

# East Locust Creek Reservoir Economic Impacts

July 2015

Water Resources Center



**MISSOURI**  
DEPARTMENT OF  
NATURAL RESOURCES

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## Executive Summary

An economic impact analysis of the East Locust Creek Reservoir was conducted by the Natural Resources Conservation Service (NRCS) and the Missouri Department of Natural Resources (MDNR) in 2005. The purpose of this 2015 report is to update the analysis and estimate the regional economic impacts of the East Locust Creek Reservoir.

East Locust Creek Reservoir provides water supply, flood control benefits and water-based recreation activities in the drought-prone north-central Missouri. The reservoir service area includes all or portions of Adair, Chariton, Grundy, Linn, Livingston, Macon, Mercer, Putnam, Schuyler, and Sullivan Counties. The reservoir will provide a sustainable water source to the community, help in meeting the State and Federal drinking water standards, and attract new businesses to the community. The local economy will benefit from both the construction (short-term) and operation and maintenance (long-term) of the reservoir.

**Table ES1. Total Economic Impacts of the East Locust Creek Reservoir Project to the Region**

	<b>Employment</b>	<b>Labor Income</b>	<b>Value- Added Benefits</b>	<b>Annualized Benefits</b>
Water supply	497	\$15,334,000	\$69,967,000	\$10,734,000
Recreation <sup>1</sup>	746	\$13,988,000	\$44,214,000	\$2,239,000
Wetland mitigation and restoration	39	\$1,135,000	\$5,789,000	\$932,000
Road and transportation	24	\$705,000	\$3,564,000	\$306,000
Lost agriculture and forestry	-162	-\$4,909,000	-\$5,070,000	-\$211,000
<b>Total</b>	<b>1,144</b>	<b>\$26,253,000</b>	<b>\$118,464,000</b>	<b>\$14,000,000</b>

The East Locust Creek Reservoir project is estimated to support 1,144 jobs, paying \$26.3 million in salaries and wages to the employees, and adding \$118.5 million to the regional economy over 56 years (Table ES 1). Based on this analysis, the short-term phase of the project supports 543 jobs and adds \$76.5 million to the economy (equivalent to \$12.25 million annually), and the long-term phase of the project supports 601 jobs and adds \$42 million to the economy (equivalent to \$1.75 million annually). The

<sup>1</sup> Based on unmet demand for recreation

annualized benefit of the East Locust Creek Reservoir project is \$14 million. Other benefits of the project include \$265,500 in annual flood damage reduction. The benefits are annualized based on the extent of the time-frame of the activity.

Water supply impacts include short-term benefits from reservoir construction, property acquisition, easement and infrastructure, engineering services, water location and pre-treatment and long-term benefits from reservoir operation and maintenance. Water supply impacts do not include transmission, distribution, or future water sales. Recreation impacts include short-term benefits from recreation facilities construction, and long-term benefits of operation and maintenance and recreation activities. Mitigation and restoration impacts include short-term benefits from real estate acquisition for wetland mitigation, and restoration construction activities and long-term benefits from operation and maintenance. Road and transportation impacts include short-term benefits from road construction, and long-term benefits from operation and maintenance. Lost agriculture and forestry impacts are due to the long-term loss of row-cropping and forestry activities within the footprint of the reservoir that will be permanently inundated.

The total present value of all construction and operation and maintenance costs of the project are \$99,069,000, and the total net present value of benefits of the project are \$118,464,000, resulting in a benefit-cost ratio of the East Locust Creek Reservoir project of 1.20. For every federal, state and local dollar that is invested in the project, \$1.20 is added to the State and regional economy. The local sponsor (North Central Missouri Regional Water Commission) is responsible for \$45,953,000 of the total costs (\$99.1 million) with the remaining balance to be funded by the federal partner, US Department of Agriculture- Natural Resources Conservation Service (USDA-NRCS). The regional benefit-cost ratio of the East Locust Creek Reservoir project is 2.58 – for every state and local dollar that is invested in the project, \$2.58 is added to the state and regional economy.

## Concept Definitions

Capitalized Costs – an expense that is incurred when building or financing a fixed asset, but recognized over a period of time via depreciation or amortization.

Direct Impacts – a measure of the total amount of additional expenditure within a defined geographical area, which can be directly attributed to a program, project or an event. Direct impact is an assessment of the net increase in spending as a result of the event.

Employment – a measure of change in jobs either supported or lost due to a change in economic activity.

Indirect Impacts – a measure of change in economic activity resulting from purchase of goods and services by businesses due to an increased activity that can be attributed to a program, project or an event.

Induced Impacts – a measure of change in economic activity resulting from purchase of household goods and services by employees due to changes in production.

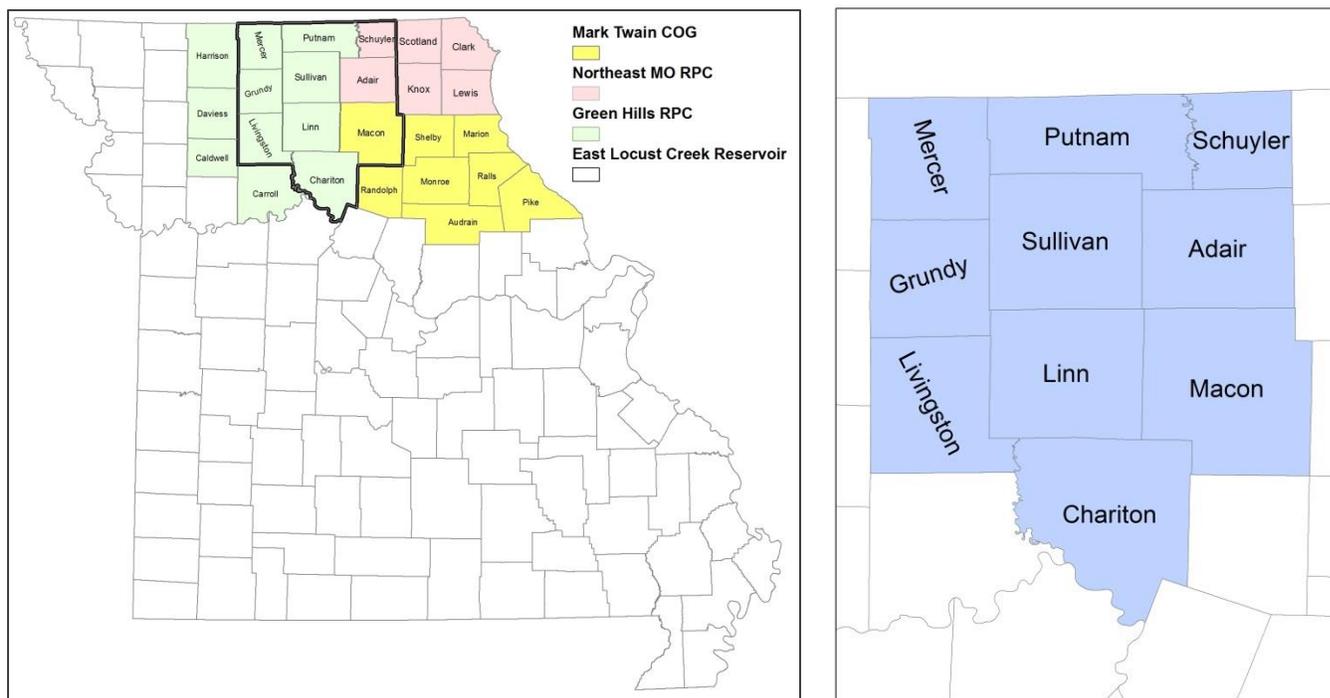
Labor Income – a measure of salaries and wages paid to employees.

Value-Added – a measure that includes employee compensation (payroll), proprietary income (self-employed), other property type income (rents, royalties and dividends) and indirect business taxes (excise taxes, property taxes, fees, licenses and business sales taxes).

## Introduction

The North Central Missouri Regional Water Commission (NCMRWC) proposed the East Locust Creek Reservoir to be built near the city of Milan in Sullivan County. The proposed reservoir service area (Figure 1) consists of all or portions of the 10 counties in three regional planning commission service areas; the Green Hills Regional Planning Commission (Green Hills RPC) area in north central Missouri, the Northeast Missouri Regional Planning Commission (Northeast MO RPC), and the Mark Twain Regional Council of Governments (Mark Twain COG), as highlighted in the map below. The purpose of the reservoir is to provide water supply, flood control, and water-based recreation activities in the 10-county region. An economic impact analysis of the proposed reservoir was conducted by the Natural Resources Conservation Service (NRCS) and the Missouri Department of Natural Resources (MDNR) in 2005. The purpose of this 2015 report is to update the analysis and the regional economic impacts of the East Locust Creek Reservoir.

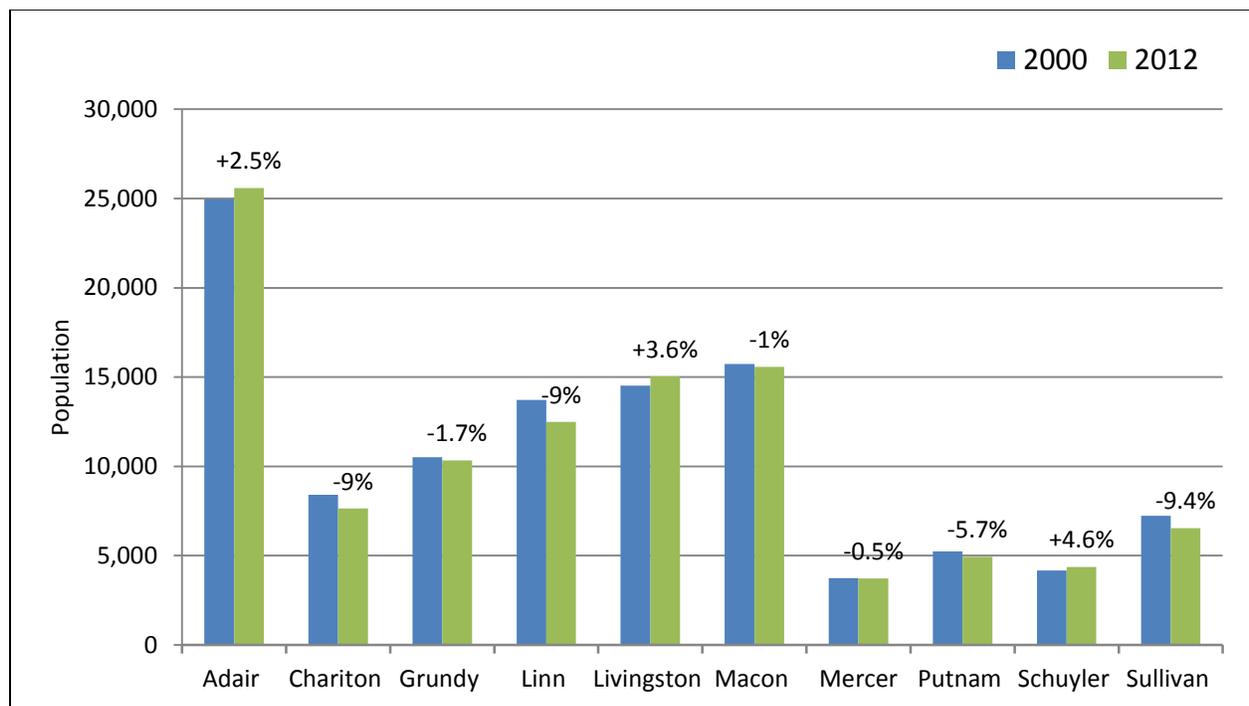
**Figure 1. East Locust Creek Reservoir Service Area**



## Regional Economy

The reservoir service area includes all or portions of the following 10 counties in north central Missouri – Adair, Chariton, Grundy, Linn, Livingston, Macon, Mercer, Putnam, Schuyler and Sullivan counties. The total population<sup>2</sup> in the 10-county region in 2012 was 106,238. From 2000 to 2012, the overall population in the 10-county region declined 3.6%. All counties except Adair (+2.5%), Livingston (+3.6%), and Schuyler (+4.6%) experienced a population decline. The counties with the greatest decline in population were Sullivan (-9.4%), Chariton (-9.0%), and Linn (-9.0%) (Figure 2).

**Figure 2. 2000-2012 Population change in 10-County region**

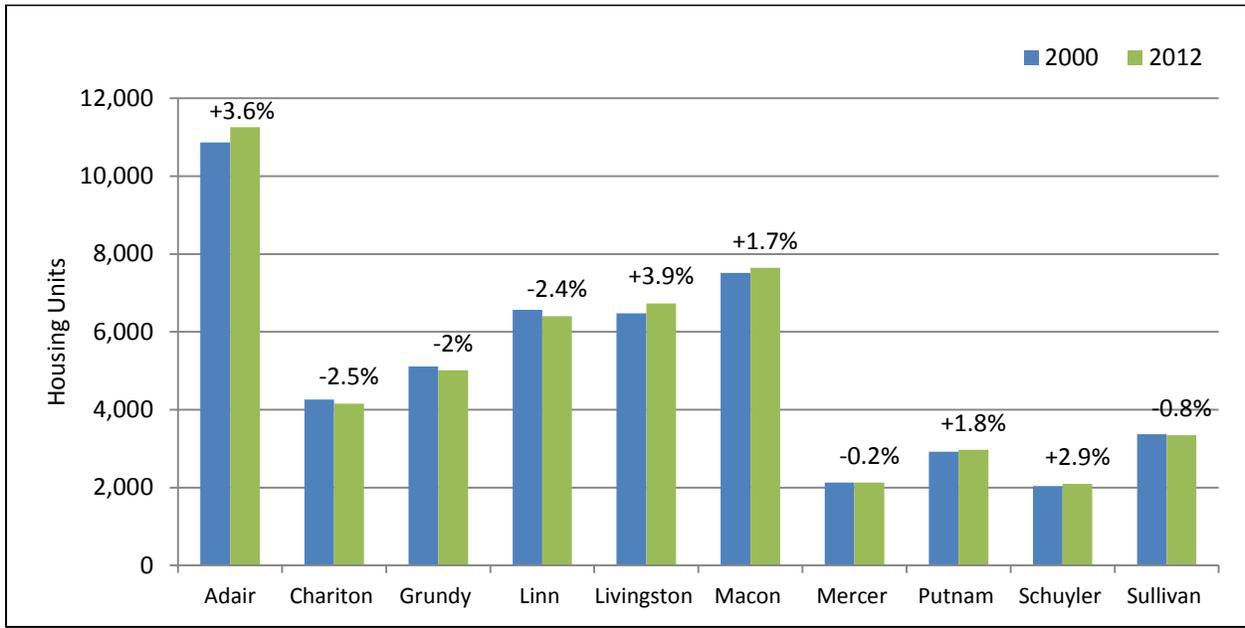


The total number of housing units in the 10-county region in 2012 was 51,733. Between 2000 and 2012, the number of housing units in the 10-county region declined by 0.93%. The housing units increased in Adair County (+3.6%), Livingston County (+3.9%), Macon (+1.7%), Putnam (+1.8%), and

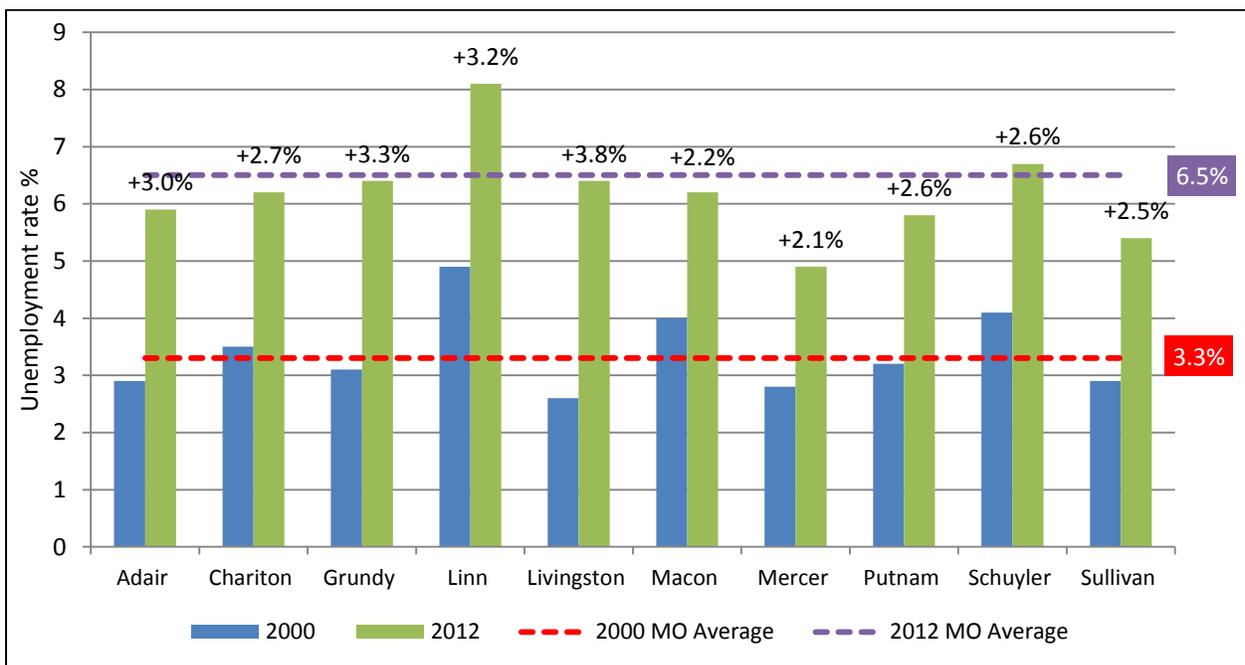
<sup>2</sup> [Annual Population Estimates](#), US Census Bureau

Schuyler (+2.9%), while the housing units in the rest of the counties declined. The greatest decline in housing units were in Chariton (-2.5%), Linn (-2.4%), and Grundy (-2%) counties (Figure 3).

**Figure 3. 2000-2012 Change in housing units in 10-County region**



**Figure 4. 2000-2012 Change in unemployment rates in 10-County region**



The average unemployment<sup>3</sup> rate for the 10-county region was above the State average for five out of seven years between 2000 and 2007, but in recent years (2008-2012), the average unemployment rate for the 10-county region has been lower than the State average<sup>4</sup>. Between 2000 and 2012, while unemployment in Adair and Livingston Counties was consistently below the State average, unemployment in Linn and Schuyler Counties was consistently above the State average (Figure 4). Grundy and Mercer Counties had unemployment rates below the state average, 12 out of 13 years. Schuyler County had unemployment rates higher than the State average in 9 out of 13 years. In 2003, ConAgra closed its facility resulting in a spike in unemployment rate in Sullivan County. Due to the recession of 2008, most of the counties experienced a relatively higher unemployment rate in the time period between 2009 and 2012.

The 2012 poverty rate<sup>5</sup> for the 10-county region was 18.1% compared with 16.2% for the State. In 2012, Chariton (14.6%), Mercer (15.6%), and Linn (15.9%) counties had a poverty rate below the State average, however, the rest of the counties were above the state average poverty rate. The highest poverty rates in 2012 were seen in Adair (24.2%), Schuyler (21.3%), and Putnam (18.5%) Counties. Between 2000 and 2012, the poverty rates for both the 10-county region and the State have steadily increased (Figure 5). Also, the poverty rate for the 10-county region has been consistently above the State average from 2000 to 2012.

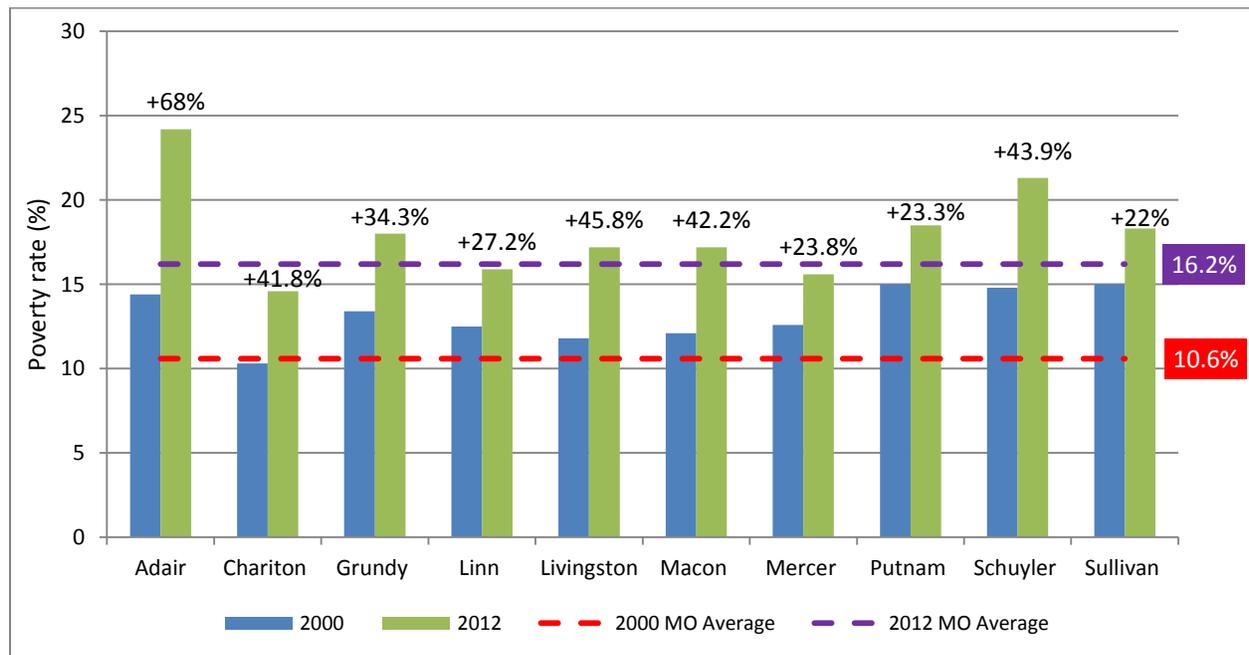
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<sup>3</sup> [Current unemployment rates](#), Missouri Department of Economic Development

<sup>4</sup> [State unemployment rate](#), Bureau of Labor Statistics

<sup>5</sup> [Small Area Income and Poverty Estimates](#), US Census Bureau

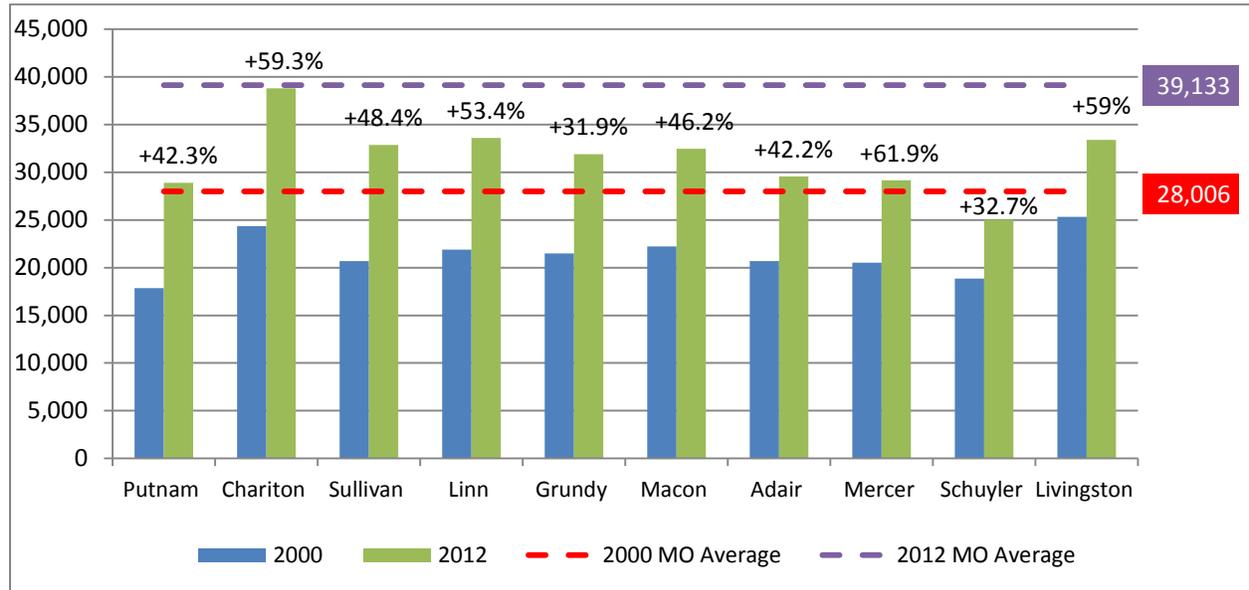
Figure 5. 2000-2012 Change in poverty in 10-County region



While the 10-county region’s per capita income<sup>6</sup> (\$21,385) in 2000 was below the state average (\$28,006), in the period from 2000 to 2012, the per capita income grew at a faster rate for the 10-county region (47.6%) than the State of Missouri (39.7%). The per capita income is not adjusted for inflation. For most of the counties, the highest growth in per capita income occurred in 2004, while the sharpest decline occurred during 2001-2002. Putnam, Chariton and Sullivan counties experienced the highest growth, at an average of 61.9%, 59.3%, and 59%, respectively. Linn County’s per capita income grew in twelve out of thirteen years, averaging 53.4% (Figure 6). Although Sullivan County experienced an income decline in five out of thirteen years, and Chariton County experienced an income decline in four out of thirteen years, the per capita income grew at a faster rate between 2002 and 2008 to end up as the fastest growing counties. Livingston County’s per capita income grew in eleven out of thirteen years, but at a slower pace, recording the lowest growth in the region at an average of 31.9%. By 2012, the per capita income of the 10-county region was \$31,565, and that of the State of Missouri was \$39,133.

<sup>6</sup> [Per capita income](#), Bureau of Economic Analysis

Figure 6. 2000-2012 Change in per capita income in 10-County region



### Assumptions

The impacts of the benefits and costs of the reservoir are modeled as shocks to the regional economy using the IMPLAN<sup>7</sup> (Impact Analysis for Planning) model as a specified sector in the 10-county regional economy. The economic impacts are presented as employment supported, salaries and wages paid to the employees, and value added to the regional economy.

The following assumptions were made in the analysis and presentation of the results of the regional impact analysis.

1. The construction period for the dam, water supply structures, recreation facilities, engineering services, road construction, water location, and pre-treatment is six years.
2. The property acquisition, easement, and infrastructure are scheduled to be completed in 20 years.
3. The reservoir is assumed to have a life span of 50 years (following 2003 Burns and McDonnell master plan and 2013 Preliminary Engineering Report), and the life cycle begins at the completion of construction.

<sup>7</sup> A brief description of economic input-output models and IMPLAN model's capabilities and limitations are presented in Appendix D

4. The recreation and industry expansion impacts will not benefit the regional economy until construction is complete. The economic impacts of potential investment in construction projects in East Locust Creek Reservoir project area are presented in Appendix B. The economic impacts of lost agriculture, and operation and maintenance for dam, transportation facilities, roads, wetland and mitigation, and recreation facilities will accrue for 50 years.
5. The non-federal sponsor cost for property acquisition, easement, infrastructure, and local construction cost, is financed at 3% for 20 years.
6. Where results are amortized, the 2015 Federal discount rate<sup>8</sup> for water resources projects of 3.375% is utilized.
7. Employment supported (or lost) is the total jobs supported (or lost) from the activity during the time period of impact, instead of annual employment supported (or lost).

## **Economic Evaluation of Benefits and Costs**

Building East Locust Creek Reservoir is a public infrastructure investment to secure water resources in a region that has limited groundwater especially in prolonged dry periods. Other benefits include making water available at an affordable rate to low-income citizens, mitigating the flood damages in the East Locust Creek floodplain, and promoting recreation and economic development opportunities in the north-central region.

Acquiring property, relocating population, construction, and operation and maintenance of a reservoir involves many economic transactions. The process of accounting for all the costs and benefits of these transactions is referred to as economic impact analysis. Input-output analysis is a common method used to assess economic impacts by quantifying and understanding the flow of goods and services in the regional economy. IMPLAN is an input-output model designed to estimate changes in economic output, value added to the economy, and employment in 440 sectors. In evaluating the impacts of East

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<sup>8</sup> [Discount rate](#), Natural Resources Conservation Service

Locust Creek Reservoir project, the benefits are modeled as short-term during the construction phase (6 to 20 years) and long-term during the operation and maintenance phase (50 years) of the project (Table 1).

The regional benefits to the local economy are a result of construction activities and operation and maintenance of facilities. The 10-county region benefits from construction of the reservoir, water supply structures (raw water intake and transmission lines), wetland restoration, transportation and recreation facilities. Operation and maintenance activities at the reservoir and recreation facilities, and public participation in recreation activities, also generate benefits to the regional economy. In order to build the reservoir, some of the lands that are currently under agricultural production and forestry will be inundated or included in the project easement area. For the purpose of this analysis, agriculture and forestry production are counted as lost benefits.

**Table 1. Regional Benefits from East Locust Creek Reservoir Construction**

<b>Regional Benefits</b>	<b>Life of Impact</b>	<b>Time-frame</b>
Reservoir construction	Short-term	6 years
Water supply construction	Short-term	6 years
Wetland mitigation and restoration construction	Short-term	6 years
Recreation facilities construction	Short-term	6 years
Recreation facilities operation and maintenance	Long-term	50 years
Recreation activities	Long-term	50 years
Reservoir operation and maintenance	Long-term	50 years
Transportation facilities	Long-term	50 years
Wetland mitigation and restoration operation and maintenance	Long-term	50 years
Lost agriculture and forestry	Long-term	50 years

The NCMRWC is primarily responsible for the cost of property acquisition, easement and infrastructure, as well as the non-federal cost-share for construction of reservoir, road, and mitigation structures. A portion of the operation and maintenance costs are also funded by NCMRWC (Table 2).

**Table 2. Regional Costs of East Locust Creek Reservoir Project**

<b>Impact</b>	<b>Life of Impact</b>	<b>Time-frame</b>
Reservoir construction	Short-term	6 years
Road and mitigation construction	Short-term	6 years
Property acquisition, easement, and infrastructure	Short-term	20 years
Operation and maintenance of reservoir	Long-term	50 years
Operation and maintenance of recreation facilities	Long-term	50 years

In addition to the benefits and costs from the project identified above, the NCMRWC assumes there will be a net increase in property tax revenue (and a portion of the retail sales tax generated) from the reservoir and associated infrastructure. The plan is to invest this additional revenue back into additional infrastructure projects to support the East Locust Creek Reservoir and surrounding development through a tax increment financing mechanism. The impacts of the potential increased tax revenue were analyzed separately and are presented in Appendix A.

### **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 the specified sector. IMPLAN delineates 440 sectors linked to the North American Industrial Classification System (NAICS) codes. The economic impacts of benefits and costs are evaluated as a shock to a sector in the IMPLAN system, the details of which are specified in tables 3 and 4.

### **Benefits**

Reservoir construction includes engineering and heavy construction, such as moving earth associated with the reservoir and dam construction. The estimated value of the reservoir construction is \$34,545,000. Water supply construction is the construction of a water intake tower and transmission lines that will provide water supply from the reservoir to the water treatment plant. The estimated value of the water supply construction is \$8,000,000. Water supply impacts do not include transmission, distribution, or future water sales.

Reservoir operation and maintenance is a continuous maintenance need that will accrue over the life of the reservoir. For the purpose of this analysis, the activities modeled include repair of pipes and structures associated with the reservoir, and mowing and brush control on the reservoir and the dam. The estimated capitalized value of reservoir and dam operation and maintenance over 50 years is \$2,339,000.

Recreation facilities construction includes boat landings, picnic shelters, and walking and biking trails. The estimated value of recreation facilities construction is \$3,405,000. The estimated capitalized value of operation and maintenance of recreation facilities is \$960,000.

Restoration efforts represent mitigation of stream and wetland areas impacted by the reservoir. The stream and wetland restoration activities planned will trap and absorb sediments, pollutants and nutrients and protect the water quality of the reservoir. Restoration includes acquisition and creation of wetland areas, replacement of failing or destructive low water crossings on streams and creation of buffer easements. The estimated capitalized value of real property acquisition for mitigation activities is \$1,838,000. Additionally, the estimated capitalized value of operation and maintenance of restoration projects is \$3,675,000.

Recreation activities represent the benefit of hunting, fishing and water-based recreation facilities available to the public and the monetary value of recreation derived due to these facilities. The estimated capitalized recreation benefit<sup>9</sup> is \$50,706,000.

Engineering services include engineering analyses and designs, geological investigations and analyses, archaeological evaluations, and other technical assistance to design and layout structural measures. The estimated value of engineering services is \$13,028,000.

The costs for transportation facilities include operation and maintenance of a bypass for State Route N on the south end of the reservoir and constructing an access road. The estimated capitalized value of construction for transportation facilities is \$2,879,000.

Lost agriculture represents the land currently in production that will be removed from production because of inundation. The costs of lost agriculture represent land in production of corn, soybeans, hay,

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<sup>9</sup> The demand for recreation is an inflation adjusted estimate from the 2007 Environmental Impact Statement

pasture and forestry. The estimated capitalized value of lost agriculture and forestry over a period of 50 years is \$9,257,000 (\$636,000 for corn, \$2,340,000 for soybeans, \$2,509,000 for hay, \$970,000 for pasture and \$2,802,000 for forestry). Appendix C presents the acreage, yield, and value of agriculture to the 10-county region. Lost forestry production represents an estimate of the land in the region that has marketable timber and would be removed from production.

The reservoir benefits are summarized by value and the associated IMPLAN sector that was used to calculate the economic impacts are presented in Table 3.

**Table 3. Reservoir Benefits by Activity and IMPLAN Sector**

<b>Activity</b>	<b>Value</b>	<b>IMPLAN Sector</b>
Reservoir construction	\$34,545,000	39 - Maintenance and repair construction of non-residential structures
Water supply construction	\$8,000,000	33 - Water, sewage and other treatment and delivery systems
Recreation facilities construction	\$3,405,000	36 - Construction of other new non-residential structures
Wetland mitigation and restoration land acquisition	\$1,838,000	39 - Maintenance and repair construction of non-residential structures
Wetland mitigation and restoration construction	\$3,675,000	39 - Maintenance and repair construction of non-residential structures
Engineering services	\$13,028,000	36 - Construction of other new non-residential structures
Transportation facilities operation and maintenance	\$2,879,000	39 - Maintenance and repair construction of non-residential structures
Reservoir operation and maintenance	\$2,339,000	39 - Maintenance and repair construction of non-residential structures
Recreation facilities operation and maintenance	\$960,000	39 - Maintenance and repair construction of non-residential structures
Recreation activities	\$50,706,000	409 - Amusement parks, arcades, and gambling industry
Lost agriculture and forestry	-\$9,257,000	1- Oilseed farming 2- Grain farming 10 - All other crop farming 16 – Commercial logging

## Regional Costs

The local sponsor (NCMRWC) is responsible for the cost of property acquisition, easement, construction, and operation and maintenance of the reservoir. The total local cost-share for the East Locust Creek Reservoir project is \$45.9 million, including \$18.2 million for property and acquisition, \$21.9 million for construction and \$5.8 million for operation and maintenance of the reservoir. The regional costs of the project and the associated IMPLAN sectors are listed in Table 4.

**Table 4. Regional Costs of East Locust Creek Reservoir**

<b>Economic activity</b>	<b>Value</b>	<b>IMPLAN Sector</b>
Reservoir construction	\$11,149,000	39 - Highway, street, bridge, tunnel construction
Engineering services	\$2,223,000	36 - Construction of other new non-residential structures
Water supply construction	\$6,841,000	33 - Water, sewage and other treatment and delivery systems
Water location and pre-treatment	\$2,500,000	36 - Construction of other new non-residential structures
Wetland mitigation and restoration construction	\$2,389,000	39 - Maintenance and repair construction of non-residential structures
Recreation facilities construction	\$652,000	36 - Construction of other new non-residential structures
Wetland mitigation and restoration land acquisition	\$1,610,000	39 - Maintenance and repair construction of non-residential structures
Road construction	\$270,000	36 - Construction of other new non-residential structures
Property acquisition, easement and infrastructure	\$15,749,000	36 - Construction of other new non-residential structures
Transportation facilities operation and maintenance	\$1,800,000	39 - Maintenance and repair construction of non-residential structures
Wetland mitigation and restoration activities	\$770,000	39 - Maintenance and repair construction of non-residential structures
<b>Total regional costs</b>	<b>\$45,953,000</b>	

## Economic Impacts

Building East Locust Creek Reservoir involves water supply construction, reservoir construction, road transportation, mitigation, and recreation activities. The economic impacts of these activities are aggregated and presented below (Figure 7). The total employment impact is 1,144 jobs supported by the construction and maintenance of the reservoir. The employment impacts are aggregated by the activity phases. Recreation activities supported the most jobs (746), followed by water supply benefits (497), mitigation and restoration (39), road and transportation (24), and finally, lost agriculture and forestry (-162).

Water supply impacts include short-term benefits from reservoir construction, property acquisition, easement and infrastructure, engineering services, water location, and pre-treatment, and long-term benefits from reservoir operation and maintenance. Water supply impacts do not include transmission, distribution, or future water sales.

Recreation impacts include short-term benefits from recreation facilities construction, and long-term benefits of operation and maintenance and recreation activities.

Mitigation and restoration impacts include short-term benefits from real property acquisition for wetland mitigation and restoration construction activities, and long-term benefits from operation and maintenance.

Road and transportation impacts include short-term benefits from road construction, and long-term benefits from operation and maintenance.

Lost agriculture and forestry impacts are due to the long-term loss of row-cropping and forestry activities within the footprint of the reservoir that will be permanently inundated.

Figure 7. Employment impacts by activity

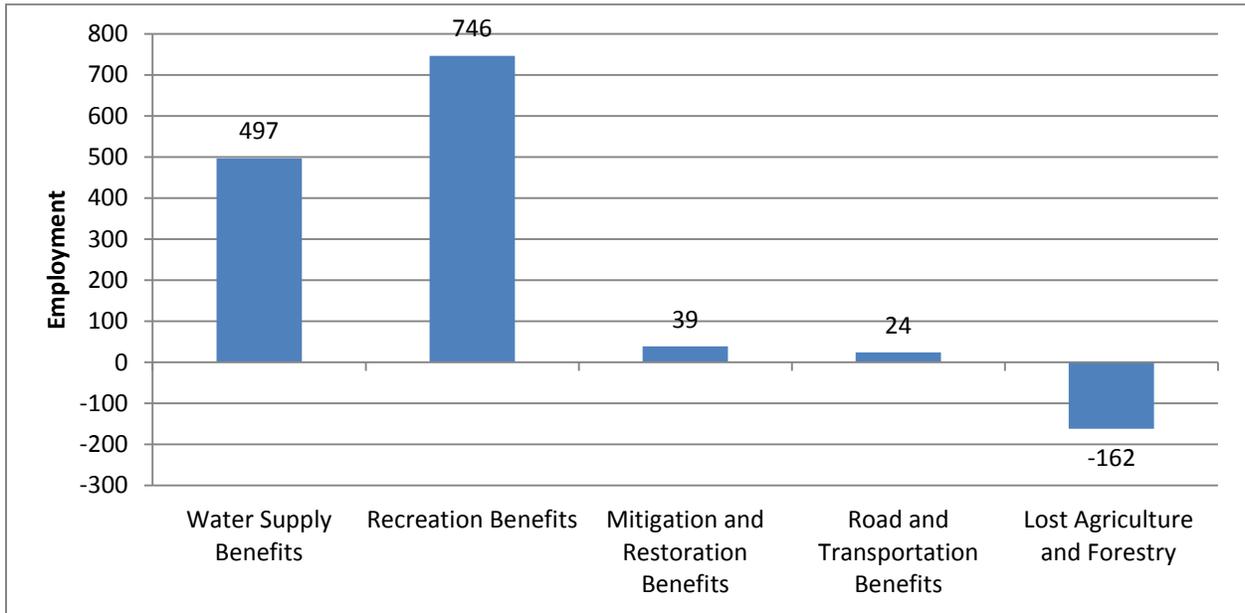
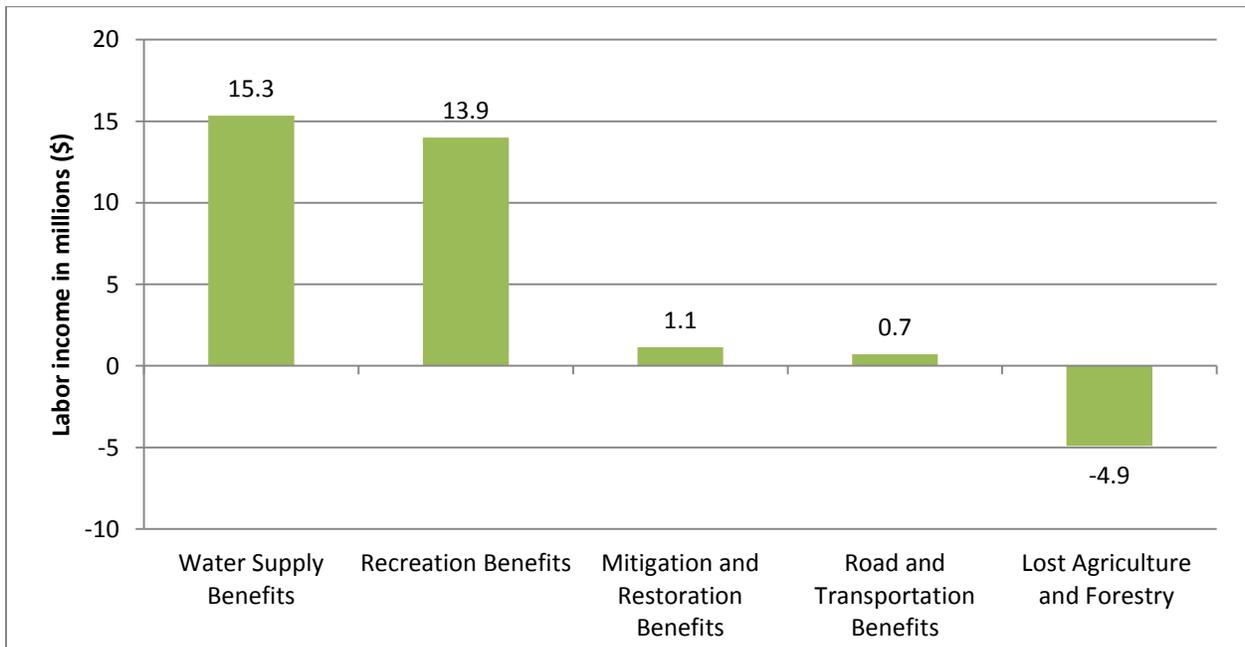


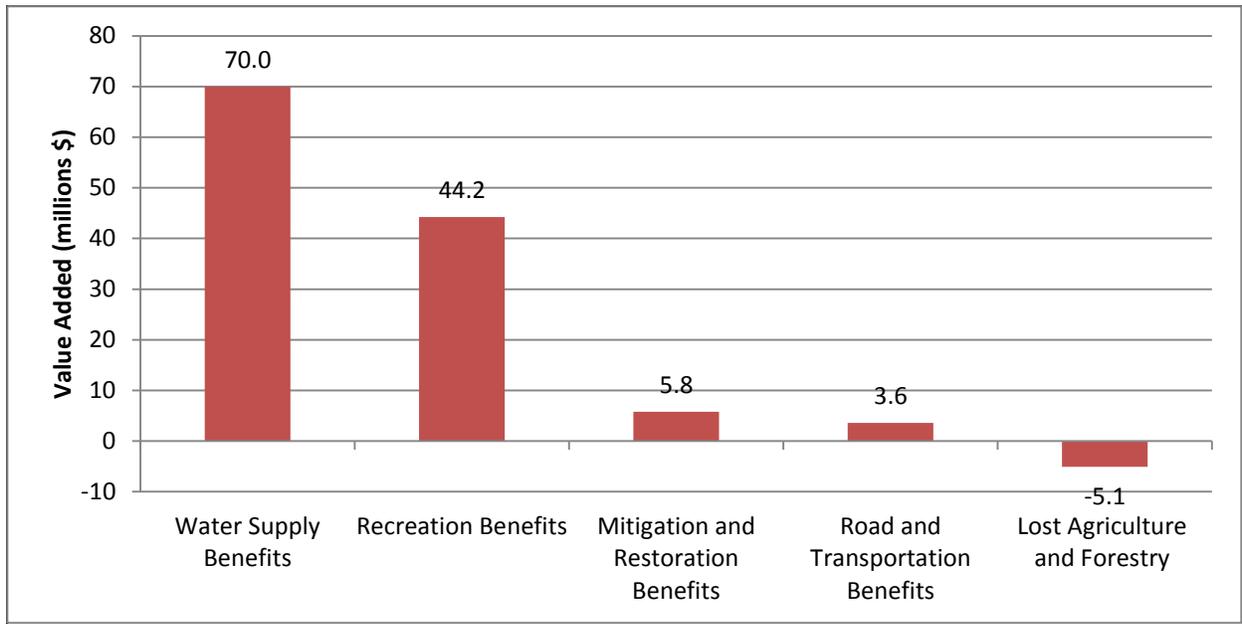
Figure 8. Labor income impacts by activity in millions



The total labor income impact is \$26.3 million. By activity, the labor income impacts did not follow the same pattern as employment. Although more jobs are supported by recreation, the salaries and wages paid to the workers in the recreation industry are relatively lower than the salaries and wages paid

to construction and operation and maintenance workers in the water supply industry. The salaries and wages of workers employed in water supply benefits are the highest, followed by recreation benefits, mitigation, road and transportation benefits, and lost agriculture and forestry (Figure 8).

**Figure 9. Value-added impacts by activity in millions**



The total value-added benefits from the East Locust Creek Reservoir project are \$118.5 million. By activity, the value-added impacts followed the same pattern as labor income, the value-added for water supply activities are the highest, followed by recreation, mitigation and restoration, road and transportation benefits, and lost agriculture and forestry (Figure 9).

Overall, aggregating the economic impacts by activity provides insights on the magnitude of benefits and contributions to the regional economy. The economic impacts are driven by the population served (106,238) and the time-period for each activity – 50 years of recreation benefits (unmet demand), and lost agriculture and forestry; six years of water supply, mitigation, restoration, and road construction.

The economic impacts are broken down as short-term (six years and 20 years) and long-term (50 years). While the short-term activities include construction, design, water location, and restoration effects, the long-term activities predominantly include operation and maintenance of reservoir, recreation,

transportation, and mitigation. The breakdown of economic impacts over time highlights that the economic impacts of continued operation and maintenance are on par with construction activities on East Locust Creek Reservoir (Table 5).

**Table 5. Economic Impacts – Short-term vs Long-term**

	<b>Employment</b>	<b>Labor Income</b>	<b>Value Added</b>	<b>Annualized Benefits</b>
Short-term impacts	543	\$16,641,000	\$76,508,000	\$12,249,000
Long-term impacts	602	\$9,612,000	\$41,956,000	\$1,749,000

The economic impacts of construction, design, and operation and maintenance activities on the East Locust Creek Reservoir project are driven by the population served and the number of years the activity is carried out. The top three activities that generated economic impacts include recreation activities, reservoir construction and property acquisition, easement, and infrastructure. On the other hand, lost agriculture and forestry results in loss of jobs, wages, and salaries, as well as value-added contributions to the regional economy. The benefits are annualized based on the time-frame of the economic activity (Table 6).

The employment, labor income, and value-added economic impacts of East Locust Creek Reservoir are broken down as direct, indirect, and induced effects. A direct effect is due to the direct changes in an area resulting from a change in that particular sector. For example, reservoir construction investment is considered a direct effect. Indirect effects are the changes in inter-industry purchase of goods and services, either backward-linked (providing raw materials, goods and services to the industry) or forward-linked (adding value to the industry products). For example, reservoir construction activities will result in an increase in demand for earth moving equipment and labor to operate the equipment, which is considered an indirect effect. An induced effect is due to changes in the household spending of employees working in the regional economy, either directly or indirectly linked to the sector. For example, workers employed in construction activities buy groceries, cars, or furniture in the regional economy, which is considered an induced effect.

**Table 6. Economic impacts of reservoir construction, operation and maintenance**

<b>Economic activity</b>	<b>Employment</b>	<b>Labor Income</b>	<b>Value Added Benefits</b>	<b>Annualized Benefits</b>
Recreation activities	721	\$13,273,000	\$40,662,000	\$1,695,000
Reservoir construction	199	\$5,843,000	\$29,811,000	\$5,572,000
Property acquisition, easement and infrastructure	126	\$3,544,000	\$17,474,000	\$1,216,000
Engineering services	75	\$2,113,000	\$10,419,000	\$1,947,000
Water supply construction	60	\$2,789,000	\$7,046,000	\$1,317,000
Water location and pre-treatment	23	\$649,000	\$3,199,000	\$598,000
Restoration efforts	21	\$622,000	\$3,171,000	\$593,000
Recreation facilities construction	20	\$552,000	\$2,723,000	\$509,000
Transportation facilities	17	\$487,000	\$2,485,000	\$104,000
Dam operation and maintenance	13	\$396,000	\$2,019,000	\$84,000
Wetland and mitigation construction	11	\$311,000	\$1,586,000	\$296,000
Road construction	8	\$218,000	\$1,079,000	\$202,000
Wetland and mitigation operation and maintenance	7	\$202,000	\$1,032,000	\$43,000
Recreation facilities operation and maintenance	5	\$162,000	\$828,000	\$35,000
Lost agriculture and forestry	-162	\$-4,909,000	\$-5,070,000	-\$211,000
<b>Total</b>	<b>1,144</b>	<b>\$26,252,000</b>	<b>\$118,464,000</b>	<b>\$14,000,000</b>

Figure 10 illustrates the employment impacts of the East Locust Creek Reservoir project. The direct effect of construction, operation and maintenance results in supporting 916 jobs, followed by 127 jobs in indirect impacts due to purchase of goods and services for backward-linked industries, and 101 jobs due to household spending of workers. A total of 1,144 jobs are projected to be supported by East Locust Creek Reservoir.

**Figure 10. Employment impacts of East Locust Creek Reservoir**

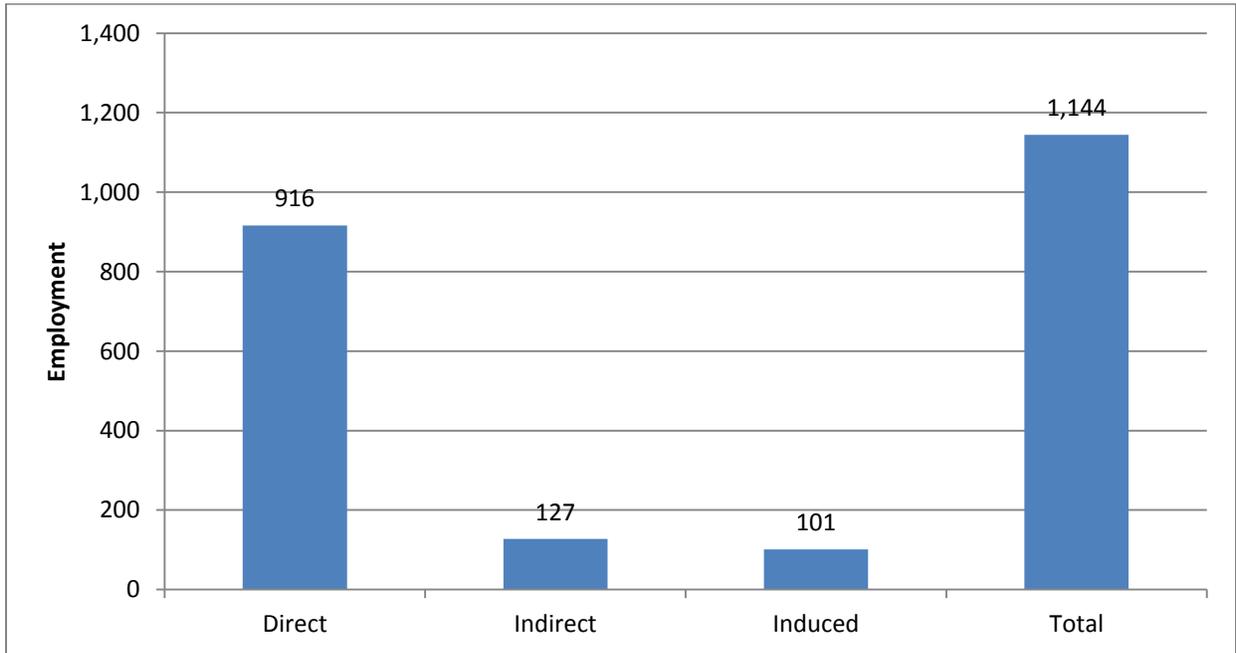


Figure 11 illustrates the labor income impacts of the East Locust Creek Reservoir project. The salaries and wages of employees follow the same pattern as employment impacts: direct impacts (\$19.2 million), followed by indirect impacts (\$4.1 million), and induced impacts (\$3 million). The total labor income of employees working in construction, operation and maintenance of East Locust Creek Reservoir amounts to \$26.3 million.

Figure 11. Labor income impacts of East Locust Creek Reservoir in million

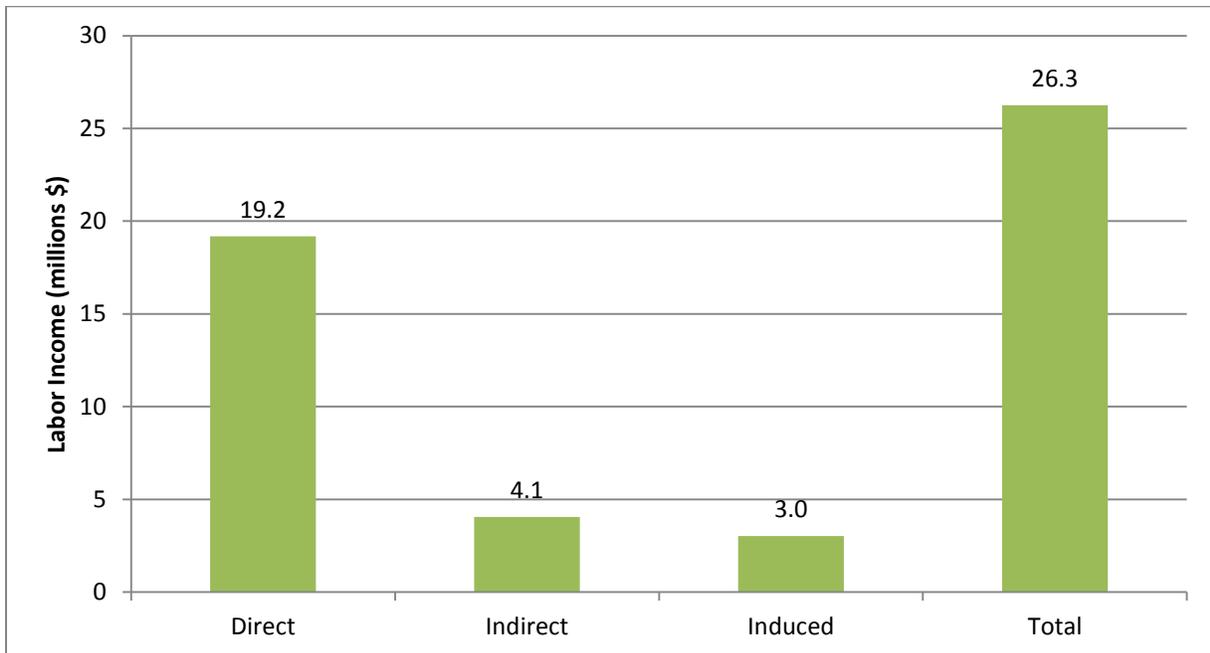
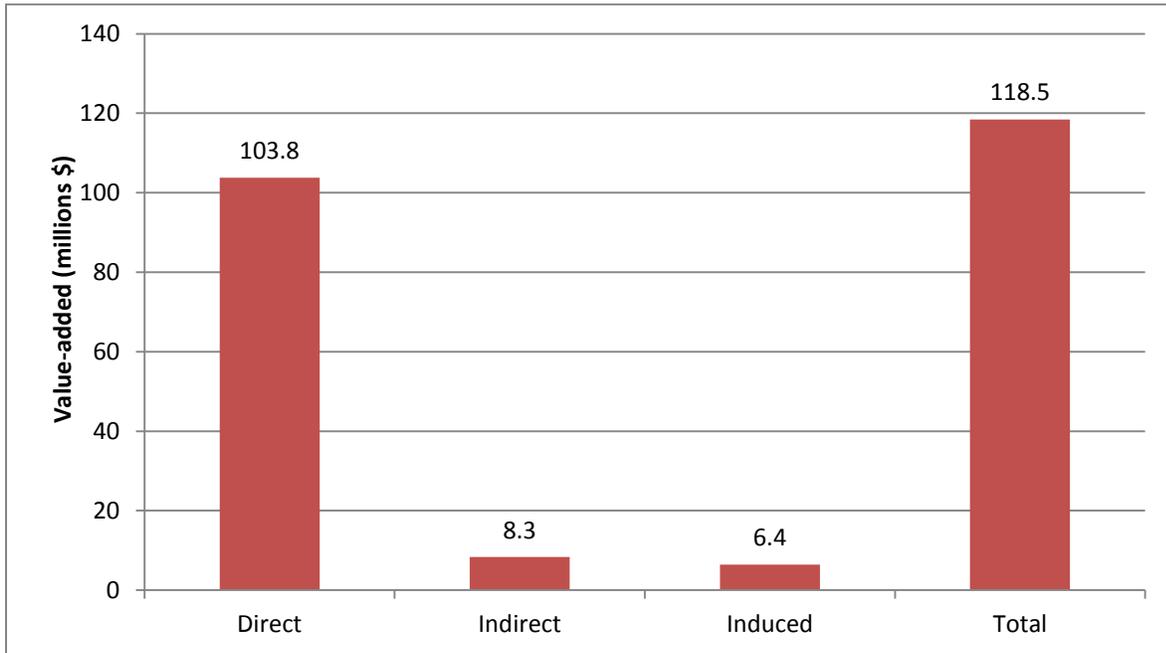


Figure 12 illustrates the value-added contribution to the regional economy as a result of the East Locust Creek Reservoir project. The value-added impacts follow the same pattern as employment and labor income; direct impacts adding \$103.8 million, followed by indirect impacts at \$8.3 million, and induced impacts at \$6.4 million. The total value-added contribution to the regional economy due to East Locust Creek Reservoir is \$118.5 million.

**Figure 12. Value-added impacts of East Locust Creek Reservoir in millions**



### **Benefit-Costs of the East Locust Creek Reservoir Project**

The total value-added benefits of the East Locust Creek Reservoir are \$118,464,000 and the total costs of the reservoir project are \$99,069,000. A detailed breakdown of benefits and costs by timeline are outlined in Figures 13 and 14. The benefit-cost ratio of the East Locust Creek Reservoir project is 1.20. In other words, for every Federal, State or local dollar invested in the project, \$1.20 is returned to the State and regional economy. The 10-county region is responsible for \$45,953,000 in costs, and the rest of the costs are anticipated to be funded by the Federal Government. The State-Regional benefit-cost ratio of the project is 2.58. Therefore, for every State and local dollar invested in the project, \$2.58 is returned to the State and Regional economy.

Figure 13. East Locust Creek Reservoir benefits over time period

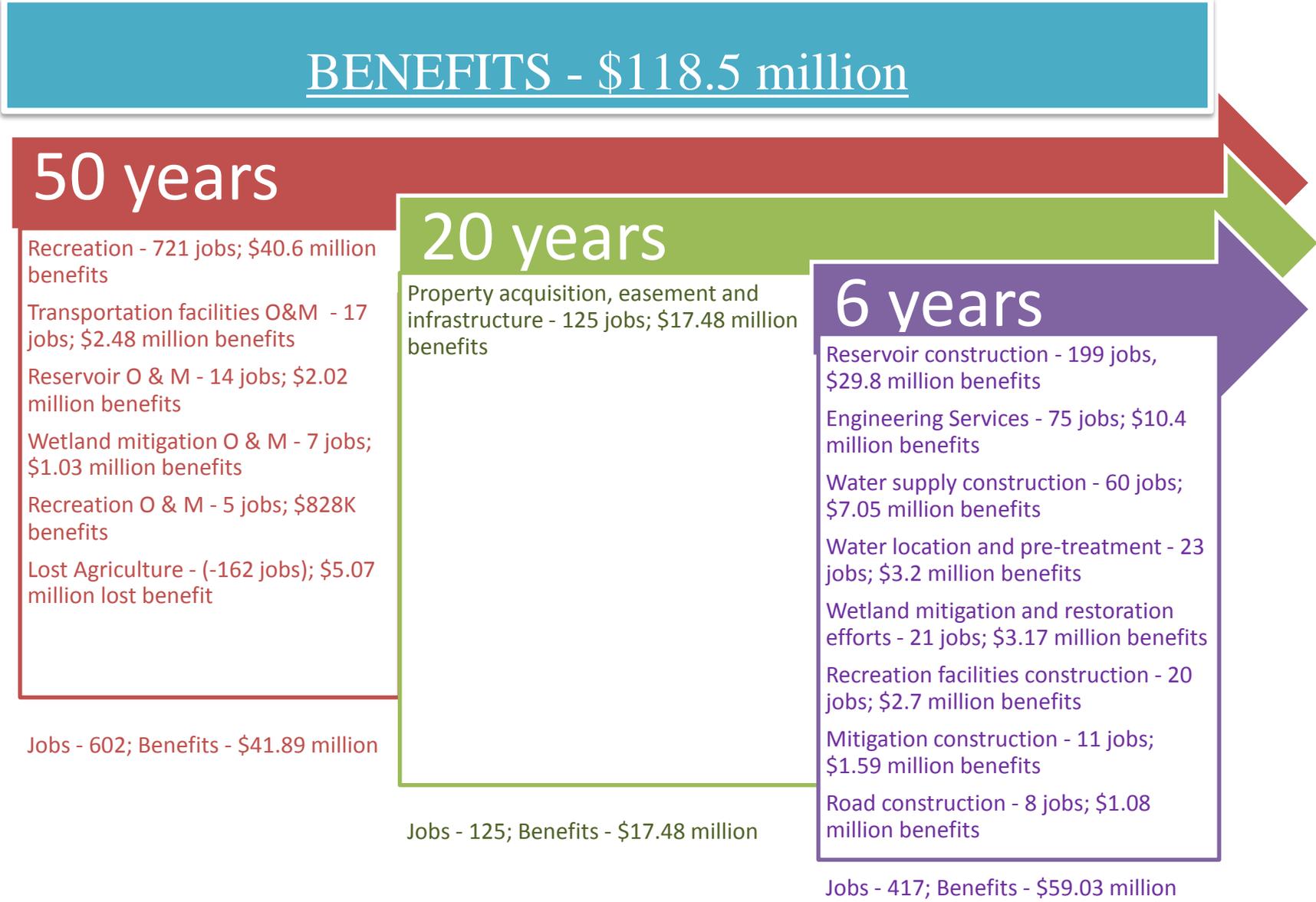


Figure 14. East Locust Creek Reservoir costs over time period

COSTS - \$99.1 million (Regional costs - \$45.9 million)

### 50 years

Transportation - \$2.8 million  
(Regional costs - \$1.8 million)  
Reservoir O & M - \$2.3 million  
Wetland mitigation O & M - \$1.2 million  
(Regional costs - \$770,000)  
Recreation O & M - \$960,000

Total costs - \$16.6 million  
Regional costs - \$2.6 million

### 20 years

Property acquisition, easement and infrastructure - \$21.8 million  
(Regional costs - \$15.8 million)

Total Costs - \$21.8 million  
Regional Costs - \$15.8 million

### 6 years

Reservoir construction - \$34.5 million  
(Regional costs - \$11.1 million)  
Engineering Services - \$13.0 million  
(Regional costs - \$2.2 million)  
Water supply construction - \$8 million  
(Regional costs - \$6.8 million)  
Water location and pre-treatment - \$4 million  
(Regional costs - \$2.5 million)  
Wetland mitigation and restoration efforts - \$3.7 million  
(Regional costs - \$2.4 million)  
Recreation facilities construction - \$3.4 million  
(Regional costs - \$652,000)  
Wetland mitigation and restoration construction - \$1.8 million  
(Regional costs - \$1.6 million)  
Road construction - \$1.4 million  
(Regional costs - \$270,000)

Total Costs - \$69.8 million  
Regional Costs - \$27.6 million

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## Appendix A. Tax Increment Financing Economic Impacts

The tax increment financing analysis for East Locust Creek Reservoir is, at best, an educated projection based on comparable projects of the likely developments that will occur in the regional economy. Although the regional economy is assumed to reinvest property and retail taxes of \$235,000 annually, with the new developments and funding from the tax increment financing, it is projected that the 10-county region will likely experience a net gain in economic activity.

Tax increment financing is a funding mechanism where a portion of the sales and real estate taxes are directed to infrastructure and community improvement projects. Under the current proposal, for a period of 23 years from the onset of the project, a portion of future gains in property and a portion of retail sales taxes will be made available to fund infrastructure projects in the East Locust Creek Reservoir project area. The Tax increment financing plan anticipates and models new, privately driven developments including housing construction, a campground, a convenience store, a marina, a storage facility, a mechanic shop, and a restaurant. It is uncertain that all of the new developments will actually occur or occur in the time-frame as projected. To cover the wide range of possibilities, based on a Spencer Fane Britt & Browne, LLP's<sup>10</sup> analysis, three scenarios of tax increment financing adjusted for reinvested property taxes<sup>11</sup> (-\$5,170,000) were developed – low (\$3,255,000), medium (\$16,855,000), and high (\$30,455,000). The tax increment financing impacts are modeled as a shock to the IMPLAN sector 36 - construction of other new non-residential structures.

The annual estimated capital cost of property tax<sup>12</sup> revenue is \$235,000, as presented in table A-1.

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<sup>10</sup> A detailed breakdown of the three scenarios of tax increment financing are presented in table A-2 in Appendix A

<sup>11</sup> A detailed breakdown of the reinvested property taxes are presented in table A-1 in Appendix A

<sup>12</sup> The source of the estimated property tax revenue is Regional Economic Impact Assessment of the North Central Missouri Regional Water Commission Water Supply Reservoir, 2005

**Table A-1. Re-invested property taxes**

<b>Property taxes</b>	<b>IMPLAN Sector</b>	<b>Annual</b>	<b>Total for 23-years</b>
Schools	391 – Private elementary and secondary schools	\$126,200	\$2,776,000
Library	393 – Other private educational services	\$3,800	\$84,000
Hospital	394 –Offices of physicians, dentists and other health practitioners	\$16,200	\$356,000
Health Department	401 – Community food, housing, and other relief services including rehabilitation services	\$9,400	\$207,000
Ambulatory service	396 – Medical and diagnosis labs, outpatient and other ambulatory services	\$18,800	\$414,000
Watershed district	432 – Other state and local government enterprises	\$60,600	\$1,333,000
<b>Total</b>		<b>\$235,000</b>	<b>\$5,170,000</b>

Since the developments are projections based upon private and individual economic activity, low, medium, and high scenarios were developed. The details of the annual accrual of funding available for tax increment financing are illustrated in the three scenarios in table A-2.

**Table A-2. Low, medium and High Scenarios for Tax Increment Financing<sup>13</sup>**

<b>Year</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
1	313	781	1,250
2	109,000	261,000	412,000
3	169,000	449,000	729,000
4	257,000	686,000	1,115,000
5	272,000	723,000	1,175,000
6	294,000	781,000	1,268,000
7	309,000	819,000	1,328,000
8	332,000	878,000	1,423,000
9	348,000	915,000	1,483,000
10	371,000	975,000	1,579,000
11	386,000	1,013,000	1,640,000
12	410,000	1,074,000	1,738,000
13	425,000	1,112,000	1,798,000
14	449,000	1,174,000	1,898,000
15	464,000	1,212,000	1,959,000
16	489,000	1,275,000	2,060,000
17	504,000	1,313,000	2,121,000
18	529,000	1,377,000	2,225,000
19	544,000	1,415,000	2,286,000
20	570,000	1,480,000	2,391,000
21	585,000	1,518,000	2,451,000
22	608,000	1,577,000	2,546,000
<b>Total</b>	<b>8,425,000</b>	<b>22,025,000</b>	<b>35,625,000</b>

The inputs for the economic impacts were from Table A-2. The economic impacts of tax increment financing are displayed in Table A-3.

<sup>13</sup> The data for the three scenarios was provided by Spencer Fane Britt & Browne, LLP

**Table A-3. Tax Increment Financing Economic Impacts - Low, Medium, and High Scenarios**

	<b>Employment</b>	<b>Labor Income</b>	<b>Value Added</b>
Low scenario	49	\$1,395,000	\$6,878,000
Medium scenario	127	\$3,646,000	\$17,979,000
High scenario	205	\$5,897,000	\$29,080,000

Based on the economic impacts, the gains to the regional economy are substantial due to the tax increment financing. As a result of tax increment financing, the 10-county region is projected to support between 49 and 205 jobs. Salaries and wages paid to the employees working in developments due to tax increment financing are in the range of \$1.4 million to \$5.9 million. The value-added contributions to the economy are in the range of \$6.9 million to \$29.1 million.

## Appendix B. Potential Economic Impacts of Proposed Developments in East Locust Creek Reservoir Project Area

Recreation facilities that are proposed as part of potential developments in the East Locust Creek Reservoir project include a 500 unit residential facility, recreation shelters, recreation vehicle park, a resort with rooms, shops and meeting rooms, campgrounds, convenience store, boat dock, fast food restaurant, marina, and a dine-in restaurant. Details of the estimated investment in the potential projects are presented in table B-1.

**Table B-1. Breakdown of estimated investment in the construction projects in East Locust Creek Reservoir project area**

<b>Construction Projects</b>	<b>Estimated Investment</b>
500 Residential units construction	\$ 93,750,000
Recreation Area – Shelters, pool, bathhouse	\$1,000,000
Recreation Area – RV Park, hookups	\$250,000
Resort Hotel Rooms	\$9,500,000
Resort Shops	\$125,000
Resort Meeting Rooms	\$625,000
Campground	\$3,264,000
Convenience Store	\$658,000
Boat Docks and Storage	\$3,750,000
Fast food	\$1,000,000
Marina	\$375,000
Restaurant	\$1,000,000
<b>Total</b>	<b>\$115,297,000</b>

The construction economic impacts of the proposed developments are presented in table B-2. As a result of construction of these recreation facilities, it is projected that a net 840 jobs are supported in the 10-county region paying \$25.8 million in salaries and wages to the employees and contributing \$89.2 million to the regional economy.

**Table B-2. Estimated Construction economic impacts of proposed developments in East Locust Creek Reservoir project area**

	<b>Employment</b>	<b>Labor Income</b>	<b>Value Added</b>
Direct	568	\$17,031,000	\$72,743,000
Indirect	174	\$5,807,000	\$10,160,000
Induced	98	\$2,989,000	\$6,307,000
<b>Total</b>	<b>840</b>	<b>\$25,827,000</b>	<b>\$89,210,000</b>

Another component of the recreation facilities are the potential sales that occur as a result of recreation activities in the 10-county region. Details of the estimated sales due to recreation activities are presented in table B-3.

**Table B-3. Estimated sales due to recreation activities on East Locust Creek Reservoir project area**

<b>Description of recreation activity</b>	<b>Estimated Sales</b>
Recreation Area - Campgrounds	\$450,000
Resort Hotel Rooms	\$4,125,000
Resort Shops	\$450,000
Resort Meeting Rooms	\$500,000
Campground	\$183,000
Convenience Store	\$400,000
Boat docks and storage	\$1,000,000
Fast food	\$400,000
Marina	\$600,000
Restaurant	\$1,000,000
<b>Total</b>	<b>\$9,108,000</b>

The sales due to recreation activities are projected to be \$9.1 million. The sales in the 10-county region can potentially generate additional economic activity. As a result of the sales, it is projected that 130 jobs will be supported, paying \$2.5 million in salaries and wages, and potentially contributing \$11.7 million to the economy. The economic impacts due to potential sales as a result of recreation activities are presented in table B-4.

**Table B-4. Economic Impacts of potential recreation activities on East Locust Creek Reservoir project area**

	<b>Employment</b>	<b>Labor Income</b>	<b>Value Added</b>
Direct	106	\$1,772,000	\$8,752,000
Indirect	14	\$486,000	\$1,850,000
Induced	10	\$295,000	\$1,055,000
<b>Total</b>	<b>130</b>	<b>\$2,553,000</b>	<b>\$11,657,000</b>

## Appendix C. Agricultural Operations in the 10-county region

Table C-1. Agricultural operations – acreage, yield and economic value to the 10-county region

	Acreage	Yield/acre	2014 Price	Value	IMPLAN Sectors	Net Present Value (50 years)
Corn	66.4	140 bushels	\$2.85/bushel	\$26,000	2-Grain farming	\$636,000
Soybeans	265.6	40 bushels	\$9.18/bushel	\$98,000	1-Oilseed farming	\$2,340,000
Hay	166	140 bales	\$4.50/60 lb. bales	\$105,000	10-All other crop farming	\$2,509,000
Pasture	664	3 tons	\$60.86	\$40,000	10 – All other crop farming	\$970,000
Forestry <sup>14</sup>	584		\$200/acre	\$117,000	14-Logging	\$2,802,000
<b>Total</b>	<b>1,746 acres</b>			<b>\$386,000</b>		<b>\$9,257,000</b>

In order to build the reservoir, many acres of cropland and forest will be inundated. The value of lost agriculture and forestry over 50 years is estimated using a net-present value method. Table C-1 breaks down the acreage of corn, soybeans, hay, pasture and forest land in the 10-county region. The 2014 average yield and price information<sup>15</sup> were obtained for north-central Missouri and the value of the agricultural operation was calculated. The economic impacts were calculated using IMPLAN model and the corresponding sector is listed in the table above. The net present value of 50 years of agricultural operation is presented in the last column.

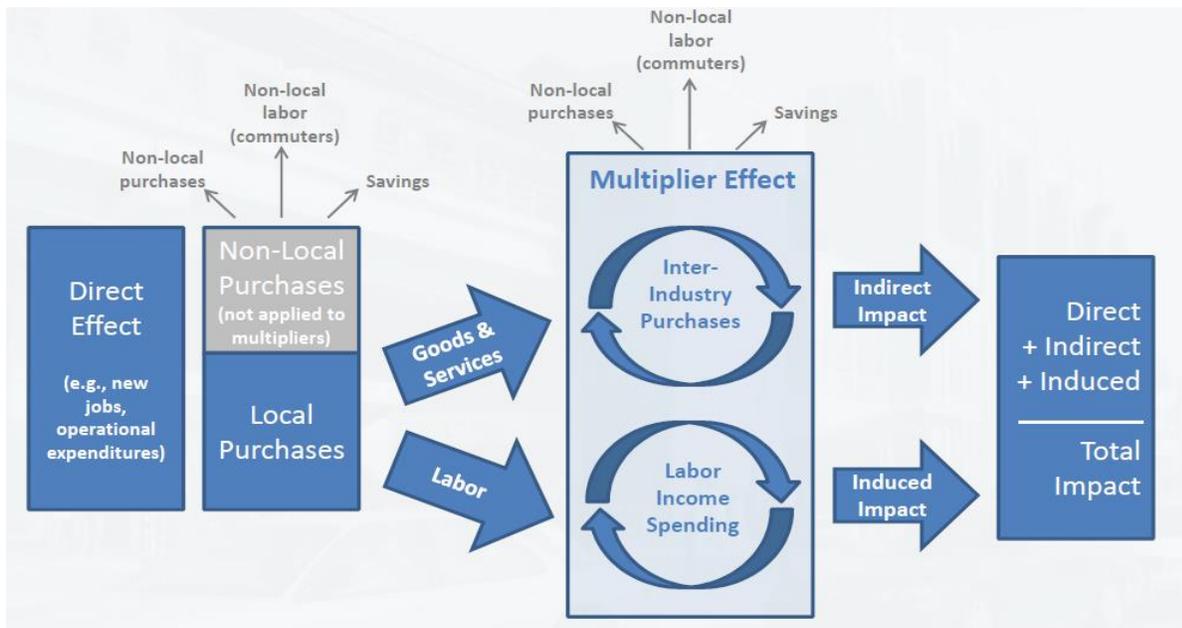
<sup>14</sup> [Price of forest products](#)

<sup>15</sup> [Yield and price information](#)

## Appendix D. Economic Impact analysis and IMPLAN Model Description

Economic impact analysis is the assessment of a change in overall economic activity as a result of some change in one or several economic activities in a given area at a particular period of time. One method of interpreting complex economic linkages and relationships is through the use of Input-Output (I-O) analysis. I-O analysis is a means of examining relationships between various businesses, and between businesses and final consumers in a given time period within a county, region, state, or country. I-O analysis techniques provide a relatively straightforward methodology to quantify and help interpret the flow of economic linkages and to assess the extensive impacts throughout an economic system. I-O modeling is a non-statistical method, and its parameters and structure are determined from actual inter-industry data. An I-O model measures the direct, indirect, and induced effects resulting from changes in final demand, as illustrated in Figure D-1 below. Direct effect is due to the new economic activity. Indirect effect is due to the purchase of raw materials and services to support the new economic activity. Induced effect is due to the household purchases of new workers in the regional economy.

Figure D-1. Conceptual overview of Input-Output Modeling<sup>16</sup>



<sup>16</sup> [IMPLAN, RIMS-II and REMI Economic Impact Models Comparison](#) – AKRF, Inc.

There are a wide range of commercially viable I-O models that can be used to evaluate economic impacts. The model used for this economic impact report is IMPLAN. IMPLAN is based on the Leontief I-O methodology. Leontief I-O technique provides a methodology to quantify and help understand the flow of economic linkages and to assess the extensive impacts throughout an economic system. I-O analysis provides a matrix of the flow of goods and services among the various sectors of an economy, taking into considerations the direct and indirect relationships among the sectors.

The IMPLAN model was originally developed by the U.S. Department of Agriculture Forest Service in cooperation with the Federal Emergency Management Agency and US Department of Interior - Bureau of Land Management, to assist the Forest Service in land and resource management planning. IMPLAN has been extensively used by both Federal and State Government agencies to estimate the economic impacts of various policies, activities, industries, and other economic stimuli. IMPLAN uses local employment and output data available at the county level and national production functions to simulate a local economy. The database is built from the following information:

1. National-level technology matrices;
2. IMPLAN data is presented annually by county and state FIPS (Federal Information Processing Standards) codes for 440 industrial sectors;
3. Estimated regional data for institutional demand and transfers, value-added, industry output and employment at the county, state and national level;
4. Regional purchase coefficients and regional value added or output ratios are used to localize the national absorption and byproduct matrices; and
5. Complete set of social accounting matrices and software for deflation, margining, and structure for complex sets of expenditures.

### Advantages of IMPLAN Model

1. IMPLAN is a user-friendly and flexible package in allowing the user to reconfigure regions to include one or more counties, change the database, modify production functions and trade flow assumptions and introduce new industries.
2. Data to use in IMPLAN can be easily modified or updated.
3. The model allows for multi-regional modeling to study the effects of changes in an economic region of zip codes, counties, or State.
4. IMPLAN breaks the impacts into direct, indirect, and induced effects, which are easy to interpret.
5. IMPLAN uses 440 industrial sectors, which is the largest among the available models.

### Disadvantages of IMPLAN Model

1. Customized simulation of costs in IMPLAN is not available.
2. IMPLAN is a static model (i.e. it does not consider the inherent changes over time in an economy). IMPLAN models economic impacts at a single point in time, and the impacts should be updated over time to capture the time effects.
3. The model assumes a linear production function or constant returns to scale; i.e. a fixed proportion of inputs are assumed to produce an output.
4. The model assumes that the output produced by different industries is of the same quality.
5. The model assumes that there are no constraints to supply of any commodity.
6. The model assumes that an increase or decrease in employment is met by in-migration or out-migration of employees.