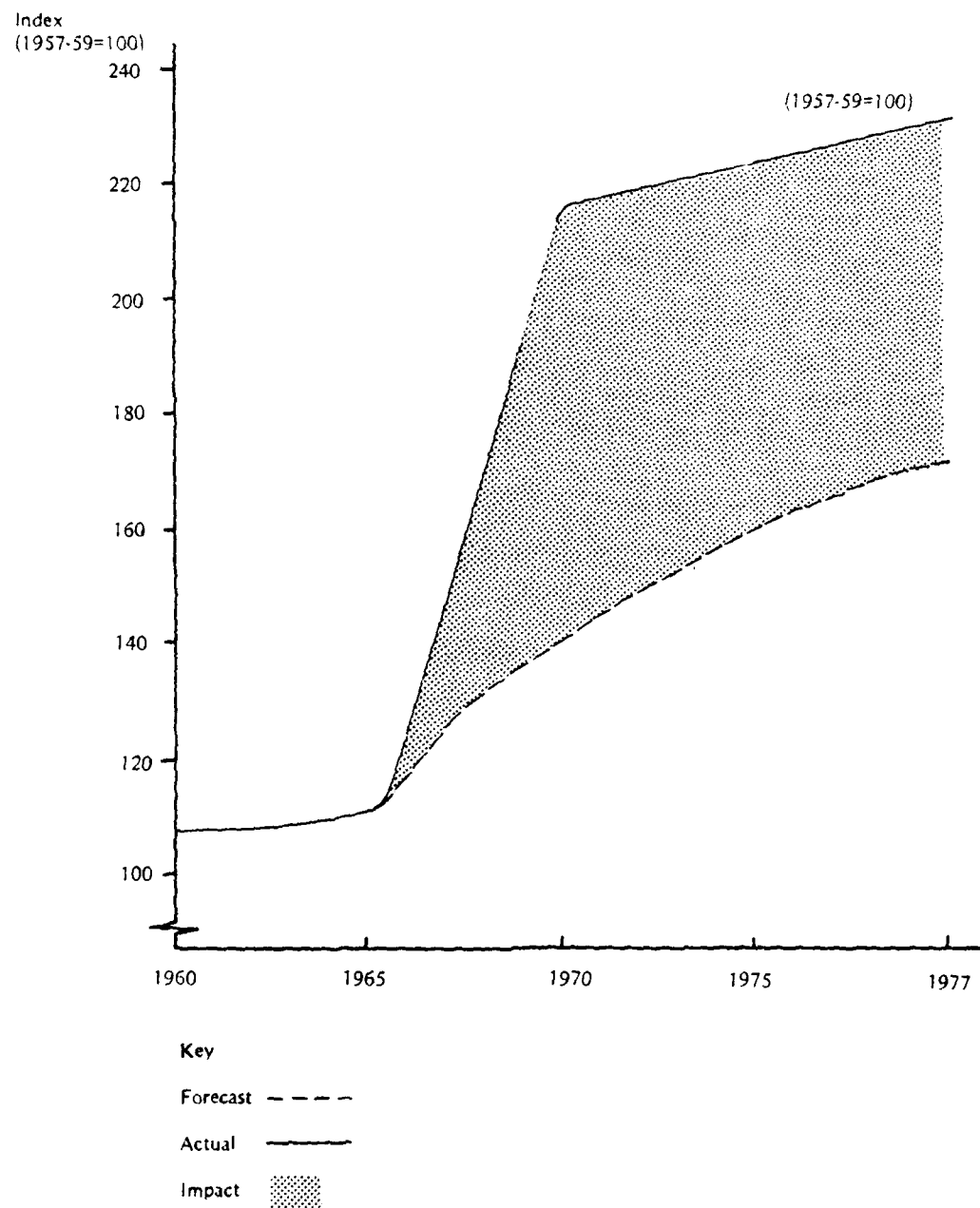
Year	Forecast ¹	Actual	Impact
1960	105	105	0
1967	110	110	0
1970	138	213	75
1975	158	219	61
1977	166	223	57

¹ Assuming the reservoir was not built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties; Business Research Center, Oklahoma City University, 1969; actual data are based on data presented elsewhere in this study.

was declining and this outmigration resulted in decreasing retail and service sales which were the bases of the economies of Hugo and Antlers. Some of those interviewed admitted that the reservoir had not aided them directly but had given new direction and purpose to the entire area. In no case were respondents to this survey critical of the reservoir in any respect.

FIGURE 8
Actual and Forecasted Trends in the General Economy
of Choctaw and Pushmataha Counties
1960-1977



Use of Control Counties in Forecasting

The reliability of forecasts of growth which are based on growth patterns in control areas depends largely upon the analysts ability to select control counties having characteristics similar to those areas being studied. The previous study of the impact of Hugo Reservoir on Choctaw and Pushmataha Counties relied on growth trends in five control counties in developing forecasts of growth.⁸ A secondary purpose of this report was to test the reliability of this method of forecasting by comparing the pattern of change in the key economic indicators control counties during the first four years of operation following the closing of the dams located in or near those counties with the pattern of change in the same indicators in the Study Area for the period 1974-1978. The key indicators used for these comparisons were population, personal income, per capita income and bank deposits. The results of these comparisons are shown in Table 50.

TABLE 50
A Comparison of Average Annual Rates of Growth
Over Four Years of Key Economic Indicators in Control Counties
With Those in Choctaw and Pushmataha Counties

Indicator	Annual Rate of Growth (%)	
	Control Counties	Study Area
Population	0.6	1.0
Personal Income	8.5	8.5
Per Capita Income	6.8	7.3
Bank Deposits	10.3	10.5

⁸The control counties were Blaine, Caddo, Custer, Kiowa and Mayes Counties in Oklahoma.

The data shown on Table 50 reveal that, except for population, the annual rate of change in the four key indicators of the control counties compares closely with the changes which occurred in the same indicators in the Study Area. This suggests that the use of control counties in developing short-term forecasts is an acceptable method so long as the control counties chosen have most of the same economic and demographic characteristics as the counties to be studied.

SECTION IV

THE SHORT-TERM IMPACT OF THE RESERVOIR USING REVISIONS OF PREVIOUS METHODOLOGIES

The forecasting methodologies and models used in the previous study were necessarily based on historical data which was available through 1966. The period of time covered by these data for the most part, did not include those years in which economic conditions were affected by the Vietnam build-up nor the sharp impact of inflation and recession of the earlier 1970's.

Since the last study was completed, additional data covering the last 11 years have become available. Incorporating this more recent information into the original equations and models used in the short-term (i.e. to 1980) forecasts resulted in equations which were identical in structure to those used previously but having different coefficients. These revised short-term estimating equations along with those used in the previous study appear in Appendix B to this report.

Following discussions will describe the forecasts resulting from the revised equations and will provide estimates of the projected impact of the reservoir indicated by these estimates. A discussion of the differences between these and previous forecasts appears in Appendix E to this report.

Forecasts to 1980 utilizing the previous methodology indicated that the reservoir would have a positive impact on nearly all sectors of the economy of the Study Area. A large estimated impact was noted in the consumption of electricity. This was due in part to the impact which the reservoir was expected to have on population and income as well as to the increases expected in the

use of appliances by all of the population - both existing and new residents.

The forecasted impact on population was expected to be accompanied by similarly large positive differences in personal income, bank deposits, loans and discounts and truck shipments. This latter economic factor was also influenced by an implicit increase in consumer demand occasioned by the forecast rise in population.

The only negative impacts forecast for 1980 were those exerted on value added by manufacture, freight carloadings and total construction. These negative impacts are, however, not attributable to the reservoir so much as to assumptions underlying the forecasts of economic conditions through 1980 if the reservoir were not built. Forecasts to 1980 using the previous techniques and the estimated impact on the economy if these forecasts hold true appear in Table 51. Figures 9-13 depict graphically the actual and expected impact of the reservoir on key economic indicators between 1970 and 1980.

TABLE 51
Short-Term Impact of the Hugo Reservoir
on Selected Economic Indicators in
Choctaw and Pushmataha Counties
1980

Indicator	Units	Forecast Without Reservoir ¹	Forecast With Reservoir ²	Impact
Commodity Producing Employment	Number	2,191	2,610	419
Non-Commodity Producing Employment	Number	4,759	6,180	1,421
Total Employment	Number	6,950	8,790	1,840
Unemployment	Number	540	760	220
Labor Force	Number	7,490	9,550	2,060
Population	Number	26,680	30,000	3,320
Per Capita Income	Dollars ³	1,520	2,045	525
Total Personal Income	\$ 000 ³	40,550	61,374	20,821
Value Added by Manufacture	\$ 000 ³	6,790	3,148	-3,642
Agriculture Production	\$ 000 ³	7,260	8,340	1,080
Residential Electricity Consumption	000 Kwh	19,000	119,643	100,643
Industrial & Commercial Elec. Cons.	000 Kwh	26,860	66,147	39,287
Total Electricity Consumption	000 Kwh	45,860	185,790	139,930
Total Bank Deposits	\$ 000 ³	19,980	43,761	23,781
Loans and Discounts	\$ 000 ³	9,160	15,813	6,653
Freight Carloadings	Number	814	632	-182
Truck Shipments	Number	16,180	22,982	6,802
Total Construction	\$ 000 ³	11,000	10,100	-900
Visitor Days	000	0	1,300	1,300
Visitor Expenditures	\$ 000 ³	0	5,122	5,122
General Economic Index	1957-59 = 100	180	233	53

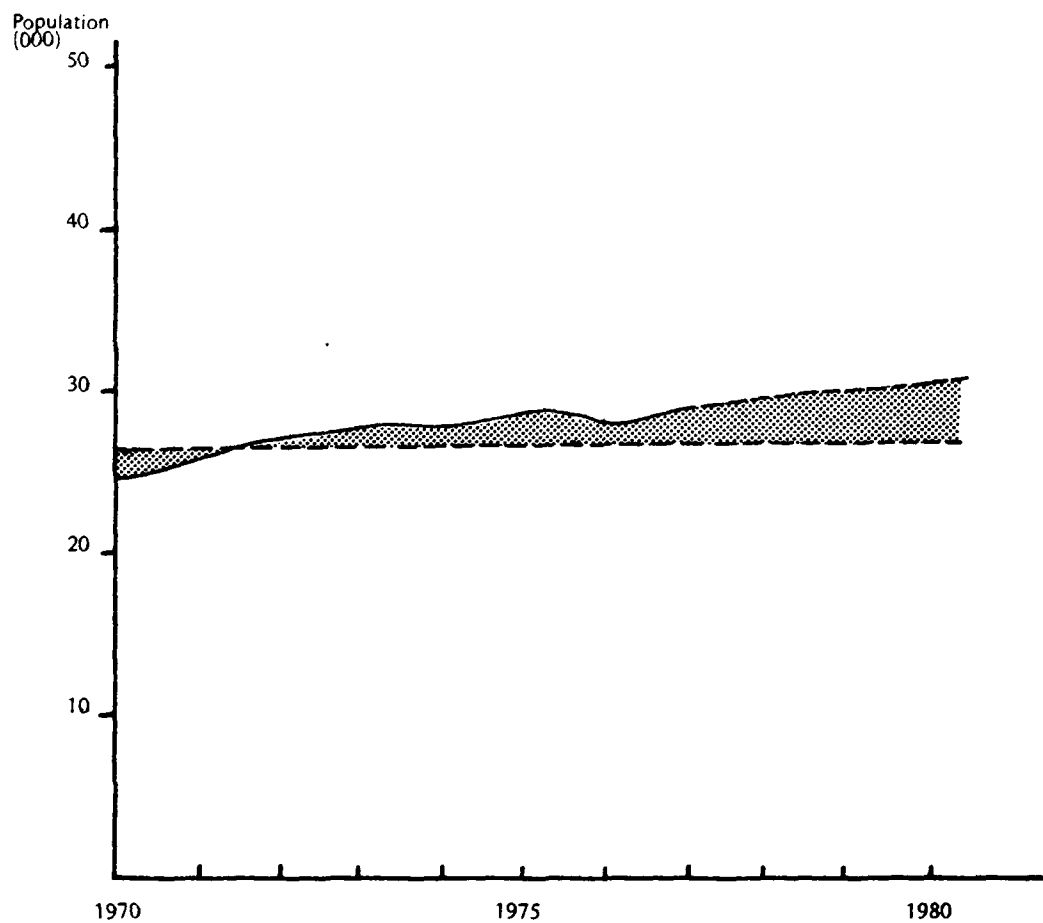
¹1967 Forecast.

²1978 Forecast.

³In 1967 dollar equivalents.

Source: Appendix E.

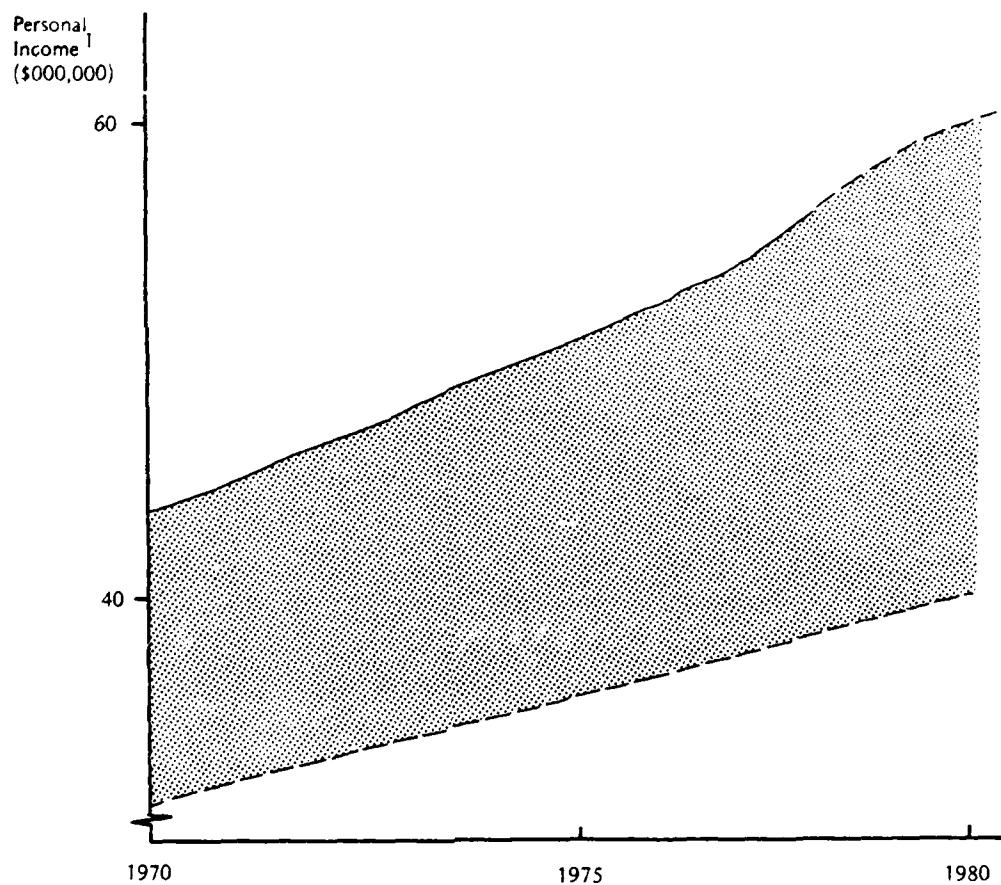
FIGURE 9
The Estimated Impact of the Hugo Reservoir
on the Population of Choctaw and Pushmataha Counties¹
1970-1980



¹ Using previous methodology

Key
Actual Population ———
Forecasted Population - - -

FIGURE 10
The Estimated Impact of the Hugo Reservoir
on the Personal Income of Choctaw and Pushmataha Counties¹
1970-1980



¹In 1967 Dollar Equivalents

Key

Actual ———

Forecast - - -

FIGURE 11
The Impact of the Hugo Reservoir
on Total Electricity Consumption
in Choctaw and Pushmataha Counties
1970-1980

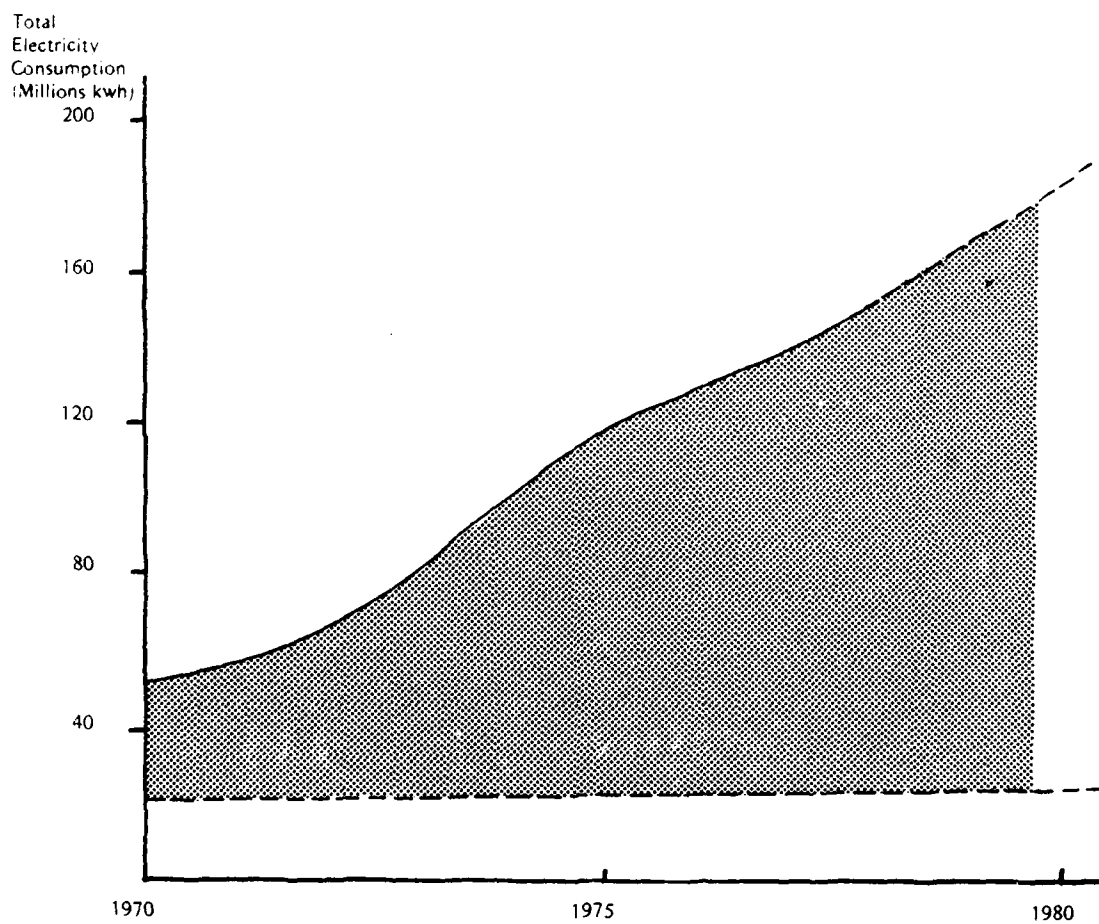
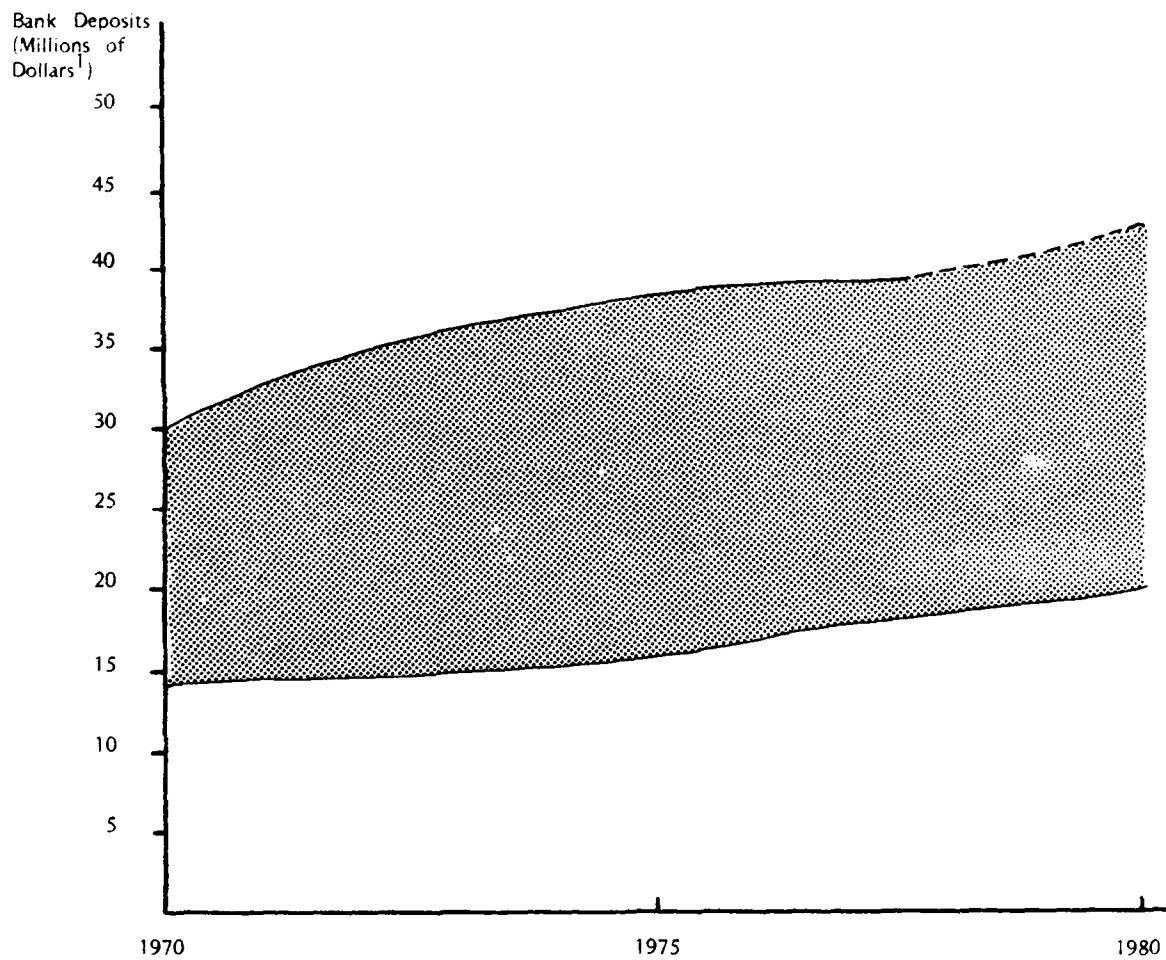


FIGURE 12
The Impact of the Hugo Reservoir
on Bank Deposits in Choctaw and Pushmataha Counties
1970-1980



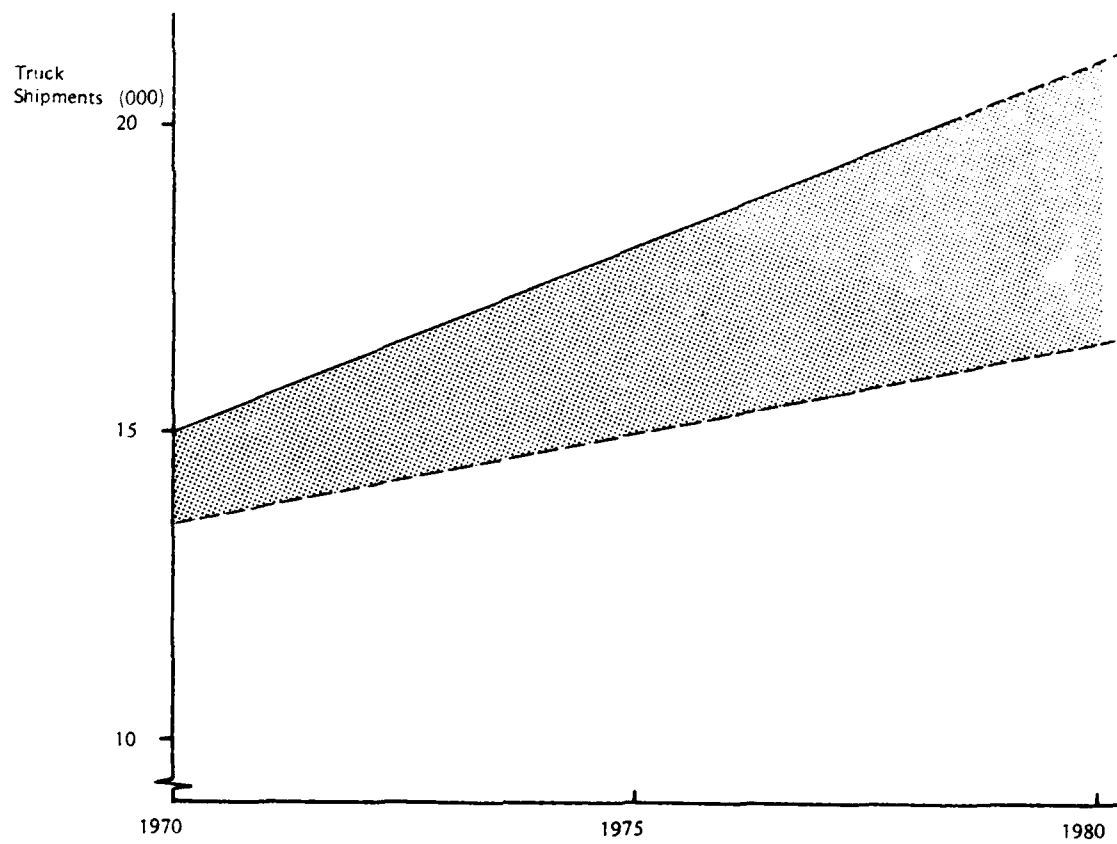
¹ In 1967 Dollar Equivalents

Key

Actual ———

Forecast - - - -

FIGURE 13
The Impact of the Hugo Reservoir
on Truck Shipments in Choctaw and Pushmataha Counties



SECTION V

THE IMPACT OF THE RESERVOIR USING DIFFERENT FORECASTING TECHNIQUES

Since the initial study of the a priori impact of the Hugo Reservoir was completed in 1967 two important elements have developed which provide a better basis for estimating the reservoir's long and short range impact. The first of these is the fact that data are available which allow the change in the economy to be measured during and shortly after the construction of the reservoir. The second of these is the development of better forecasting measures. Of the two, the former is probably more significant in short range measurements while the latter is more important for longer term projections of impact. For the most part, the newer forecasting techniques employed in this study were multivariate econometric models described in the section of this report entitled Methodology (See Appendix B). However, in some instances, the econometric modeling approach provided unrealistic forecasts. In these cases it was found that curvilinear time series methods (such as the Logistic Curve fitting technique) provided a better fit to the data and more reasonable results.

Short-Term Impact

Measuring the short-term (i.e. through 1980) impact of the reservoir on the study area using the new techniques indicates that, except in the cases of commodity producing employment, value added by manufacture, freight carloadings and the general economic index, the reservoir had beneficial effects on the community. Not all of the increases, of course, can be attributable to the reservoir nor can the decreases. For example, the large gains noted in the consumption of electricity both by residences and the industrial/commercial sector are due in large measure to increased use of appliances, electric heat and air conditioning

(at the expense of natural gas) and in greater use of lighting for storage areas, farms and shopping center parking areas since 1960. Conversely, the adverse impact on value added by manufacturing was due to an overestimation of the trend in this series under control conditions (i.e. without the reservoir). Since commodity producing employment and freight carloadings were weighted heavily by manufacturing activity, these too were overestimated as a result of the overstatement in value added by manufacturing.

The remainder of the impacts as shown in Table 52 tend to reflect the effects of the reservoir on the economy of the two county area with some accuracy.

TABLE 52
Short-Term Impact of the Hugo Reservoir
on Selected Economic Indicators
in Choctaw and Pushmataha Counties
1980

Indicator		Forecast Without Reservoir ¹	Forecast With Reservoir ²	Impact
Commodity Producing Employment	Number	2,191	1,962	-229
Non-Commodity Producing Employment	Number	4,759	7,098	2,339
Total Employment	Number	6,950	9,060	2,110
Unemployment	Number	540	619	79
Labor Force	Number	7,490	9,679	2,189
Population	Number	26,680	30,000	3,320
Per Capita Income	Dollars ³	1,520	2,236	716
Total Personal Income	\$ 000 ³	40,550	67,080	26,530
Value Added by Manufacture	\$ 000 ³	6,790	2,637	-4,153
Agriculture Production	\$ 000 ³	7,260	10,994	3,734
Residential Electricity Consumption	000 kwh	19,000	102,760	83,760
Industrial & Commercial Elec. Cons.	000 kwh	26,860	71,469	44,609
Total Electricity Consumption	000 kwh	45,860	174,229	128,369
Total Bank Deposits	\$ 000 ³	19,980	50,700	30,720
Loans and Discounts	\$ 000 ³	9,160	27,810	18,650
Freight Carloadings	Number	814	675	-139
Truck Shipments	Number	16,180	24,300	8,120
Total Construction	\$ 000 ³	11,000	12,484	1,484
Visitor Days	000	0	1,046	1,046
Visitor Expenditures	\$ 000 ³	0	5,122	5,122
General Economic Index	1957-59 = 100	180	172	-8

¹1967 Forecast.

²Forecast using new methodology.

³In 1967 dollar equivalents.

Note: County details may be found in source documents.

Source: Appendix Table C-4 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Long Range Impact

The long range impacts of the reservoir on various segments of the Study Area's economy are shown in Table 53. Most notable among these impacts is the fact that by 2000, the reservoir is expected to have generated more new commodity producing jobs than would occur had the reservoir not been built. It is also noted however, that the new forecasts of value added by manufacturing (in terms of 1967 dollars) remain well below those forecast without the reservoir although forecasts of value added by manufacturing in current dollars (i.e. without adjustment for inflation) are considerably above those forecast without the reservoir. The difference between the forecasts in 1967 dollar equivalents is due in large measure to an underestimation of future growth in inflation by the original study. Applying the currently projected rate of inflation through 2050 to previously estimated values added by manufacturing reveals that in 2000, the value added by manufacturing with the reservoir will exceed that of the area had the reservoir not been built by \$171,000. By the year 2050, the margin of excess value due to the reservoir would be \$224,000 in 1967 dollar equivalents. These data were not shown in Table 53, however, since a purpose of the study was to compare forecasts using new techniques with forecasts contained in the previous study.

A similar situation is noted in the impact of per capita income occasioned by the reservoir in 2020 where the adjusted figure is below that forecast for the area without the reservoir. If the forecast for 2020 without the reservoir contained in the previous study is adjusted for the current projection of the rate of inflation, it is noted that per capita income (in 1967 dollar equivalents) in the Study Area assuming no reservoir is built is forecast to be \$2,284. Thus, the reservoir is expected to have a positive impact of \$178 on per capita income by 2020.

TABLE 53
Long-Term Impact of the Hugo Reservoir
on Selected Economic Indicators
in Choctaw and Fushmataha Counties
2000-2050

Indicator	Units	2000				2050			
		Without Reservoir ¹	With Reservoir ²	Impact	Without Reservoir ¹	With Reservoir ²	Impact	Without Reservoir ¹	With Reservoir ²
Commodity Producing Employment	Number	2,180	2,945	765	2,189	3,408	1,219	2,194	4,005
Non Commodity Producing Employment	Number	4,820	10,659	5,839	4,881	14,256	9,375	5,026	19,731
Total Employment	Number	7,000	13,604	6,804	7,070	17,664	10,594	7,220	23,736
Unemployment	Number	550	923	373	550	1,056	506	580	1,420
Labor Force	Number	7,550	14,527	6,977	7,620	18,720	11,100	7,800	25,136
Population	Number	26,430	39,700	13,270	26,680	43,400	16,720	27,270	52,800
Per Capita Income	Dollars ³	2,308	2,374	66	2,970	2,463	-507	-	-
Total Personal Income	\$ 000 ³	61,010	92,646	31,636	79,260	106,916	27,656	-	-
Value Added by Manufacture	\$ 000 ³	10,600	2,515	-8,085	14,780	2,624	-12,156	19,070	2,691
Agriculture Production	\$ 000 ³	9,720	12,467	2,747	11,800	13,766	1,966	-	-
Residential Electricity Consumption	000 kwh	19,800	152,269	132,469	21,900	179,246	157,346	23,700	233,923
Industrial & Commercial Electricity Cons.	000 kwh	41,490	94,811	53,321	59,920	141,274	81,354	90,300	213,306
Total Electricity Consumption	000 kwh	61,290	247,080	185,790	81,820	320,520	238,700	114,000	447,229
Total Bank Deposits	\$ 000 ³	29,190	76,990	47,800	37,470	91,493	54,023	-	-
Loans and Discounts	\$ 000 ³	13,820	42,820	29,000	17,520	50,911	33,391	-	-
Freight Carloadings	Number	694	1,140	446	633	1,430	797	543	1,500
Truck Shipments	Number	18,550	34,530	15,980	21,130	40,240	19,110	25,020	41,640
Total Construction	\$ 000 ³	15,000	28,630	13,630	20,000	34,976	14,976	-	-
Visitor Days	000 ³	0	1,320	1,320	0	1,550	1,550	-	-
Visitor Expenditures	\$ 000 ³	0	6,452	6,452	0	7,576	7,576	-	-
General Economic Index	1957-59=100	240	258	18	279	336	57	300	451

¹1967 Forecast

²Forecasts using new methodology

³In 1967 dollar equivalents

Note: County detail can be obtained from source of documents.

Source: Appendix Tables C-1 and C-4

Other Effects

The location of the Hugo Reservoir at its present site had one further impact on the Study Area which was unforeseen in 1967. The Western Farmers Rural Electric Cooperative, a major supplier of electricity for Oklahoma rural electric associations, has selected a site near Hugo on which a large, new generating plant will be built. This plant, which will utilize coal as an energy source, will be located below the dam on the Kiamichi river. Its water supplies will come from the Kiamichi river which, because of the dam and its ability to regulate and stabilize water flows below the dam, allowed the selected site to be ideal for this purpose. Without the dam, however, and a guaranteed flow of water down the river, the generating plant would have been located elsewhere.

The importance of this facility to the economy of the study area is best depicted by the following characteristics of the plant:

Size of Site - 800 acres

Length of Construction period - 14 years

Date Construction will begin - 1980

Estimated Size of Work Force - 700

Estimated Payroll during construction - \$10.2 million

Number of additional jobs supported by the work force in the area - 500

The effects of this important construction project are partially reflected in 1980 forecasts and the after effects of this project appear in long-term forecasts.

APPENDIX A
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APPENDIX B

Methodology

and

Equations

APPENDIX B

METHODOLOGY

Forecasting

Two separate methodologies were used to forecast the impact of the Hugo Reservoir on various sectors of the two county Study Area. The first approach utilized the same techniques as those employed in the first study. However, because later data (i.e. 1967-1977) were available, the coefficients in the various equations differed significantly from those originally used. These revised equations - both with and without the reservoir - appear in Tables B-1 and B-2.

The second method of approach employed econometric modeling techniques consisting for the most part of multivariate equations. However, because multivariate equations would not always provide results which adequately represented the data, a few forecasts employed curvilinear time series forecasting equations. These models and time series equations appear in Table B-3. These models were tested for period 1967-1977 to determine how well they would have operated if used in the previous study. The test results are shown in Table B-4.

Location Quotient

The location quotient is designed to evaluate the extent to which an area attracts purchases from outside the area or to which purchases of its residents leak (or are exported) to other areas. By the nature of its methodology it adjusts for differences in per capita income. The equation for determining the location quotient is:

$$LQ = \frac{\frac{PCSa}{PCIa}}{\frac{PCSS}{PCIS}}$$

where LQ = Location Quotients

PCSa = Per Capita Sales in the Study Area

PCIa = Per Capita Income in the Study Area

PCSS = Per Capita Sales in the State

PCIS = Per Capita Income in the State

TABLE B-1
Forecasting Equations Describing the
Changes Expected to Occur in the
Economies of Choctaw and Pushmataha Counties¹

Variable Forecast	Equation
Forecasts for the study area assuming the reservoir will not be built:	
Per Capita Income	Choctaw County: $Y_c = - \\$12 + \\$40X$ Pushmataha County: $Y_c = - \\$12 + \\$33X$ Where Y_c = Forecasted per capita income for period C X = Number of years from base period
Employment and Labor Force	$E_c = CE_c + NCE_c$ CE_c = Commodity Producing Employment in year C NCE_c = Non Commodity Producing Employment in year C Choctaw County: $CE_c = 4,818 - 892X$ X_c = Number of 10 year time units since the base period Pushmataha County: $CE_c = 4,022 - 1,071X$ Choctaw County: $NCE_c = .10 + .078(1.71 CE_c)$ Pushmataha County: $NCE_c = .07 + .02(1.71 CE_c)$ U_c = Exogenous U_c = Unemployment, Period C Labor Force (Each County) $L_c = E_c + U_c$

¹Original methodology assuming no reservoir was built.

TABLE B-1 (Continued)

Variable Forecast	Equation
Population:	
P_c (Choctaw County)	$= 2,376 + 2.97 L_c$
	$R = .99$
	$L_c = \text{Labor force in period } C$
P_c (Pushmataha County)	$= 1,644 + 2.98 L_c$
	$R = .99$
Bank Deposits:	
Choctaw County:	$D_c = 627,400 + .310X$
Pushmataha County:	$D_c = 631,900 + .34X$
	Where $D_c = \text{Demand Deposits in period } C$
	$PY_c = \text{Personal Income in period } C$
Choctaw County:	$S_c = .45 D_c$
Pushmataha County:	$S_c = .33D_c$
	Where $S_c = \text{Savings Deposits in period } C$
	$TD_c = D_c + S_c$
	Where $TD_c = \text{Total Deposits in period } C$
Loans and Discounts	
Choctaw County:	$LD_c = -1,200,000 + .350 PY_c$
Pushmataha County:	$LD_c = -2,673,000 + .580 PY_c$
	Where $LD_c = \text{Loans and Discounts in period } C$
	$PY_c = \text{County Personal income in period } C$
	$PY_c = P_c \cdot Y_c$

TABLE B-1 (Continued)

Variable Forecast	Equation
Residential Electricity Consumption	Choctaw County: $RE_c = -(9 \times 10^6) \text{ kwh} + 1,170 P_c$ Pushmataha County: $RE_c = (1 \times 10^6) \text{ kwh} + 440 P_c$ RE_c = Residential Electricity Consumption in County for period C. P_c = County Population in period C.
Commercial and Industrial Electricity Consumption	Choctaw County: $CE_c = (11.894 \times 10^6) \text{ kwh} + 790 X_c$ Pushmataha County: $CE_c = (3.365 \times 10^6) \text{ kwh} + 368 X_c$ CE_c = Commercial and Industrial Electricity Consumption in the County for period C. X_c = Number of years between the base period and period C.
Value Added by Manufactures	Choctaw County: $VA_c = (\\$1.4 \times 10^6) + .56 CE_c$ Pushmataha County: $VA_c = (\\$.45 \times 10^6) + .02 CE_c$ VA_c = Value Added by Manufactures in the County during period C.
Agriculture Production	Choctaw County: $A_c = (\\$.35 \times 10^6) + 200,000 X_c$ Pushmataha County: $A_c = (\\$.12 \times 10^6) + 125,000 X_c$ A_c = Agriculture Production in period C. X_c = Number of years from base period to period C.

TABLE B-1 (Continued)

Variable Forecast	Equation
Construction Activity	(Both Counties estimated in aggregate)
	$C_c = (\$8.2 \times 10^6) + .19 X_c$
	C_c = Construction Activity in period C.
	X_c = Number of years from base period to period C.
Inbound Truck Shipments	Choctaw County: $IT_c = 5,380 + 39.5 X_c$
	Pushmataha County: $IT_c = 2,100 + 16 X_c$
	IT_c = Inbound Truck Shipments in period C.
	X_c = Number of years between base period and period C.
Outbound Truck Shipments	Choctaw County: $OT_c = 2,710 + 107 X_c$
	Pushmataha County: $OT_c = 56 + 1.5 X_c$
	OT_c = Outbound Truck Shipments for period C.
	X_c = Number of years between base period and period C.
Inbound Rail Carloads	Choctaw County: $IR_c = 301 - 1.8 X_c$
	Pushmataha County: $IR_c = 1.4 - .005 X_c$
	IR_c = Inbound Rail Carloads in period C.
	X_c = Number of years between base period and period C.

TABLE B-1 (Continued)

Variable Forecast	Equation
Outbound Rail Car- loads	Choctaw County: $OR_c = 625 - 3.3 X_c$ Pushmataha County: $OR_c = 5 - .04 X_c$ OR_c = Outbound Rail Carloads in period C. X_c = Number of years between base period and period C.
General Economic Index	(See pages 176-179 of <u>A Study of the Economic Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties</u>, Business Research Center, Oklahoma City University, 1969).

TABLE B-2
Forecasting Equations Describing the
Changes Expected to Occur in the
Economies of Choctaw and Pushmataha Counties¹

Variable Forecast	Equation
Per Capita Income	Choctaw County: $Y_c = (\\$272 + 83 X_c) \cdot F_c$ Pushmataha County: $Y_c = (\\$99 + 77 X_c) \cdot F_c$ Y_c = Per Capita income in period C X_c = Number of years between base period and period C. F_c = Reciprocal of the consumer price index in period C divided by 100.
Employment and Labor Force	Choctaw County: $CE_c = (4,818 - 892 X_c) \cdot G_c$ Pushmataha County: $CE_c = (4,022 - 1,071 X_c) \cdot G_c$ CE_c = Commodity Producing Employment in period C. X_c = Number of 10 year periods between base period and period C. G_c = Growth factor in Commodity Producing Employment counties with reservoirs in period C. Choctaw County: $NCE_c = [.10 + .078 (1.71 CE_c)] \cdot GN_c$ Pushmataha County: $NCE_c = [.07 + .02 (1.71)] \cdot GN_c$ NCE_c = Non Commodity Producing Employment in period C. GN_c = Growth factor in Non-Commodity Producing Employment in counties with reservoirs.
Both Counties	$UA_c = U_c \cdot GU_c$ UA_c = Adjusted Unemployment in period C U_c = Unemployment in period C. GU_c = Adjustment factor in Unemployment in counties with reservoirs.

¹ Original methodology assuming the reservoir is built.

TABLE 3-2 (Continued)

Variable Forecast	Equation
Both Counties	$E_c = CE_c + NCE_c$ $E_c = \text{Total Employment in each county for period C.}$ $LF_c = E_c + UA_c$ $LF_c = \text{Labor Force in each county in period C.}$
Population	$P_c = \text{Exogenous variable (Oklahoma Employment Security Commission)}$
Bank Deposits	Choctaw County: $TD_c = (\\$4.329 \times 10^6) + .83 PY_c$ Pushmataha County: $TD_c = (-\\$.714 \times 10^6) + .63 PY_c$ $TD_c = \text{Total Bank Deposits in period C}$ $PY_c = \text{Total County personal income in period C.}$ $PY_c = P_c \cdot Y_c$
Loans and Discounts	Choctaw County: $LD_c = (-\\$2.106 \times 10^6) + .43 PY_c$ Pushmataha County: $LD_c = (\\$.904 \times 10^6) + .32 PY_c$ $LD_c = \text{Loans and discounts in period C}$ $PY_c = \text{Total County Personal Income in period C.}$
Residential Elec- tricity Consump- tion	Choctaw County: $RE_c = (-236.6 \times 10^6) \text{ kwh} + 16.68 P_c$ Pushmataha County: $RE_c = (-167.9 \times 10^6) \text{ kwh} + 18.5 P_c$ $RE_c = \text{Residential Electricity Consumption in period C.}$ $P_c = \text{Population in period C.}$

TABLE B-2 (Continued)

Variable Forecast	Equation
Commercial and Industrial Electric Consumption	Choctaw County: $CE_c = (-2,969 \times 10^6) \text{ kwh} + (3.05 \times 10^6) X_c$ Pushmataha County: $CE_c = (-579 \times 10^3) \text{ kwh} + (.657 \times 10^6) X_c$ CE_c = Commerical and Industrial electricity consumption in period C. X_c = Number of years between the base period and period C.
Value Added by Manufactures	Choctaw County: $VA_c = (\\$2.106 \times 10^6) + .04 CE_c$ Pushmataha County: $VA_c = (\\$.2129 \times 10^6) + .07 CE_c$ VA_c = Value added by Manufactures in period C.
Agriculture Production	Choctaw County: $A_c = (\\$2.9 \times 10^6) + 554.9 X_c$ Pushmataha County: $A_c = (\\$2.4 \times 10^6) + 428.5 X_c$ A_c = Agriculture Production in period C. X_c = Number of years between the base period and period C.
Construction Activity	Residential Construction: Choctaw County: $RC_c = (\\$2.082 \times 10^6) + 153 X_c$ Pushmataha County: $RC_c = (1.216 \times 10^6) + 254 X_c$ RC_c = Residential Construction in period C. X_c = Number of years from base period to to period C.

TABLE B-2 (Continued)

Variable Forecast	Equation
Construction Activity	Non-Residential Construction: Choctaw County: $NR_c = (.615 \times 10^6) + 611 X_c$ Pushmataha County: $NR_c = (.346 \times 10^6) + 262 X_c$ NR_c = Non Residential Construction in period C. $C_c = RC_c + NR_c$ C_c = Total Construction in period C.
Inbound Truck Shipments	Choctaw County: $IT_c = 4,415 + 977 X_c$ Pushmataha County: $IT_c = 1,187 + 255 X_c$ IT_c = Inbound Truck Shipments in period C
Outbound Truck Shipments	Choctaw County: $OT_c = 2,107 + 79 X_c$ Pushmataha County: $OT_c = 12 + 14 X_c$ OT_c = Outbound Truck Shipments in period C.
Inbound Rail Carloads	Choctaw County: $IR_c = 52 + 11.5 X_c$ Pushmataha County: $IR_c = 1.4 + .5 X_c$ IR_c = Inbound Rail Carloads in period C.
Outbound Rail Carloads	Choctaw County: $OR_c = 441 + 8 X_c$ Pushmataha County: $OR_c = 1 + 1.5 X_c$
General Economic Index	The general economic index of the area consisted of the same factors as in the original with one exception. Bank debits were replaced with personal income which bore the same weight as bank debits. This revised index was then projected over time using time series techniques. These equations are:

TABLE B-2 (Continued)

Variable Forecast	Equation										
General Economic Index	Choctaw County: $GI_c = 19 + 29 X_c$ Pushmataha County: $GI_c = 18 + 27 X_c$ GI_c = General Index for period C.										
Visitors to Lake Hugo Area	The original methodology as shown on pp. 172-173 of the first study was followed except that revised data were substituted for those originally used. Note: All forecasts stated in terms of dollars were reduced to constant 1967 dollar equivalents by dividing the forecasts obtained by the forecast of the Consumer price index (divided by 100) as developed by the U.S. Department of Labor. This forecast for the period 1980-2050 is shown below (1967 = 100): <table> <tr> <th><u>Year</u></th><th><u>CPI Forecast</u></th></tr> <tr> <td>1980</td><td>193.2</td></tr> <tr> <td>2000</td><td>360.3</td></tr> <tr> <td>2020</td><td>505.0</td></tr> <tr> <td>2050</td><td>723.0</td></tr> </table>	<u>Year</u>	<u>CPI Forecast</u>	1980	193.2	2000	360.3	2020	505.0	2050	723.0
<u>Year</u>	<u>CPI Forecast</u>										
1980	193.2										
2000	360.3										
2020	505.0										
2050	723.0										

TABLE B-3
Forecasting Equations Describing the
Changes Expected to Occur in the
Economies of Choctaw and Pushmataha Counties¹

Variable Forecast	Equation	
Per Capita Income	Both Counties:	$Y_c = \frac{PY_c}{P_c}$ Y_c = Per Capita Income in period C PY_c = Total Personal Income in period C P_c = Population in period C
Total Personal Income		$PY_c = PRY_c + WS_c - SS_c$ PRY_c = Property and Proprietors Income in period C WS_c = Wages and Salaries in period C SS_c = Social Security Payments in period C
	Choctaw County:	$PRY_c = (-\$1452 \times 10^8) + 1.70495 NPE_c$ $(-.714) \quad (5.070)$ $+ .92014 RS_c$ (42.888) $R^2 = .98655$ $WS_c = (\$1,602 \times 10^6) + 821,845 X_c - 2692 E_c$ $(4.779) \quad (3.920) \quad (-1.300)$ $+ .72401 WS_{c-1}$ (6.219) $R^2 = .97736$ $SS_c = (\$196 \times 10^6) + 100309 X_c + .0158 WS_c$ $(9.924) \quad (21.983) \quad (1.267)$ $R^2 = .9885$
	Pushmataha County:	$PRY_c = (-\$1.88 \times 10^7) + .075 RS_c + 3.05 NPE_c$ $(-1.021) \quad (0.955) \quad (128.612)$ $R^2 = .9831$ $WS_c = -\$5.9 \times 10^8 + 297185 X_c + 5230.7 E_c$ $(-1.698) \quad (7.416) \quad (13.448)$ $+ .1089 WS_{c-1}$ (0.198) $R^2 = .9824$ $SS_c = (-\$8.2 \times 10^7) + .022 WS_c + 41726 X_c$ $(-.594) \quad (9.095) \quad (67.409)$ $R^2 = .99356$
Population		P = Exogenous

¹ Assuming the reservoir is built. New methodology.

TABLE B-3 (Continued)

Variable Forecast	Equation
Bank Deposits	Choctaw County: $TD_c = -\\$470189 + 96.68 P_c + .6062550 PY_c$ $(-1.298) \quad (.003) \quad (5.381)$ $+ .3178 TD_{c-1}$ $(.0920)$ $R^2 = .96911$ Pushmataha County: $TD_c = \\$3580713 - 361.7 P_c + .1544350 PY_c$ $(19.645) \quad (-.211) \quad (.312)$ $+ .8415 TD_{c-1}$ (3.073) $R^2 = .98484$
Loans & Discounts	Choctaw County: $LD_c = -\\$4,963,564 + .3858 PY_c + .0010469 TD_c$ $(-5.942) \quad (6.071) \quad (.001)$ $+ .21221 RS_c$ (1.091) $R^2 = .97978$ Pushmataha County: $LD_c = -\\$566439 + .036 PY_c + .44127 TD_c$ $(-19,440) \quad (.113) \quad (.073)$ $+ .19619 RS_c$ $R^2 = .98136$
Residential Electricity Consumption	Choctaw County: $RE_c = \left[\frac{5181}{1 \times 10^6 (1.2787 - .11376)} \right] P_c$ Pushmataha County: $RE_c = \left[\frac{6670}{1 \times 10^6 1.48198} \right] P_c$
Commercial and Industrial Electricity Consumption	Choctaw County: $IE_c = (-57.1 \times 10^6) kwh + 4.37 VA_c +$ $(-2.191) \quad (4.311)$ $85913 NEM_c$ (56.121) $R^2 = .97072$ Pushmataha County: $IE_c = (-86.1 \times 10^5) kwh + 35792.8 NEM_c$ $(-.064) \quad (268.761)$ $+ 2.35987 VA_c$ (1.256) $R^2 = .08197$
Value Added by Manufactures	Choctaw County: $VA_c = \\$672,155 + 3,955.6 NEM_c + .26314 VA_{c-1}$ $(2.207) \quad (1.089) \quad (.309)$ $- 2313.5 GI_c$ $(-.008)$ $R^2 = .86440$ Pushmataha County: $VA_c = \\$73,832 + 364.0 NEM_c + .6027 VA_{c-1}$ $(3.422) \quad (.456) \quad (5.642)$ $- 36.08 GI_c$ $(-.001)$ $R^2 = .76793$

TABLE B-3 (Continued)

Variable Forecast	Equation	
General Economic Index	Both Counties :	Weighted averages of the forecasts of components of the index were computed and converted to an aggregate index for each of the years for which a forecast was required.
Visitors to the Area	Choctaw County:	$NV_c = -2,563,271 + 1.0139 OP_c + 0.866 NV_{c-1}$ $(-3.402) \quad (4.049) \quad (9.627)$ $R^2 = .747$
	Pushmataha County:	$NV_c = -244,280 + 1.0359 NV_{c-1} + .0966 OP_c$ $(-1.021) \quad (15.040) \quad (4.079)$ $R^2 = .7975$
Employment	Choctaw County:	$E_c = -127.698 - .0276 P_c + .523 E_{c-1}$ $(-2.135) \quad (-1.047) \quad (1.593)$ $+ 66.1 X_c$ (1.043) $R^2 = .9405$
	Pushmataha County:	$E_c = [-129.88 + 5.7646 X_c + .1849 P_c + .9408 E_{c-1}]$ $(-2.105) \quad (5.670) \quad (1.857) \quad (9.229)$ $R^2 = .9218$
Labor Force	Choctaw County:	$LF_c = 105.5 + .29 P_c$ $(1.262) \quad (1.410)$ $R^2 = .96040$
	Pushmataha County:	$LF_c = -638.6 + .34 P_c$ $(-2.696) \quad (1.161)$ $R^2 = .9801$
Unemployment	Choctaw County and Pushmataha County	
	$U_c = LF_c - E_c$	
Commodity Pro- ducing Employ- ment	Choctaw County:	$CE_c = 955.6 + .1 VA_c$ $(3.134) \quad (2.314)$ $R^2 = .72$
	Pushmataha County:	$CE_c = 172.2 + .27 VA_c$ $(.916) \quad (.419)$ $R^2 = .89$

TABLE B-3 (Continued)

Variable Forecast	Equation	
Agriculture Production	Choctaw County:	$A_c = -\$1,260,563,000 + 637658 X_c - 347.0 P_c + 42621 FE_c$ $(6.402) \quad (.449) \quad (-.007) \quad (.430)$ $R^2 = .92177$
	Pushmataha County:	$A_c = (\$12,632 \times 10^7) + 186885.1 FE_c - 97.66 LF_c - 9072.9 P_c$ $(1.397) \quad (.895) \quad (-10.516) \quad (-9.182)$ $R^2 = .83617$
	Choctaw County:	$RC_c = \$25,520,370 - 1786.995 P_c - 0.134 PY_c + 0.49 RS_c$ $(6.218) \quad (-.486) \quad (-.410) \quad (.663)$ $R^2 = .90991$
	Pushmataha County:	$RC_c = (\$44,20354 \times 10^6) - 6522.5 P_c - .064 PY_c + .76895 RS_c$ $(8.964) \quad (-.951) \quad (-.023) \quad (2.255)$ $R^2 = .70453$
Residential Construction	Choctaw County:	$NR_c = \$14,646,840 + .646 RS_c + 767,293 GI_c - .005 VA_c - 131,382 NEM_c$ $(4.779) \quad (1.515) \quad (.964) \quad (-.001) \quad (-1.428)$ $R^2 = .89513$
	Pushmataha County:	$NR_c = -\$21,498,000 + 58520 NEM_c + 79,396.6 GI_c - 16.03 VA_c$ $(-5.792) \quad (.933) \quad (-.042) \quad (-.195)$ $R^2 = .81878$
	$C_c = RC_c + NR_c$	
Total Construc- tion	Choctaw County:	$IT_c = 53.5 + 2878 X_c$ $(3.675) \quad (4.719)$ $R^2 = .9829$
	Pushmataha County:	$IT_c = 566 + 632 X_c$ $(2.290) \quad (3.383)$ $R^2 = .9883$
Inbound Truck Shipments		

TABLE B-3 (Continued)

Variable Forecast	Equation	
Outbound Truck Shipments	Choctaw County:	$OT_c = 598 + 244 X_c$ $(2.755) (4.685)$ $R^2 = .9247$
	Pushmataha County:	$OT_c = 12 + 15 X_c$ $(.466) (4.123)$ $R^2 = .8816$
	Choctaw County:	$IR_c = 1,583 - .05 IT_c$ $(6.797) (7.122)^c$ $R^2 = .8247$
	Pushmataha County:	$IR_c = 2 - (.5 \times 10^{-8} IT_c)$ $(.012) (-.0012)$ $R^2 = .8410$
Inbound Rail Carloadings	Choctaw County:	$OR_c = 650 + 8 X_c$ $(3.143) (6.977)$ $R^2 = .9105$
	Pushmataha County:	$OR_c = 5 + 1.25 X_c$ $(1.122) (2.476)$ $R^2 = .8701$
	Choctaw County:	$RS_c = -\$86.11 \times 10^6 + 5.173 NV_c + 6734.9 P_c$ $(-.296) (5.796) (78.348)$ $R^2 = .9397$
	Pushmataha County:	$ST_c = \$38,791.5 + .0145 RS$ $(6.963) (196.880)^c$ $R^2 = .94708$
Other Equations Used in the Basic Equations	Choctaw County:	$PE_c = (-\$22.47 \times 10^7) + 55,419.76 PD_c$ $(-6.116) (.043)$ $+ .693 PE_{c-1} + 115629 X_c$ $(1.848) (.272)^c$ $R^2 = .95079$
	Pushmataha County:	$PD_c = \frac{P_c}{\text{Land Area}}$
	Choctaw County:	$RS_c = -\$86.11 \times 10^6 + 5.173 NV_c + 6734.9 P_c$ $(-.296) (5.796) (78.348)$ $R^2 = .9397$
	Pushmataha County:	$ST_c = \$38,791.5 + .0145 RS$ $(6.963) (196.880)^c$ $R^2 = .94708$

TABLE B-3 (Continued)

Variable Forecast	Equation
Other Equations Used in the Basic Equations	
Choctaw County:	$FL_c = 8,294,526 - 1,371.6 PD_c - 4040.4 X_c$ $(239.057) \quad (-.734) \quad (-78.554)$ $R^2 = .97951$ $NEM_c = -229.02 + .24115 E_c$ $(-2.210) \quad (58.1108)$ $R^2 = .84085$ $FE_c = -330.216 + .4088 NF_c + .0756880 E_c$ $(-6.088) \quad (12.142) \quad (9.925)$ $R^2 = .74909$ $NPE_c = -\$1,348,246 + .052 NPE_{c-1} + .8408 PE_c$ $(-1,126.919) \quad (.250) \quad (112.087)$ $R^2 = .99558$ $ME_c = 79.62 + .0000193 MO_c - .01176 E_c$ $(6.999) \quad (2.967) \quad (-3.203)$ $R^2 = .78333$ $MO_c = \text{Exogenous variable}$
Pushmataha County:	$RS_c = (-\$42.465 \times 10^6) + 4,400.971 P_{c-1}$ $(-3.898) \quad (2.271)$ $+ .91673 RS_{c-1}$ (1.146) $R^2 = .78457$ $ST_c = \$67,287.51 + .0089 RS_c$ $(5.936) \quad (34.619)$ $R^2 = .75887$ $PE_c = (-\$80.773 \times 10^7) + 413,118.9 X_c$ $(-13.122) \quad (9.058)$ $+ .0944 PE_{c-1} + 644694 PD_c$ $(.082) \quad (2.167)$ $R^2 = .98812$ $PD_c = \frac{P_c}{\text{Land Area}}$

TABLE B-3 (Continued)

Variable Forecast	Equation
Other Equations Used in the Basic Equations	Pushmataha County:
	$FL_c = (16.962 \times 10^6) - 8513.9 X_c + 24475.6 PD_c$ $(74.5941) \quad (-134.578) \quad (5.210)$ $R^2 = .93715$
	$NEM_c = 21.22 + 1.111159 NEM_{c-1}$ $(.207) \quad (218.980)$ $R^2 = .95217$
	$FE_c = -832.4326 + .7769 NF_c + .206 E_c$ $(-6.59918) \quad (8.845) \quad (12.717)$ $R^2 = .76893$
	$NPE_c = -\$789,106.8 + .91346 PE_c - .03366759 NPE_{c-1}$ $(-10.203) \quad (593.777) \quad (-.591)$ $R^2 = .99951$
	$ME_c = 19,476 + .00001134 MO_c - .006403 E_c$ $(.951) \quad (.548) \quad (-.960)$ $R^2 = .75978$
	$MO_c = \text{Exogenous variable}$

Note: All dollar values for series stated in dollars were deflated to 1967 dollar equivalents by use of the Consumer Price Index as shown in Table B-2.

LIST OF VARIABLES

Y = Per Capita Income
PY = Total Personal Income
P = Population
PRY = Proprietors Income
WS = Wages and Salaries
SS = Social Security Payments
PE = Property Evaluation
RS = Retail Sales
X = Time
TD = Bank Deposits
LD = Loans and Discounts
RE = Residential Electricity Consumption
IE = Commercial and Industrial Electricity Consumption
NEM = Manufacturing Employment
VA = Value Added by Manufactures
A = Agriculture Production
FE = Farm Employment
RC = Residential Construction
NR = Non Residential Construction
GI = Business Index
C = Total Construction
IT = Inbound Truck Shipments
OT = Outbound Truck Shipments
IR = Inbound Rail Carloading
OR = Outbound Rail Carloading

LIST OF VARIABLES (Continued)

E = Employment
NV = Number of Visitors
OP = Oklahoma Population
NPE = Net Property Evaluation
ST = Sales Tax
NF = Number of Farms
FL = Land in Farms
E₋₁ = Employment in Previous Period
VA₋₁ = Value Added by Manufactures in Previous Period
TD₋₁ = Total Bank Deposits in Previous Period
NPE₋₁ = Net Property Evaluation in Previous Period
NV₋₁ = Number of Visitors in Previous Period
WS₋₁ = Wages and Salaries in Previous Period
RS₋₁ = Retail Sales in Previous Period
PE₋₁ = Property Evaluation in Previous Period
MO = Mining Output
FE = Farm Employment
ME = Mining Employment
NEM₋₁ = Manufacturing Employment in Previous Period
U = Unemployment
LF = Labor Force
CE = Commodity Producing Employment

TABLE B-4
A Comparison of Forecasts of Economic Factors with Actual Data
in Choctaw and Pushmataha Counties¹
1970 and 1977

Data Series	Units	1970		1977	
		Forecast	Actual	Forecast	Actual
Commodity Producing Employment	Number	1,898	1,726	1,988	2,379
NonCommodity Producing Employment	Number	3,796	5,041	6,079	5,750
Total Employment	Number	5,694	6,767	8,067	8,129
Unemployment	Number	802	640	879	510
Labor Force	Number	6,496	7,407	8,946	8,639
Population	Number	24,526	24,526	27,600	27,600
Per Capita Income	\$0002	1,920	1,862	1,740	1,906
Total Annual Income	\$0002	47,082	44,784	48,025	52,606
Value Added by Manufacturing	\$0002	3,202	2,866	2,853	2,834
Agriculture Production	\$0002	16,705	14,706	7,455	6,871
Residential Electricity Consumption	000 kwh	28,527	30,882	33,665	94,426
Commercial and Industrial Electricity Consumption	000 kwh	22,890	22,947	24,903	60,628
Total Electricity Consumption	000 kwh	51,417	53,829	60,568	155,054
Total Bank Deposits	\$0002	27,523	29,748	38,902	39,119
Loans and Discounts	\$0002	13,595	13,698	19,679	22,038
Freight Carloadings	Number	834	918	661	709
Truck Shipments	Number	15,854	14,793	21,645	20,436
Total Construction	\$0002	10,039	12,200	13,342	13,800
Visitors to the Area	Number	0	0	886,802	842,100
General Economic Index	1957-59=100	209	213	220	223

¹Forecasts used new methodology applied to data contained in the previous report.

²In constant 1967 dollars.

APPENDIX C
Supporting Tables

Appendix TABLE C-1
Forecasts of Economic Activity
in Choctaw and Pushmataha Counties
Without the Reservoir

Data Series	Unit	2000			2020			2050		
		Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
Employment and Population:										
Commodity Producing	Number	1,600	580	2,180	1,610	579	2,189	1,620	574	2,194
Non-Commodity Producing	Number	3,200	1,620	4,820	3,250	1,631	4,881	3,350	1,676	5,026
Total Employment	Number	4,800	2,200	7,000	4,860	2,210	7,070	4,970	2,250	7,220
Unemployment	Number	390	160	550	390	160	550	410	170	580
Labor Force	Number	5,190	2,360	7,550	5,250	2,370	7,620	5,380	2,420	7,800
Population	Number ¹	17,420	9,010	26,430	17,630	9,050	26,680	18,070	9,200	27,270
Per Capita Income	Dollar ¹	2,480	1,977	2,308	3,167	2,589	2,970	-	-	-
Total Annual Income	\$000 ¹	43,200	17,810	61,010	55,830	23,430	79,260	-	-	-
Value Added by Manufacture	\$000 ¹	10,200	400	10,600	14,200	580	14,780	18,300	770	19,070
Agriculture Production	\$000 ¹	6,500	3,220	9,720	7,900	3,900	11,800	-	-	-
Residential Electric Cons.	000 kwh	14,000	5,800	19,800	16,000	5,900	21,900	17,000	6,700	23,700
Commercial & Ind. Elec. Cons.	000 kwh	28,470	13,020	41,490	39,460	20,460	59,920	59,700	31,600	90,300
Total Electricity Consumption	000 kwh	42,470	17,820	60,290	55,460	26,360	81,820	75,700	38,300	114,000
Total Deposits ²	\$000 ¹	20,276	8,914	29,190	26,012	11,458	37,470	-	-	-
Loans and Discounts	\$000 ¹	9,810	4,010	13,820	11,840	5,680	17,520	-	-	-
Freight Carloadings	Number	690	4	694	630	3	633	540	3	543
Truck Shipments	Number	15,770	2,780	18,550	18,000	3,130	21,130	21,460	3,560	25,020
Total Construction	\$000 ¹	-	-	15,000	-	-	20,000	-	-	-
General Economic Index	1957-59 = 100	-	-	240	-	-	279	-	-	300

¹ 1967 dollar equivalents

² Adjusted to include Time Deposits

Appendix TABLE C-2
Old Forecasts of Economic Activity¹
Choctaw and Pushmataha Counties
Selected Years

Data Series	Units	2000			2020			2050		
		Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
Employment and Population:										
Commodity Producing	Number	2,040	776	2,816	2,200	760	2,960	2,390	736	3,126
Non-Commodity Producing	Number	4,150	1,854	6,004	4,490	1,890	6,380	4,880	1,964	6,844
Total Employment	Number	6,190	2,630	8,820	6,690	2,650	9,340	7,270	2,700	9,970
Unemployment	Number	510	180	690	560	190	750	610	200	810
Labor Force	Number	6,700	2,810	9,510	7,250	2,840	10,090	7,880	2,900	10,780
Population	Number	23,150	11,240	34,390	25,380	11,360	36,740	27,790	11,600	39,390
Per Capita Income	Dollar ²	2,618	2,094	2,447	3,356	2,742	3,166	-	-	-
Total Annual Income	\$0002	60,610	23,540	84,150	85,170	31,150	116,320	-	-	-
Value Added by Manufacture	\$0002	16,800	740	17,540	25,000	1,180	26,180	33,300	2,060	35,360
Agriculture Production	\$0002	7,700	4,630	12,330	9,300	5,600	14,900	-	-	-
Residential Electric Cons.	000Kwh	19,000	6,700	25,700	22,000	7,600	29,600	23,000	8,400	31,400
Commercial & Ind. Elec. Cons.	000Kwh	45,300	18,900	64,200	64,500	27,700	92,200	92,500	40,900	133,400
Total Electricity Consumption	000Kwh	64,300	25,600	89,900	86,500	35,300	121,800	115,500	49,300	164,800
Total Deposits ³	\$0002	28,090	11,490	39,580	39,100	14,920	54,020	-	-	-
Loans and Discounts	\$0002	13,850	6,400	20,250	18,800	9,370	28,250	-	-	-
Freight Carloadings	Number	1,490	44	1,534	1,780	57	1,837	2,060	79	2,139
Truck Shipments	Number	24,490	4,770	29,260	28,740	6,200	34,940	33,490	8,390	41,880
Total Construction	\$0002	-	-	17,800	-	-	21,100	-	-	-
General Economic Index	1957-59 = 100	-	-	338	-	-	443	-	-	538

¹With reservoir

²1967 dollar equivalents

³Adjusted to include Time Deposits

Appendix TABLE C-3
Revised Forecasts¹
of Economic Activity in
Choctaw and Pushmataha Counties
Selected Years

Data Series	Units	2000			2020			2050		
		Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
Employment:										
Commodity Producing	Number	2,610	1,120	3,730	3,260	1,220	4,480	4,330	1,400	5,730
Non Commodity Producing	Number	6,240	2,720	8,960	6,740	2,890	9,630	8,460	3,480	11,940
Total Employment	Number	8,850	3,840	12,690	10,000	4,110	14,110	12,790	4,880	17,670
Unemployment	Number	570	240	810	640	310	950	820	370	1,190
Labor Force	Number	9,420	4,080	13,500	10,640	4,420	15,060	13,610	5,250	18,860
Population	Number	27,700	12,000	39,700	30,400	13,000	43,400	37,800	15,000	52,800
Per Capita Income	Dollar/yr ²	3,078	2,676	2,956	3,998	3,078	3,722	-	-	-
Total Annual Income	\$000 ²	85,260	32,110	117,370	121,540	40,010	161,550	-	-	-
Value Added by Manufacture	\$000 ²	3,670	597	4,267	5,285	620	5,905	6,630	650	7,280
Agriculture Production	\$000 ²	4,768	1,960	6,728	4,102	1,690	5,792	-	-	-
Residential Electric Cons.	000 kwh	225,376	63,370	288,746	367,156	100,925	468,081	578,158	153,280	731,438
Commercial & Ind. Elec. Cons.	000 kwh	116,137	16,503	132,640	189,432	23,088	212,520	250,513	41,868	292,381
Total Electricity Cons.	000 kwh	341,513	79,873	421,386	556,588	124,013	680,601	828,671	195,148	1,023,819
Total Deposits	\$000 ²	33,605	10,523	44,128	46,790	14,070	60,860	-	-	-
Loans & Discounts	\$000 ²	17,352	5,790	23,142	26,303	8,020	34,323	-	-	-
Freight Carloadings	Number	1,010	12	1,022	1,400	32	1,432	1,780	82	1,862
Truck Shipments	Number	27,640	3,820	31,460	36,260	5,110	41,370	48,450	7,050	55,500
Total Construction	\$000 ²	-	-	9,850	-	-	9,490	-	-	-
Visitor Days	000	-	-	1,673	-	-	1,964	-	-	-
Visitor Expenditures	\$000 ²	-	-	7,696	-	-	9,427	-	-	-
General Economics Index	1957-59 = 100	-	-	268.7	-	-	367.7	-	-	442.1

¹Old Series using revised coefficients

²In 1967 dollar equivalents

Appendix TABLE C-4
Forecasts of Economic Activity-New Method
Choctaw and Pushmataha Counties

Data Series	Units	1980			2000			2020			2050		
		Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
Employment and Population:													
Commodity Producing	Number	1,172	790	1,962	1,659	1,286	2,945	1,927	1,481	3,408	2,345	1,660	4,005
Non Commodity Producing	Number	4,253	2,845	7,098	6,021	4,638	10,659	8,036	6,220	14,256	11,043	8,688	19,731
Total Employment	Number	5,425	3,635	9,060	7,680	5,924	13,604	9,963	7,701	17,664	13,388	10,348	23,736
Unemployment	Number	404	215	619	572	319	923	612	444	1,056	813	607	1,420
Labor Force	Number	5,829	3,850	9,679	8,252	6,275	14,527	10,575	8,145	18,720	14,201	10,955	25,156
Population	Number	19,200	10,800	30,000	27,700	12,000	39,700	30,400	13,000	43,400	37,800	15,000	52,800
Per Capita Income	Dollar ¹	2,334	2,061	2,236	2,171	2,708	2,334	2,234	2,999	2,463	-	-	-
Total Annual Income	\$000 ¹	44,820	22,260	67,080	60,143	32,503	92,646	67,924	38,992	106,916	-	-	-
Value Added by Manufacture	\$000 ¹	2,270	367	2,637	1,952	563	2,515	1,923	701	2,624	1,905	786	2,691
Agriculture Production	\$000 ¹	7,105	3,889	10,994	8,260	4,207	12,467	9,083	4,683	13,766	-	-	-
Residential Elec. Cons.	000 kwh	67,120	35,640	102,760	97,753	54,516	152,269	115,611	63,635	179,266	154,828	79,095	233,923
Commercial & Ind. Elec. Cons.	000 kwh	54,756	16,713	71,469	69,943	24,868	94,811	106,484	34,790	141,274	161,845	51,461	213,306
Total Electricity Consumption	000 kwh	121,876	52,353	174,229	167,696	79,384	247,080	222,095	98,425	320,520	316,673	130,556	447,229
Total Deposits	\$000 ¹	35,889	14,811	50,700	51,956	25,034	76,990	59,546	31,947	91,493	-	-	-
Loans and Discounts	\$000 ¹	20,462	7,348	27,810	30,140	12,680	42,820	34,725	16,186	50,911	-	-	-
Freight Carloadings	Number	670	5	675	1,130	10	1,140	1,400	30	1,430	1,440	60	1,500
Truck Shipments	Number	21,360	2,940	24,300	30,340	4,190	34,530	35,260	4,980	40,240	36,840	5,000	41,840
Total Construction	\$000 ¹	10,730	1,754	12,484	23,552	5,078	28,630	28,054	6,872	34,926	-	-	-
Visitor Days	000	-	-	1,046	-	-	1,320	-	-	1,350	-	-	-
Visitor Expenditures	\$000 ¹	-	-	9,968	-	-	12,580	-	-	14,772	-	-	-
General Economic Index	1957-59=100	-	-	172.1	-	-	258.4	-	-	335.6	-	-	650.9

¹In 1967 dollar equivalents

APPENDIX D

A Comparison of Trends and Forecasts
1967-1977

TABLE D-2
Actual Population Compared With Population Forecasts¹
of Choctaw and Pushmataha Counties

Year	Choctaw		Pushmataha		Total	
	Actual	Forecast	Actual	Forecast	Actual	Forecast
1967	14,740	18,820	10,000	9,250	24,740	28,070
1970	15,141	20,820	9,385	10,880	24,526	31,700
1971	15,500	20,900	9,400	10,900	24,900	31,800
1972	16,400	21,000	9,600	10,900	26,000	31, 00
1973	16,700	21,200	9,800	11,000	26,500	32,200
1974	16,600	21,300	10,100	11,000	26,700	32,300
1975	16,900	21,400	10,300	11,100	27,200	32,500
1976	16,700	21,500	10,500	11,100	27,200	32,600
1977	17,000	21,600	10,600	11,200	27,600	32,800

¹ Forecasts assume the development of the reservoir.

Source: Table D-1 and A Study of the Economic Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, January 1969.

Much of the differences which occurred between the actual increase in population and that which was forecast to occur over the 10 year period was due to the forecasting technique used. This technique assumed that population changes which occurred in the Oklahoma and Texas Counties selected as control counties would also occur in the Study Area after the reservoir was built. This assumption proved to be invalid over the short term since neither of the counties in the Study Area developed a viable industrial base as rapidly as did the control counties in Texas. A part of this lag in development was due to a recessionary period and to the emergence of the energy crisis shortly after the impoundment of water in the reservoir. In addition to this is the fact that a large labor pool has not readily available in the Study Area during the period of this study. These factors coupled with some fear that industrial energy supplies may be curtailed has tended to dampen industrial growth in the area.

A comparison of the population growth patterns shown in Table D-1 with those developed in the earlier study assuming that the Hugo reservoir would be built indicates first that the previous estimates far overestimated the impact of the reservoir on the population of Choctaw County over the short run period. But, because the impact on Pushmataha County was assumed to be less significant, the a priori estimates of population more closely approximated the actual experience of that county than was the case in Choctaw County. (See Table D-2)

TABLE D-1
Population of
Choctaw and Pushmataha Counties
1970-1977

Year	Choctaw	Pushmataha	Total
1967	14,740	10,000	24,740
1970	15,141	9,385	24,526
1971	15,500	9,400	24,900
1972	16,400	9,600	26,000
1973	16,700	9,800	26,500
1974	16,600	10,100	26,700
1975	16,900	10,300	27,200
1976	16,700	10,500	27,200
1977	17,000	10,600	27,600

Source: Census of Population, Oklahoma, 1970, U.S. Bureau of the Census; Oklahoma Population Estimates 1971-1977, Oklahoma Employment Security Commission.

The trends in forecasts based on no reservoir suggest that the methods used to forecast population of the area without the reservoir - particularly that of Choctaw County - relied too great an extent on past trends and did not reflect the accelerated decline in population between 1960 and 1967 which therefore resulted in a forecasted increase of more than 1,300 persons to 16,990 persons by 1970. Actually, the population of the county did not reach this level until 1977, thus the annual rate of increase used in the forecasting model was too high thereby creating excessively high population projections throughout the short term. As will be discussed later, this situation became even more pronounced in the long-term projections.

A comparison of forecasts contained in the earlier study with actual changes in population is shown in Table D-3

Labor Force and Employment

An analysis of the changes in labor force and employment data since 1970 compared with the changes which were forecast to occur after construction of the reservoir began followed similar patterns but varied significantly in the extent of impact. Generally, the forecasted impact of the reservoir during the construction period 1967-1974 tended to overstate the influence which the reservoir would have on employment and the labor pool in the area. As was the case with population, estimates and forecasts for Choctaw County contributed most to the overestimation. The significance of these overestimations was the result of the original estimating equation's failure to capture the full extent of the declining levels of labor force and employment through 1967. In fact, both the estimating model for labor force and for employment indicated that each series would increase in 1967 and would continue to rise at a rather high rate throughout

TABLE D-3
Expected vs Actual Impact of the Hugo Reservoir
on the Population of Choctaw and Pushmataha Counties
1970-1977

Year	Expected Impact ¹			Actual Impact ²			Difference		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1970	3,830	2,180	6,010	-1,849	685	-1,164	5,679	1,495	7,174
1971	3,860	2,190	6,050	-1,560	680	-	5,420	1,510	6,930
1972	3,900	2,200	6,100	-	860	120	4,640	1,340	5,980
1973	3,930	2,220	6,150	-	1,030	510	4,450	1,190	5,640
1974	3,970	2,230	6,200	-	1,310	610	4,670	920	5,590
1975	4,000	2,240	6,240	-	1,480	980	4,500	760	5,260
1976	4,040	2,250	6,290	-	1,650	870	4,820	600	5,420
1977	4,080	2,260	6,340	-	1,730	1,160	4,650	530	5,180

¹Forecast with Reservoir - Forecast without Reservoir.

²Actual population - forecast without Reservoir.

Source: Tables D-1 and D-2.

the time period covered by the study. Thus, because the impact of the construction activities began at a lower rate and later period, all forecasts through 1977 exceeded the actual experience by significant amounts (see Table D-4).

The levels of the labor force and employment actually experienced in the Study Area in the period 1967-1970 failed to achieve the level forecast for the same period. In the earlier years (i.e. 1968-1973) the differences were extremely large but it is noted that these variations between the expected impact and the actual impact were diminishing each year. This phenomenon is due in part to the fact that the forecasts began at a higher level and an earlier period than was the actual case. However, at the current rate at which the levels of employment and labor force are converging with the forecasts, the two series should reach equality at about 1981 (see Table D-5). This is to say that the overestimation of labor force which was 1,733 in 1968 and 453 in 1977 should be non-existent or nearly so by 1981.

TABLE D-4
Actual Labor Force and Employment Compared with Forecasts¹
for Choctaw and Pushmataha Counties
1968, 1970, 1975 and 1977

Item	1968		1970		1975		1977	
	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Forecast
Labor Force; Total Study Area	6,589	8,322	7,407	8,850	8,347	9,043	8,639	9,122
Choctaw County	4,240	5,662	4,947	6,130	5,445	6,285	5,449	6,348
Pushmataha County	2,349	2,660	2,460	2,720	2,902	2,758	3,190	2,774
Unemployment; Total Study Area	530	600	640	630	1,200	649	510	657
Choctaw County	370	420	550	460	780	474	310	480
Pushmataha County	160	180	90	170	420	175	200	177
Employment; Total Study Area	6,059	7,722	6,767	8,220	7,147	8,394	8,129	8,465
Choctaw County	3,870	5,242	4,397	5,670	4,665	5,811	5,139	5,868
Pushmataha County	2,189	2,480	2,370	2,550	2,482	2,583	2,990	2,597
Commodity Producing Industry	1,724	2,630	1,726	2,729	1,908	2,745	2,379	2,752
Choctaw County	1,171	1,810	1,196	1,896	1,298	1,930	1,509	1,944
Pushmataha County	553	820	530	833	610	815	870	808
Non Commodity Producing Industry	4,335	5,092	5,041	5,491	5,239	5,649	5,750	5,713
Choctaw County	2,699	3,432	3,201	3,774	3,367	3,881	3,630	3,924
Pushmataha County	1,636	1,660	1,840	1,717	1,872	1,768	2,120	1,789

¹Forecasts assume the development of the Reservoir.

Source: A Study of the Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969; and Oklahoma Employment Security Commission.

TABLE D-5

Forecasted Versus Actual Impact of the Hugo Reservoir
on the Labor Force of Choctaw and Pushmataha Counties
1968, 1970, 1975 and 1977

Item	1968			1970			1975			1977		
	Expected	Actual	Diff. ¹	Expected	Actual	Diff. ¹	Expected	Actual	Diff. ¹	Expected	Actual	Diff. ¹
Labor Force, Study Area	1,016	-717	1,733	1,420	-23	1,443	1,563	867	696	1,637	1,154	483
Choctaw County	655	-767	1,422	990	-193	1,183	1,124	284	840	1,192	293	899
Pushmataha County	361	50	311	430	170	260	439	583	-144	445	861	-416
Unemployment, Study Area	82	12	70	100	110	-10	91	642	-551	100	-47	147
Choctaw County	52	2	50	80	170	-90	71	377	-306	80	-90	170
Pushmataha County	30	10	20	20	-60	80	20	265	-245	20	43	-23
Employment, Study Area	934	-729	1,663	1,320	-133	1,453	1,472	225	1,247	1,537	1,201	336
Choctaw County	603	-769	1,372	910	-363	1,273	1,053	-93	1,146	1,112	383	729
Pushmataha County	331	40	291	410	230	180	419	318	101	425	818	-393
Commodity Prod., Study Area	322	-584	906	406	-597	1,003	490	-347	837	524	151	373
Choctaw County	138	-501	639	192	-508	700	274	-358	632	308	-127	435
Pushmataha County	184	-83	267	214	-89	303	216	11	205	216	278	-62
Non Commodity Prod. Study Area	612	-145	757	914	464	450	982	572	410	1,013	1,050	-37
Choctaw County	465	-268	733	718	145	573	779	265	514	804	510	294
Pushmataha County	147	123	24	196	319	-123	203	307	-104	209	540	-331

Note: Expected Impact = Forecast with reservoir - Forecast with no reservoir.

Actual Impact = Actual Experience - Forecast without reservoir.

¹Difference = Over or Under estimation.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969 and Table D-4.

TABLE D-6
Actual and Forecast Increases in Per Capita Income
of Choctaw and Pushmataha Counties
1967-1970
(Dollars Per Person)

Year	Forecast ¹			Actual ²			Difference ³		
	Choctaw	Pushmataha	Average	Choctaw	Pushmataha	Average	Choctaw	Pushmataha	Average
1967	1,246	1,002	1,158	1,567	1,214	1,424	-321	-212	-266
1968	1,278	1,083	1,208	1,695	1,296	1,595	-417	-213	-327
1970	1,576	1,322	1,484	2,226	1,842	2,079	-650	-520	-595
1975	1,609	1,343	1,513	3,018	2,930	2,984	-1,409	-1,587	-1,471
1977	1,622	1,353	1,525	3,531	3,332	3,459	-1,909	-1,979	-1,934

¹1967 forecast assuming the reservoir is built. In 1967 dollar equivalents.

²In current dollars.

³Forecast minus actual.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, January 1969 and Bureau of Economic Analysis, U.S. Department of Commerce.

Per Capita Income

When comparing the forecasts of per capita income over the short term with the actual gains experienced by residents of the study area, it was noted that the forecasts understated the potential for every year. Whereas the gains in per capita income were projected to be 2.8 percent between 1970 and 1977, the actual rate of increase was 66.4 percent (see Table D-6).

The most apparent reason for the wide divergence between the forecasts and the actual levels of per capita income attained by the study area was that the forecasting model did not reflect the acceleration in the rate of inflation which became most evident in 1970 and subsequent years. In addition, the forecasting model was based on non-residence adjusted income data thereby failing to include incomes received by residents of the study area who were employed outside the area. Very often, these area residents receive significantly higher wages and salaries than those employed within the area, thus the data on which the model was built understated per capita incomes in past periods. It should be noted that residence adjusted income data for the period covered in the previous report have been available only since 1973.

Because the original model was not adequately designed to accommodate an inflation rate such as has been witnessed during the past seven years, the actual per capita income levels experienced by the study area have been reduced to 1967 dollar equivalents. This was done to eliminate the effects of inflation since that time and thereby obtain a more accurate evaluation of the efficacy of the previous estimating equation. This comparison which appears in Table D-7 indicates that after adjustment for inflation, the forecasts still remain well below the actual experience of the area.

TABLE D-7
Actual and Forecast Per Capita Income
of the Study Area
1967-1977
(Dollars Per Person)

Year	Forecast ¹	Actual ²	Difference ³
1967	1,158	1,424	-266
1968	1,208	1,535	-327
1970	1,484	2,079	-595
1975	1,513	1,894	-381
1977	1,525	1,906	-381

¹ 1967 forecast assuming the reservoir is built.

² In 1967 dollar equivalents (constant dollars).

³ Difference = Forecast-actual.

Source: Table D-6.

An analysis of the income data for the study area before adjustment for residence reveals that the average annual increase in per capita incomes in the study area between 1967 and 1977 was \$163 ranging from a low of \$50 per person in 1967 to a high of \$243 per person in 1971. Increasing the forecast results by the indicated residence adjustments results in the data exhibited in Table D-8.⁹

The data contained in Table D-8 suggest that even after adjustment for inflation and place of residence, the prior estimating equation failed to account for all the factors influencing per capita income. Probably, the relative lack of change in the levels of per capita income between 1940 and 1960 restricted the growth coefficient to such an extent as to understate levels even after accounting for other pressures acting on income.

⁹ The use of residence adjusted data also adjusts for temporary workers, such as construction workers, living outside the area but performing on jobs in the county or area.

TABLE D-8
Actual and Adjusted Forecasted Per Capita Income
of the Study Area
1967-1977
(Dollars Per Person)¹

Year	Adjusted ² Forecast	Actual	Difference ³
1967	1,208	1,424	-216
1968	1,291	1,535	-244
1970	1,617	1,862	-245
1975	1,677	1,894	-217
1977	1,712	1,906	-194

¹In 1967 dollar equivalents.

²1967 forecast assuming the reservoir is built. Adjusted for place of residence.

³Difference = Forecast-Actual.

Source: Table D-7 and the Bureau of Economic Analysis, U.S. Department of Commerce.

A comparison of the actual impact of the reservoir with that which was expected to occur reveals that incomes in the area rose more than was expected due either to the failure of the previous forecasting method to account for all forces affecting income or to properly evaluate the true effects of the reservoir. For whatever reason, however, adjusted forecasts of per capita income averaged about \$193 annually per person below the levels attained by residents of the area during the 10 year period 1967-1977. The differences between the expected and actual impact of the reservoir are detailed in Table D-9.

TABLE D-9

Actual Versus the Expected Impact of
the Hugo Reservoir on Per Capita Income of
Choctaw and Pushmataha Counties
1967-1977
(Dollars Per Person)

Year	Expected Impact ¹			Actual Impact ²			Difference ³	
	Choctaw	Pushmataha	Average	Choctaw	Pushmataha	Average	Choctaw	Pushmataha
1967	146	69	118	349	176	271	-203	-108
1968	150	75	124	468	237	389	-318	-162
1970	300	162	253	484	271	389	-184	-109
1975	188	93	173	341	473	390	-153	-297
1977	142	65	114	240	425	308	-98	-360

¹Expected Impact = Forecast with reservoir - Forecast without reservoir. Both forecasts adjusted for place of residence and inflation.

²Actual Impact = Actual Experience - Forecast without reservoir adjusted for place of residence and inflation.

³Difference = Expected - Actual

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University and Table D-8.

Total Personal Income

The total personal income data appearing in the previous study reflected many of the same problems found in per capita income data. First, the data were stated in 1960 dollar equivalents and thus any forecasts would not include inflation rates of any magnitude since that time. Next, the personal income totals would not include the income of area residents working outside the area. For these reasons, statements concerning the variations between forecasts and actual per capita income data also apply here. As might be expected, since the population projections contained in the previous study overstated the actual population levels of the area in the short term, forecasted income levels might approach those actually experienced despite the underestimation of per capita income levels. Such, however, was not the case for reasons which will be given later.

Prior to comparing the actual trends in total personal income with the forecasts contained in the previous study, it was necessary to adjust the data for comparability. First, since the income data appearing in the previous study was stated in terms of 1960 constant dollars, it was necessary to convert these data to 1967 dollar equivalents. Next, the data contained in the previous study did not reflect income of persons residing in the area but working else where. Therefore, these data were further adjusted for place of residence. Finally, the data shown in Tables D-10 and D-11 are stated in current dollars and they require adjustment so as to reflect 1967 dollar equivalents. The data appearing in Table D-12 have been adjusted in these ways and thus are comparable.

It is noted in Table D-12 that between 1967 and 1977, total personal income in the Study Area was expected to increase by \$22 million to a level of \$56.4 million by the latter year. This exceeded the increase of \$17.3 million which actually occurred between the two years. The reason for the relatively high

variation between the actual experience and that expected after construction of the reservoir began was an overestimation of population growth particularly between 1968 and 1970. But, because of the large increase projected for population, coupled with a moderate rise in per capita income between 1968 and 1970, the forecasted total income of the area increased by nearly \$12 million, whereas it actually grew by only slightly more than \$5 million. Following 1970, however, the rates of increase of the forecast closely paralleled those which actually occurred. (See Table D-12).

Until 1969, the actual impact of the reservoir on the Study Area was slightly greater than that which was forecast for the short term. This is evidenced by the fact that in 1968, the total personal income was \$10.2 million higher than might have been the case had the reservoir not been built whereas the forecasts of the impact indicated a gain of \$9.6 million. The situation reversed itself in 1970 as the forecasted gain of \$16.3 million exceeded the actual benefits by nearly \$8 million. After completion of the reservoir in 1974, however, the margin between the forecasts and actual experience narrowed to about \$3.9 million (see Table D-13).

TABLE 12-10
Personal Income by Industrial Source¹
Choctaw County
(\$000)

Source	1940	1950	1960	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Farm	1,341	1,887	967	589	480	792	493	881	1,232	1,443	1,413	3,000	455	-(702)	109	360
Non Farm	2,837	5,958	8,541	10,666	11,362	12,202	15,062	18,299	18,900	18,396	20,390	23,274	25,362	27,624	29,064	30,990
Private	1,524	4,750	6,301	7,657	8,055	8,521	10,863	13,634	13,765	12,692	14,553	16,661	18,019	19,227	20,356	21,705
Mfg.	103	323	1,294	1,435	1,544	1,601	1,794	1,996	2,242	1,944	2,756	2,757	2,528	3,379	3,577	3,814
Mining	-	7	74	-	-	-	-	-	-	-	-	-	-	-	-	-
Constr.	-	235	421	406	420	432	1,584	2,940	2,940	1,668	1,805	1,752	1,385	1,749	1,840	1,962
W/R Trade	632	1,010	1,806	2,230	2,373	2,485	2,618	2,703	2,625	2,895	3,136	3,758	4,258	4,509	5,070	5,530
FIRE	-	162	305	424	462	504	603	611	665	749	806	889	1,030	1,077	1,168	1,251
TC, etc.	377	1,048	1,287	1,487	1,582	1,651	1,953	2,206	2,416	2,640	2,888	3,594	4,199	3,948	4,179	4,327
Services	309	1,066	1,052	1,447	1,439	1,587	2,020	2,830	2,877	2,796	3,162	3,400	3,823	4,065	4,303	4,456
Other	103	99	91	-	-	-	-	-	-	-	-	511	796	500	219	363
Govt.	1,313	1,208	2,229	3,009	3,307	3,681	4,195	4,665	5,225	5,704	5,837	6,613	7,343	8,197	8,708	9,285
Fed.Civ.	771	268	372	438	441	516	731	847	932	1,022	707	965	1,181	1,461	1,515	1,616
Fed.Mil.	10	94	190	181	205	212	230	263	271	267	304	331	358	376	390	416
S & L	532	846	1,667	2,390	2,661	2,953	3,234	3,555	4,017	4,415	4,826	5,317	5,804	6,560	6,803	7,253
Total	4,178	7,845	9,508	11,255	11,842	12,994	15,555	19,180	20,132	19,839	21,803	26,274	25,817	26,922	29,173	31,350
Soc. Sec.	30	138	261	359	426	526	647	787	794	840	872	1,137	1,282	1,384	1,478	1,588
Net	4,148	7,707	9,247	10,896	11,416	12,468	14,908	18,393	19,338	18,999	20,931	25,137	24,535	25,538	27,695	29,762
Res. Adj.	-	-	-	558	742	970	1,060	1,234	1,494	2,180	2,130	2,285	2,670	2,588	2,783	2,990
Total	4,148	7,707	9,247	11,454	12,158	13,438	15,968	19,627	20,832	21,179	23,061	27,422	27,205	28,126	30,478	32,752
+ Int. Div.	185	517	1,551	2,556	2,800	3,175	3,538	4,006	4,910	5,536	5,503	6,195	7,144	7,631	8,269	8,886
+ Transfr	554	2,761	4,256	5,503	5,809	6,484	6,965	7,198	8,002	8,939	9,637	10,474	12,603	15,246	16,520	18,512
Total	4,887	10,985	15,054	19,513	20,767	23,097	26,471	30,831	33,744	35,654	38,201	44,091	46,952	51,003	55,267	60,150

¹ Adjusted for Place of Residence. Stated in current dollars.

Source: Bureau of Economic Analysis, U.S. Department of Commerce.

TABLE D-11
Personal Income by Industrial Source¹
Pushmataha County
(\$000)

Source	1940	1950	1960	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Farm	722	1,489	1,056	(222)	(185)	(65)	(104)	151	343	1,020	1,249	1,864	617	-(305)	(21)	166
Non Farm	1,767	2,667	3,751	5,491	5,971	6,489	7,385	8,817	9,046	8,439	9,425	10,675	11,911	13,160	13,889	14,861
Private	787	1,716	2,137	3,001	3,224	3,465	4,093	5,247	5,051	4,145	4,759	5,490	6,310	6,897	7,310	7,811
Mfg.	239	281	280	243	265	273	284	269	274	301	361	494	657	862	914	976
Mining	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-
Constr.	-	104	138	267	296	302	860	2,046	1,572	377	298	483	508	529	560	599
W/R Trade	360	875	1,066	1,284	1,342	1,420	1,573	1,516	1,709	1,619	2,069	2,365	2,722	3,048	3,230	3,451
FIRE	-	86	141	205	215	226	260	241	251	292	340	372	378	414	440	469
TCPU	-	-	-	-	57	112	150	186	190	191	235	208	279	243	257	275
Services	188	320	512	650	696	777	943	959	990	1,260	1,301	1,417	1,620	1,716	1,818	1,943
Other	-	50	-	352	353	355	28	30	65	105	103	151	146	85	91	98
Govt.	980	951	1,710	2,490	2,747	3,024	3,287	3,370	3,995	4,294	4,666	5,185	5,601	6,263	6,579	7,030
Fed. Civ.	606	166	224	305	303	316	325	364	416	416	457	503	504	535	562	600
Fed. Mil.	7	56	103	113	129	133	144	167	168	157	173	194	210	221	232	249
S & L	367	729	1,383	2,072	2,315	2,575	2,818	3,039	3,411	3,721	4,036	4,488	4,887	5,507	5,785	6,181
Total	2,489	4,156	4,807	5,269	5,786	6,424	7,281	8,968	9,389	9,459	10,674	12,539	12,528	12,855	13,910	14,675
Soc. Sec.	17	71	112	177	229	278	312	397	401	380	390	471	569	625	677	714
Net	2,472	4,085	4,695	5,092	5,557	6,146	6,969	8,571	8,988	9,079	10,284	12,068	11,959	12,230	13,233	13,961
Res. Adj.	-	-	-	222	275	311	372	338	455	777	732	2,361	2,762	2,926	3,167	3,341
Total	2,472	4,085	4,695	5,314	5,832	6,457	7,341	8,909	9,443	9,856	11,016	14,429	14,721	15,156	16,400	17,302
+ Int. Div.	112	250	930	1,360	1,608	1,840	1,965	2,332	2,654	2,835	2,656	3,510	4,487	4,782	5,175	5,459
+ Transfer	344	1,491	2,169	3,065	3,296	3,843	4,231	4,511	5,195	5,800	6,143	6,918	8,469	10,239	11,080	12,572
Total	2,928	5,826	7,794	9,739	10,736	12,140	13,537	15,752	17,292	18,491	19,815	24,857	27,677	30,177	32,655	35,333

¹Adjusted for Place of Residence. Stated in current dollars.
Source: Bureau of Economic Analysis, U.S. Department of Commerce.

TABLE D-12

Year	Forecast ¹			Actual			Difference ²		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	24,635	9,555	34,190	23,097	12,140	35,237	-1,538	2,585	1,047
1968	28,072	10,484	38,556	25,374	12,960	38,334	-2,698	2,476	-222
1970	35,790	15,667	51,457	28,980	14,528	43,508	-6,810	-1,139	-7,949
1975	38,156	16,072	54,228	32,009	18,725	50,734	-6,147	2,653	-3,494
1977	39,917	16,531	56,448	33,082	19,462	52,544	-6,835	2,931	-3,904

¹1967 forecast assuming the reservoir is built. Adjusted for place of residents.

$$^2 \text{Difference} = \text{Actual} - \text{Forecast.}$$

All data are stated in 1967 dollar equivalents for comparability.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, January 1969 and Bureau of Economic Analysis, U.S. Department of Commerce.

TABLE D-13
Actual and Forecast Impact of the Hugo Reservoir
on Personal Income of Choctaw and Pushmataha Counties
1967-1977
(Thousands of Dollars)¹

Year	Forecast ²		Actual ³		Difference ⁴	
	Choctaw	Pushmataha	Choctaw	Pushmataha	Choctaw	Pushmataha
1967	5,359	1,062	4,633	4,383	-726	3,321
1968	7,949	1,644	5,581	4,608	-2,368	2,964
1970	11,681	4,635	5,026	3,583	-6,655	-1,052
1975	10,403	4,209	4,256	6,862	-6,147	2,653
1977	9,943	4,015	3,108	6,946	-6,835	2,931
				10,354		-3,904
				9,016		2,595
				10,189		596
				8,609		-7,707
				11,118		-3,494

¹ Stated in 1967 dollar equivalents. Adjusted for other construction projects.

² Forecast = Forecast with Reservoir - Forecast without Reservoir.

³ Actual = Actual Experience - Forecast without Reservoir.

⁴ Difference = Actual - Forecast

Source: Tables D-11 and D-12.

Agriculture Production

The pattern of production experienced by the agriculture sector varied significantly from that which was forecast for the area during the construction phase and after completion of the reservoir. The forecasts prepared for the earlier study indicated that small but continuous increases were expected to occur in agriculture output during the short term between 1967 and 1977. These forecasted gains suggested that the value of the farm production in the study area would increase from the \$5.9 million registered in 1967 to an estimated \$7.6 million in 1977. Thus, the reservoir was expected to result in a \$1.7 million increase in agriculture production. A comparison of these forecasts with the actual production levels (after adjustment) are shown in Table D-14.

TABLE D-14
Actual and Forecast Agriculture Production
in Choctaw and Pushmataha Counties
for Selected Years, 1967-1977
(Thousands of Dollars)

Year	Actual Production ¹			Forecasted Production ²		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	3,700	2,240	5,940	3,700	2,240	5,940
1968	3,890	2,351	6,241	2,474	2,078	4,552
1970	4,300	2,590	6,890	8,240	6,491	14,731
1975	4,589	2,766	7,355	2,859	2,099	4,958
1977	4,711	2,840	7,551	4,012	2,858	6,870

¹In 1967 dollar equivalents.

²1967 forecast assuming the reservoir is built.

Source: U.S. Department of Agriculture, and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

A comparison of the actual short-term trends with those forecast earlier indicate that the model used previously was probably successful in capturing the major elements of the secular trend but was not sensitive to (nor designed to) capture the cyclical variations which occurred in the agricultural sector of the study area's economy. It is apparent that cyclical forces (such as extremely high cattle and hog prices) acted on the area's farming and ranching operations in the period between 1969 and 1973, after which these forces declined in importance thus causing a downward pattern in the value of agriculture output. This downward pattern was probably amplified to some extent by sharp increases in prices paid by farmers which discouraged many farmers and ranchers from continuing operations at or near pre 1975 levels.

As noted earlier, the trend in agriculture output between 1967 and 1977 varied significantly from the short term-trend forecast in the earlier study. In most years, the tendency of the forecasts was to understate the value of farm production by appreciable amounts. For example in 1973, the forecasted impact was nearly \$18 million below the impact actually experienced after adjusting the actual impact to 1967 dollar equivalents. However, it should be noted that in four of the ten years in this period, the forecasted impacts exceeded the actual impacts by amounts ranging from \$681 thousand to \$2.4 million. The dollar value of the forecasted impact is compared with that of the actual impact in Table D-15.

TABLE D-15
Actual and Forecasted Impact of the Hugo Reservoir¹
on Agriculture Production in
Choctaw and Pushmataha Counties
for Selected Years, 1967-1977
(thousands of Dollars)

Year	Forecasted Impact			Actual Impact ²			Difference		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	0	0	0	0	0	0	0	0	0
1968	109	72	181	-1,307	-201	-1,508	1,416	273	1,689
1970	350	230	580	4,290	4,131	8,421	-3,940	-3,901	-7,841
1975	350	238	588	-1,380	-429	-1,809	1,730	667	2,397
1977	350	241	591	-349	259	-90	699	-18	681

¹Forecasted Impact = Forecast with reservoir - Forecast without reservoir.

²In 1967 dollar equivalents.

Actual Impact = Actual Output - Forecast without reservoir.

Difference = Forecasted Impact - Actual Impact.

Source: Tables D-14, and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Value Added by Manufacturing

Preliminary data released by the Bureau of the Census in 1968 indicated that the value added in the Study Area totaled \$4.2 million of which more than \$4.0 million was attributable to manufacturers in Choctaw County and the remainder in Pushmataha County. However, when the final report of the Census of Manufacturing for 1967 was released, these value added totals were revised downward to \$2,632,000 for Choctaw County and \$463,000 for Pushmataha County. These totaled \$3,095,000 which is more than \$1 million below the original level reported for this area.

The original study indicated that, under the then current conditions (i.e. that no reservoir would be available), the value added by manufacturing in the two county area would increase from \$4.2 million in 1967 to \$6.1 million in 1977. This represents an increase of about \$1.9 million over the 10 year period. However, the original study also forecast that, with the reservoir construction activities (1967-1974) and its subsequent operation, the value added by manufacturing in the area would grow from \$4.2 million in 1967 to nearly \$8.3 million by 1977.

The actual increase in value added by manufacturing over the period 1967-1977 amounted to approximately \$2 million in current dollars which closely approximated that forecast for the area under the assumption that no reservoir would be built. It should be noted, however, that since the original study made no effort to account for inflation after 1967, (and thus, implicitly those forecasts were in 1967 dollars), the actual levels of value added since 1967 should be adjusted for inflation. As a result of this adjustment, the value

added by manufacture actually declined from about \$3.1 million in 1967 to \$2.3 in 1977. Thus, in terms of constant dollars (or dollars with 1967 buying power) the value added to products manufactured in this area actually declined during the 10 year period (see Table D-16).

For reasons listed earlier (i.e. the declining importance of surface water in plant location decision, and the overstated value added figure reported in 1967) the reservoir has had virtually no impact on the value added by manufacturing in the two county area. In fact, because the increases in the value added in this study area have not kept pace with increased industrial prices, the value added by firms in the area has actually declined over the ten year period.

It should be noted that this decline is not general throughout the area as the value added in Pushmataha County as registered gains over the period even after adjusting for inflation. In 1977, the actual value added (after adjustment) in Pushmataha County was \$46 thousand higher than the forecast of value added if no reservoir was built. This difference was, however well below the impact forecast in the original study as is shown in Table D-17.

The data shown in Table D-17 reveals the fact that, for the area as a whole, the original method for estimating and forecasting value added by manufacturing consistently overestimated that economic indicator and these overestimations tended to increase in size over time. This tendency to overestimate the level of this indicator was due in part to the growing importance of industrial location factors (energy, transportation and market orientation) while the importance of water declined particularly in years after 1972.

Value Added by Type of Industry

Forecasts of value added by manufacturing in the two county Study Area

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[illegible]

¹In 1967 dollar equivalents.

²1967 forecast without reservoir.

3} 1967 forecast with reservoir.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969; The Census of Manufacturers, Oklahoma, 1967 and 1972, U.S. Bureau of the Census; and estimates by the Center for Economic and Management Research, University of Oklahoma.

The Impact of the Hugo Reservoir on
the Value Added by Manufacturing
in Choctaw and Pushmataha Counties
Selected Years, 1967-1977
(Thousands of Dollars)

Year	Impact ¹		Total	Actual Impact ²		Total	Difference ³		Total
	Choctaw	Pushmataha		Choctaw	Pushmataha		Choctaw	Pushmataha	
1967	0	0	0	-1,428	325	-1,103	-1,428	325	-1,103
1972	1,194	90	1,284	-2,367	119	-2,248	-3,561	29	-3,532
1975	1,670	153	1,823	-3,014	113	-2,901	-4,684	-40	-4,724
1977	2,050	155	2,205	-3,302	46	-3,256	-5,352	-109	-5,461

¹1967 forecast assuming reservoir is built minus forecast without reservoir.

²Actual Experience in 1967 dollar equivalents - Forecast without Reservoir.

³Actual Impact - Forecast Impact.

Note: the actual data differs from the forecast data in 1967 due to the use of preliminary data in the original report.

Source: Table D-16.

badly overstated the actual value added (in constant 1967 dollars) in the area during the short term as was noted earlier. The majority of the overestimations occurred in the Choctaw County forecasts particularly in the apparel and lumber and wood products industries.

The short-term forecasts for Pushmataha County however, more nearly approximated the actual experience of firms in that county. This was probably due to the fact that the estimating equation for Pushmataha County more nearly captured the short-term pattern of growth than was the case with Choctaw County where the greater water supply was expected to attract more industry and to assist in the growth of existing industry. These data are detailed in Table D-18.

TABLE D-18

Actual and Forecast Value Added by Manufacture
in Choctaw and Pushmataha Counties
by Type of Manufacturing Activity
Selected Years, 1963-1977¹
(Thousands of Dollars)²

County/Activity	1972			1975			1977	
	1963	1967	Actual	Forecast ²	Actual	Forecast ²	Actual	Forecast ²
Choctaw								
Food	227	291	289	313	243	405	227	449
Apparel	1,495	1,577	1,393	2,785	1,300	3,123	1,261	3,464
Lumber and Wood Products	944	636	662	1,407	610	1,727	708	1,933
Printing and Publishing	264	114	116	370	107	421	100	455
Chemicals	76	14	16	214	24	295	23	349
Electrical Machinery	0	0	0	69	0	74	0	78
Other Transportation	0	0	0	96	0	135	55	161
Fabricated Metals	0	0	0	61	28	72	38	79
Other Durable Goods	529	0	0	722	51	830	64	902
Other Non Durable Goods	0	0	0	0	25	0	34	0
Miscellaneous Manufacturing	0	0	0	0	6	0	8	0
Total	3,535	2,632	2,476	6,037	2,394	7,078	2,518	7,870
Pushmataha								
Food	11	114	0	23	0	31	0	35
Apparel	0	0	0	14	134	20	123	25
Lumber and Wood Products	88	248	219	131	169	141	155	148
Printing and Publishing	22	38	43	42	35	68	33	72
Electrical Machinery	11	15	0	43	0	73	0	80
Other Durable Goods	0	42	54	25	0	34	0	44
Other Non Durable Goods	0	6	3	12	6	18	7	23
Total	132	463	319	290	345	385	318	427
Total Study Area	3,467	3,095	2,795	6,327	2,739	7,463	2,836	8,297

¹In 1967 dollar equivalents²1967 forecast assuming the reservoir is built.

Source: Census of Manufactures, Oklahoma, 1963, 1967 and 1972, U.S. Department of Commerce, and estimates based on County Business Patterns, U.S. Bureau of Labor Statistics. The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Electric Power Consumption

The previous study estimated that during the construction phase and shortly thereafter, (i.e. 1967-1977) the total consumption of electricity in the two county area would rise from 36.3 million kwh in 1967 to 53.5 million kwh by 1977. The major portion of this increase was forecast to occur among the commercial and industrial users while residential use was expected to rise only minimally (see Table D-19).

The reasons for the large divergence between the levels of electricity forecast and those actually used (as shown in Table D-20) stems first from the rapid increase in per capita residential usage of electricity during the latter portions of the 1960's and the 1970's to date. This period was marked by significant increases in all electric homes - particularly in the rural areas and in the rising use of refrigerated air conditioning equipment. Between 1967 and 1977, these changes in consumption patterns altered the per capita residential use of electricity in the area from 772 kwh per year to 3,421 kwh per year. Prior to the accelerated use of appliances and air conditioning equipment, residential consumption of electricity had averaged about 400 kwh per person per year. Thus, the relationships between population and residential electricity consumption which existed between 1940 and 1967 and used to forecast future demand were not able to adjust for the sharp increases in per capita use which developed after 1967. As a result, all forecasts of residential use badly understated consumption levels after that time (see Table D-21).

With respect to commercial and industrial consumption forecasts, the forecasting model used was based on time series analysis applied to 1940-1967 data. In this use category also, 1940-1967 trends did not include new technology which required significant increases in the use of electricity nor was it

TABLE D-19
¹Forecasted Consumption of Electricity
in Choctaw and Pushmataha Counties
by Type of Consumption
1967-1977
(Thousands of Kwh)

Year	Total Consumption		Residential Consumption			Commercial & Industrial		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha
1967	27,185	9,136	36,321	12,709	4,718	17,427	14,476	4,418
1968	28,220	9,770	37,990	13,020	4,970	17,990	15,200	4,800
1970	30,420	11,190	41,610	13,650	5,500	19,150	16,770	5,690
1972	32,640	12,060	44,700	14,260	5,630	19,890	18,380	6,430
1975	36,280	13,500	49,780	15,220	5,840	21,060	21,060	7,660
1977	38,930	14,550	53,480	15,900	5,980	21,880	23,030	8,570
								31,600

¹ 1967 forecast assuming the development of the reservoir.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

TABLE D-20

Actual Consumption of Electricity
in Choctaw and Pushmataha Counties
by Type of Consumption
1967-1977
(Thousands of kWh)

Year	Total Consumption			Residential Consumption			Commercial & Industrial		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	27,185	9,136	36,321	12,709	6,378	19,087	14,476	2,758	17,234
1968	30,167	10,665	40,832	14,615	7,702	22,317	15,552	2,963	18,515
1970	39,187	14,642	53,829	19,912	10,970	30,882	19,275	3,672	22,947
1972	56,835	20,817	77,652	29,178	15,497	44,675	27,657	5,320	32,977
1975	87,434	35,184	122,618	46,752	27,357	74,109	40,682	7,827	48,509
1977	110,264	44,790	155,054	59,436	34,990	94,426	50,828	9,800	60,628

Source: Public Service Company of Oklahoma and Choctaw Rural Electric Association.

TABLE D-21
The Difference Between Actual and Forecast Use of Electricity ¹
in Choctaw and Pushmataha Counties
by Type of Consumption
1967-1977
(Thousands Kwh)

Year	Total Consumption			Residential Consumption			Commercial & Industrial Consumption		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967 ²	0	0	0	0	-1,660	-1,660	0	1,660	1,660
1968	-1,947	-895	-2,842	-1,595	-2,732	-4,327	-352	1,837	1,485
1970	-8,767	-3,452	-12,219	-6,262	-5,470	-11,732	-2,505	2,018	-487
1972	-24,195	-8,757	-32,952	-14,918	-9,869	-24,785	-9,277	1,110	-8,167
1975	-51,154	-21,684	-72,838	-31,532	-21,517	-53,049	-19,262	-167	-19,789
1977	-71,334	-30,240	-101,574	-43,536	-29,010	-72,549	-27,798	-1,230	-29,028

¹ 1967 forecast assuming the development of the reservoir. Difference = Forecast - Actual.

² Residential consumption varies due to a revision of the data reported in 1967.

Note: Negative sign indicates that the forecast understated the actual growth.

Source: Tables D-19 and D-20.

capable of accounting for the rising use of temperature modification devices by commercial firms following 1967.

It should also be noted that a part of the early underestimation in the residential use and overestimation use of electricity in Pushmataha County stemmed from an error in reporting the use of electricity (i.e. a portion of the rural electricity used in 1967 was mistakenly recorded as industrial rather than household).

As noted earlier in this section, forecasts of future energy consumption in the short term under the assumption that the reservoir would be built compared with similar forecasts assuming the reservoir would not be built indicated moderate increases in use of electricity because of the reservoir. These increases were noted in both residential uses as well as commercial and industrial uses.

The impact of the reservoir on total energy consumption was forecast to range from 870 thousand kwh in 1968, to 9.9 million kwh by 1977 with the majority of the impact attributable to gains in commercial and industrial use with a lesser impact being felt in residential uses. These data are detailed in Table D-22

As sizeable as the forecasted impact of the reservoir might have been at the time the original study was completed, it amounted to only a fraction of the increase in electricity consumption actually experienced in the short term. In addition, the actual pattern of use reversed that which was expected as the greatest margin of gain was noted in residential consumption while commercial and industrial users were impacted to a lesser extent. For example, residential use in 1977 was 75.1 million kwh greater than was forecast if the reservoir was not built compared with the forecasted difference of 2.5 million kwh (see Table D-23).

TABLE D-22
Forecast Impact of the Hugo Reservoir
on Electricity Consumption
in Choctaw and Pushmataha Counties
by Type of Use
1967-1977
(Thousands Kwh)

Year	Total Consumption			Residential Consumption			Commercial and Industrial Use		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	0	0	0	0	0	0	0	0	0
1968	870	0	870	220	20	240	650	-20	630
1970	2,730	170	2,900	650	100	750	2,080	70	2,150
1972	4,310	370	4,680	1,160	80	1,240	3,150	290	3,440
1975	6,960	730	7,690	1,970	60	2,030	4,990	670	5,660
1977	8,870	1,010	9,880	2,500	40	2,540	6,370	970	7,340

Source: Table D-20 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

TABLE D-23
Actual Impact of the Hugo Reservoir
on Electricity Consumption in Choctaw and Pushmataha Counties
by Type of Use
1967-1977
(Thousands Kwh)

Year	Total Consumption			Residential Consumption			Commercial and Industrial Use		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	0	0	0	0	1,660	1,660	0	-1,660	-1,660
1968	2,817	895	3,712	1,815	2,752	4,567	1,002	-1,857	-855
1970	11,497	3,622	15,119	6,912	5,570	12,482	4,585	-1,948	2,637
1972	28,505	9,127	37,632	16,078	9,947	26,025	12,427	-820	11,607
1975	58,114	22,414	80,528	33,502	21,577	55,079	24,612	837	25,449
1977	80,204	31,250	111,454	46,036	29,050	75,086	34,168	22,000	36,368

Source: Table D-20 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Bank Deposits

Bank deposits in the Study Area during and after the construction of the reservoir were forecast to increase by 61 percent between 1967 and 1977. The expanded business activity which the reservoir was forecast to generate was expected to raise total bank deposits in the area to \$34.3 million by 1977. Of these, \$21.3 million were expected to be in Choctaw County banks and \$13 million in Pushmataha banks.

The actual history of bank deposits in this area between 1967 and 1977, however, differed significantly from that which was forecast earlier as levels in area banks rose 232 percent during the period. This increase brought the total to \$70.6 million by the end of 1977. It should be remembered that between 1967 and 1977 the rate of inflation accelerated rapidly so that by 1977 prices were 81.5 percent above 1967 levels. It should also be noted that the original forecasting method had no mechanism for adjusting for such rapid increases in the rate of inflation; therefore forecasts resulting from the previous techniques were actually stated in 1967 dollar equivalents. For the purposes of comparison, then, the actual deposit balances between 1967 and 1977 were adjusted to 1967 dollar equivalents. These are compared with forecasts of total deposits (assuming that the reservoir is built and that the reservoir is not built) in Table D-24. The data contained in Table D-24 indicate that, for the area as a whole, the forecasts of deposits during and after the construction of the reservoir understated the deposit potential of the area between 1967 and 1977. However, the underestimation occurred in the activity of Choctaw County banks while forecasts for Pushmataha County banks generally overestimated their potential except for 1972.

Earlier forecasts suggested that during and after the construction phase, bank deposits would increase more rapidly than would be the case were the

TABLE D-24
Actual and Forecast Bank Deposits
in Choctaw and Pushmataha Counties
1967-1977
(Thousands of Dollars)

Year	Actual Deposits ¹			Forecast Deposits ²			Forecast ³		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	13,963	7,325	21,288	13,963	7,325	21,288	13,963	7,325	21,288
1968	15,998	7,332	23,330	14,534	8,193	22,427	14,387	7,991	22,298
1970	21,580	8,168	29,748	16,981	10,029	27,010	15,272	9,226	24,498
1972	24,484	10,887	35,371	18,140	11,866	30,006	16,214	10,761	26,975
1975	25,987	11,627	37,614	20,031	12,529	32,560	17,736	11,362	29,098
1977	26,434	12,685	39,118	21,340	12,991	34,331	18,832	11,781	30,613

¹In 1967 dollar equivalents.

²1967 forecast assuming the reservoir is built.

³1967 forecast assuming the reservoir is not built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969 and The Official Directory of Oklahoma Banks, Oklahoma Bankers Association.

reservoir not built. The impact of the reservoir was forecast to result in an increase in area bank deposits during 1968 of \$429 thousand over the level expected without the reservoir. This margin was expected to grow steadily so as to reach \$3.7 million by 1977 with most of the gain occurring between 1968 and 1970. The effects of the reservoir were forecast to have greater effect on deposits of Pushmataha County banks than on banks in Choctaw County in 1968 but thereafter, the impact on Choctaw County banks was expected to be greater.

Actually, the impact of the reservoir on bank deposits (in terms of 1967 dollar equivalents) in the Study Area were much greater than was forecast. For example, in 1968, actual deposits in the area banks were more than \$1 million higher than if the reservoir were not built. By 1977, the actual deposits were \$8.5 million above the levels forecast if the reservoir were not built. It is of note that the greatest impact throughout the period has been on Choctaw County banks as shown in Table D-25.

The data presented in Table D-25 indicate that even though the forecasting techniques consistently overestimated the impact of the reservoir on Pushmataha County bank deposits, the forecasts for the area as a whole underestimated the reservoir's effects area wide. This suggests first, that the effects of leakage noted for the area in the previous study have tended to lessen over time. It also indicates that the omission of savings deposits in banks tended to cause the forecasting model to underestimate future deposits because savings account balances in these banks have increased in relation to total deposits regularly since 1967 and now account for more than one half of all area bank deposits.

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TABLE D-25
Actual and Forecast Impact
of the Hugo Reservoir on Bank Deposits
in Choctaw and Pushmataha Counties
1967-1977
(Thousands of Dollars)

Year	Forecast Impact ¹			Actual Impact ²			Difference ³		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	0	0	0	0	0	0	0	0	0
1968	147	282	429	1,611	-579	1,032	-1,464	861	-603
1970	1,709	803	2,512	6,308	-1,058	5,250	-4,600	1,861	-2,739
1972	1,926	1,105	3,031	8,270	126	8,396	-6,344	979	-5,365
1975	2,295	1,167	3,462	8,251	265	8,516	-5,956	902	-5,054
1977	2,508	1,210	3,718	7,602	904	8,506	-5,094	306	-4,788

¹ 1967 forecast with reservoir - Forecast without reservoir.

² Actual - Forecast without reservoir; in 1967 dollar equivalents. Negative sign denotes overestimation in forecast.

³ 1967 forecast - Actual, Negative sign indicates underestimation in forecast.

Source: Table D-24.

Loans and Discounts

A review of the data and forecasting models utilized in the original study revealed that the forecasting model was constructed on the basis of the relationships between loans and discounts (as the dependent variable) and population (as the independent variable) which existed between 1940 and 1960. Thus, forecasts of succeeding years (i.e. after 1960) did not include the accelerated rate of increase in this series after 1960. For this reason, differences will exist between the forecasted impact and the actual impact in 1967.

Because the forecasting model was not affected by the increases between 1960 and 1967, the outlook for loans and discounts it presented was for very moderate increases in the short term. Under the assumption that the reservoir would be built, loans and discounts were projected to increase by 54 percent between 1967 and 1977 so as to reach \$12.8 million by the latter year. The actual experience of area banks insofar as loans and discounts were concerned was an increase of 269 percent during the period. Had the reservoir not been built, however, the expected increase was 32.7 percent. (See Table D-26).

The large difference between the forecasted levels of loans and discounts and the annual volume of loans and discounts during the period 1967-1977 was due to several factors. The first and probably the factor which affected the forecasts most was the fact that the model construction did not account for the accelerated rate of increase in loan and discount volumes between 1960 and 1967. Second, as has been the case with all forecasts of dollar volumes, the model was not equipped to cope with sharp rates of inflation. This problem has been handled by converting the actual data to 1967 dollar equivalents. Even with this adjustment, however, loans and discounts of area banks rose 103 percent between 1967 and 1977. The last factor contributing to these differences

was attributable either to more aggressive lending policies by the six banks in the area or to a higher demand for loans or a combination of the two. That this factor contributed to the variations between the forecast and the actual experience is witnessed by the fact that in 1960 and prior years, the loan to deposit ratio of these banks averaged less than 45 percent, whereas by 1977, this ratio was 55 percent and was showing evidence of a tendency to continue upward.

Forecasts of loans and discounts assuming the reservoir will be built, indicate that this form of borrowing from banks in the study area increased the dollar volume of loans by \$1.8 million in 1967, over the level expected had the reservoir not been constructed. These same forecasts for 1977, estimated that loans and discounts would be \$4.2 million more than if no reservoir existed. The major portion of the impact of the reservoir was projected for Choctaw County with a lesser benefit projected for Pushmataha County.

Comparing actual loans and discounts made by banks in the study area with forecasts of these instruments without the benefit of the reservoir indicated a vastly larger gain after the construction phase of the reservoir was underway and even more extensive gains after the reservoir was placed in operation. In 1967, for example, loans and discounts made by area banks were \$4.1 million greater than the level forecast without a reservoir. By 1977, this margin had increased 3 fold to \$12.4 million. Thus, the weaknesses in the original estimating model described earlier in this section resulted in regular and sizeable underestimations of the volume of loans and discounts of banks in the Study Area. These underestimations ranged from \$2.3 million in 1967 to \$8.2 million in 1977. Details of the impact for selected years between 1967 and 1977 are shown in Table D-27.

TABLE D-26

¹In 1967 dollar equivalents.

¹In 1967 dollar equivalents.

2 1967 forecast assuming the reservoir is built.

3 1967 forecast assuming the reservoir is not built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969 and The Official Oklahoma Bank Directory, Oklahoma Bankers Association.

TABLE D-27
Actual and Forecast Impact
of the Hugo Reservoir on Loans and Discounts of
Banks in Choctaw and Pushmataha Counties
1967-1977
(Thousands of Dollars)

Year	Forecast Impact ¹			Actual Impact ²			Difference ³		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	1,106	700	1,806	2,599	1,482	4,081	-1,493	-782	-2,275
1968	1,337	877	2,214	3,703	1,872	5,575	-2,366	-995	-3,361
1970	1,870	1,320	3,190	4,567	1,675	6,242	-2,697	-355	-3,052
1972	2,072	1,383	3,455	4,788	2,863	7,651	-2,716	-1,480	-4,196
1975	2,415	1,534	3,949	7,199	2,884	10,083	-4,784	-1,350	-6,134
1977	2,660	1,550	4,210	8,338	4,049	12,387	-5,678	-2,499	-8,177

¹ Actual Loans and Deposits - Forecast without reservoir.

² 1967 forecast with reservoir - Forecast without reservoir.

³ 1967 forecast impact - Actual Impact, Negative sign denotes Underestimation.

Source: Table D-26 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Transportation

Short-term forecasts of rail shipments to 1977 indicated that this mode of transportation would experience slight but regular gains during the period. In fact, the existence of the reservoir was expected to raise the level of total shipments by rail from 1,212 carloads in 1967 to 1,286 carloads by 1977. In fact, however, freight carloading declined rather sharply over the ten year period.

One of the major reasons for the divergence in the actual trend from that which was forecast was in the method used in the earlier study in forecasting this series. This method involved the extrapolation of the 1940-1967 trend in both inbound and outbound freight carloadings. This trend was then applied to the data compiled for the Study Area to arrive at short-term forecasts (assuming the reservoir was built). The years included in the development of the trend pattern for the Study Area were those in which freight carloadings were still increasing - or at worst had stabilized. Thus, the model was not able to capture the future effects of increased market penetration by the trucking industry thereby allowing total rail traffic to decline as trucking became more popular.

The previous forecast to 1977 (assuming the reservoir was built) is compared with actual freight movements by rail in Table D-28.

The data in Table D-28 reveal that the short-term growth in rail shipments was far less than anticipated and therefore, the impact of the reservoir on this mode of transportation was less. The fact that rail shipments declined after completion of the reservoir was not due to the reservoir but more probably a function of rail's principal competitor in the area - the trucking industry.

Table D-29 details the differences between forecasts of rail movements had the reservoir not been built and the actual rail movements between 1967 and 1977.

The data shown in Table D-29 reflect the fact that the forecasts of rail

shipments under the assumption that no reservoir were built actually were more indicative of the trends in rail shipments than the forecasts under conditions if the reservoir were built. This suggests that the modification of the original estimating equation which included the implied effects of increases in retail sales and value added by manufacture further expanded the already extensive overestimation of rail shipments in the area.

**Actual and Forecasted Rail Shipments¹
for Choctaw and Pushmataha Counties
1967-1977**

²1967 forecast assuming the reservoir is built.

Source: The St. Louis and San Francisco Railroad, Inc., and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

TABLE D-29

Actual and Forecasted Rail Shipments¹
For Choctaw and Pushmataha Counties
1967-1977
(Number of Carloadings)

Year	Forecast ²			Actual			Difference		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	1,200	12	1,212	1,200	12	1,212	0	0	0
1968	1,175	11	1,186	1,113	11	1,124	-64	0	-64
1970	870	7	877	906	12	918	36	5	41
1975	944	6	950	396	4	400	-548	-2	-550
1977	884	4	888	709	7	716	-175	3	-172

¹Includes both inbound and outbound shipments.

²1967 forecast assuming no reservoir is built.

Source: Table D-28 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, 1967, Business Research Center, Oklahoma City University, 1969.

Truck Transportation

Truck shipments into and out of the Study Area since 1967 have tended to exceed the forecasts developed under the assumption that the reservoir would be built by a wide margin and this margin appears to be growing annually. These comparative data are shown in Table D-30.

The data shown in Table D-30 reflect the degree to which the original estimating equations for truck shipments of both types failed to account for the rapid replacement of rail by trucks as a prime mover of goods. This is not surprising since, in no place in the estimating equations are the effects of competition taken into account. The differences between the forecasts and actual truck shipments are, in fact, due largely to market penetration given the relative lack of change in such major economic and demographic indicators as population, employment and value added by manufacturing.

As noted earlier, truck shipments in the area have been influenced both by the ability of the trucking industry to acquire more of the market and to the economic growth which occurred after the completion of the reservoir. The data shown in Table D-31 reflect the effects of both of these influences. It should be noted that, except for 1968, the joint effects of the reservoir and market penetration have resulted in a large growth in truck shipments in Choctaw County over what might have been expected had the reservoir not been built.

One possible way to isolate the influence of the reservoir from the market acquisition experience of the trucking industry between 1967 and 1977 is to compare the differences between actual truck movements and forecasts made under the assumption that the reservoir would be built with differences between actual truck movements and forecasts made under the assumption that the reservoir would not be built. These comparisons are shown in Table D-32.

The differences noted in the adjusted impact column of Table D-32 probably more nearly reflect the impact of the reservoir on truck shipments because at least a part of the market penetration factor is eliminated by the comparisons made in the table.

TABLE D-30

Actual and Forecasted Truck Shipments¹
for Choctaw and Pushmataha Counties
1967-1977

(Number of Shipments)

	(Number of Shipments)					
	Forecast ²			Actual		
Year	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	10,672	2,198	12,870	10,672	2,198	12,870
1968	10,910	2,417	13,327	10,396	2,106	12,502
1970	12,336	2,734	15,070	12,590	2,383	14,973
1975	14,129	2,958	17,087	14,636	3,198	17,834
1977	15,179	3,174	18,353	16,855	3,581	20,436
Difference				Choctaw	Pushmataha	Total
				0	0	0
				-514	-311	-825
				254	-351	-97
				507	240	747
				1,676	-407	2,083

¹ Includes inbound and outbound shipments.

²1967 forecast assuming the reservoir is built.

Source: Members of the trucking industry and Pushmataha Counties; Business Research Center, Oklahoma City University, 1969.

TABLE D-31
Actual and Forecast Truck Shipments¹
for Choctaw and Pushmataha Counties
1967-1977
(Number of Shipments)

Year	Forecast ²			Actual			Impact		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	10,672	2,198	12,870	10,672	2,198	12,870	0	0	0
1968	10,883	2,150	13,033	10,396	2,106	12,502	-487	-44	-531
1970	12,100	2,260	14,360	12,590	2,383	14,973	70	123	193
1975	12,520	2,890	15,410	14,636	3,198	17,834	2,116	308	2,424
1977	12,630	3,310	15,940	16,855	3,581	20,436	4,225	271	4,496

¹Includes inbound and outbound shipments.

²1967 forecast assuming no reservoir was built.

Source: Table D-30 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties; Business Research Center, Oklahoma City University, 1969.

TABLE D-32
Differences Between Actual and Forecast Truck Shipments¹
for Choctaw and Pushmataha Counties
Under Different Assumptions
1967-1977
(Number of Shipments)

Year	Difference A ²			Difference B ³			Adjusted Impact ⁴		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1967	0	0	0	0	0	0	0	0	0
1968	-514	-311	-825	-487	-44	-531	27	267	294
1970	254	-351	-91	70	123	193	-184	474	290
1975	507	240	747	2,116	308	2,424	1,609	68	1,677
1977	1,676	407	2,083	4,225	271	4,496	2,549	-136	2,413

¹Includes inbound and outbound shipments.

²Difference A = Actual - Forecast assuming the reservoir is built.

³Difference B = Actual - Forecast assuming the reservoir is not built.

⁴Adjusted Impact = Difference B - Difference A

Source: Tables D-30 and D-31.

Construction

The forecasts of construction activity during the short-term period including the period of construction indicated that, peak construction expenditures of nearly \$17 million would be made in 1970 after which activity would decline, reaching about \$16 million in 1977. Actually, the patterning of these forecasts was reasonably accurate until 1977 but the forecasted values were above those attained after removal of the effects of the expenditures for highway construction. After adjusting actual construction data for inflation, these differences become even more significant as shown in Table D-33.

TABLE D-33
Actual and Forecasted Construction Activity
in Choctaw and Pushmataha Counties
1967-1977
(Thousands of Dollars)

Year	Forecast ¹	Actual ²	Actual ³
1967	6,700	6,700	6,700
1968	9,670	7,200	6,896
1970	17,000	14,163	12,178
1975	16,250	14,803	10,022
1977	15,960	25,057	13,805

¹1967 forecast assuming the reservoir is built.

²In current dollars excluding highway expenditures.

³In 1967 dollar equivalents, excluding highway expenditures.

Source: Construction Division, U.S. Department of Commerce, and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

There are several reasons the forecasts differ from the actual experience in the area over the short term, the most probable being that the actual

expenditures for the reservoir did not follow the schedule assumed in the original study. A second cause for variation was found in the method itself which utilized past trends and thus was not able to forecast unusual construction activities such as government housing programs which have been inaugurated in the area.

General Economic Impact

The original study forecast rather significant economic gains for the Study Area after completion of the reservoir. In fact, the economic activity in the area in 1970 was forecast to be double that experienced in 1960. By 1977 economic activity was projected to rise another 15 percent over the 1970 level.

The actual experience in the Study Area indicates that economic activity more than doubled between 1960 and 1970 but the rate of increase slowed somewhat after that time so that, by 1977 the level was slightly less than 5 percent higher than in 1970. Table D-34 details these trends.

It is noted that the greatest impact of the reservoir on the area occurred during the construction period after which its effects tended to decline. This is not surprising in view of the fact that industry did not develop as rapidly as was expected and therefore the population, employment and other factors rose less rapidly than was originally forecast. In short, the initial influx of construction money into the area created a very short-term increase which was not supplemented after 1974 by as large a number of new businesses in the area.

TABLE D-34
Actual and Forecast General Economic Conditions
In Choctaw and Pushmataha Counties
1960-1977
(1957-59 = 100)

Year	Forecast ¹	Forecast ²	Actual	Impact ³
1960	105	105	105	0
1970	138	210	213	75
1975	158	221	219	61
1977	166	231	223	57

¹1967 forecast assuming the reservoir was not built

²1967 forecast assuming the reservoir was built

³Impact = Actual minus forecast without reservoir

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties; Business Research Center, Oklahoma City University, 1969; actual data based on economic data presented in other tables in this study.

APPENDIX E
Short-Term Forecasts to 1980

APPENDIX E

SHORT-TERM FORECASTS TO 1980 USING PREVIOUS METHODOLOGIES

The methodologies and models used in the prior study were based on data compiled through 1966 and thus the coefficients of these models required some modification due to the changes in trends occurring between 1966 and 1967. This is to say that while the original approach was used, the coefficients of the forecasting equations were altered because of the accessibility of eleven years of additional data. The original and revised equations are shown in the Methodology which appears as Appendix A.

Population

The original study estimated that the population of the Study Area would increase slightly between 1970 and 1980 even if the reservoir were not constructed. This forecasted increase was expected to raise the level of population in the area from an estimated 25,690 in 1970 to 26,680 by 1980. The effects of the reservoir, however, were projected to raise both the 1970 and the 1980 levels of population significantly (i.e. to 31,700 in 1970 and 33,130 in 1980). Thus without the reservoir, population in the Study Area was projected to increase by 990 persons during the decade of the 1970's whereas the gain was expected to be 1,430 persons if the reservoir were built.

Latest short run forecasts of population of the Study Area developed by the Bureau of the Census in conjunction with the Bureau of Economic Analysis reveals that by 1980, the Study Area is forecast to have a population of 30,000 persons which is an expected increase of 5,474 persons over the 1970 census count of 24,526. This suggests that even though the original study tended to overestimate both the 1970 and 1980 population levels of the Study Area if the reservoir were built, it failed to capture the rapidity of the increase between the two periods.

A part of the tendency to both overestimate the levels of population in the two periods and underestimate the extent of the increase between the two periods was due to the fact that the population projections employed in the earlier study were based on OBERs projections developed in 1967 while those used in this study relied essentially on later OBERs work published in 1972 which assumed a lower fertility rate and thus a lower birth rate. Table E-1 details the projections by county under each assumption.

The data shown in Table E-1 suggest that the actual impact of the reservoir on the population of the study area was actually 1,160 persons in 1977 and is projected to reach 3,320 persons by 1980, rather than the higher effects of 6,360 for 1977 and 6,450 for 1980 shown in the previous study.

Labor Force and Employment

Trends in labor force and its composition between 1966 and 1970 impacted heavily on the original short-term forecasts contained in the earlier study. For example, where in 1970 the commodity producing industries were expected to contribute 33 percent of the jobs, actually this sector only contributed 27 percent of the jobs. An analysis of the work force which was gainfully employed during that year indicates that the overestimation in the job contributions expected of the commodity producing industries was due to a sharp decline in the number of agricultural jobs. The discussions which follow will provide more detail relative to the short-term forecasts through 1980 of the labor force and employment and the impact of the reservoir on these important economic factors.

Employment

Employment in the Study Area during the next three years is expected to continue the upward trend which has been the general pattern since 1971.

TABLE E-1

Actual and Estimated Population
of Choctaw and Pushmataha Counties
Assuming Different Growth Rates
1970, 1977 and 1980

Year	Without Reservoir ¹			With Reservoir ²			Actual ³		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
1970	16,990	8,799	25,690	20,820	10,880	31,700	15,141	9,385	24,526
1977	17,570	8,870	26,440	21,600	11,200	32,800	17,000	10,600	27,600
1980	17,750	8,930	26,680	21,930	11,200	33,130	19,200	10,800	30,000

¹Based on trends between 1930 and 1966.

²Based on projections for control counties using OBERs 1967 projection assumptions.

³1970 data were obtained from the Census of Population, Oklahoma, 1970; 1977 data were estimates prepared by the Oklahoma Employment Security Commission; 1980 data are estimates based on OBERs 1972 projections.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University; Oklahoma Employment Security Commission and Census of Population, Oklahoma, 1970, U.S. Department of Commerce; Oklahoma Population Estimates, Oklahoma Employment Security Commission.

Only a slight downturn occasioned by a drop in noncommodity producing employment in 1973, has interrupted this trend. However, since 1974, the total number of jobs in the two county area has risen consistently and are expected to continue at about this rate of increase through 1980. Employment by industry of employment is depicted by county in Table E-2. This table indicates that of the 661 new jobs forecast for the Study Area over the period 1977 to 1980, commodity producing jobs will provide only 231 (or 35 percent) of these, while non-commodity producing jobs will account for the remaining 65 percent. It should be noted that one of the largest increases in this latter category will be in the construction sector. This increase will be due to the beginning of a new coal-fired electric generating plant in 1980 which will be located near Hugo in Choctaw County. In its early stages, this project is expected to employ 250 persons.

Comparing these later forecasts with those contained in the earlier study indicates that the forecasted total civilian employment in the area by 1980 will exceed that forecast previously by 1,840 rather than 1,810. Table E-3 details these projections.

TABLE F 2

Actual and Estimated Employment
in Choctaw and Pushmataha Counties
by Type of Industry
1970-1980

Type of Industry	1970			1977			1980		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
Commodity Producing	1,196	530	1,726	1,509	870	2,319	1,720	890	2,610
Agriculture	367	210	577	426	388	814	530	382	912
Mining	39	10	49	21	0	21	20	18	38
Manufacturing	790	310	1,100	1,062	482	1,544	1,170	490	1,660
Food	210	10	220	275	20	295	290	22	312
Apparel	274	21	295	280	96	376	286	116	402
Lumber & Wood	168	215	383	246	286	532	262	293	555
Printing & Publishing	25	9	34	30	14	44	34	16	50
Chemicals	9	0	9	9	0	9	15	0	15
Electrical	0	4	4	0	7	7	16	8	24
Transport Equipment	9	0	9	14	0	14	20	0	20
Fabricated Metal	34	0	34	70	0	70	76	0	76
Other Durables	35	45	80	83	46	129	100	26	126
Other Non Durables	19	6	25	48	13	61	61	9	70
Miscellaneous	7	0	7	7	0	7	10	0	10
Non-Commodity Producing	3,201	1,840	5,041	3,630	2,120	5,750	3,910	2,270	6,180
Construction	475	317	792	458	278	736	625	315	940
Utilities ¹	356	109	465	495	141	636	497	155	652
Trade	977	454	1,431	1,108	601	1,709	1,156	627	1,783
Services	774	595	1,369	830	640	1,470	865	678	1,543
Finance, Insurance ³	119	32	151	122	38	160	129	40	169
Government ⁴	500	333	833	617	422	1,039	638	455	1,093
Industry Not Reported	0	0	0	0	0	0	0	0	0
Total Civilian Employ	4,397	2,370	6,767	5,139	2,990	8,129	5,630	3,160	8,790

¹Includes Transportation and Communications.

²Includes Wholesale and Retail Trade.

³Includes Banks, Thrift Institutions and Real Estate.

Source: Oklahoma Employment Security Commission; County Business Patterns, U.S. Department of Labor and estimates based on National Planning Association projections.

TABLE E-3
A Comparison of Employment Forecasts
for Choctaw and Pushmataha Counties
by Industry of Employment
1980

Industry	Without Reservoir	With Reservoir ¹	With Reservoir ²	Impact
Commodity Producing	<u>2,191</u>	<u>2,764</u>	<u>2,610</u>	<u>419</u>
Agriculture	1,106	1,421	912	-194
Mining	31	37	38	7
Manufacturing	1,054	1,306	1,660	606
Non Commodity Producing	<u>4,759</u>	<u>5,816</u>	<u>6,180</u>	<u>1,421</u>
Construction	674	740	940 ³	266
Utilities	335	356	652	317
Trade	1,134	1,343	1,783	649
Services	1,209	1,563	1,543	334
Finance, Insurance	181	261	169	-12
Government	1,094	1,405	1,093	-1
Industry not reported	<u>132</u>	<u>148</u>	<u>0</u>	<u>-132</u>
Total Civilian Employment	6,950	8,580	8,790	1,840

¹1967 forecast.

²1978 forecast.

³Includes 250 workers on the proposed electricity generating plant.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, and forecasts by the authors.

Labor Force

The labor force in the Study Area is projected to continue the trend evident since 1974 so that by 1980, it should reach 9,550 persons. Along with this increase, however, will come an increase in unemployment. This will come about as a result of an increased entry of women into the labor market. The sharpest gain in unemployment is expected to occur in Choctaw County where the population is largest. These data are detailed in Table E-4 and are compared with projections contained in the earlier study for 1980.

It should be noted that the impact of the reservoir as shown in Table E-4 includes 250 employees which scheduled to begin work on a new electricity generating plant in 1980. These have been included because the reservoir was essential to the downstream flow control essential to the generating facility. Thus, the generating plant is directly the result of the reservoir.

TABLE E-4
Employment and Labor Force Projections
for Choctaw and Pushmataha Counties
1980

1980

Item	Without Reservoir			With Reservoir ¹			With Reservoir ²			Impact		
	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total	Choctaw	Pushmataha	Total
Employment	4,760	2,190	6,950	5,960	2,620	8,580	5,630	3,160	8,790	870	970	1,840
Unemployment	380	160	540	490	180	670	510	250	760	130	90	220
Labor Force	5,140	2,350	7,490	6,450	2,800	9,250	6,140	3,410	9,550	1,000	1,060	2,060

¹ 1967 forecast.

² 1978 forecast.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969; and estimates by the Authors.

Personal Income

The failure of the original study to foresee the sharp increases which would occur in per capita income during the period 1970-1977 and its overestimation of population during the same period resulted in total personal income forecasts which, in many years, did not differ greatly from the actual income received in the area. Forecasts of population based on trends through 1977 are considerably more conservative than were those in the earlier study while per capita income forecasts based on the higher historical levels (and adjusted for place of residence) will likewise be more indicative of future periods. Thus, short-term forecasts of total personal income through 1980 should be more reflective of the situation as it will exist a few years hence.

Per Capita Income

Per capita income in each of the counties is forecast to continue the trend established between 1970 and 1977 and thereby will experience moderate gains in 1978 as well as in 1979 and 1980. These increases will raise the average income per person in Choctaw County to \$3,758 per year in 1980 while the level in Pushmataha County will rise to \$3,518 per year. These averages are, of course stated in current dollars and thus must be adjusted to 1967 dollar equivalents before being compared with prior forecasts. These data, both unadjusted and adjusted are shown in Table E-5.

It should be noted that the increase in per capita income between 1970 and 1977 did not keep pace with inflation and thus the average purchasing power per person declined somewhat over the period. However, new jobs forecast for the area tend to be in higher wage brackets than past job additions which will reverse this trend resulting in 1980 levels approaching those of 1970.

TABLE E-5
Actual and Forecast Per Capita Personal Income
for Choctaw and Pushmataha Counties
In Current and Constant Dollars
1970-1980

Year	Unadjusted			Adjusted ¹		
	Choctaw	Pushmataha	Average	Choctaw	Pushmataha	Average
1970	2,226	1,842	2,079	2,171	1,584	2,079
1977	3,531	3,332	3,459	1,946	1,836	1,906
1980 ²	3,758	3,518	3,681	2,143	1,873	2,045

¹In terms of 1967 dollar equivalents.

²Forecast.

Source: Bureau of Economic Analysis, U.S. Department of Commerce; and estimates by the authors based on forecasts by the National Planning Association.

The result of the accelerated increases in per capita income through 1980 are such that the forecasts based on later data will exceed previous forecasts by significant amounts as shown in Table E-6.

TABLE E-6
Actual and Estimated Per Capita Personal Incomes
In Choctaw and Pushmataha Area¹
1980

County	Forecast ²	Forecast ³	Forecast ⁴	Impact
Choctaw	1,598	1,644	2,143	545
Pushmataha	1,365	1,365	1,873	508
Average	1,520	1,549	2,045	525

¹All data in 1967 dollar equivalents.

²Assuming no reservoir will be built.

³1967 estimates assuming the reservoir is built.

⁴1978 estimates assuming the reservoir is built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969, and estimates by the authors.

Total Personal Income

Applying the forecasts for 1980 shown in Table E-6 to the forecasted population detailed in Table E-1 results in the estimates of total personal income shown in Table E-7.

The relatively large impact indicated for Choctaw County is due in part to the projected influx of construction workers into the area in 1980. Current estimate of wages paid construction workers of the types who will be working on the proposed project indicate that, in terms of 1967 dollars, this work force will receive about \$2.5 million in 1980. This added income contributes a significant increase in future income of area residents and is a direct result of the reservoir.

TABLE --
 Forecasts of Total Personal Income
 in Choctaw and Pushmataha Counties¹
 1980
 (Thousands of Dollars)

County	Forecast ²	Forecast ³	Forecast ⁴	Impact
Choctaw	28,364	36,053	41,146	12,782
Pushmataha	12,189	15,288	20,228	8,039
Total	40,553	51,341	61,374	20,821

¹All data in 1967 dollar equivalents.

²1967 forecast assuming no reservoir is built.

³1967 forecast assuming the reservoir is built.

⁴1978 forecasts.

Source: Tables E-1 and E-6 and The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969.

Agriculture

The decline noted in agriculture production between 1973 and 1975 showed signs of reversal by 1977 and this pattern is expected to continue through 1980. It is of note, however, that all of the gains through the next three years are expected to occur in Choctaw County while the farm output in Pushmataha County will continue to decline. These data are detailed in Table E-8.

TABLE E-8
Actual and Forecast Agriculture Production
in Choctaw and Pushmataha Counties
1970-1980
(Thousands of Dollars)¹

Year	Choctaw	Pushmataha	Total
1970	9,584	7,549	17,133
1977	7,283	5,188	12,471
1980 ²	10,925	4,499	15,424

¹In current dollars.

²Forecasts.

Source: U.S. Department of Agriculture; the Bureau of Economic Analysis, U.S. Department of Commerce and estimates by the authors.

The data related in Table E-8 are quoted in current dollars and thus are not comparable with forecasts prepared during the earlier study. The data for 1980, adjusted to constant 1967 dollar equivalents are shown in Table E-9, and are compared with earlier forecasts.

The data shown in Table E-9 reflect first that later data available between 1967 and 1977 did not materially change the forecast of farm production for 1980. These data also show that, in terms of buying power, the agriculture sector was not greatly influenced by the reservoir. A part of this relative lack of

TABLE E-2
Actual and Forecast Agriculture Production
In Choctaw and Pushmataha Counties
1980
(Thousands of Dollars)

County	Forecast ²	Forecast ³	Forecast ⁴	Impact
Choctaw	4,550	4,900	5,655	1,105
Pushmataha	2,710	2,950	2,685	-25
Total	7,260	7,850	8,340	1,080

¹In 1967 dollar equivalents.

²Assuming no reservoir is built.

³1967 forecast assuming the reservoir is built.

⁴1978 forecast assuming the reservoir is built (new method).

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969, and estimates by the authors.

reaction to the reservoir by the farming industry was due to the fact that other economic influences such as inflation and some market gluts have held the dollar value of farm output below what might have been expected.

Value Added by Manufacturing

The short-term forecasts for value added by manufacture suggest that the upward trends noted since 1970 will continue at least through 1980 when the total will exceed \$6 million in current dollars. This represents nearly twice the value added by manufacturing reported for the area in the Census of Manufactures, 1972 and is more than double the volume in 1967.

When the dollar figures are deflated to 1967 dollar equivalents, the apparent increase in efficiency and size of the manufacturing sector of the area's economy is less significant since much of the growth has been due to inflation. A comparison of the actual and forecast value added by manufacturing in current dollars and in 1967 dollar equivalents is shown in Table E-10.

TABLE E-10
Actual and Forecast Value Added by Manufacturing
In Choctaw and Pushmataha Counties
1972 and 1980
(Thousands of Dollars)

County	1972		1980 ¹	
	Current	1967 Equivalents	Current	1967 Equivalents
Choctaw	3,085	2,476	5,410	2,799
Pushmataha	400	319	675	349
Total	3,485	2,795	6,085	3,148

¹Forecast.

Source: Census of Manufactures, Oklahoma, 1972; and estimates by the authors.

It should be noted that, the absolute value added by manufacturing in 1980 (in terms of 1967 dollars) was slightly above that of 1972. This indicates that, while inflation will erode some of the increases in manufacturing activity in the Study Area, some gains will occur.

In an attempt to determine the areas of manufacturing in which increases should occur, the manufacturing activities in the area were disaggregated into two digit SIC groupings. This analysis appears in Table E-11.

TABLE E-11
Actual and Forecast Value Added by Manufacture
In Choctaw and Pushmataha Counties
by Industrial Classification
1972 and 1980
(Thousands of Dollars)¹

Industrial Category	1972	1980 ²	Change
Food	289	248	-41
Apparel	1,393	1,452	59
Lumber & Wood Products	881	946	65
Printing and Publishing	158	150	-8
Chemical	16	31	15
Electrical	0	55	55
Other Transportation	0	81	81
Fabricated Metal	0	41	41
Other Durables	54	84	30
Other Non Durables	4	44	40
Miscellaneous Mfg.	0	16	16
Total	2,795	3,148	353

¹In 1967 dollar equivalents.

²Forecast.

Source: Table E-10 and estimates by the authors based on projections by the National Planning Association.

The data shown in Table E-11 indicate that the category "Other Transportation" evidences the greatest potential for growth. This manufacturing activity is currently represented in the area by a rail freight car repair and rehabilitation operation. Given the growing emphasis on the future use of rail as a transportation mode, particularly for transporting coal and other bulky commodities, industries supplying products and services have a particularly bright outlook.

Comparing the present forecasts to 1980 with those developed for the prior study reveal, as was the case with employment, that the previous study rather significantly over estimated the potential growth in manufacturing, at least in the short term. These forecasts are compared in Table E-12.

TABLE E-12
Forecasts of Value Added by Manufacture
In Choctaw and Pushmataha Counties
1980
(Thousands of Dollars)¹

County	Forecast ²	Forecast ³	Forecast ⁴	Impact
Choctaw	6,500	9,230	2,799	-3,701
Pushmataha	290	500	349	59
Total	6,790	9,730	3,148	-3,642

¹In 1967 dollar equivalents.

²Assuming no reservoir is built.

³1967 forecast assuming a reservoir is built.

⁴1978 forecast assuming a reservoir is built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969; and Tables E-10 and E-11.

Electric Power Consumption

Consumption of electrical energy in the Study Area accelerated rapidly during the 1970's particularly in residential uses. As pointed out earlier, this sharp rise in consumption of electricity by residential users was due to the rapid adoption of new appliances and growth in use of electric heat by residents of the Study Area. With the growing shortage of energy and ballooning of electricity bills, however, it appears that the rate of increase in residential use is slowing down. This latter trend is expected to continue through 1980 at which time total energy consumption in the area will exceed 185.7 million kilowatt hours per year. These trends are detailed by county in Table E-13.

Comparing the forecast of electricity consumption as shown in Table E-13 with the forecasts prepared for the earlier study confirms the fact that the trend extrapolation method used in the previous study, based on low usage levels prevalent between 1940 and 1967 could not capture the effects of the rapidly increasing household consumption which characterized the 1970's. Thus, the earlier forecasts for 1980 understated forecasts utilizing later data by 68 percent. The various forecasts of electricity consumption in 1980 appear in Table E-14.

It should be noted that while the reservoir may cause some of the increase in industrial and commercial use of electricity, the major influence on consumption has been the aggressive advertising programs of the area's electricity suppliers. These programs have resulted in changes in energy sources (i.e. gas or fuel oil to electric) and have also increased the appliance inventories in the area.

TABLE E-13
Actual and Estimated Electricity Consumption
in Choctaw and Pushmataha Counties
by Type of User
1970-1980
(Thousand Kilowatt Hours)

County	1970			1977			1980 ¹		
	Residential	Industrial	Total	Residential	Industrial	Total	Residential	Industrial	Total
Choctaw	19,912	19,275	39,187	59,436	50,828	110,264	83,727	55,056	138,783
Pushmataha	10,970	3,672	14,642	34,990	9,800	44,790	35,916	11,091	47,007
Total	30,882	22,947	53,829	94,426	60,628	155,054	119,643	66,147	185,790

¹ Forecast.

Source: Public Service Company of Oklahoma; Choctaw Rural Electric Cooperative and forecasts by the authors based on projections by Choctaw Rural Electric Cooperative.

TABLE E-14
Forecasts of Electricity Consumption
in Choctaw and Pushmataha Counties
by Type of User
1980
(Thousand Kilowatt Hours)

County	Forecast ¹			Forecast ²			Forecast ³			Impact	
	Residential	Industrial	Total	Residential	Industrial	Total	Residential	Industrial	Total	Residential	Industrial
Choctaw	13,500	17,570	31,070	17,000	26,270	43,270	83,727	55,056	138,783	70,227	37,486
Pushmataha	5,500	9,290	14,790	6,200	10,100	16,300	35,916	11,091	47,007	30,416	1,801
Total	19,000	26,860	45,860	23,200	36,370	59,570	119,643	66,147	185,790	100,643	39,287
											139,930

¹ Assuming no reservoir is built.

² 1967 forecast assuming the reservoir is built.

³ 1978 forecast assuming the reservoir is built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969 and forecasts by the authors.

Finance

A previous discussion pointed out the fact that the original Study Area considered only demand deposits whereas a more revealing indicator of financial activities would have been total bank deposits. For this reason, bank deposit data contained in the earlier study have been adjusted to include savings deposits in banks.

The upward trend noted in bank deposits between 1970 and 1977 are expected to continue through 1980 at least at which time they will exceed \$84 million (in current dollars) which is nearly \$14 million above the 1977 level. When converted to 1967 dollar equivalents, area bank deposits in 1980 are forecast to reach \$43.8 million which is \$4 million above the 1977 total. These adjusted bank deposit data are shown for selected years in Table E-15.

TABLE E-15
Actual and Forecast Bank Deposits
in Choctaw and Pushmataha Counties
1970-1980
(Thousands of Dollars)¹

County	1970	1977	1980 ²
Choctaw	21,580	26,434	29,787
Pushmataha	8,168	12,685	13,974
Total	29,748	39,119	43,761

¹In 1967 dollar equivalents.

²Forecast.

Source: The Official Directory of Oklahoma Banks, Oklahoma Bankers Association and estimates by the authors.

Comparing the forecast of deposits in area banks in 1980 with forecasts contained in the previous study reveals that, as was the case in other economic indicators the estimating method used in the prior study seriously underestimated bank deposits. In the prior method, bank deposits were assumed to vary with changes in income. Since income in the Study Area behaved differently after 1967 than in prior years, the estimating equation was conditioned by the pre-1967 trends and did not capture the impact of changes in later years. As a result, the 1980 forecast of bank deposits contained in the earlier study was nearly \$19 million less than the more current forecast. These forecasts are compared in Table E-16.

TABLE E-16
Forecasts of Bank Deposits
in Choctaw and Pushmataha Counties
1980
(Thousands of Dollars)¹

County	Forecast ²	Forecast ³	Forecast ⁴	Impact
Choctaw	13,624	17,080	29,797	16,173
Pushmataha	6,356	7,750	13,974	7,618
Total	19,980	24,830	43,761	23,781

¹In 1967 dollar equivalents.

²Assuming the reservoir is not built.

³1967 forecast assuming the reservoir is built.

⁴1978 forecast assuming the reservoir is built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969 and estimates by the authors.

The previous study commented at some length on the leakage of funds from the Study Area to external environments. A portion of this leakage was due to a lack of a thrift institution (i.e. Savings and Loan Association) in the area.

In 1977, a savings and loan association was chartered in Choctaw County with assets in excess of \$2 million and savings account balances of \$3.7 million. Based on its rate of growth since its inception, this financial institution is expected to have savings account balances of \$5.5 million (in current dollars, or \$2.8 million in 1967 dollar equivalents) by 1980. A more accurate picture of the changes in the financial conditions of the Study Area would be the inclusion of these savings balances with the bank deposits. Thus, deposits in all financial institutions by 1980 are expected to be \$26.5 million greater than was forecast in 1967 assuming that no reservoir were to be built

Loans and Discounts

Loans and discounts by banks in the Study Area are forecast to continue the patterns set in the late 1960's and during the 1970's. These forces are expected to raise the total loan and discount volume in the area to more than \$48 million (in current dollars) by 1980. When reduced to 1967 dollar equivalents this loan and discount volume will be near \$25 million.

Table E-17 compares this forecast with forecasts developed in the earlier study.

TABLE E-17
Forecasts of Bank Loans and Discounts
in Choctaw and Pushmataha Counties
1980
(Thousands of Dollars)¹

County	Forecast ²	Forecast ³	Forecast ⁴	Impact
Choctaw	6,530	9,590	16,978	10,448
Pushmataha	2,630	4,290	7,995	5,365
Total	9,160	13,880	24,973	15,813

¹In 1967 dollar equivalents.

²Assuming no reservoir is built.

³1967 forecast assuming the reservoir is built.

⁴1967 forecast assuming the reservoir is built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties,
Business Research Center, Oklahoma City University, 1969 and estimates by the
authors.

Transportation

The original study projected significant increases in both truck and rail shipments between 1970 and 1977 when actually rail shipments tended to decline and truck shipments rose rapidly. These trends are expected to continue throughout the remainder of the 1970's unless the rising costs of motor vehicle fuel raise trucking costs to an unacceptable level, at which time rail movements, because of their cost advantage will once again turn upward.

Railway Movements, 1977-1980

Rail freight car movements were forecast to increase to 1,313 carloads by 1980 from the 1,203 forecast for 1970, assuming the reservoir was built. However, trends in rail shipments between 1967 and 1977 indicated that a definite change had occurred in the use of transportation media serving the area and that use of rail for shipments was of lesser importance than was originally projected. As a result of this reversal, freight car shipments for the area by 1980 are forecast to be 632 carloads. These data are detailed in Table E-18.

The data shown in Table E-18 reveal that even after the reservoir was built, freight shipments by rail declined in the Study Area. This lends further credence to the assumption that the original estimating technique was not able to adjust for a decrease in use of rail.

Truck Shipments

Truck shipments of freight into and out of the Study Area were originally forecast to increase by approximately one third between 1970 and 1980 as business

TABLE E-18
Actual and Forecast Rail Shipments
in Choctaw and Pushmataha Counties
1970-1980
(Number of Carloads)

Year	Forecast ¹	Forecast ²	Actual ³	Impact
	Total	Total	Total	Total
1970	877	1,203	918	41
1977	833	1,280	709	-124
1980	814	1,313	632	-182

¹Forecast assuming reservoir is not built.

²1967 forecast assuming reservoir is built.

³Actual 1970 and 1977. 1980 forecast assuming reservoir is built.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969, and estimates by the authors.

activity in the area accelerated. In fact however, total truck shipments between 1970 and 1977 rose 62 percent which was well above the rate projected for the full ten year period. This accelerated trend caused the revised forecast for 1980 to reach a level at near 23 thousand shipments, an increase of about 78 percent over the ten year period. The actual and revised forecast of truck shipments between 1970 and 1980 is compared with forecasts for the same period presented in the original study in Table E-19.

TABLE E-19
Actual and Forecast Truck Shipments
in Choctaw and Pushmataha Counties
1970-1980
(Numbers of Shipments)

Year	Forecast ¹	Forecast ²	Actual ³	Impact
1970	14,360	15,070	14,973 ⁴	613
1977	15,940	18,353	20,436 ⁴	4,496
1980	16,180	20,250	22,982 ⁵	6,802

¹Forecast assuming no reservoir is built.

²1967 forecast assuming the reservoir is built.

³1978 actual and forecast adjusted for revised data.

⁴Actual.

⁵Forecast.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969; and estimates by the authors.

Construction

The effects of highway construction which tended to cloud the picture between 1967 and 1977 have now disappeared so that forecasts to 1980 can more nearly reflect the impact of the reservoir without undue adjustment. Of course, to make the revised 1980 forecast compatible with those previously presented, the dollar volume of the forecast presented herein will be adjusted for price changes since 1967.

Construction 1977-1980

Previous forecasts of total construction activity in the Study Area indicated that by 1980, the dollar volume of this economic sector would approximate \$15.5 millions, a decline of \$1.5 million from the 1970 total. However, the experience since 1967 and an analysis of the construction cycle of the area indicates that, in current dollars, the volume of construction by 1980 will approximate \$19.5 million. This represents an increase of \$2.3 million over the 1970 level. In terms of 1967 dollar equivalents, the 1980 volume is projected to be \$10.1 million. These data are shown in Table E-20.

TABLE P-20
Actual and Forecast Construction Activity
in Choctaw and Pushmataha Counties
1970-1980
(Millions of Dollars)

Year	Forecast ¹	Forecast ²	Actual ³	Actual ⁴	Impact ⁵
1970	9.0	17.0	14.2	12.2	3.2
1977	10.4	16.0	25.1	13.8	3.4
1980 ⁶	11.0	15.5	19.5	10.1	-0.9

¹Forecast assuming no reservoir is built.

²1967 forecast assuming the reservoir is built.

³Actual and 1978 forecast assuming reservoir is built in current dollars.

⁴Actual and 1978 forecast assuming reservoir is built (new method) in 1967 dollar equivalents.

⁵Impact = Actual in 1967 dollar equivalents minus forecast without reservoir.

⁶Forecast.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969; and estimates by the authors.

General Economic Growth

The varying effects of the reservoir on the individual economic sectors noted between 1967 and 1977 continued, although to a lesser degree, through 1980. Thus, the use of an aggregative index composed of several economic factors provided the only suitable means for forecasting the future impact of the reservoir on the total economy of the area.

Economic Change 1977-1980

The slowdown in the rate of economic growth of the study area since 1970 will continue at least through 1980 when the index constructed for this purpose will reach 233 compared with 241 forecast earlier. Thus, the impact of the reservoir will be eight index points less than earlier projected. Trends of general economic activity between 1970 and 1980 are shown in Table E-21.

TABLE E-21
Trends in General Economic Activity
of Choctaw and Pushmataha Counties
1970-1980
(1957-59 = 100)

Year	Forecast ¹	Forecast ²	Actual ³	Impact ⁴
1970	138	210	213	68
1977	166	231	223	57
1980 ⁵	180	241	233	53

¹Assuming no reservoir is built.

²1967 forecast assuming reservoir is built.

³Actual and 1978 forecast by the authors.

⁴Impact = Actual minus forecast without reservoir.

⁵Forecast.

Source: The Impact of the Hugo Reservoir on Choctaw and Pushmataha Counties, Business Research Center, Oklahoma City University, 1969; and estimates by the authors.

Recreation Activities

As noted earlier, the projections of visitor days of the Hugo Reservoir presented in the original report badly understated both the number and expenditures of visitors. Based on current growth patterns, the number of visitor days which are projected for the reservoir by 1980 will be 1.3 million. Total expenditures since 1975 are forecast to be \$9.0 million (in current dollars or \$4.6 million in 1967 dollar equivalents).

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