

APPENDIX Y

REGIONAL ECONOMIC IMPACT ASSESSMENT OF THE NORTH CENTRAL MISSOURI REGIONAL WATER COMMISSION (NCMRWC) WATER SUPPLY RESERVOIR

**Regional Economic Impact Assessment of the North Central Missouri
Regional Water Commission (NCRMWC) Water Supply Reservoir**

Lauren Cartwright
Economist
USDA-NRCS
Columbia, MO

Mubarak Hamed
Economist
MoDNR
Jefferson City, MO

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Introduction

In 2002 the North Central Missouri Regional Water Commission (NCRMWC) was formed to develop a reliable supply of water for north central Missouri. The area proposed for service by NCRMWC is referred to as the Green Hills Service area consisting of all or portions of ten counties in north central Missouri. In August 2003, Burns and McDonnell engineering completed a feasibility study for NCRMWC which estimated future water demands and identified potential water sources. The feasibility study has led to a Revised Watershed Plan and Environmental Impact Statement conducted by NRCS for a multiple purpose water supply and recreation reservoir in Sullivan County on East Locust Creek.

The development of the reservoir in Sullivan County to provide water supply and recreation is projected to have an impact on the local economy in terms of economic value added and jobs.

The main purpose of this study is to estimate the economic impact of the planned reservoir on the Green Hills Area. The reservoir is assumed to generate a variety of economic benefits to the region. The IMPLAN computer model is used to quantify the benefits and costs to the region from the construction of the reservoir. The IMPLAN assessment will aid NCRMWC in planning and project justification at the local level.

General Description of the Green Hills Service Area

The reservoir will serve the Green Hills region of North Missouri. The service area incorporates all or portions of the following counties: Adair, Chariton, Grundy, Linn, Livingston, Macon, Mercer, Putnam, Schuyler, and Sullivan.

The economy of the Green Hills region of North Central Missouri generally lags behind the economy of Missouri. There has been a varied amount of economic growth in this region during the last ten years. From 1990 to 2003, the population has declined -0.6% in the Green Hills Region, while the state's population has grown 11.5% (OSED, 2005). Four counties in the Green Hills Region experienced population growth; Sullivan

(11.9%), Macon (1.5%), Putnam (1.4%) and Adair (0.9%). The remaining six counties declined in population. The greatest decline in population are Chariton (-10.3%), Mercer (-3.4%), and Linn (-3.1%).

The 2000 poverty rate for this area is 15.3%. This compares with 11.7% for the state as a whole. Only Chariton County at 11.6% compares with the state poverty rate. All other counties in the Green Hills Region are above the state rate. The highest poverty rates are seen in Adair (23.3%), Schuyler (17.0%), and Sullivan (16.5%) (OSED, 2005).

The average unemployment rate for the Green Hills Region has fluctuated around the state unemployment rate each year since 2000 with some years slightly above the state unemployment rate (2001 and 2003), some years slightly below the state unemployment rate (2000 and 2004), and 2002 equal to the state unemployment rate (OSED, 2005 and DED, 2005)¹. From 2001 to 2004 Chariton and Linn Counties were consistently above the state unemployment rate. Adair and Livingston Counties have remained consistently below the state unemployment rate during 2000 to 2004. Sullivan County experienced a spike in unemployment in 2003 (11.2%) as a result of a major employer, ConAgra, closing its facility.

The average growth in per capita income in the Green Hills Region from 1992 to 2002 is slightly below the growth of the state as a whole (14.3% in the Green Hills Regions versus 15.1% in the state). Average per capita income in the region was \$21,606 in 2002 compared with \$28,512 for the state (OSED, 2005). Mercer County experienced the slowest rate of growth in per capita income from 1992-2002 at 5.8%. Sullivan, Schuyler, and Putnam counties experienced the highest rates of growth in per capita income from 1992-2002 of 22.3%, 18.1% and 18.3% respectively. The remaining counties in the Green Hills Region experienced rates between 10.3% (Grundy County) and 16.3% (Chariton County).

¹ State unemployment rates are 5.3% in 2000, 4.7% in 2001, 5.5% in 2002, 5.6% in 2003 and 5.1% as of October 2004.

Methodology

Economic Evaluation of Benefits and Costs

Establishing the reservoir represents a public investment in natural resources that will generate a variety of environmental and economic benefits and costs. The analysis of these benefits and costs is referred to as economic impact analysis. Economic impact analysis is an assessment of change in overall economic activity as a result of some change in one or several economic activities (MIG, 2004). This study evaluates the economic impacts of the NCMRWC reservoir project using the IMPLAN (Impact Analysis for Planning) model. IMPLAN is a non-survey-based input-output model developed by the US Forest Service in 1993. IMPLAN is used for input-output analysis of any county or combination of counties in the U.S, and is designed to estimate changes in total economic output, total value added to the economy and employment for impacts in up to 509 economic sectors.

The IMPLAN economic impact model for the reservoir measures both the benefits and costs of the project. Benefits are increases in regional economic activity. Costs are decreases in regional economic activity and direct local cost expenditures related to the reservoir. Economic activity is measured in terms of dollars (value added and output) and jobs (employment). Value added is a monetary measure of employee compensation, proprietary income, other property type income and indirect business taxes generated (or lost) due to the impact. Output is a monetary measure of total industry production generated (or lost) due to the impact. Employment is measured in jobs gained (or lost) due to the impact. In the reservoir model, the impacts are modeled as either long term and short term impacts according to whether the impact will continue throughout the life of the project (long term) or whether the impact will occur during the construction phases of the project only (short term).

The Green Hills region's benefits from the reservoir accrue from the construction activities related to the construction of the dam itself, the water supply structures (raw water intake structure and transmission lines), and the recreation facilities. Benefits also accrue due to operation and maintenance activities, the public's participation in recreation

activities and the expansion of industry. Table 1 summarizes the impact and whether the impact is modeled as a short term or long term impact.

Table 1: Regional Benefits of the Reservoir

Impact	Life of Impact
Dam Construction	Short Term
Water Supply Construction (raw water intake and transmission lines)	Short Term
Dam Operation and Maintenance	Long Term
Recreation Facilities Construction	Short Term
Recreation Facilities Operation and Maintenance	Long Term
Recreation Activities	Long Term
Industry Expansion	Long Term

The Green Hills region's costs of installing the reservoir are lost agricultural production and lost forestry production for lands that will be inundated and included as part of the project easement area. The region will also lose local property tax revenue from those same properties. The local sponsor of the reservoir project is responsible for the cost of property acquisition, easement and infrastructure, the local construction cost portion of the reservoir construction and operation and maintenance costs. Table 2 summarizes the impacts and whether they are modeled as a short term or long term impact.

Table 2: Regional Costs of the Reservoir

Impact	Life of Impact
Lost Agriculture (includes forestry)	Long Term
Lost Property Tax Revenue	Long Term
Property Acquisition, Easement, and Infrastructure	Short Term
Local Construction Cost	Short Term
Operation and Maintenance	Long Term

Tables 1 and 2 provide the general framework for modeling the regional impacts of the reservoir. The magnitude of the impacts and the economic sectors where the impact occurs in the model is described below.

Assumptions

During the course of the development of the IMPLAN model, two additional impacts were identified; the cost of additional road maintenance as a result of increased visitation to the recreation area, and increased or decreased cost of water to the users compared to their current cost.

The pool area of the reservoir will inundate several roads. The closure of roads represents a decrease in road maintenance costs to the region. Due to the difficulties in trying to capture a net change in road maintenance, the model assumes that the increase in road maintenance due to recreation visitors is offset by the decrease in road maintenance from the inundated roads. As more information is obtained this factor can be added to the model and analyzed.

This early in the planning process of the reservoir means that water supply costs are not known, and any modeling of an increase or decrease in water costs to the users is purely speculation. Therefore, the model assumes that the user will not experience any change in their water supply costs. As more information is obtained on water rates for the new reservoir this factor can be added to the model.

Value of Impacts and Sectors Modeled

The impacts of the benefits and costs of the reservoir are modeled as shocks to the regional economy in a specified sector of the economy. IMPLAN delineates 509 sectors linked to NAICS (North American Industry Classification Scheme) and Bureau of Economic Analysis (BEA) commodity classifications (MIG, 2004).

Benefits

Dam construction represents the actual physical construction and earthmoving associated with constructing the dam. The estimated cost of dam construction is \$34,767,000 and is modeled as a shock to IMPLAN sector 39, highway, street, bridge, tunnel construction. Water supply construction is the construction of the raw water intake structure and transmission lines that will provide water supply from the reservoir to the treatment plant. The estimated cost of water supply construction is \$4,651,200 and is modeled as a shock

to IMPLAN sector 40, water, sewer and pipeline construction. Dam operation and maintenance is the continuous maintenance needs that will accrue over the life of the dam. This includes activities such as mowing and brush control on the dam itself to replacement and repair of pipes and structures associated with the reservoir. The estimated capitalized² cost of dam operation and maintenance is \$1,684,000 and is modeled as a shock to IMPLAN sector 44, maintenance and repair of highway, street, bridge and tunnel construction.

Recreation facilities construction is the construction of facilities needed to enhance recreation opportunities such as boat landings, picnic shelters and walking/biking trails. The estimated cost of recreation construction is \$2,269,000 and is modeled as a shock to IMPLAN sector 41, other new construction. The estimated capitalized cost of recreation facilities operation and maintenance is \$621,500 and is modeled as a shock to IMPLAN sector 45, other maintenance and repair construction. Recreation activities represent the benefits of having recreation available to the public and the monetary value of that recreation to the public. The estimated capitalized recreation benefit is \$38,861,800 and is modeled as a shock to IMPLAN sector 478, other amusement, gambling, and recreation industry.

Industry expansion represents the benefits of Premier Foods, Inc. plans to expand production as a result of more available water (Wise, 2004). The estimated benefit of industry expansion is 550 new jobs and is modeled as a shock to IMPLAN sector 13, animal production. Table 3 summarizes the benefits, value of the impact and IMPLAN sector.

² Operation and maintenance costs are generated in average annual terms for planning. In order to convert to a capitalized value to model in IMPLAN, we use the project life of 100 years and 5.375% discount rate (the 2005 Federal Rate for Water Resources Projects)

Table 3: Benefits, Value and IMPLAN Sector

Impact	Value	IMPLAN Sector
Dam Construction	\$34,767,000	39- Highway, street, bridge, tunnel construction
Water Supply Construction	\$4,651,200	40- Water, sewer, pipeline construction
Dam Operation and Maintenance	\$1,684,000	44- Maintenance and repair of highway, street, bridge, tunnel
Recreation Facilities Construction	\$2,269,000	41- Other new construction
Recreation Facilities Operation and Maintenance	\$621,500	45- Other maintenance and repair
Recreation Activities	\$38,861,800	478- Other amusement, gambling, recreation industry
Industry Expansion	550 jobs	13- Animal production

Costs

Lost agriculture represents the land currently in agricultural production that will be removed from production because of the reservoir. The regional costs of lost agricultural production represent lands in corn, soybeans, hay and pasture. The estimated capitalized value of lost agricultural production is \$3,355,000 (\$340,500 for corn, \$1,127,000 for soybeans, \$1,286,100 for hay, \$601,400 for pasture) and is modeled as shocks to the following IMPLAN sectors: sector 2, grain farming for corn; sector 1, oilseed farming for soybeans; sector 10, all other crop farming for hay; sector 11, cattle ranching and farming for pasture. Lost forestry production represents an estimate of the land in the region that has marketable timber and will be removed from production by the reservoir. The estimated capitalized value of lost forestry production is \$1,703,000 and is modeled as a shock to IMPLAN sector 14, logging.

Lost property tax revenue represents the revenue the local economy will lose as a result of the reservoir. Lost property taxes impact schools, library, hospital, health department, ambulance services and watershed district/county/state/townships. The estimated capitalized cost of lost property tax revenue is \$235,000 (\$126,200 for schools, \$3,800 for library, \$16,200 for library, \$9,400 for Health Department, \$18,800 for ambulance service, and \$60,600 for watershed district/county/state/townships) (Hostetter, 2005) and is modeled as a shock to the following IMPLAN sectors: sector 461, elementary and

secondary schools; sector 463, other educational services; sector 467, hospitals; sector 470 social assistance; sector 466, other ambulatory health care service; and sector 499, other state and local government enterprises.

The local sponsor is responsible for the cost of property acquisition, easement and infrastructure. The estimated cost is \$6,138,800. The local sponsor is also responsible for a portion of the cost of reservoir construction³. The estimate local construction cost is \$11,060,500. The local sponsor is also responsible for the operation and maintenance costs. The estimated capitalized operation and maintenance costs for the dam and recreation facilities are \$1,684,000 and \$621,200 respectively. These costs are included in the analysis as direct costs. Table 4 summarizes the cost, value of the impact and IMPLAN sector.

Table 4: Costs, Value and IMPLAN Sector

Impact	Value	IMPLAN Sector
Lost Agriculture Production		
Corn	\$340,500	2- Grain farming
Soybeans	\$1,127,000	1- Oilseed farming
Hay	\$1,286,100	10- All other crop farming
Pasture	\$601,400	11- Cattle ranching and farming
Forestry	\$1,703,000	14- Logging
Lost Property Tax Revenue		
Schools	\$126,200	461- Elementary and secondary schools
Library	\$3,800	463- Other educational services
Hospital	\$16,200	467- Hospitals
Health Department	\$9,400	470- Social assistance
Ambulatory Service	\$18,800	466- Other ambulatory health care services
Watershed District/county/state/townships	\$60,600	499- Other state and local government enterprises
Property Acquisition, Easement and Infrastructure	\$6,138,800	Direct cost
Local Construction Cost	\$11,060,500	Direct cost
Operation and Maintenance, Reservoir	\$1,684,00	Direct cost
Operation and Maintenance, Recreation Facilities	\$621,200	Direct cost

³ NRCS National Watershed Manual Part 500, Subpart B, Section 11 provides guidance on cost share rates.

Results and Discussion

As described above, the impacts of the benefits and costs of the reservoir are modeled as shocks to the regional economy that is initiated in a specified sector of the economy. These are the inputs of the IMPLAN model. The output represents what impact that input has as it influences all sectors of the economy. Outputs of the model can be analyzed on a sector basis or as an aggregate total impact. For the purposes of this model, the aggregate total impacts are presented in terms of the value added to the economy and the jobs generated.

There are several assumptions related to the presentation of the results of the regional impact analysis.

- The construction period for the dam, water supply structures and recreation facilities is six years
- The reservoir has a 100 year life span, and the life begins at the completion of construction
- The recreation and industry expansion benefits do not begin accruing until construction is complete, and will accrue for the 100 year life span of the reservoir
- The local sponsor cost for property acquisition, easement and infrastructure and the local construction cost is financed at 5% for 20 years
- Costs associated with lost agriculture, forestry and lost property taxes begin accruing at the start of construction and continue to the end of the project life
- All costs and benefit results (except property rights and local cost share) are annualized to allow for comparison using 5.375%, the 2005 federal discount rate for water related projects
- Employment generated (or lost) is the total jobs generated (or lost) from the activity during the period of impact, not annual employment generation (or loss)

Benefits

During the six year construction period, recreation facilities construction, dam construction and water supply construction generate \$1,672,541, \$18,972,233 and \$2,254,448 in value added to the regional economy respectively. Annualized over the six years, recreation facilities construction generates \$333,500 annual value added, dam construction generates \$3,782,800 annual value added and water supply construction generates \$449,500 annual value added. Total employment generated during the six years is 66 jobs for recreation facilities construction, 681 jobs for dam construction and 84 jobs for water supply construction.

At the end of the six year construction period, the benefits resulting from industry expansion, recreational activities, dam operation and maintenance, and recreational facilities operation and maintenance will begin to accrue and will continue for the 100 year life of the reservoir. The value added to the regional economy is as follows; \$15,336,134 (\$828,700 annually) for industry expansion, \$32,555,294 (\$1,759,200 annually) for recreational activities, \$801,418 (\$43,300 annually) for dam operation and maintenance, and \$436,622 (\$23,600 annually) for recreational facilities operation and maintenance.

Costs

The local sponsor is responsible for property acquisition, easement and infrastructure costs and the local construction cost portion of the reservoir. Property costs are estimated at \$6,138,800 (\$492,600 annually). The local construction cost is estimated to be \$11,060,500 (\$887,500 annually). These costs are assumed to be financed for 20 years.

At the end of the construction period, the local sponsor is responsible for the costs of operation and maintenance of the reservoir and recreation facilities for the life of the project. The operation and maintenance costs for the reservoir are \$1,684,000 (\$91,000 annually), and the operation and maintenance costs for the recreation facilities are \$621,200 (\$33,600 annually).

The lost value added associated with lost agricultural production (including forestry) and lost property taxes are \$3,150,442 (\$170,000 annually) and \$150,768 (\$8,100 annually) respectively. The lost employment is 129 jobs for lost agriculture and 7 jobs for lost property tax revenue.

Figure 1 presents the results of the analysis and the time frame in which those benefits and costs occur. Figure 2 summarizes the annual value added or lost to the region.

Figure 1: Value Added and Employment Costs and Benefits

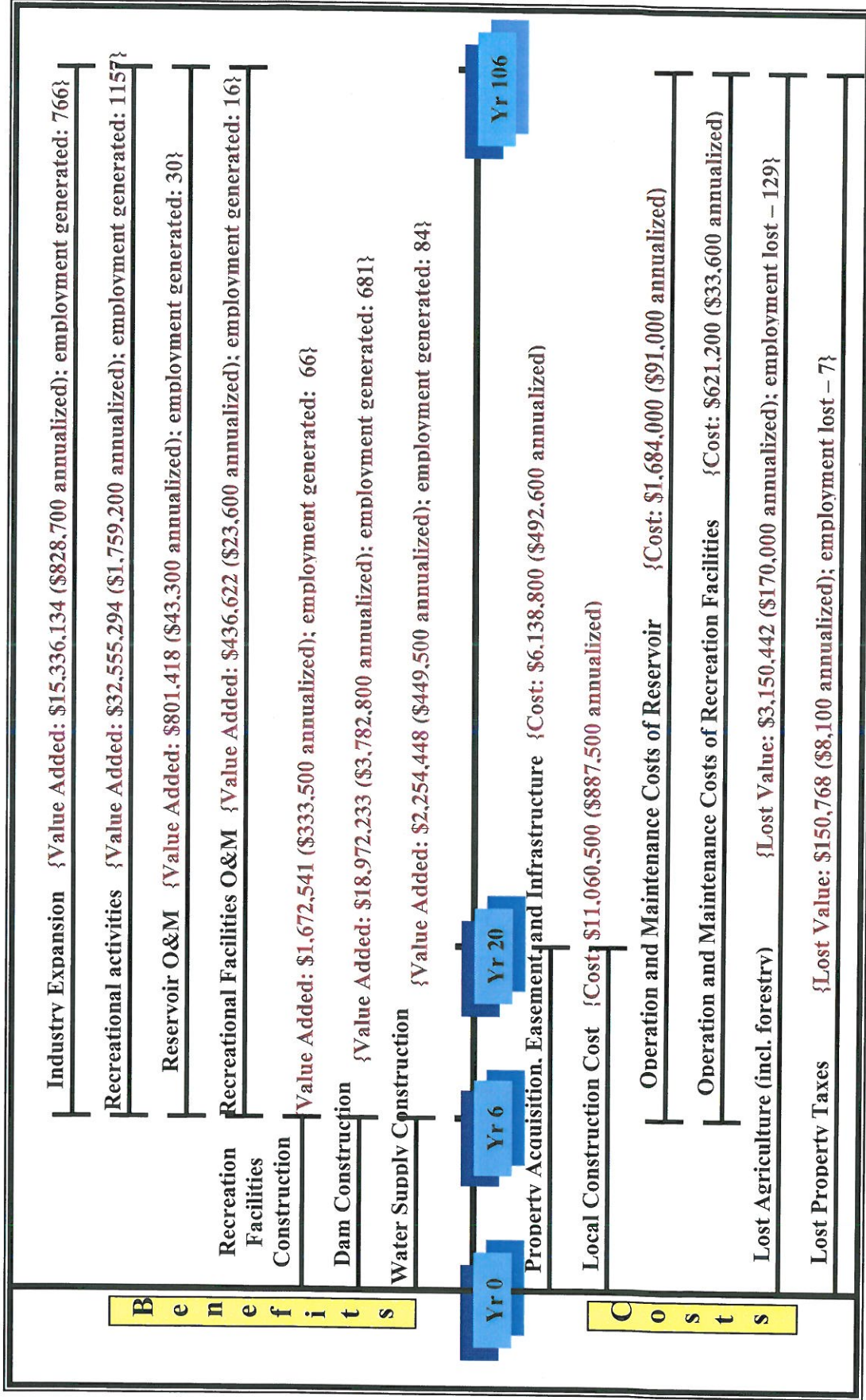
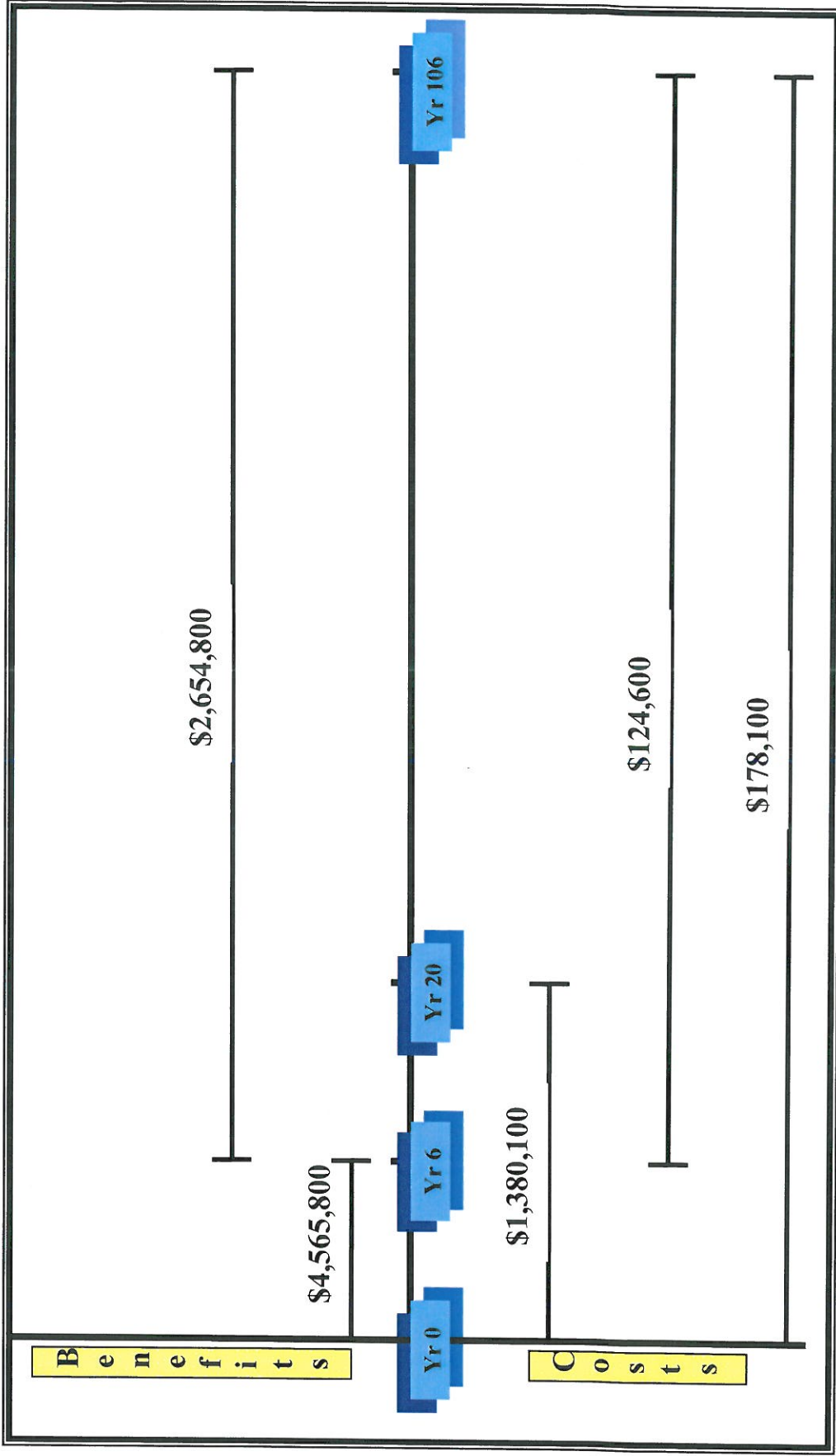


Figure 2: Summary of Annual Value Added or Lost in the Local Economy



Conclusion

The average annual net benefits of the reservoir vary by time frame. During the construction time period (year zero through six), the average annual net benefits of the reservoir are \$3,007,600. Once construction is completed the benefits of the recreation facilities, industry expansion and operation and maintenance activities begin to accrue while the cost of the financing of the property rights and local cost share are being paid off. Additionally, the costs of operation and maintenance begin to occur. The average annual net benefits during year seven through twenty are \$972,000. The average annual net benefits during the remaining years of the life of the reservoir are \$2,352,100. The greatest net benefits are generated during the construction period of the reservoir and recreation facilities. Table 5 summarizes the average annual cost, benefits and net benefits during the three time periods, and Figure 3 graphically illustrates those results.