

This Economics/Recreation Appendix contains several individual reports prepared under contract.

The Economics portion of the appendix is made of up two reports prepared by the University of Nevada, Reno. The first report, which includes two parts, is the “Truckee River Basin Regional Economic Impact Model,” Technical Report UCED 94-18. This first report initially was prepared for the 1998 draft EIS/EIR and still applies to analyses included in this revised draft EIS/EIR. The second report is entitled “Economic Impact Model for Analyses Associated with the Truckee River Operating Agreement and the Water Quality Settlement Agreement Study Areas,” Technical Report UCED 98/99-04. This report was prepared for the revised draft EIS/EIR for the Truckee River Operating Agreement as well as for the EIS for the Water Quality Settlement Agreement. This report updates and expands information contained in Technical Report UCED 94-18.

The Recreation portion of this appendix also is made up of two reports: “Instream Flows and Recreation on the Truckee River and selected Tributaries” and “Recreation Model Results for the Truckee River Water Quality Settlement Agreement Environmental Impact Statement.” The first report was prepared for this study by Colorado State University to be used in evaluating river-related recreation. The second report, prepared by the University of Nevada, Reno, includes recreation model results and analyses based on more recent survey data from California Department of Water Resources that were used for this study as well as for the Truckee River Water Quality Settlement Agreement EIS.

**TRUCKEE RIVER BASIN
REGIONAL ECONOMIC IMPACT MODEL**

PART 1 OF 2



**Truckee River Basin
Regional Economic Impact Model**

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Executive Summary

The U.S. Bureau of Reclamation is preparing an *Environmental Impact Statement (EIS)* for the *Truckee River Operating Agreement (TROA)*. As part of their *EIS*, the Bureau is looking at the potential economic impacts of *TROA* on the Truckee River Basin economy. The potential impacts include economic impacts on recreation from changes in reservoir storage levels at Donner Lake, and at, Prosser, Stampede, and Boca Reservoirs as well as economic impacts of reallocations of water between agriculture, commercial, and residential uses. To estimate these economic impacts, the Department of Agricultural Economics at the University of Nevada has been under contract with the Bureau to develop a regional economic impact model of the Truckee River Basin.

The research by the Department of Agricultural Economics to develop this regional economic impact model is complete. This regional model encompasses the Truckee River Basin. Portions of Sierra, Nevada, Placer, El Dorado, and Alpine counties in eastern California and portions of Pershing, Washoe, Lyon, and Douglas counties and Carson City, an independent city, in western Nevada make-up the basin. Besides estimation of economic impacts, the modeling effort involved a survey of visitation and recreation use at Donner Lake, and at, Prosser, Stampede, and Boca Reservoirs and an accounting of economic activity in the region by economic sector. Features of the model include relationships between visitation and reservoir storage levels, annual patterns of visitation, and expenditures. These features allow for estimation of the number of visitors and their expenditures in the region relative to reservoir storage levels. Given reservoir storage levels for the year 1993, the model estimates 800,000 visitors at the four sites with expenditures in the region of \$7 million. Additional model features include economic relationships between measures of economic activity and economic linkages between economic sectors. Economic activity in the region is output of \$18 billion, employment of 188,000 jobs, personal income of \$7 billion, population of 308,000 persons, housing of 122,000 dwellings, agriculture water use of 74,000 acre-feet, commercial water use of 12,000 acre-feet, and residential water use of 72,000 acre-feet. These features allow for estimation of economic impacts relative to reservoir storage levels. With expenditures of \$7 million, the model estimates an overall economic impact on the region of \$10 million. This level of impact supports employment of 80 jobs and creates \$1.5 million in personal income. These same model features also allow for estimation of economic impacts of reallocations of water. Expected future growth in the region requires a 40,000 acre-foot transfer from agriculture use to commercial and residential uses. For this reallocation, the model estimates a positive overall economic impact on the region of \$9 billion in 1990 dollars. This level of impact supports employment of an additional 101,000 jobs and creates an additional \$2 billion in personal income over this period. Growth in population is 164,000 persons and new housing is 65,000 dwellings. Commercial water use increases by 11,000 acre-feet and residential water use increases by 29,000 acre-feet. Research to further develop this regional model may possibly continue with respect to economic impacts of river flows.

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1. Introduction

The Bureau of Reclamation is preparing an *Environmental Impact Statement (EIS)* for the *Truckee River Operating Agreement (TROA)*. This is required by the *National Environmental Policy Act*. In preparing this *EIS*, the Bureau must look at the potential economic impacts of the *Truckee River Operating Agreement* on the Truckee River Basin economy. A regional economic impact model of the Truckee River Basin has been developed for this purpose. A description of the study area, justification for the model, and specification of the objectives are presented here.

1.1. Description of the Study Area

The Truckee River Basin covers five counties in California (Sierra, Nevada, Placer, El Dorado and Alpine) and five counties (Washoe, Pershing, Storey, Lyon and Douglas) and Carson City in Nevada. The location of the Truckee River Basin is shown in Figure 1.1-1.

The Truckee River, approximately 110 miles in length, begins in California at the outlet from Lake Tahoe near the town of Tahoe City. The river flows north pass the town of Truckee to the California-Nevada state line, then east into Nevada and through the Truckee Meadows. Within the Truckee Meadows are the cities of Reno and Sparks. The river then continues east towards the town of Wadsworth and then turns north, to end in Nevada at Pyramid Lake on the Pyramid Lake Indian Reservation.

Three natural lakes with regulated outlets and four man-made reservoirs, all located in California, permit control of Truckee River flows and provide storage for watershed runoff. These are Lake Tahoe, Donner Lake, Independence Lake, Martis Creek Reservoir, Prosser Creek Reservoir, Stampede Reservoir, and Boca Reservoir. Operation and management of the water levels in these lakes and reservoirs is under the control of the Bureau of Reclamation. These lakes and reservoirs provide storage and allow for regulation of Truckee River flows. The hydrologic features of the Truckee River Basin are shown in Figure 1.1-2.

Tourism is the single most important economic segment of the California communities. The towns of Tahoe City and Truckee rely on both summer and winter recreation attractions to draw thousands of visitors to the area. Summer recreation attractions include Lake Tahoe, the Truckee River and the lakes and reservoirs. The beauty of Lake Tahoe is known internationally. Winter recreation attractions include several ski areas. Winter activities also provide an important economic boost to the area. Most of the future development within California is expected to be related to recreation and the development of second or vacation homes.

With the exception of Boca Reservoir, most of the visitors to the lakes and reservoirs are from out of the area. Any operation or management change affecting lake and reservoir levels as well as river flows will have an impact on the number of visitors to the area. In an initial study by Loomis (OCAP DEIS May 1986) found "that visitation change is most sensitive to water levels; a one percent change in water level results in a 1.36 percent change in visitation, holding all other factors constant". The recreation season for the area is short (Memorial Day through Labor Day) and includes primarily camping, picnicking, fishing, boating, swimming, and water skiing activities.

The Little Truckee River, which flows into Stampede and Boca Reservoirs, provides irrigation water for the Sierra Valley. About 25 ranches having an irrigated acreage of approximately 9,700 acres rely partly on this water. Most of the acreage is either meadows or pastures that produce forage for cattle. The irrigation water rights held by these ranches are dictated in the *Middle Fork of the Feather River Decree*.

Major tributaries draining the hills surrounding the Truckee Meadows provide additional water flow to the Truckee River. These tributaries are Hunter, Evans, Thomas, and Whites Creeks. Additional water flow to the Truckee River is also from Steamboat Creek and its tributaries near the eastern edge of the Truckee Meadows. Washoe Lake and Little Washoe Lake provide regulation of Steamboat Creek.

Truckee Meadows, including the cities of Reno and Sparks, has a diversified economy including gaming, warehousing, and some light manufacturing industries. Although the Truckee Meadows relies significantly on the Truckee River for its municipal and industrial water, there is an increasing recognition over the importance of having a clean and scenic river to enhance the quality of life in the Truckee Meadows. The Washoe County Regional Planning Board has initiated a Truckee River Corridor effort to protect and enhance the river. Also the Reno Redevelopment Commission has initiated a number of downtown projects associated with the river to encourage both local residents and tourists to visit local parks and walkways along the river.

The Truckee River provides irrigation water to the Truckee Meadows. The irrigated acreage is either meadows, pastures or alfalfa fields. Cattle graze on the meadows and pastures and are fed hay from the alfalfa fields. The irrigation water is water diverted from the river into ditches, water from creeks and drainage water. These irrigation water rights are dictated in the *Orr Ditch Decree*.

Over-time, the irrigation water rights are being purchased for municipal and industrial (M&I) uses. Truckee Meadows population is expected to grow 2 to 2.5 percent annually. On account of this growth, commercial and residential water use will increase. As transfers of water from agriculture to M&I use continues, income and employment in the agricultural sector can be expected to diminish with concomitant increases in other sectors purchasing water from agriculture.

East of the Truckee Meadows and near the town of Wadsworth, part of the Truckee River water is diverted at Derby Dam. The diverted water continues east through the Truckee Canal for irrigation in the Newlands Reclamation Project operated by the Truckee-Carson Irrigation District (TCID). The Newlands Project consists of two divisions. The Truckee Division surrounds the town of Fernley and the Carson Division surrounds the town of Fallon. Within the Newlands Project approximately 60,000 acres are irrigated with water from both the Truckee and Carson Rivers. Irrigation water from

both rivers is stored in Lahontan Reservoir and released on demand to farms in the Carson Division and also to farms on the Fallon Indian Reservation. Outflows from the Carson Division and Fallon Indian Reservation go to the Stillwater Wildlife Management Area (SWMA) and Carson Lake Pasture. These two areas are wetlands that provide habitat for fish, wildlife, and migratory fowl.

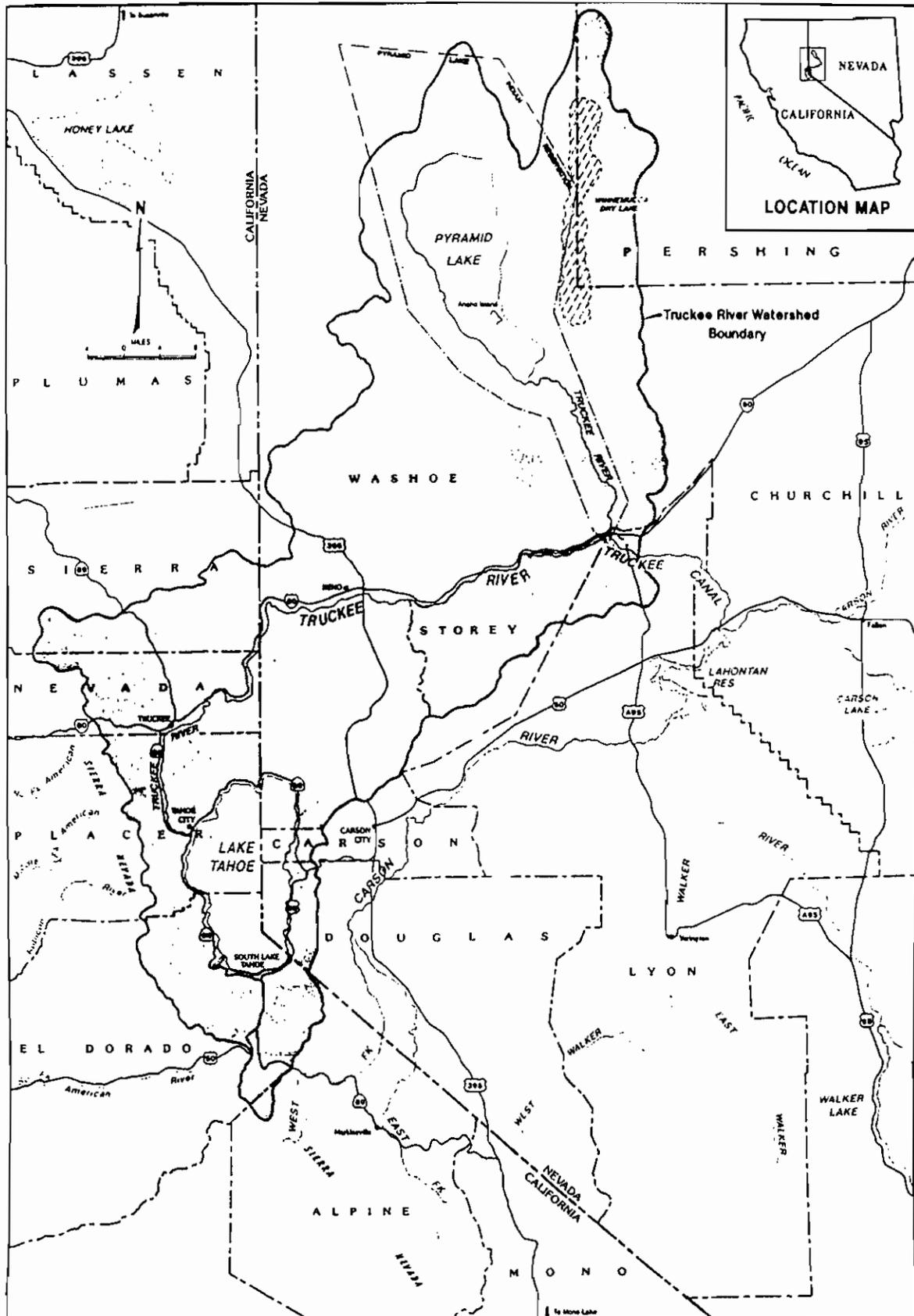
Recreation activities along the lower Carson River are primarily associated with fishing and other recreational uses on Lahontan Reservoir and hunting and bird watching associated with the wetlands at the Stillwater Wildlife Refuge.

Agriculture and the Fallon Naval Air Station are the primary industries in the Fallon area.

North of Wadsworth, the Truckee River ends at Pyramid Lake on the Pyramid Lake Indian Reservation. Aside from some irrigation en route (including the Pyramid Lake Paiute Indian farm lands), water flowing into Pyramid Lake helps sustain the Lahontan Cutthroat Trout and the Cui-ui fish, listed as an endangered species.

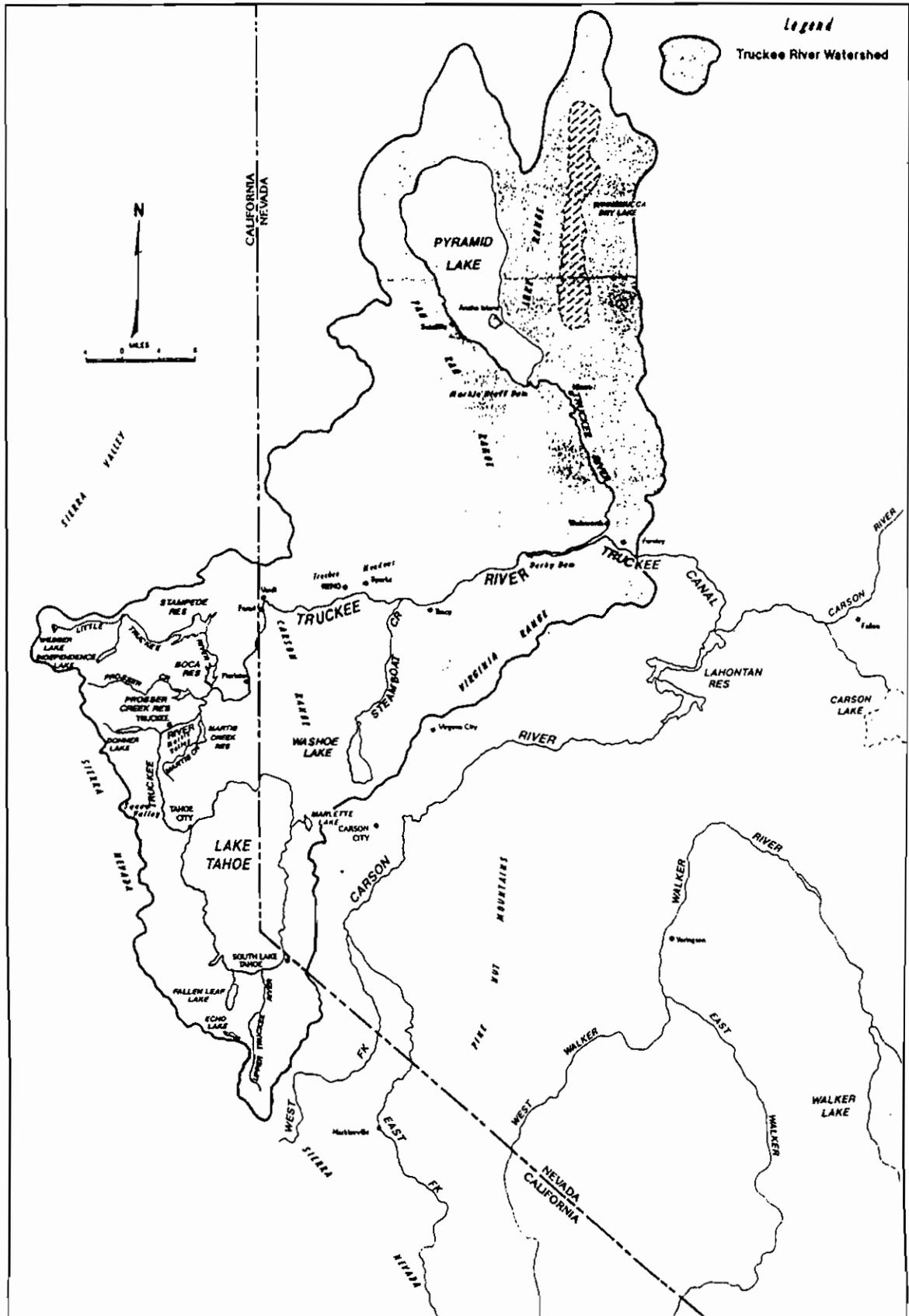
The Pyramid Lake Paiute Tribe has extensive plans for economic development for Pyramid Lake emphasizing the natural resources of the lake. Pyramid Lake supports a population of Lahontan Cutthroat Trout, and is popular for boating and fishing for trophy size cutthroat trout. Other activities include camping, swimming, water skiing, sightseeing and picnicking. The Tribe has recently completed construction of a new marina and campground along the west shore of the lake. Future development will be designed to enhance and utilize the lakes resources.

Figure 1.1-1. Location of the Truckee River Basin.



Source: State of California. *Truckee River Atlas*. Department of Water Resources. Sacramento, California. June 1991. Page 3.

Figure 1.1-2. Hydrologic Features of the Truckee River Basin.



Source: State of California. *Truckee River Atlas*. Department of Water Resources. Sacramento, California. June 1991. Page 4.

1.2. Justification for the Model

The Truckee River has had a long history of legal conflicts over who gets the water, how much, and when. The river is managed by a federal water master and the operation rules are dictated in the *Truckee River Agreement of 1935* which was made part of the *Orr Ditch Decree*. The continuing conflicts in the allocation of water in the Truckee River Basin include monitoring storage levels in the upstream reservoirs and stream flows for recreation, meeting growing water demands for municipal use in the Truckee Meadows (including provisions for drought periods), providing water deliveries to the Newlands Reclamation Project, protecting fish species at Pyramid Lake and stabilizing the lake level, and maintaining and improving wetlands at the Stillwater Wildlife Management Area. Any resolution to these conflicts will entail changes in the operation of the upstream reservoirs, changes in instream flows, and changes in intersectoral water allocations.

Public Law 101-618, also referred to as the "*Negotiated Settlement*" was passed by the 101st Congress at the end of its 1990 session to settle a number of water related issues in the Truckee and Carson River Basins. *Title I* of this public law establishes a fund for \$43 million to settle the water related issues of the Fallon Paiute-Shoshone Indian Tribe. *Title II* of this law is intended to settle the water related issues associated with the Truckee River, Carson River, and Pyramid Lake.

One of the means by which the goals of *Title II* will be accomplished is through a *Truckee River Operating Agreement (TROA)*. This operating agreement is essentially modification in the operation of the upstream reservoirs to provide benefits to fish and wildlife and to municipal, industrial, agricultural and recreational users downstream of Tahoe City, and satisfy the requirements of the *Endangered Species Act* by promoting the enhancement and recovery of the Cui ui fish at Pyramid Lake. This operating agreement is to be negotiated between the Secretary of the Department of the Interior and the states of California and Nevada after consultation with affected parties. The regulations concerning this operating agreement are outlined in *Section 205 of Public Law 101-618*. Under these regulations, the Secretary and the signatures to the operating agreement shall, if necessary, develop and implement a plan to mitigate any significant adverse environmental impacts resulting from the operating agreement.

For this purpose, one potentially important impact will be the effect of the *Truckee River Operating Agreement* on the economy of the Truckee River Basin. Therefore, in describing economic impacts resulting from the operating agreement, there is a definite need for a tool to both identify and quantify economic impacts from changes in the operation of the upstream reservoirs, changes in instream flows, and changes in intersectoral water allocations.

1.3. Specification of the Objectives

The objective of this research is a regional economic impact model of the Truckee River Basin. This model will be developed by following input-output analysis and input-output modeling procedures. This model will have a recreation model component and an input-output model component. Application of this model will be estimation of the economic impacts resulting from the *Truckee River Operating Agreement* on the Truckee River Basin economy. The sub-objectives of this research are:

1. Survey of the Visitation

Personal interviews of visitors at selected river, lake and reservoirs sites will be done to collect information on recreation visitation, activities, and expenditures.

2. Estimation of the Expenditure Function

An expenditure function will be estimated to calculate recreation expenditures of visitors at selected river, lake and reservoir sites.

3. Formulation of the Model Equations

Model equations will be formulated to estimate the annual number of visitors at selected lake and reservoir sites and expenditures relative to reservoir storage levels and annual patterns of visitation.

4. Definition of the Region

The region will be defined in terms of economic area, population base, and economic sectors.

5. Collection of the Control Total Data

Control total data for the region will be collected for output, employment, income, population, housing, agriculture water use, commercial water use, and residential water use.

6. Derivation of the Model Tables

Model tables for estimation of economic impacts will be derived from a transactions matrix that reflects the economy of the region.

7. Estimation of the Economic Impacts for Alternative Reservoir Storage Levels

A program will be developed to estimate economic impacts for alternative reservoir storage levels.

8. Estimation of the Economic Impacts for Reallocations of Water

A program will be developed to estimate economic impacts for reallocations of water.

The main objective and these sub-objectives are completed through the following chapters. The second chapter is on model development. The third chapter covers the recreation model component. The fourth chapter covers the input-output model component. The fifth chapter is on model application. The sixth chapter is a conclusion. In addition to these chapters there are two supplement chapters on model improvement. References are given at the end.

2. Model Development

The regional economic impact model is developed following input-output procedures. Input-output refers to the analytical framework developed by Professor Wassily Leontief in the late 1930's. Professor Leontief later received the Nobel Prize in Economic Science in 1973 for his work in this area (Miller and Blair, 1985). These input-output procedures are input-output analysis and input-output modeling. An explanation of input-output analysis and a description of input-output modeling are presented here.

2.1. Explanation of Input-Output Analysis

Input-output analysis concerns the measurement of an economic impact, accounting of the economic activity, and estimation of an economic impact.

Measurement of an Economic Impact

The economic impact on the region is the dollar amount of economic activity, reported as output, that would occur as a result of either alternative reservoir storage levels at Prosser, Stampede, and Boca Reservoirs or reallocations of water from agriculture use to commercial and residential uses. Measurement of economic impacts from both is done through direct, indirect, induced, and total effects.

The economic impact for alternative reservoir storage levels at Prosser, Stampede, and Boca Reservoirs is measured in the following manner. An economic impact occurs because of recreation activities at the reservoirs. At each alternative reservoir storage level there is a different level of recreation in terms of visitation to the reservoirs and expenditures in the economy. Visitation to the reservoirs is by camping and day use visitors. Expenditures in the economy are on items necessary for recreation at the reservoirs. Items such as gas, groceries, supplies, meals at restaurants, hotel rooms, and vacation-home rent. Camping and day use visitors purchase these items from businesses and cause a direct effect to occur on the economic activity in the region. In addition to this direct effect, indirect and induced effects also occur. Given that businesses in the region sell items for recreation to camping and day use visitors, these businesses also purchase products and services from other businesses in the region. Because of these purchases being made, there is then an indirect effect on other businesses and on economic activity in the region. The induced effect on economic activity in the region is household spending by employees of these affected businesses. At each alternative reservoir storage level there is a different amount of household spending by employees. Together the direct, indirect, and induced effects on economic activity make-up the total effect or economic impact on the region for alternative reservoir storage levels.

The economic impact for a reallocation of water from agriculture use to commercial use is measured in the following manner. An economic impact occurs since water is a resource requirement for agriculture production and commercial activity. A reallocation of water transfers an amount of water from agriculture use to commercial use. The direct effect on economic activity in the region is a decrease in agriculture production from farms and ranches, and an increase in commercial activity from businesses. The indirect effect on economic activity in the region is also a decrease in business activity from those businesses that sell products and services to farms and ranches for agriculture production, and also an increase in business activity of the businesses that sell products and services to businesses that have an increase in commercial activity. The induced effect on economic activity in the region is a decrease in household spending by employees on farms and ranches, and an increase in household spending by employees in commercial businesses. Together the direct, indirect, and induced effects on economic activity make-up the total effect or economic impact on the region for a reallocation of water from agriculture use to commercial use.

As a result of the total effect on economic activity there are also response effects that occur in the region. Response effects include effects on employment, income, population, housing, agriculture water use, commercial water use, and residential water use. These response effects are an additional part of an economic impact.

Accounting of the Economic Activity

There are several economic sectors in the region. An accounting of the economic activity is necessary to determine the sectors interdependence. Relationships between sectors are identified through intersector transactions. Transactions that are accounted for by sector include intermediate demand, final demand, final payments, total output, and total input.

A transactions matrix provides for the accounting of the economic activity by sector in the region. The arrangement of this matrix is shown in Figure 2.1-1. Sectors are both selling sectors and purchasing sectors. There are four quadrants in the matrix. Quadrant I contains intermediate demand transactions. Intermediate demand transactions are sales and purchases of products and services among sectors. Sales of products and services represent output and purchases of products and services represent input. Quadrant II contains final demand transactions. Final demand transactions are sales of output to personal consumption, private fixed investment, government, and exports. Quadrant III contains final payment transactions. Final payment transactions are payments for primary inputs. Primary inputs include value-added items of employee compensation, profits, interest, indirect business taxes, and depreciation. Imports are also a primary input. Quadrant IV describes transactions that are not directly linked to the other quadrants. Total output are total sales by sectors. Total input are total purchases by sectors.

The transactions matrix is a double-entry accounting system. There is a rowwise accounting of sales by sector and a columnwise accounting of purchases by sector. The rowwise accounting of sales by sector depict the sale pattern of products and services. The columnwise accounting of purchases by sector depict the purchase pattern of products and services in the production process. Total sales of products and services represent total output. Total purchases of products and services represent total input. Furthermore, the rowwise accounting sales by a sector reflect relationships known as forward linkages and the columnwise accounting of purchases by a sector reflect relationships known as backward linkages.

Rowwise, for Quadrants I and II, total output for each selling sector X_i consist of intersector sales of output to purchasing sectors of intermediate demand x_{ij} 's and sales of output to final demand Y_i . This is expressed through the following accounting equations:

$$X_i = x_{i1} + \dots + x_{ij} + \dots + x_{in} + Y_i; \quad \text{where } i = 1, n; \quad (2.1-1)$$

or,

$$X_i = \sum_j^n x_{ij} + Y_i; \quad \text{where } i = 1, n. \quad (2.1-2)$$

The summation over j reflects intersector sales for the products or services of sector i .

The final demand component of total output is disaggregated into personal consumption pc_i , private fixed investment fi_i , government g_i , and exports outside the region e_i . This is expressed through the following accounting equation:

$$Y_i = pc_i + fi_i + g_i + e_i; \quad \text{where } i = 1, n. \quad (2.1-3)$$

Again, consumption, investment, government, and exports comprise final demand. Government can be further disaggregated into federal, state, and local government.

Columnwise, for Quadrants I and III, total input for each purchasing sector X_j consists of intersector purchases of input from selling sectors of intermediate demand x_{ij} 's and purchases of input from final payments P_j . This is expressed through the following accounting equations:

$$X_j = x_{1j} + \dots + x_{ij} + x_{nj} + P_j; \quad \text{where } j = 1, n; \quad (2.1-4)$$

or,

$$X_j = \sum_i^n x_{ij} + P_j; \quad \text{where } j = 1, n. \quad (2.1-5)$$

The summation over i reflects intersector purchases for the products or services of sector j .

The final payments component of total input is disaggregated into employee compensation ec_j , profit income pr_j , interest income in_j , indirect business taxes t_j , charges against depreciation of capital equipment d_j , and imports from outside the region m_j . This is expressed through the following accounting equation:

$$P_j = ec_j + pr_j + in_j + t_j + d_j + m_j; \quad \text{where } j = 1, n. \quad (2.1-6)$$

The employee compensation, profit income, interest income, indirect business taxes, and depreciation is the value-added portion of final payments.

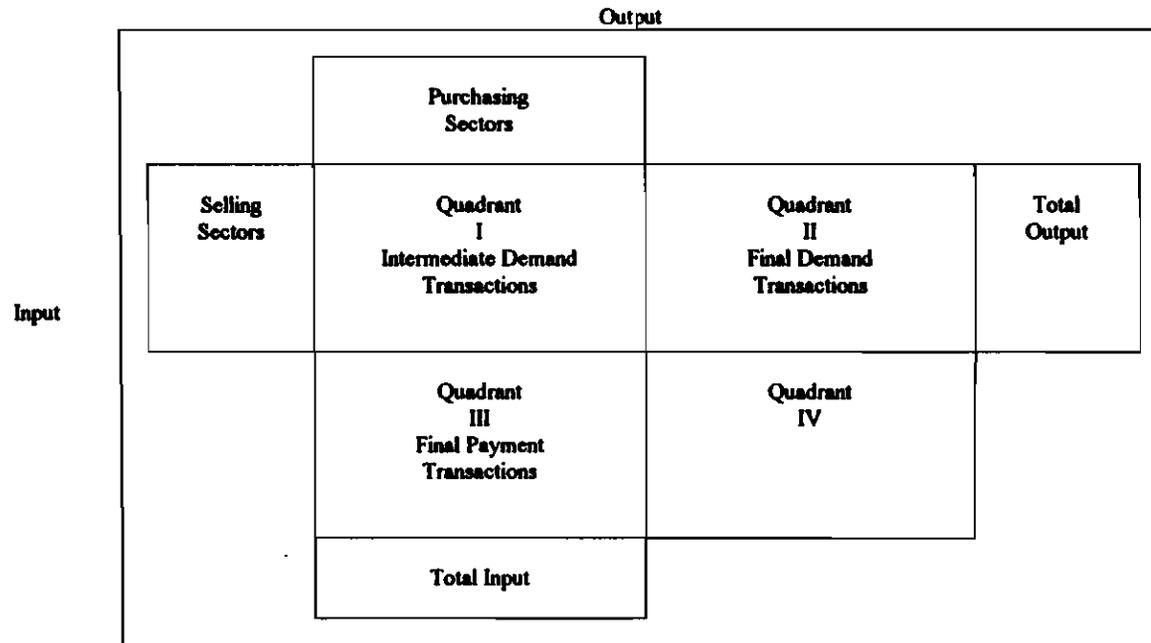
The final accounting identity of the transaction matrix is that for each sector total output X_i must equal total input X_j . This is expressed through the following accounting equation:

$$X_i = X_j; \quad \text{where } i = j. \quad (2.1-7)$$

The summation of total output for all sectors is gross output. The summation of total input for all sectors is gross outlay. Then gross output must also equal gross outlay.

The accounting of economic activity in the region is extended to also include employment, income, population, housing, agriculture water use, commercial water use, and residential water use by sector.

Figure 2.1-1. Arrangement of the Transactions Matrix.



Estimation of an Economic Impact

Estimation of an economic impact on the region is done by using the output requirements of an input-output model. The transactions matrix for the region is the basis for the input-output model. Through a sequence of calculations involving matrix algebra, the transactions matrix becomes an input-output model which provides direct requirements, final demand requirements, output requirements, employment requirements, and income requirements. Output requirements indicate the total effect on economic activity from a change in output. Output requirements also provide the distribution of the total effect over all economic sectors.

Three assumptions are made before the transactions matrix becomes an input-output model. The first assumption is that individual businesses which make-up the economy in the region can be grouped together into economic sectors. The reasoning here is that businesses in a given sector will be affected similarly by a given change. The second assumption is that all businesses in a given sector produce homogeneous products and services. The third assumption is that purchases of products and services by businesses in a sector from businesses in other sectors represent linear production functions. This last assumption is the assumption of fixed proportionality.

The transactions matrix for the region becomes an input-output model in the following manner. Purchases of products and services by businesses in a sector from businesses in other sectors are inputs into the production process. Inputs into the production process by a sector are used in direct proportion to the total output from that sector. This production relationship is expressed through the following equations:

$$a_{ij} = \frac{x_{ij}}{X_j}; \quad \text{where } i, j = 1, n; \quad (2.1-8)$$

or,

$$x_{ij} = a_{ij}X_j; \quad \text{where } i, j = 1, n. \quad (2.1-9)$$

The a_{ij} is the direct requirement of production. The direct requirements are determined for each sector by dividing the purchases of the given sector by the total output of the same sector. Each direct requirement is defined as the dollar value of input per dollar value of output. Rowwise, the direct requirements are then substituted into the

accounting equations (2.1-1):

$$X_i = a_{i1}X_1 + \dots + a_{ij}X_j + \dots + a_{in}X_n + Y_i; \quad \text{where } i = 1, n. \quad (2.1-10)$$

For n sectors, the equations are more compactly restated in matrix algebra notation by the following equation:

$$X = AX + Y. \quad (2.1-11)$$

The X is an $(n \times 1)$ matrix that includes the total output for n sectors. The A is the $(n \times n)$ matrix of direct requirements. The Y is an $(n \times 1)$ matrix of final demand. This equation is then solved for X in terms of the A matrix and Y by matrix inversion. Matrix inversion provides for the following equations:

$$X(I - A) = Y; \quad (2.1-12)$$

and,

$$X = (I - A)^{-1} Y; \quad (2.1-13)$$

or,

$$X = BY. \quad (2.1-14)$$

The I is an $(n \times n)$ identity matrix. The A matrix is subtracted from the I matrix and then through matrix inversion becomes the final demand requirements matrix or B matrix. Inversion of the $(I - A)$ matrix is represented by the superscript -1 . The final demand requirements imply that, given a vector of final demand, economic activity can be directly determined for each sector by the following equation:

$$X_i = b_{i1}Y_1 + \dots + b_{ij}Y_j + \dots + b_{in}Y_n; \quad \text{where } i = 1, n. \quad (2.1-15)$$

Then differentiating this equation with respect to final demand:

$$b_{ij} = \frac{\partial X_i}{\partial Y_j}; \quad \text{where } i, j = 1, n. \quad (2.1-16)$$

The final demand requirements, b_{ij} 's, indicate the total effect on economic activity of sector i from a change in final demand for sector j . Their columnwise summation over all sectors is the final demand total requirement B_j . This summation is expressed through

the following equation:

$$B_j = \sum_i^n b_{ij}; \quad \text{where } j = 1, n. \quad (2.1-17)$$

The B_j indicates the total effect on economic activity over all sectors from a change in final demand for sector j . Similar to final demand requirements are output requirements. Output requirements are derived through the following equation:

$$c_{ij} = \frac{b_{ij}}{b'_{ij}}; \quad \text{where } i, j = 1, n. \quad (2.1-18)$$

The c_{ij} 's are output requirements. These are placed into a C matrix. Columnwise, the output requirements are calculated by dividing the final demand requirements by the intrasector final demand requirement b'_{ij} . The intrasector final demand requirement is the final demand requirement along the main diagonal of the B matrix. Output requirements, c_{ij} 's, indicate the total effect on economic activity of sector i from a change in output for sector j . Their columnwise summation over all sectors is the output total requirement C_j . This summation is expressed through the following equation:

$$C_j = \sum_i^n c_{ij}; \quad \text{where } j = 1, n. \quad (2.1-19)$$

The C_j indicates the total effect on economic activity over all sectors from a change in output for sector j . Following this, employment and income requirements are found to complete the input-output model.

Estimating an economic impact on the region is done using the output requirements matrix because the effects on economic activity are due to changes in output as opposed to changes in final demand.

Again, response effects are an additional part of the economic impact. Response effects include effects on employment, income, population, housing, agriculture water use, commercial water use, and residential water use. These are estimated by output response coefficients. Output response coefficients are defined as the unit values of employment, income, population, housing, agriculture water use, commercial water use, and residential water use per dollar value of output for each economic sector in the region.

2.2. Description of Input-Output Modeling

Input-output modeling involves the development of the recreation model component, development of the input-output model component, and application of the model.

Development of the Recreation Model Component

The regional economic model includes a recreation model component to estimate the direct effect on the region for alternative reservoir storage levels at Prosser, Stampede, and Boca Reservoirs. This direct effect is referred to as the direct economic impact.

The recreation model generates the annual number of camping and day use visitors, and the annual camping and day use visitor expenditures relative to end of the month storage levels at Prosser, Stampede, and Boca Reservoirs for a given year. Then annual camping and day use visitor expenditures are allocated by economic sector to become the direct economic impact.

Development of the recreation model component required three tasks. These tasks are titled: survey of the visitation, estimation of the expenditure function, and formulation of the model equations. A summary of each task is given below.

A survey of the visitation was done during the week of August 9th through the 15th, 1993. This survey involved personal interviews of both camping and day use visitors along the Upper Truckee River, at Prosser Reservoir, at Stampede Reservoir, at Boca Reservoir, along the Lower Truckee River, and at Pyramid Lake. A questionnaire was used for the personal interviews. Camping and day use respondents were asked questions on site visitation, group size, site characteristics, expenditures, activity hours, site visitation at alternative water levels, site substitution, and demographics. In all, 162 respondents participated in the survey.

An expenditure function was estimated with data taken from the survey of the visitation. An expenditure function estimates the expenditures of camping and day use visitors per day per group by site. The sites, again, include Upper Truckee River, Prosser Reservoir, Stampede Reservoir, Boca Reservoir, Lower Truckee River, and Pyramid Lake. This expenditure function is specified in a semi-logarithmic form and then estimated using a maximum-likelihood estimation technique. The expenditures per group per day by site were found to be dependent upon activity hours of respondents at the site and group size of respondents at the site.

Model equations were formulated to calculate the annual number of camping and day use visitors at the reservoirs and the annual expenditures of the camping and day use visitors relative to end of the month storage levels at Prosser, Stampede, and Boca Reservoirs. This model has eleven separate functions. A set of equations and group of variables is given for each function. Also data is described that was used to develop each function. Data was either taken from the survey of the visitation and estimation of the expenditure function or collected from additional sources. Data from additional sources include the number of camping visitors to the campgrounds at each reservoir and end of

the month storage levels for each reservoir. The end of the month reservoir storage levels for each reservoir serve as the input into the model.

More details on the recreation model component and each of these tasks is provided in Chapter 3.

Development of the Input-Output Model Component

The regional economic model includes a input-output model component to estimate the total effect and the response effect on the region for alternative reservoir storage levels at Prosser, Stampede, and Boca Reservoirs. The total effect and response effect are referred to as the total economic impact and the response economic impact, respectively. The input-output model is also used to estimate the direct economic impact, the total economic impact, and the response economic impact on the region for reallocations of water from agriculture use to commercial use.

The input-output model generates the total economic impact and the response economic impact on the region for alternative reservoir storage levels at Prosser, Stampede, and Boca Reservoirs. The input-output model also generates the direct economic impact, the total economic impact, and the response economic impact for reallocations of water from agriculture use to commercial use.

Development of the input-output model component required three tasks. These tasks are titled: definition of the region, collection of the control total data, and derivation of the model tables. A summary of each task is given below.

The region was defined by an economic area, a population base, and several economic sectors. The hydrologic boundaries of the Truckee River Basin outline the region. Within the region, the economic area covers part of eastern California and part of western Nevada. Part of eastern California includes portions of Sierra, Nevada, Placer, El Dorado, and Alpine counties and the towns of Truckee, Tahoe City, and South Lake Tahoe. Part of western Nevada includes portions of Pershing, Washoe, Lyon, Carson City (an independent city), and Douglas counties and the cities of Reno and Sparks. The population base for the region is 316,381 persons. Of this amount, 16% is from the California counties and 84% is from the Nevada counties. There are also twenty aggregated economic sectors that make-up the economy in the region. These sectors are livestock production, dairy production, alfalfa hay production, other hay production, barley production, agricultural services, gold mining, other mining, construction, manufacturing, transportation and communications, utilities, trade, eating, drinking, and lodging, finance, insurance, and real estate, services, hotels, gaming, and recreation, health, local government, and households.

Control total data was collected for the region. There is a control total for output, employment, income, population, housing, agriculture water use, commercial water use, and residential water use. A definition, a source, and values by economic sector for the region by state are given for each control total. The values are estimated either by using specific information, coefficients, or county level data adjusted to the region by population. For the region, output is \$17,857,271,279. Employment is 188,121 jobs.

Income is \$6,720,549,054. Population is 307,874 persons. Housing is 122,239 dwellings. Agriculture water use is 73,696 acre-feet. Commercial water use is 12,432 acre-feet. Residential water use is 72,453 acre-feet. Output response coefficients are also provided for the region. These coefficients indicate how employment, income, population, housing, agriculture water use, commercial water use and residential water use change from a one dollar change in output.

Input-output tables were derived from the transactions matrix for the region. The transactions matrix is developed for Washoe county using IMPLAN, but, rebalanced by a modified RAS technique to the output control total for each economic sector in the region. Following this, input-output tables are found by performing a sequence of calculations involving matrix algebra. The input-output tables include direct requirements, final demand requirements, output requirements, employment requirements, income requirements, and multipliers. A description is provided for each of these tables. The description includes a definition of the table, and explanation of any calculations, and representation of the table in matrix algebra notation.

More details on the input-output model component and each of these tasks is provided in Chapter 4.

Application of the Model

The regional economic model has two applications. The first application is to estimate economic impacts for alternative reservoir storage levels at Prosser, Stampede, and Boca Reservoirs. The second application is to estimate economic impacts for reallocations of water from agriculture use to commercial use. A computer program was written to perform the calculations for each of these applications.

The operation of the computer program to calculate economic impacts for alternative reservoir storage levels at Prosser, Stampede, and Boca Reservoirs follows the flowchart in Figure 2.2-1. This program integrates the recreation model component with the input-output model component. A summary of the operation of this program is given below.

The program starts with input data. The input data is the alternative reservoir storage levels at Prosser, Stampede, and Boca Reservoirs. The program takes the alternative reservoir storage levels and performs the first process. This process calculates each of the eleven functions of the recreation model. Output from this process includes the direct economic impact by economic sector. From this, the program takes the direct economic impact by economic sector and performs the second process. This process multiplies the direct economic impact by economic sector by the output requirements of the input-output model. Output from this process is the total economic impact by economic sector. Finally, the program takes the total economic impact by economic sector and performs the third process. This process multiplies the total economic impact by economic sector by the output response coefficients of the input-output model. Output from this process is the response economic impact by economic sector. Having generated the direct economic impact, total economic impact, and response economic impact the program stops.

The operation of the computer program to calculate economic impacts for reallocations of water from agriculture use to commercial use follows the flowchart in Figure 2.2-2. This program uses only the input-output model component. A summary of the operation of this program is given below.

The program starts with input data. The input data is either an agriculture water transfer amount or a commercial water transfer amount. From this, the program takes the water transfer amount and performs the first process. This process multiplies the water transfer amount by water transfer coefficients of the input-output model. Water transfer coefficients for agriculture water use are the proportions of agriculture water use in the agriculture sectors. Water transfer coefficients for commercial water use are the proportions of commercial water use in the commercial sectors. Output from this process is the water transfer amount by economic sector for either an agriculture water transfer or

a commercial water transfer. From this, the program takes the water transfer amount by economic sector and performs the second process. This process divides the water transfer amount by economic sector by the output response coefficients for either agriculture water use or commercial water use of the input-output model. Output from this process is the direct economic impact by economic sector for either an agriculture water transfer or a commercial water transfer. From this, the program takes the direct economic impact by economic sector and performs the third process. This process multiplies the direct economic impact by economic sector by the output requirements of the input-output model. Output from this process is the total economic impact by economic sector for either an agriculture water transfer or a commercial water transfer. Finally, the program takes the total economic impact by economic sector and performs the fourth process. This process multiplies the total economic impact by economic sector by output response coefficients of the input-output model. Output from this process is the response economic impact by economic sector for either an agriculture water transfer or a commercial water transfer. Having generated the direct economic impact, total economic impact, and response economic impact the program stops.

More details on model application and each of these computer programs is provided in Chapter 5.

Figure 2.2-1. Flowchart for Estimation of the Economic Impacts for Alternative Reservoir Storage Levels.

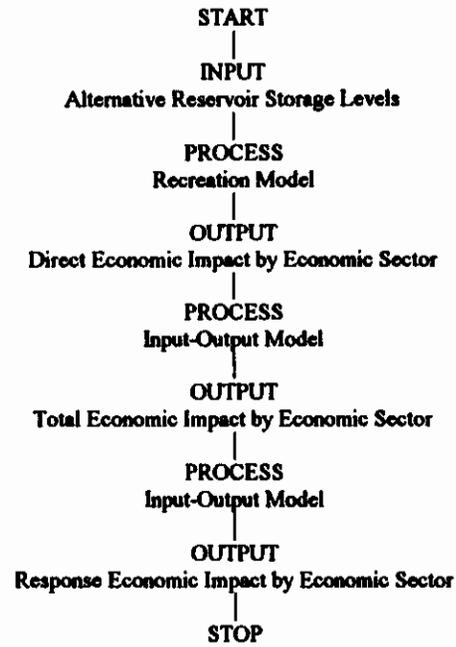
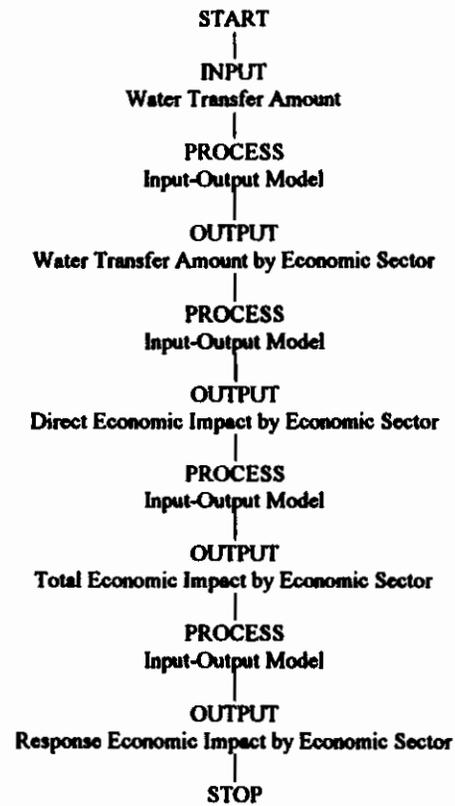


Figure 2.2-2. Flowchart for Estimation of the Economic Impacts for Reallocations of Water.



3. Recreation Model Component

The recreation model component of the regional economic impact model serves the purpose of estimating the annual number of camping and day use visitors at Prosser, Stampede, and Boca Reservoirs and their annual expenditures in the regional economy. Development of this component involved survey of the visitation, estimation of the expenditure function, and formulation of the model equations.

3.1. Survey of the Visitation

A visitation survey of the Truckee River Basin was done from August 9th through the 15th, 1993. Specific recreation sites visited included the Upper Truckee River, Prosser Reservoir, Stampede Reservoir, Boca Reservoir, the Lower Truckee River, and Pyramid Lake. The purpose of the survey was to first obtain an overall picture of the visitation and recreation activities occurring at the sites, second, quantify the amount of expenditures that visitors at the sites make to the local economy, and third, identify how the visitation would change in relation to the level of water at the sites. To achieve this purpose, information was gathered from visitors at the site through an interview process using a questionnaire. During the interview process, observations were also made at each site. Once the interview process was completed, all the data was then compiled and analyzed to develop a set of descriptive statistics. The interview questionnaire, a list of observations, and the descriptive statistics of the data are presented below.

Interview Questionnaire

On-site interviews were done using a questionnaire. Through this questionnaire, visitors were asked general, site specific, and demographic questions. General questions were asked to identify where recreation activities were occurring, the type of recreation activities, and months during the year that a visitor came to the area. Site specific questions were asked on the site where the visitor was at the time of the interview. These questions were to identify reasons for choosing to visit the site, local expenditures made to visit the site, the number of hours spent participating in recreation activities at the site, whether or not respondents would continue to visit the site if the water level were to change, which other site would be chosen in the event that the water level did change to the point they would no longer continue to visit the site, and the willingness to pay by the visitor to keep the water level at the interview site suitable for recreation. Demographic questions were also asked on the age, education, and household income of the visitor. These questions, however, due to their sensitivity, were made optional. The questions asked are given below.

General Questions

1. How many times during the year do you visit the following recreation sites?

Upper Truckee River	_____
Prosser Reservoir	_____
Stampede Reservoir	_____
Boca Reservoir	_____
Lower Truckee River	_____
Pyramid Lake	_____

2. What recreation activities do you enjoy at these sites? (if other activity is given, just make a note)

Picnicking	_____
Camping	_____
Fishing	_____
Swimming	_____
Boating	_____
Boating-fishing	_____
Boating-water skiing	_____
Jet skiing	_____
Rafting	_____
Kayaking	_____
Biking	_____
Hiking	_____
Other _____	_____

3. At what months during the year do you visit these sites?

April	_____
May	_____
June	_____
July	_____
August	_____
September	_____
October	_____

Site Specific Questions

1. How many times do you visit this site in a year? _____
2. Where are you from? City _____ County _____
State _____ Zip Code _____
3. How many people are in your party? Adults _____ Children _____
4. Are you camping at this site? Yes _____ No _____

If yes, how many days are you staying at this site? _____

If no, how many hours are you staying at this site? _____

5. What is your reason for choosing to visit this site in order of preference? (scale 5 as highest and 1 as lowest, if other reason is given, just make a note)

Location _____
Water level _____
Facilities / services _____
Fees _____
Crowd _____
Other _____

6. How much did you spend on the following items to visit this site? (only list local expenditures at or around the interview site, i.e. Tahoe City, Truckee, Reno)

License fees _____
Camping fees _____
Hotel / motel _____
Restaurant _____
Grocery purchases _____
Equipment and supplies _____
Rental _____
Fuel cost _____
Other _____

Total \$ _____

7. How many hours per day during your visit is spent on the following activities at this site?

Picnicking	_____
Camping	_____
Fishing	_____
Swimming	_____
Boating	_____
Boating-fishing	_____
Boating-water skiing	_____
Jet skiing	_____
Rafting	_____
Kayaking	_____
Biking	_____
Hiking	_____
Other _____	_____
 Total hours per day	 _____

8. How often would you visit this site per year if the water level at this site dropped by the following schedule? (only use the schedule for the interview site)

Upper Truckee River (Tahoe City to Boca Reservoir outlet)

1) No reduction in river level (350 cfs; suitable for rafting)	_____
2) 1 / 3 reduction in river level (250 cfs; suitable for rafting)	_____
3) 2 / 3 reduction in river level (125 cfs; minimum level suitable for rafting)	_____
4) Over 2 / 3 reduction in river level (Below 125 cfs, not suitable for rafting)	_____

Prosser Reservoir

- 1) No reduction in lake level
(29,840 af; boat ramp usable) _____
- 2) Minor reduction in lake level
(28,000 af; boat ramp usable) _____
- 3) 1 / 3 reduction in lake level
(19,000 af; boat ramp usable, minimum level for recreation) _____
- 4) 2 / 3 reduction in lake level
(11,000 af; minimum level for boat ramp use) _____

Stampede Reservoir

- 1) No reduction in lake level
(226,000 af; boat ramp usable) _____
- 2) 1 / 4 reduction in lake level
(170,000 af; boat ramp usable) _____
- 3) 1 / 2 reduction in lake level
(130,000 af, boat ramp usable) _____
- 4) 2 / 3 reduction in lake level
(below 80,000 af; minimum level for boat ramp use) _____

Boca Reservoir

- 1) No reduction in lake level
(41,100 af; boat ramp usable) _____
- 2) Minor reduction in lake level
(38,000 af; boat ramp usable) _____
- 3) 1 / 3 reduction in lake level
(33,000 af; minimum level for boat ramp use) _____
- 4) 1 / 2 reduction in lake level
(22,000 af, minimum level for recreation) _____
- 5) Over half reduction in lake level
(Below 22,000 af) _____

Lower Truckee (Boca Reservoir outlet through Reno)

- 1) No reduction in river level _____
(1,000 cfs; suitable for rafting or kayaking)
- 2) 1 / 3 reduction in river level _____
(700 cfs; suitable for rafting or kayaking)
- 3) 2 / 3 reduction in river level _____
(400 cfs; Floriston rates; suitable for rafting, not suitable for kayaking)
- 4) Over 2 / 3 reduction in river level _____
(below 400 cfs; not suitable for rafting)

9. Would you choose to visit another site, given that the water level dropped and you quit visiting this site? Yes _____ No _____

If yes, which of the following recreation sites would you choose? (delete the interview site)

- Upper Truckee River _____
- Prosser Reservoir _____
- Stampede Reservoir _____
- Boca Reservoir _____
- Lower Truckee River _____
- Pyramid Lake _____

10. How much would you be willing to pay per year not to have the water level drop so you can continue to visit this site?

- \$0 _____
- \$5 _____
- \$10 _____
- \$25 _____
- \$50 _____
- \$100 _____
- \$ _____

Demographic Questions

1. Please indicate your age by marking the appropriate response?

under 16 years	_____
16 - 20	_____
21 - 30	_____
31 - 40	_____
41 - 50	_____
51 - 60	_____
61 - 70	_____
over 70	_____

2. Please indicate your education level by marking the appropriate response?

Elementary School	_____
High School	_____
Technical School	_____
2 Years of College	_____
4 Years of College	_____
Over 4 Years of College	_____

3. Please indicate your total household income level by marking the appropriate response?

below \$10,000	_____
\$10,000 - \$25,000	_____
\$26,000 - \$50,000	_____
\$51,000 - \$75,000	_____
\$76,000 - \$100,000	_____
over \$100,000	_____

The total number of visitors that participated in an interview was 177. There were 23 on the Upper Truckee River, 8 at Prosser Reservoir, 50 at Stampede Reservoir, 49 at Boca Reservoir, 27 on the Lower Truckee River, and 20 at Pyramid Lake. A day was spent at each site during the week. An additional day was spent at Stampede Reservoir and Boca Reservoir on the weekend.

List of Observations

Observations were made at each site during the interview process. Key observations are listed below.

1. The water flow in the Upper Truckee River was below 125 cubic feet per second. Prosser Reservoir held 19,000 acre-feet of water in storage. Storage in Stampede Reservoir was between 130,000 acre-feet and 170,000 acre-feet. There was 33,000 acre-feet of water held in storage in Boca Reservoir. The water flow in the Lower Truckee River was below 400 cubic feet per second.
2. The highest number of day use visitors for water related recreation activities were at Boca Reservoir followed by Prosser Reservoir, the Lower Truckee River, and Pyramid Lake. The highest number of camping visitors were at Stampede Reservoir, followed by the Upper Truckee River, Boca Reservoir, and Pyramid Lake.
3. The proportionate split of day use visitors to camping visitors was approximately 80% day users to 20% campers on the Upper Truckee River, at Prosser Reservoir, and at Boca Reservoir. Stampede Reservoir had a proportionate split of 20% day users to 80% campers. The Lower Truckee River was 100% day users. Pyramid Lake had about 50% day users to 50% campers.
4. Very little water related recreation activity was seen to occur along the Upper Truckee River. Reason for this was a low level of water flow in the river. River rafting and fishing from shore would be the activities seen on the river given a sufficient level of river flow. Mountain biking was the only recreation activity seen to occur along the river. This activity was seen throughout the day along developed bike paths beside the river.
5. The highest number of water related recreation activities were observed at Boca, Stampede, and Prosser Reservoirs. At Boca Reservoir, the early morning activities seen were fishing from shore and by boat. A definite change in activities occurred at mid-morning. The fishing activities were replaced by swimming, boating, water skiing, jet skiing, and wind surfing. The level of these activities grew throughout the day and started to diminish by late afternoon. Similar activities occurred at Stampede Reservoir. However, morning fishing by boat was observed as the predominant activity at Stampede Reservoir. Also jet skiing and wind surfing weren't seen at Stampede Reservoir. Only morning fishing from shore and by boat were seen at Prosser Reservoir. There were no afternoon activities on Prosser Reservoir like there were on Boca and Stampede Reservoirs.

6. Competition among fishing, pleasure boating, water skiing, and jet skiing activities was very apparent at Boca Reservoir. Pleasure boating and water skiing were seen to interrupt the fishing and the jet skiing was seen to interrupt the boating and water skiing.
7. The water related recreation activity seen along the Lower Truckee River was fishing from shore and this was mainly seen in the morning and evenings.
8. The water related recreation activities at Pyramid Lake were observed to be swimming, water skiing, and jet skiing. These activities occurred throughout the day. Fishing was not permitted at Pyramid Lake at the time of survey.
9. July and August were popular months for both day use and camping visitors at Boca and Stampede Reservoirs for water related recreation activities other fishing. During these months, day use visitors tended to visit a site more than once while camping visitors chose to visit a site only once. Camping visitors, however, chose to stay from a couple of days to about ten days. A stay of at least a week seemed to be common at Stampede Reservoir.
10. Reasons given for visiting each recreation site were different between the sites. The Upper Truckee River was visited because of location. Boca Reservoir was visited because of the water level, the location, and the fees. Stampede Reservoir was visited because of the facilities, location, water level, and the crowd. Prosser Reservoir was visited because of location, water level, and the fees. Visitation on the Lower Truckee River was dependent on the water level. Pyramid Lake was visited because of the water level.
11. Local expenditures were primarily made in Truckee. Expenditures varied among each site and by recreation activity. Expenditures made to visit Boca Reservoir were for fishing license fees, grocery purchases, equipment and supplies, and fuel costs. Likewise, expenditures for a visit to Stampede Reservoir were on fishing license fees, user fees, restaurant, grocery purchases, equipment and supplies, and fuel costs.
12. The Upper Truckee River with a water flow below 125 cubic feet per second was limited to camping and biking activities. A water flow above 125 cubic feet per second and below 350 cubic feet per second would add fishing and rafting activities.

13. A storage level at Prosser Reservoir of above 19,000 acre-feet to capacity at 29,840 acre-feet would cause camping, fishing by boat, and fishing from shore to remain. At a reservoir level below 19,000 acre-feet to 11,000 acre-feet the boat ramp would be usable but below 11,000 acre-feet the boat ramp is unusable eliminating much of the fishing by boat activity.
14. At Stampede Reservoir, a storage level of above 130,000 acre-feet to capacity at 226,000 acre-feet and below 130,000 acre-feet to 80,000 acre-feet, recreation activity would remain with camping, fishing, pleasure boating, and water skiing. Below 80,000 acre-feet the boat ramp would become unusable eliminating virtually all boating activities. Visitors also preferred some shoreline area to support swimming, fishing, boating, water skiing, jet skiing, and other activities.
15. There was 33,000 acre-feet of water in storage in Boca Reservoir. Recreation activities observed at this level were camping, fishing, pleasure boating, water skiing, and jet skiing. These activities would still be seen at a 38,000 acre-foot storage level. Above the 38,000 acre-foot level, however, reduces the amount of shoreline eliminating much or most of the boating and jet skiing activities. Similarly below the 33,000 acre-foot water level the boat ramp would become unusable eliminating all the boating activities. Jet skiing along with fishing from shore and camping are activities that would possibly remain to a certain extent at a lower water level.
16. The water flow in the Lower Truckee River was below 400 cubic feet per second and fishing from shore was the primary recreation activity. At a flow over 400 cubic feet per second rafting could be expected to occur. A flow at 700 cubic feet per second adds kayaking. A flow over 700 cubic feet per second, however, eliminates rafting.
17. At Pyramid Lake, visitors indicated that because of its large size, the water related recreation activities would occur at any lake level.
18. Day use visitors will tend to visit Boca Reservoir if the water level is suitable for recreation activities rather than visit Stampede Reservoir. Pyramid Lake will attract day use visitors when water levels at both Boca Reservoir and Stampede Reservoir are not suitable for recreation activities. Camping visitors will tend to visit Stampede Reservoir as opposed to Boca Reservoir. Both day use and camping visitors will tend to visit Boca Reservoir and Stampede Reservoir when other recreation areas in the vicinity are filled-up.

19. **The willingness to pay to maintain a water level suitable for recreation activities was different between day use and camping visitors with regards to distance of travel to the recreation site, the recreation site itself, and the recreation activity.**
20. **Day use visitors as well as camping visitors were of all ages, education levels, and household income levels.**

Descriptive Statistics

The descriptive statistics of the data are presented below with an explanation of their interpretation. The descriptive statistics include number of respondents, site visitation of respondents, activities of respondents, annual visitation of respondents, annual visitation of respondents per site, number of visits by respondents per site, local and non-local respondents per site, group make-up of respondents per site, camping and day use respondents per site, ranking of reasons to visit by respondents per site, expenditures by respondents per site, expenditures by camping respondents per site, expenditures by day use respondents per site, activity hours per day by respondents per site, activity hours per day by camping respondents per site, activity hours per day by day use respondents per site, indicated number of visits by respondents at alternative water levels per site, site substitution of respondents per site, willingness of respondents to pay to maintain water level per site, age brackets of respondents, education levels of respondents, and household income levels of respondents.

Number of Respondents

The number of respondents successfully interviewed were 162 out of the 177 visitors.

The breakdown of the number of respondents for each site is provided in Table 3.1-1. There were 20 respondents on the Upper Truckee River, 6 respondents at Prosser Reservoir, 46 respondents at Stampede Reservoir, 46 respondents at Boca Reservoir, 25 respondents on the Lower Truckee River, and 19 respondents at Pyramid Lake. These numbers reflect the number of days spent interviewing at each site. Again, just a day was spent at each site during the week. Then an additional day was spent at Stampede Reservoir and Boca Reservoir on the weekend.

Prosser Reservoir had the fewest respondents because visitation was observed to be low. Factors that possibly attributed to this were: the water level at Prosser was lower relative to the water levels at nearby Stampede and Boca Reservoirs; only two of four campgrounds at Prosser were open; a five mile per hour speed limit is enforce on the reservoir which rules out water skiing, jet skiing, and pleasure boating; and, Prosser is essentially unknown to non-local visitors.

Table 3.1-1. Number of Respondents.

	Study Area	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Number of Respondents	162	20	6	46	46	25	19
Percentage of Respondents		12.35%	3.70%	28.40%	28.40%	15.43%	11.73%

Site Visitation of Respondents

The overall greatest site visitation of respondents was at Boca Reservoir.

The site visitation of respondents is presented in Table 3.1-2. Of the 162 respondents, 32% indicated that they visited the Upper Truckee River an average of 5 visits during the year, 19% indicated that they visited Prosser Reservoir an average of 8 visits during the year, 53% indicated that they visited Stampede Reservoir an average of 4 visits during the year, 49% indicated that they visited Boca Reservoir an average of 11 visits during the year, 23% indicated that they visited the Lower Truckee River an average of 22 visits during the year, and 28% indicated that they visited Pyramid Lake an average of 8 visits during the year. The highest percentage of respondents indicated that they visited Stampede and Boca Reservoirs. These numbers are however skewed upward by the number of respondents for these sites shown in Table 3.1-1. The highest average number of visits by respondents are indicated for Boca Reservoir and the Lower Truckee River. These numbers are influenced by local day use visitors choosing to visit the sites more frequently. In contrast, the lowest number of visits by respondents are for Stampede Reservoir and the Upper Truckee River. These numbers are influenced by non-local camping visitors choosing to visit the sites less frequently.

Table 3.1-2. Site Visitation of Respondents.

	Study Area	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Number of Respondents	162	52	30	86	80	38	46
Percentage of Respondents		32.10%	18.52%	53.09%	49.38%	23.46%	28.40%
Number of Visits by Respondents		252	242	313	895	853	371
Average Number of Visits by Respondents		4.85	8.07	3.64	11.19	22.45	8.07

Activities of Respondents

Most of the respondents participated in camping, fishing, and swimming activities.

Activities of respondents are shown in Table 3.1-3. The activities include picnicking, camping, fishing, swimming, boating, fishing from a boat, water skiing, jet skiing, rafting, kayaking, biking, hiking, and other activities. Of the 162 respondents, 31% indicated that they were picnicking, 65% indicated that they were camping, 57% indicated that they were fishing, 34% indicated that they were swimming, 19% indicated that they were boating, 33% indicated that they were fishing from a boat, 28% indicated that they were water skiing, 15% indicated that they were jet skiing, 7% indicated that they were rafting, 3% indicated that they were kayaking, 15% indicated that they were biking, and 30% indicated that they were doing other activities. The other activities mentioned by the respondents include relaxing, getting away from it all, reading, and drinking beer.

Table 3.1-3. Activities of Respondents.

	Study Area
Number of Respondents Picnicking	50
Number of Respondents Camping	106
Number of Respondents Fishing	92
Number of Respondents Swimming	55
Number of Respondents Boating	30
Number of Respondents Fishing from Boat	54
Number of Respondents Water Skiing	45
Number of Respondents Jet Skiing	24
Number of Respondents Rafting	11
Number of Respondents Kayaking	4
Number of Respondents Biking	25
Number of Respondents Hiking	0
Number of Respondents Other	49
Percentage of Respondents Picnicking	30.86%
Percentage of Respondents Camping	65.43%
Percentage of Respondents Fishing	56.79%
Percentage of Respondents Swimming	33.95%
Percentage of Respondents Boating	18.52%
Percentage of Respondents Fishing from Boat	33.33%
Percentage of Respondents Water Skiing	27.78%
Percentage of Respondents Jet Skiing	14.81%
Percentage of Respondents Rafting	6.79%
Percentage of Respondents Kayaking	2.47%
Percentage of Respondents Biking	15.43%
Percentage of Respondents Hiking	0.00%
Percentage of Respondents Other	30.25%

Annual Visitation of Respondents

Annual visitation of respondents to the study area is the highest in the summer months of June, July, and August.

Annual visitation of respondents is presented in Table 3.1-4. Of the 162 respondents, 26% indicated that they visit the study area in April, 43% indicated that they visit the study area in May, 68% indicated that they visit the study area in June, 78% indicated that they visit the study area in July, 100% indicated that they visit the study area in August, 52% indicated that they visit the study area in September, 32% indicated that they visit the study area in October, and 7% indicated that they visit the study area in Other months. Other months include November, December, January, February, and March.

Table 3.1-4. Annual Visitation of Respondents.

	Study Area
Number of Respondents that Visit during April	42
Number of Respondents that Visit during May	70
Number of Respondents that Visit during June	110
Number of Respondents that Visit during July	126
Number of Respondents that Visit during August	162
Number of Respondents that Visit during September	85
Number of Respondents that Visit during October	52
Number of Respondents that Visit during Other	11
Percentage of Visitation during April	25.93%
Percentage of Visitation during May	43.21%
Percentage of Visitation during June	67.90%
Percentage of Visitation during July	77.78%
Percentage of Visitation during August	100.00%
Percentage of Visitation during September	52.47%
Percentage of Visitation during October	32.10%
Percentage of Visitation during Other	6.79%

Annual Visitation of Respondents per Site

The annual visitation of respondents per site follow a similar pattern. This pattern shows that during the year visitation at a site will begin in April and steadily increase throughout May, June, July, and August to peak in August and then decrease sharply during September and October to end at very low or even no visitation during the Other months.

The annual visitation of respondents per site are shown in Table 3.1-5. The pattern of annual visitation for a site is based on the number of respondents that indicated that they visit the study area and visit the site in a given month. To clarify this, for Boca Reservoir, 14 out of the 42 respondents indicated that they visit in April, 28 out of the 70 respondents indicated that they visit in May, 36 out of the 110 indicated that they visit in June, 42 out of the 126 respondents indicated that they visit in July, 46 out of the 162 respondents indicated that they visit in August, 31 out of the 85 indicated that they visit in September, 19 out of the 52 respondents indicated that they visit in October, and 6 out of the 11 respondents indicated that they visit in Other months.

These numbers are then divided by their summation and presented as a percentage of visitation during the given month. Of the total annual visitation at Boca Reservoir, 6% is during April, 13% is during May, 16% is during June, 19% is during July, 21% is during August, 14% is during September, 9% is during October, and 3% is during Other months.

The percentages taken together for all the months then show the pattern of annual visitation.

A similar interpretation can be made for the other sites.

Table 3.1-5. Annual Visitation of Respondents per Site.

Study Area	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake	
Number of Respondents that Visit during April	42	3	3	10	14	9	3
Number of Respondents that Visit during May	70	4	3	16	28	10	9
Number of Respondents that Visit during June	110	9	3	25	36	20	17
Number of Respondents that Visit during July	126	13	4	26	42	23	18
Number of Respondents that Visit during August	162	20	6	46	46	25	19
Number of Respondents that Visit during September	85	8	3	20	31	14	9
Number of Respondents that Visit during October	52	2	3	10	19	11	7
Number of Respondents that Visit during Other	11	1	1	0	6	1	2
Total		60	26	153	222	113	84
Percentage of Visitation during April		5.00%	11.54%	6.54%	6.31%	7.96%	3.57%
Percentage of Visitation during May		6.67%	11.54%	10.46%	12.61%	8.85%	10.71%
Percentage of Visitation during June		15.00%	11.54%	16.34%	16.22%	17.70%	20.24%
Percentage of Visitation during July		21.67%	15.38%	16.99%	18.92%	20.35%	21.43%
Percentage of Visitation during August		33.33%	23.08%	30.07%	20.72%	22.12%	22.62%
Percentage of Visitation during September		13.33%	11.54%	13.07%	13.96%	12.39%	10.71%
Percentage of Visitation during October		3.33%	11.54%	6.54%	8.56%	9.73%	8.33%
Percentage of Visitation during Other		1.67%	3.85%	0.00%	2.70%	0.88%	2.38%

Number of Visits by Respondents per Site

The highest number of visits by respondents occur at Boca Reservoir, on the Lower Truckee River, and at Pyramid Lake. Opposite of this, the lowest number of visits by respondents occur on the Upper Truckee River, at Prosser Reservoir, and at Stampede Reservoir.

These numbers are shown in Table 3.1-6. On the Upper Truckee River, the 20 respondents indicated that they make 34 visits to the site for an average of 1.7 visits each. At Prosser Reservoir, the 6 respondents indicated that they make 34 visits to the site for an average of 5.7 visits each. At Stampede Reservoir, the 46 respondents indicated that they make 87 visits to the site for an average of 1.9 visits each. At Boca Reservoir, the 46 respondents indicated that they make 428 visits to the site for an average of 9.3 visits each. On the Lower Truckee River, the 25 respondents indicated that they make 720 visits to the site for an average of 28.8 visits each. At Pyramid Lake, the 19 respondents indicated that they make 192 visits to the site for an average of 10.1 visits each. The higher numbers for Boca Reservoir, Lower Truckee River, and Pyramid Lake reflect that a greater proportion of the respondents were local residents that frequented the site as day use visitors.

Table 3.1-6. Number of Visits by Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Number of Visits by Respondents	34	34	87	428	720	192
Average Number of Visits by Respondents	1.70	5.70	1.90	9.30	28.80	10.10

Local and Non-Local Respondents per Site

A higher number of respondents living within the study area were at Boca Reservoir, on the Lower Truckee, and at Pyramid Lake. Whereas, a higher number of respondents living outside the study area were on the Upper Truckee River, at Prosser Reservoir, and at Stampede Reservoir. Respondents living within the study area are considered as local respondents and respondents living outside the study area are considered as non-local respondents.

The numbers and the percentages of local and non-local respondents per site are provided in Table 3.1-7. At Boca Reservoir, 74% of the respondents were local respondents. On the Lower Truckee River, 72% of the respondents were local respondents. At Pyramid Lake, 89% of the respondents were local respondents. The higher number of local respondents at these sites is because these sites are primarily day use sites that draw visitors from Truckee and the Reno-Sparks area. In contrast, on the Upper Truckee River, 85% of the respondents were non-local respondents. At Prosser Reservoir, 67% of the respondents were non-local respondents. At Stampede Reservoir, 59% of the respondents were non-local respondents. The higher number of non-local respondents at these sites is because these sites are primarily camping sites that draw visitors from Sacramento and the San Francisco Bay area.

Table 3.1-7. Local and Non-Local Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Number of Local Respondents	3	2	19	34	18	17
Number of Non-Local Respondents	17	4	27	12	7	2
Percentage of Local Respondents	15.00%	33.33%	41.30%	73.91%	72.00%	89.47%
Percentage of Non-Local Respondents	85.00%	66.67%	58.70%	26.09%	28.00%	10.53%

Group Make-Up of Respondents per Site

Average group size of respondents among all sites ranged from 2.28 persons on the Lower Truckee River to 4.78 persons at Stampede Reservoir. As per group, the number of adults were greater than the number of children at all sites. The percentage of groups that included children ranged from 24% on the Lower Truckee River to 53% at Pyramid Lake.

This group make-up information is presented in Table 3.1-8. On the Upper Truckee River, the average group size was 3.8 persons of which 2.65 persons were adults and 45% of the groups included children. At Prosser Reservoir, the average group size was 3.33 persons of which 2.16 persons were adults and 29% of the groups included children. At Stampede Reservoir, the average group size was 4.78 persons of which 3.56 persons were adults and 43% of the groups included children. At Boca Reservoir, the average group size was 4.54 persons of which 3.15 persons were adults and 41% of the groups included children. On the Lower Truckee River, the average group size was 2.28 persons of which 1.68 persons were adults and 24% of the groups included children. At Pyramid Lake, the average group size was 3.84 persons of which 2.89 persons were adults and 53% of the groups included children.

Table 3.1-8. Group Make-Up of Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Average Group Size of Respondents	3.80	3.33	4.78	4.54	2.28	3.84
Average Number of Adults in Group of Respondents	2.65	2.16	3.56	3.15	1.68	2.89
Percentage of Groups that include Children	45.00%	28.57%	43.48%	41.30%	24.00%	52.63%

Camping and Day Use Respondents per Site

The highest percentage of camping respondents were on the Upper Truckee River and at Stampede Reservoir. The largest average group size of camping respondents was also at Stampede Reservoir. The greatest average numbers of days spent by camping respondents were at Boca Reservoir and on the Upper Truckee River.

This camping respondent information is provided in Table 3.1-9. On the Upper Truckee River, 85% of the respondents were camping respondents having a group size of 3.71 persons with 5.11 days being spent. At Stampede Reservoir, 78% of the respondents were camping respondents having a group size of 5.14 persons with 3.69 days being spent. At Boca Reservoir, 11% of the respondents were camping respondents having a group size of 3.20 persons with 6.40 days being spent. On the Lower Truckee River, 4% of the respondents were camping respondents having a group size of 2.00 persons with 2.00 days being spent. At Pyramid Lake, 63% of the respondents were camping respondents having a group size of 3.17 persons with 3.42 days being spent. At Prosser Reservoir, this information is not available because no interviews of camping visitors were made.

The highest percentage of day use respondents, except for Prosser Reservoir, were at Boca Reservoir and on the Lower Truckee River. The largest average group size of day use respondents was at Pyramid Lake. The greatest average number of hours spent by day use respondents were at Pyramid Lake and at Stampede Reservoir.

This day use respondent information is also provided in Table 3.1-9. On the Upper Truckee River, 15% of the respondents were day use respondents having a group size of 4.33 persons with 2.67 hours being spent. At Stampede Reservoir, 22% of the respondents were day use respondents having a group size of 3.50 persons with 5.50 hours being spent. At Boca Reservoir, 89% of the respondents were day use respondents having a group size of 4.71 persons with 5.10 hours being spent. On the Lower Truckee River, 96% of the respondents were day use respondents having a group size of 2.29 persons with 3.96 hours being spent. At Pyramid Lake, 37% of the respondents were day use respondents having a group size of 5.00 persons with 6.14 hours being spent. At Prosser Reservoir, 100% of the respondents were day use respondents having a group size of 3.33 persons with 3.33 hours being spent. Only interviews of day use visitors were made at Prosser Reservoir.

Table 3.1-9. Camping and Day Use Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Number of Camping Respondents	17	0	36	5	1	12
Percentage of Camping Respondents	85.00%	N.A.	78.00%	11.00%	4.00%	63.16%
Average Group Size of Camping Respondents	3.71	N.A.	5.14	3.20	2.00	3.17
Average Number of Days Spent by Camping Respondents	5.11	N.A.	3.69	6.40	2.00	3.42
Number of Day Use Respondents	3	6	10	41	24	7
Percentage of Day Use Respondents	15.00%	100.00%	22.00%	89.00%	96.00%	36.84%
Average Group Size of Day Use Respondents	4.33	3.33	3.50	4.71	2.29	5.00
Average Number of Hours Spent by Day Use Respondents	2.67	3.33	5.50	5.10	3.96	6.14

Ranking of Reasons to Visit by Respondents per Site

Location was ranked the highest by respondents at all sites as being the first reason for choosing to visit a site. Following location, however, water level, facilities, fees, and crowd level were ranked differently according to their average values.

Ranking of reasons to visit by respondents per site is shown in Table 3.1-10. On the Upper Truckee River, the respondents ranked location as first with 4.65, crowd level as second with 2.50, facilities as third with 2.10, water level as fourth with 1.85, and fees as fifth with 1.80. At Prosser Reservoir, the respondents ranked location as first with 4.20, facilities as second with 2.50, water level as third with 2.30, fees as fourth with 2.20, and crowd level as fifth with 1.80. At Stampede Reservoir, the respondents ranked location as first with 3.70, facilities as second with 2.90, water level as third with 2.50, crowd level as fourth with 2.00, and fees as fifth with 1.50. At Boca Reservoir, the respondents ranked location as first with 4.40, water level as second with 2.90, fees as third with 2.30, crowd level as fourth with 1.90, and facilities as fifth with 1.30. On the Lower Truckee River, respondents ranked location as first with 4.20, water level as second with 2.20, crowd level as third with 1.32, fees as fourth with .90, and facilities as fifth with .80. At Pyramid Lake, the respondents ranked location as first, crowd level as second with 2.80, water level as third with 2.10, fees as fourth with 2.10, and facilities as fifth with 1.40.

Table 3.1-10. Ranking of Reasons to Visit by Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Reasons /1						
Average Value of Location by Respondents	4.65	4.20	3.70	4.40	4.20	4.20
Average Value of Water Level by Respondents	1.85	2.30	2.50	2.90	2.20	2.10
Average Value of Facilities and Services by Respondents	2.10	2.50	2.90	1.30	0.80	1.40
Average Value of Fees by Respondents	1.80	2.20	1.50	2.30	0.90	2.10
Average Value of Crowd Level by Respondents	2.50	1.80	2.00	1.90	1.32	2.80

1. Ranking: Range Highest Value=First Reason to Lowest Value=Fifth Reason.

Expenditures by Respondents per Site

Expenditures are the highest amount for respondents at Prosser Reservoir followed by expenditures of respondents on the Upper Truckee River, at Stampede Reservoir, at Pyramid Lake, at Boca Reservoir, and on the Lower Truckee River. Main expenditures are on groceries, camping fees, restaurant, fuel, and licenses.

The expenditures by respondents are presented as average values in Table 3.1-11. On the Upper Truckee River, respondents have total expenditures of \$199.83 in which the largest portion is on groceries, camping fees, restaurant, hotel, and fuel. At Prosser Reservoir, respondents have total expenditures of \$289.90 in which the largest portion is on rental, restaurant, groceries, and licenses. At Stampede Reservoir, respondents have total expenditures of \$165.06 in which the largest portion is on groceries, camping fees, licenses, and fuel. At Boca Reservoir, respondents have total expenditures of \$117.20 in which the largest portion is on groceries, hotel, fuel, and restaurant. On the Lower Truckee River, respondents have a total expenditure of \$72.30 in which the largest portion is on hotel, licenses, fuel, and rental. At Pyramid Lake, respondents have a total expenditure of \$123.57 in which the largest portion is on groceries, fuel, licenses, and camping fees.

Table 3.1-11. Expenditures by Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Average Expenditures on Licenses by Respondents	9.08	23.73	21.06	10.27	16.60	20.21
Average Expenditures on Camping Fees by Respondents	34.25	0.00	37.93	6.52	0.00	10.89
Average Expenditures on Hotel or Motel by Respondents	23.15	1.00	3.48	29.13	22.20	0.00
Average Expenditures on Restaurant by Respondents	29.45	41.67	9.98	11.30	6.44	8.68
Average Expenditures on Groceries by Respondents	71.25	41.67	59.96	29.33	5.60	52.11
Average Expenditures on Equipment and Supplies by Respondents	9.90	4.50	9.90	5.17	2.84	1.58
Average Expenditures on Rental by Respondents	0.00	162.50	0.00	0.00	8.00	5.26
Average Expenditures on Fuel by Respondents	20.35	14.83	20.35	17.65	9.02	24.84
Average Expenditures on Other by Respondents	2.40	0.00	2.40	7.83	1.60	0.00
Average Total Expenditures by Respondents	\$199.83	\$289.90	\$165.06	\$117.20	\$72.30	\$123.57

Expenditures by Camping Respondents per Site

Expenditures are the highest amount for camping respondents at Stampede Reservoir followed by expenditures of camping respondents on the Upper Truckee River, at Pyramid Lake, at Boca Reservoir, and on the Lower Truckee River. Main expenditures are on groceries, camping fees, and fuel.

The expenditures for camping respondents are provided as average values in Table 3.1-12. On the Upper Truckee River, camping respondents have total expenditures of \$176.84 in which the largest portion is on groceries, camping fees, fuel, and restaurant. At Stampede Reservoir, camping respondents have total expenditures of \$199.12 in which the largest portion is on groceries, camping fees, fuel, and licenses. At Boca Reservoir, camping respondents have total expenditures of \$92.40 in which the largest portion is on groceries, licenses, and fuel. On the Lower Truckee River, camping respondents have a total expenditure of \$35.00 in which the largest portion is on groceries and restaurant. At Pyramid Lake, camping respondents have a total expenditure of \$153.74 in which the largest portion is on groceries, fuel, licenses, and camping fees. At Prosser Reservoir, this information is not available because no interviews of camping visitors were made.

Expenditures per day by camping respondents is calculated by dividing the expenditures by camping respondents by the number of days spent by camping respondents. On the Upper Truckee River, total expenditures per day are \$34.61. At Stampede Reservoir, total expenditures per day are \$53.96. At Boca Reservoir, total expenditures per day are \$14.44. On the Lower Truckee River, total expenditures per day are \$17.50. At Pyramid Lake, total expenditures per day are \$44.95.

Expenditures per day per person by camping respondents is calculated by dividing the expenditures per day by camping respondent by the average group size of camping respondents. On the Upper Truckee River, total expenditures per day per person are \$9.33. At Stampede Reservoir, total expenditures per day per person are \$10.50. At Boca Reservoir, total expenditures per day per person are \$4.51. On the Lower Truckee River, total expenditures per day per person are \$8.75. At Pyramid Lake, total expenditures per day per person are \$14.18.

Table 3.1-12. Expenditures by Camping Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Average Expenditures on Licenses by Camping Respondents	8.91	N.A.	16.18	17.40	0.00	18.25
Average Expenditures on Camping Fees by Camping Respondents	40.29	N.A.	48.47	0.00	0.00	16.33
Average Expenditures on Hotel or Motel by Camping Respondents	3.71	N.A.	0.00	0.00	0.00	0.00
Average Expenditures on Restaurant by Camping Respondents	19.35	N.A.	8.58	0.00	10.00	13.33
Average Expenditures on Groceries by Camping Respondents	67.35	N.A.	70.39	46.00	25.00	70.00
Average Expenditures on Equipment and Supplies by Camping Respondents	11.65	N.A.	15.08	0.40	0.00	2.50
Average Expenditures on Rental by Camping Respondents	0.00	N.A.	0.00	0.00	0.00	8.33
Average Expenditures on Fuel by Camping Respondents	22.76	N.A.	40.42	16.60	0.00	25.00
Average Expenditures on Other by Camping Respondents	2.82	N.A.	0.00	12.00	0.00	0.00
Average Total Expenditures by Camping Respondents	\$176.84	N.A.	\$199.12	\$92.40	\$35.00	\$153.74
Average Expenditures per Day on Licenses by Camping Respondents	1.74	N.A.	4.38	2.72	0.00	5.34
Average Expenditures per Day on Camping Fees by Camping Respondents	7.88	N.A.	13.14	0.00	0.00	4.77
Average Expenditures per Day on Hotel or Motel by Camping Respondents	0.73	N.A.	0.00	0.00	0.00	0.00
Average Expenditures per Day on Restaurant by Camping Respondents	3.79	N.A.	2.33	0.00	5.00	3.90
Average Expenditures per Day on Groceries by Camping Respondents	13.18	N.A.	19.08	7.19	12.50	20.47
Average Expenditures per Day on Equipment and Supplies by Camping Respondents	2.28	N.A.	4.09	0.06	0.00	0.73
Average Expenditures per Day on Rental by Camping Respondents	0.00	N.A.	0.00	0.00	0.00	2.44
Average Expenditures per Day on Fuel by Camping Respondents	4.45	N.A.	10.95	2.59	0.00	7.31
Average Expenditures per Day on Other by Camping Respondents	0.55	N.A.	0.00	1.88	0.00	0.00
Average Total Expenditures per Day by Camping Respondents	\$34.61	N.A.	\$53.96	\$14.44	\$17.50	\$44.95
Average Expenditures per Day per Person on Licenses by Camping Respondents	0.47	N.A.	0.85	0.85	0.00	1.68
Average Expenditures per Day per Person on Camping Fees by Camping Respondents	2.13	N.A.	2.56	0.00	0.00	1.51
Average Expenditures per Day per Person on Hotel or Motel by Camping Respondents	0.20	N.A.	0.00	0.00	0.00	0.00
Average Expenditures per Day per Person on Restaurant by Camping Respondents	1.02	N.A.	0.45	0.00	2.50	1.23
Average Expenditures per Day per Person on Groceries by Camping Respondents	3.55	N.A.	3.71	2.25	6.25	6.46
Average Expenditures per Day per Person on Equipment and Supplies by Camping Respondents	0.61	N.A.	0.80	0.02	0.00	0.23
Average Expenditures per Day per Person on Rental by Camping Respondents	0.00	N.A.	0.00	0.00	0.00	0.77
Average Expenditures per Day per Person on Fuel by Camping Respondents	1.20	N.A.	2.13	0.81	0.00	2.31
Average Expenditures per Day per Person on Other by Camping Respondents	0.15	N.A.	0.00	0.59	0.00	0.00
Average Total Expenditures per Day per Person by Camping Respondents	\$9.33	N.A.	\$10.50	\$4.51	\$8.75	\$14.18

Expenditures by Day Use Respondents per Site

Expenditures are the highest amount for day use respondents on the Upper Truckee River followed by expenditures of day use respondents at Prosser Reservoir, at Boca Reservoir, at Stampede Reservoir, on the Lower Truckee River, and at Pyramid Lake. Main expenditures are on groceries, hotel, restaurant, and fuel.

The average expenditures by day use respondents are shown in Table 3.1-13. On the Upper Truckee River, day use respondents have total expenditures of \$330.00 in which the largest portion is on hotel, groceries, and restaurant. At Prosser Reservoir, day use respondents have total expenditures of \$289.90 in which the largest portion is on rental, groceries, and restaurant. At Stampede Reservoir, day use respondents have total expenditures of \$117.46 in which the largest portion is on groceries, licenses, and fuel. At Boca Reservoir, day use respondents have total expenditures of \$120.23 in which the largest portion is on groceries, hotel, and fuel. On the Lower Truckee River, day use respondents have a total expenditure of \$73.86 in which the largest portion is on hotel and licenses. At Pyramid Lake, day use respondents have a total expenditure of \$71.85 in which the largest portion is on fuel, licenses, and groceries.

Expenditures per person by day use respondents is calculated by dividing the expenditures by day use respondents by the average group size of day use respondents. On the Upper Truckee River, total expenditures per person are \$76.21. At Prosser Reservoir, total expenditures per person are \$87.06. At Stampede Reservoir, total expenditures per person are \$33.56. At Boca Reservoir, total expenditures per person are \$25.33. On the Lower Truckee River, total expenditures per person are \$32.25. At Pyramid Lake, total expenditures per person are \$14.37.

Table 3.1-13. Expenditures by Day Use Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Average Expenditures on Licenses by Day Use Respondents	10.00	23.73	38.60	9.40	17.29	23.57
Average Expenditures on Camping Fees by Day Use Respondents	0.00	0.00	0.00	7.32	0.00	1.57
Average Expenditures on Hotel or Motel by Day Use Respondents	133.33	1.00	16.00	32.68	23.13	0.00
Average Expenditures on Restaurant by Day Use Respondents	86.67	41.67	15.00	12.68	6.29	0.71
Average Expenditures on Groceries by Day Use Respondents	93.33	41.67	22.40	27.29	4.79	21.43
Average Expenditures on Equipment and Supplies by Day Use Respondents	0.00	4.50	3.76	5.76	2.96	0.00
Average Expenditures on Rental by Day Use Respondents	0.00	162.50	0.00	0.00	8.33	0.00
Average Expenditures on Fuel by Day Use Respondents	6.67	14.83	20.20	17.78	9.40	24.57
Average Expenditures on Other by Day Use Respondents	0.00	0.00	1.50	7.32	1.67	0.00
Average Total Expenditures by Day Use Respondents	\$330.00	\$289.90	\$117.46	\$120.23	\$73.86	\$71.85
Average Expenditures per Person on Licenses by Day Use Respondents	2.31	7.13	11.03	2.00	7.55	4.71
Average Expenditures per Person on Camping Fees by Day Use Respondents	0.00	0.00	0.00	1.55	0.00	0.31
Average Expenditures per Person on Hotel or Motel by Day Use Respondents	30.79	0.30	4.57	6.94	10.10	0.00
Average Expenditures per Person on Restaurant by Day Use Respondents	20.02	12.51	4.29	2.69	2.75	0.14
Average Expenditures per Person on Groceries by Day Use Respondents	21.55	12.51	6.40	5.79	2.09	4.29
Average Expenditures per Person on Equipment and Supplies by Day Use Respondents	0.00	1.35	1.07	1.22	1.29	0.00
Average Expenditures per Person on Rental by Day Use Respondents	0.00	48.80	0.00	0.00	3.64	0.00
Average Expenditures per Person on Fuel by Day Use Respondents	1.54	4.45	5.77	3.77	4.10	4.91
Average Expenditures per Person on Other by Day Use Respondents	0.00	0.00	0.43	1.55	0.73	0.00
Average Total Expenditures per Person by Day Use Respondents	\$76.21	\$87.06	\$33.56	\$25.53	\$32.25	\$14.37

Activity Hours per Day by Respondents per Site

Hours per day spent by respondents participating in non-camping activities at all sites ranged from 3.30 hours at Prosser Reservoir to 5.75 hours at Stampede Reservoir. Activities of respondents also varied among all sites from that of fishing on the Upper Truckee River, at Prosser Reservoir, and on the Lower Truckee River to that of fishing, swimming, boating, water skiing, and jet skiing at Stampede Reservoir, at Boca Reservoir, and at Pyramid Lake.

The average activity hours per day by respondents are provided in Table 3.1-14. On the Upper Truckee River, respondents spent 4.53 hours per day participating in activities including picnicking, fishing, swimming, rafting, and biking. At Prosser Reservoir, respondents spent 3.30 hours per day fishing. At Stampede Reservoir, respondents spent 5.75 hours per day participating in activities including picnicking, fishing, swimming, boating, water skiing, rafting, and biking. At Boca Reservoir, respondents spent 5.09 hours per day participating in activities including picnicking, fishing, swimming, boating, water skiing, jet skiing, and biking. On the Lower Truckee River, respondents spent 3.92 hours per day participating in activities including fishing, swimming, boating, and rafting. At Pyramid Lake, respondents spent 5.36 hours per day participating in activities including picnicking, swimming, boating, water skiing, and jet skiing.

Camping is not included in the activities because respondents had difficulty relating to camping as a separate activity.

Table 3.1-14. Activity Hours per Day by Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Average Activity Hours per Day spent Picnicking by Respondents	0.35	0.00	0.20	0.74	0.00	0.68
Average Activity Hours per Day spent Camping by Respondents	8.30	0.00	0.98	* 1.04	0.00	1.26
Average Activity Hours per Day spent Fishing by Respondents	1.70	2.00	1.50	0.83	3.56	0.00
Average Activity Hours per Day spent Swimming by Respondents	0.38	0.00	0.39	0.28	0.04	1.00
Average Activity Hours per Day spent Boating by Respondents	0.00	0.00	0.20	0.20	0.16	0.68
Average Activity Hours per Day spent Fishing from Boat by Respondents	0.00	1.30	1.80	0.80	0.00	0.00
Average Activity Hours per Day spent Water Skiing by Respondents	0.00	0.00	0.83	0.87	0.00	1.29
Average Activity Hours per Day spent Jet Skiing by Respondents	0.00	0.00	0.00	1.11	0.00	0.50
Average Activity Hours per Day spent Rafting by Respondents	0.15	0.00	0.04	0.00	0.08	0.00
Average Activity Hours per Day spent Kayaking by Respondents	0.00	0.00	0.00	0.00	0.00	0.00
Average Activity Hours per Day spent Biking by Respondents	0.20	0.00	0.21	0.04	0.00	0.00
Average Activity Hours per Day spent Hiking by Respondents	0.00	0.00	0.00	0.00	0.00	0.00
Average Activity Hours per Day spent on Other activities by Respondents	1.75	0.00	0.58	0.22	0.08	1.21
Total Activity Hours per Day by Respondents	12.83	3.30	6.73	6.13	3.92	6.62
Total Activity Hours per Day spent on Non-Camping Activities by Respondents	4.53	3.30	5.75	5.09	3.92	5.36

Activity Hours per Day by Camping Respondents per Site

Hours per day spent by camping respondents participating in non-camping activities at all sites ranged from 3.00 hours on the Lower Truckee River to 5.80 hours at Stampede Reservoir. Activities of camping respondents also varied among all sites from that of fishing on the Upper Truckee River and on the Lower Truckee River to that of fishing, swimming, boating, water skiing, and jet skiing at Stampede Reservoir, at Boca Reservoir, and at Pyramid Lake.

The average activity hours per day by camping respondents are presented in Table 3.1-15. On the Upper Truckee River, camping respondents spent 4.85 hours per day participating in activities including picnicking, fishing, swimming, rafting, and biking. At Stampede Reservoir, camping respondents spent 5.80 hours per day participating in activities including picnicking, fishing, swimming, boating, water skiing, rafting, and biking. At Boca Reservoir, camping respondents spent 5.00 hours per day participating in activities including fishing, water skiing, and biking. On the Lower Truckee River, camping respondents spent 3.00 hours per day fishing. At Pyramid Lake, camping respondents spent 5.67 hours per day participating in activities including picnicking, swimming, boating, water skiing, and jet skiing. At Prosser Reservoir, this information is not available because no interviews of camping visitors were made.

Again, camping is not included in the activities because respondents had difficulty relating to camping as a separate activity.

Table 3.1-15. Activity Hours per Day by Camping Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Average Activity Hours per Day spent Picnicking by Camping Respondents	0.41	N.A.	0.25	0.00	0.00	0.25
Average Activity Hours per Day spent Camping by Camping Respondents	9.76	N.A.	1.25	9.60	0.00	2.00
Average Activity Hours per Day spent Fishing by Camping Respondents	1.74	N.A.	1.53	0.60	3.00	0.00
Average Activity Hours per Day spent Swimming by Camping Respondents	0.35	N.A.	0.50	0.00	0.00	1.17
Average Activity Hours per Day spent Boating by Camping Respondents	0.00	N.A.	0.25	0.00	0.00	0.67
Average Activity Hours per Day spent Fishing from Boat by Camping Respondents	0.00	N.A.	1.33	0.80	0.00	0.00
Average Activity Hours per Day spent Water Skiing by Camping Respondents	0.00	N.A.	0.89	2.80	0.00	0.83
Average Activity Hours per Day spent Jet Skiing by Camping Respondents	0.00	N.A.	0.00	0.00	0.00	0.83
Average Activity Hours per Day spent Rafting by Camping Respondents	0.18	N.A.	0.06	0.00	0.00	0.00
Average Activity Hours per Day spent Kayaking by Camping Respondents	0.00	N.A.	0.00	0.00	0.00	0.00
Average Activity Hours per Day spent Biking by Camping Respondents	0.18	N.A.	0.26	0.40	0.00	0.00
Average Activity Hours per Day spent Hiking by Camping Respondents	0.00	N.A.	0.00	0.00	0.00	0.00
Average Activity Hours per Day spent on Other activities by Camping Respondents	2.00	N.A.	0.74	0.40	0.00	1.92
Total Activity Hours per Day by Camping Respondents	14.62	N.A.	7.05	14.60	3.00	7.67
Total Activity Hours per Day spent on Non-Camping Activities by Camping Respondents	4.85	N.A.	5.80	5.00	3.00	5.67

Activity Hours per Day by Day Use Respondents per Site

Hours per day spent by day use respondents participating in activities at all sites ranged from 2.67 hours on the Upper Truckee River to 6.14 hours at Pyramid Lake. Activities of day use respondents also varied among all sites from that of fishing on the Upper Truckee River, at Prosser Reservoir, at Stampede Reservoir, and on the Lower Truckee River to that of fishing, swimming, boating, water skiing, and jet skiing at Boca Reservoir and at Pyramid Lake.

The average activity hours per day by day use respondents are shown in Table 3.1-16. On the Upper Truckee River, day use respondents spent 2.67 hours per day participating in activities including fishing, swimming, and biking. At Prosser Reservoir, day use respondents spent 3.33 hours per day fishing. At Stampede Reservoir, day use respondents spent 5.50 hours per day participating in activities including fishing and water skiing. At Boca Reservoir, day use respondents spent 5.10 hours per day participating in activities including picnicking, fishing, swimming, boating, water skiing, and jet skiing. On the Lower Truckee River, day use respondents spent 3.96 hours per day participating in activities including fishing, swimming, boating, and rafting. At Pyramid Lake, day use respondents spent 6.14 hours per day participating in activities including picnicking, swimming, boating, water skiing, and jet skiing.

Table 3.1-16. Activity Hours per Day by Day Use Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Average Activity Hours per Day spent Picnicking by Day Use Respondents	0.00	0.00	0.00	0.83	0.00	1.43
Average Activity Hours per Day spent Camping by Day Use Respondents	0.00	0.00	0.00	0.00	0.00	0.00
Average Activity Hours per Day spent Fishing by Day Use Respondents	1.50	2.00	1.40	0.85	3.58	0.00
Average Activity Hours per Day spent Swimming by Day Use Respondents	0.50	0.00	0.00	0.32	0.04	0.71
Average Activity Hours per Day spent Boating by Day Use Respondents	0.00	0.00	0.00	0.22	0.17	0.71
Average Activity Hours per Day spent Fishing from Boat by Day Use Respondents	0.00	1.33	3.50	0.80	0.00	0.00
Average Activity Hours per Day spent Water Skiing by Day Use Respondents	0.00	0.00	0.60	0.63	0.00	2.07
Average Activity Hours per Day spent Jet Skiing by Day Use Respondents	0.00	0.00	0.00	1.24	0.00	1.21
Average Activity Hours per Day spent Rafting by Day Use Respondents	0.00	0.00	0.00	0.00	0.08	0.00
Average Activity Hours per Day spent Kayaking by Day Use Respondents	0.00	0.00	0.00	0.00	0.00	0.00
Average Activity Hours per Day spent Biking by Day Use Respondents	0.33	0.00	0.00	0.00	0.00	0.00
Average Activity Hours per Day spent Hiking by Day Use Respondents	0.00	0.00	0.00	0.00	0.00	0.00
Average Activity Hours per Day spent on Other activities by Day Use Respondents	0.33	0.00	0.00	0.20	0.08	0.00
Total Activity Hours per Day by Day Use Respondents	2.67	3.33	5.50	5.10	3.96	6.14

Indicated Number of Visits by Respondents at Alternative Water Levels per Site

Respondents, at all sites not including Pyramid Lake, indicated more visits at higher water levels and less visits at lower water levels.

The indicated average number of visits by respondents at alternative water levels are presented in Table 3.1-17.

Alternative water levels are 1 for the highest and either 4 or 5 for the lowest. On the Upper Truckee River, water level 1 is 350 cubic feet per second and water level 4 is less than 125 cubic feet per second. At Prosser Reservoir, water level 1 is 29,840 acre-feet or maximum storage and water level 4 is 11,000 acre-feet of storage. At Stampede Reservoir, water level 1 is 226,000 acre-feet or maximum storage and water level 4 is 80,000 acre-feet of storage. At Boca Reservoir, water level 1 is 40,870 acre-feet or maximum storage and water level 5 is less than 22,000 acre-feet of storage. On the Lower Truckee River, water level 1 is 1,000 cubic feet per second and water level 4 is less than 400 cubic feet per second.

Given the alternative water levels, the number of visits by respondents vary accordingly. On the Upper Truckee River, respondents indicated 1.50 visits at water level 1 to .65 visits at water level 4. At Prosser Reservoir, respondents indicated 5.67 visits at water level 1 to .50 visits at water level 4. At Stampede Reservoir, respondents indicated 1.82 visits at water level 1 to .87 visits at water level 4. At Boca Reservoir, respondents indicated 11.09 visits at water level 1 to .37 visits at water level 5. On the Lower Truckee River, respondents indicated 8.56 visits at water level 1 to 4.56 visits at water level 4.

Assuming that there is 100% visitation at alternative water level 1, the average number of visits by respondents at other water levels are also provided in relative percentage terms. On the Upper Truckee River, visitation drops from 100% at water level 1 to 43% at water level 4. At Prosser Reservoir, visitation holds constant at 100% for water levels 1, 2 and 3 and then drops to 8% at water level 4. At Stampede Reservoir, visitation increases from 100% at water level 1 to 101% at water level 2 and then drops to 48% at water level 4. At Boca Reservoir, visitation drops from 100% at water level 1 to 3% at water level 5. On the Lower Truckee River, visitation drops from 100% at water level 1 to 53% at water level 4.

Table 3.1-17. Indicated Number of Visits by Respondents at Alternative Water Levels per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River
Cubic Feet per Second of Flow or Acre-Feet of Storage at Alternative Water Level 1	350	29,840	226,000	41,100	1,000
Cubic Feet per Second of Flow or Acre-Feet of Storage at Alternative Water Level 2	250	28,000	170,000	38,000	700
Cubic Feet per Second of Flow or Acre-Feet of Storage at Alternative Water Level 3	125	19,000	130,000	33,000	400
Cubic Feet per Second of Flow or Acre-Feet of Storage at Alternative Water Level 4	<125	11,000	80,000	22,000	<400
Cubic Feet per Second of Flow or Acre-Feet of Storage at Alternative Water Level 5				<22,000	
Average Number of Visits by Respondents at Alternative Water Level 1	1.50	5.67	1.82	11.09	8.56
Average Number of Visits by Respondents at Alternative Water Level 2	1.00	5.67	1.85	9.11	5.56
Average Number of Visits by Respondents at Alternative Water Level 3	0.90	5.67	1.39	8.15	5.00
Average Number of Visits by Respondents at Alternative Water Level 4	0.65	0.50	0.87	4.46	4.56
Average Number of Visits by Respondents at Alternative Water Level 5				0.37	
Percentage of Visitation of Respondents at Alternative Water Level 1	100.00%	100.00%	100.00%	100.00%	100.00%
Percentage of Visitation of Respondents at Alternative Water Level 2	66.67%	100.00%	101.42%	82.16%	64.95%
Percentage of Visitation of Respondents at Alternative Water Level 3	60.00%	100.00%	76.34%	73.53%	58.41%
Percentage of Visitation of Respondents at Alternative Water Level 4	43.33%	8.82%	47.69%	40.19%	53.27%
Percentage of Visitation of Respondents at Alternative Water Level 5				3.33%	

Site Substitution of Respondents per Site

A high number of respondents indicated that they would substitute an alternative site for their preferred site when they could no longer visit their preferred site because of water level.

Site substitution of respondents per site is shown in Table 3.1-18. The number of respondents that indicated site substitution are 13 on the Upper Truckee River, 5 at Prosser Reservoir, 34 at Stampede Reservoir, 40 at Boca Reservoir, 21 on the Lower Truckee River, and, 11 at Pyramid Lake. For respondents on the Upper Truckee River, site substitution to Donner Lake is 3%, to Prosser Reservoir is 23%, to Stampede Reservoir is 27%, to Boca Reservoir is 27%, to the Lower Truckee River is 3%, to Pyramid Lake is 3%, and, to Other Sites is 13%. For respondents at Prosser Reservoir, site substitution to the Upper Truckee River is 11%, to Stampede Reservoir is 44%, to Boca Reservoir is 33%, and, to the Lower Truckee River is 11%. For respondents at Stampede Reservoir, site substitution to Lake Tahoe is 2%, to the Upper Truckee River is 10%, to Prosser Reservoir is 16%, to Boca Reservoir is 29%, to the Lower Truckee River is 2%, to Pyramid Lake is 19%, and, to Other Sites is 23%. For respondents at Boca Reservoir, site substitution to Lake Tahoe is 4%, to the Upper Truckee River is 1%, to Donner Lake is 12%, to Prosser Reservoir is 12%, to Stampede Reservoir is 34%, to Pyramid Lake is 19%, and, to Other Sites is 18%. For respondents on the Lower Truckee River, site substitution to the Upper Truckee River is 9%, to Donner Lake is 3%, to Prosser Reservoir is 18%, to Stampede Reservoir is 24%, to Boca Reservoir is 24%, to Pyramid Lake is 3%, and, to Other Sites is 18%. For respondents at Pyramid Lake, site substitution to the Upper Truckee River is 6%, to Stampede Reservoir is 35%, to Boca Reservoir is 35%, and, to Other Sites is 24%. Other Sites are located outside the Truckee River Basin.

Table 3.1-18. Site Substitution of Respondents per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Number of Respondents indicating Site Substitution	13	5	34	40	21	11
Percentage of Respondents indicating Site Substitution	65.00%	83.33%	73.91%	86.96%	84.00%	57.89%
Number of Respondents indicating Site Substitution to Lake Tahoe	0	0	1	3	0	0
Number of Respondents indicating Site Substitution to Upper Truckee River	N.A.	1	6	1	3	1
Number of Respondents indicating Site Substitution to Donner Lake	1	0	0	9	1	0
Number of Respondents indicating Site Substitution to Prosser Reservoir	7	N.A.	10	9	6	0
Number of Respondents indicating Site Substitution to Stampede Reservoir	8	4	N.A.	25	8	6
Number of Respondents indicating Site Substitution to Boca Reservoir	8	3	18	N.A.	8	6
Number of Respondents indicating Site Substitution to Lower Truckee River	1	1	1	0	N.A.	0
Number of Respondents indicating Site Substitution to Pyramid Lake	1	0	12	14	1	N.A.
Number of Respondents indicating Site Substitution to Other Sites /1	4	0	14	13	6	4
Percentage of Site Substitution to Lake Tahoe	0.00%	0.00%	1.61%	4.05%	0.00%	0.00%
Percentage of Site Substitution to Upper Truckee River	0.00%	11.11%	9.68%	1.35%	9.09%	5.88%
Percentage of Site Substitution to Donner Lake	3.33%	0.00%	0.00%	12.16%	3.03%	0.00%
Percentage of Site Substitution to Prosser Reservoir	23.33%	0.00%	16.13%	12.16%	18.18%	0.00%
Percentage of Site Substitution to Stampede Reservoir	26.67%	44.44%	0.00%	33.78%	24.24%	35.29%
Percentage of Site Substitution to Boca Reservoir	26.67%	33.33%	29.03%	0.00%	24.24%	35.29%
Percentage of Site Substitution to Lower Truckee River	3.33%	11.11%	1.61%	0.00%	0.00%	0.00%
Percentage of Site Substitution to Pyramid Lake	3.33%	0.00%	19.35%	18.92%	3.03%	0.00%
Percentage of Site Substitution to Other Sites /1	13.33%	0.00%	22.58%	17.57%	18.18%	23.53%

1. Other sites are located outside the Truckee River Basin.

Willingness of Respondents to Pay to Maintain Water Level per Site

Respondents at Boca Reservoir show a greater willingness to pay not to have the water level drop than do respondents at any other site.

The willingness to pay information is provided in Table 3.1-19. On the Upper Truckee River, with 60% of respondents indicating a "Zero" response, the average value for respondents is \$12.00. At Prosser Reservoir, with 29% of the respondents indicating a "Zero" response, the average value for respondents is \$12.86. At Stampede Reservoir, with 30% of the respondents indicating a "Zero" response, the average value for respondents is \$30.22. At Boca Reservoir, with 17% of the respondents indicating a "Zero" response, the average value for respondents is \$79.74. On the Lower Truckee River, with 20% of the respondents indicating a "Zero" response, the average value for respondents is \$32.80. At Pyramid Lake, with 37% of the respondents indicating a "Zero" response, the average value for respondents is \$29.47.

In addition, respondents living inside the study area show a greater willingness to pay than do respondents living outside the study area. This information is also provided in Table 3.1-19. On the Upper Truckee River, the average value for local residents is \$16.67 compared to an average value of \$11.18 for non-local residents. At Prosser Reservoir, the average value for local residents is \$25.00 compared to an average value of \$8.00 for non-local residents. At Stampede Reservoir, the average value for local residents is \$31.05 compared to an average value of \$29.63 for non-local residents. At Boca Reservoir, the average value for local residents is \$97.15 compared to an average value of \$30.42 for non-local residents. On the Lower Truckee River, the average value for local residents is \$38.06 compared to an average value of \$19.29 for non-local residents. At Pyramid Lake, the average value for local residents is \$30.00 compared to an average value of \$25.00 for non-local residents.

Table 3.1-19. Willingness of Respondents to Pay to Maintain Water Level per Site.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Average Value for Respondents	\$12.00	\$12.86	\$30.22	\$79.74	\$32.80	\$29.47
Percentage of Respondents indicating a "Zero" Response	60.00%	28.57%	30.43%	17.39%	20.00%	36.84%
Average Value for Local Respondents	\$16.67	\$25.00	\$31.05	\$97.15	\$38.06	\$30.00
Average Value for Non-Local Respondents	\$11.18	\$8.00	\$29.63	\$30.42	\$19.29	\$25.00

Age Brackets of Respondents

The greatest number of respondents were between 31 and 50 years of age.

Presented in Table 3.1-20 are the age brackets with corresponding number of respondents and percentage of respondents. Of only 97 respondents, 3% were between 16 and 20 years of age, 12% were between 21 and 30 years of age, 30% were between 31 and 40 years of age, 26% were between 41 and 50 years of age, 14% were between 51 and 60 years of age, 5% were between 61 and 70 years of age, and 9% were over 70 years of age.

Table 3.1-20. Age Brackets of Respondents.

	Study Area
Number of Respondents under 16 Years of Age	0
Number of Respondents between 16 - 20 Years of Age	3
Number of Respondents between 21 - 30 Years of Age	12
Number of Respondents between 31 - 40 Years of Age	29
Number of Respondents between 41 - 50 Years of Age	25
Number of Respondents between 51 - 60 Years of Age	14
Number of Respondents between 61 - 70 Years of Age	5
Number of Respondents over 70 Years of Age	9
Percentage of Respondents under 16 Years of Age	0.00%
Percentage of Respondents between 16 - 20 Years of Age	3.09%
Percentage of Respondents between 21 - 30 Years of Age	12.37%
Percentage of Respondents between 31 - 40 Years of Age	29.90%
Percentage of Respondents between 41 - 50 Years of Age	25.77%
Percentage of Respondents between 51 - 60 Years of Age	14.43%
Percentage of Respondents between 61 - 70 Years of Age	5.15%
Percentage of Respondents over 70 Years of Age	9.28%

Education Levels of Respondents

The greatest number of respondents held a college level of education.

Provided in Table 3.1-21 are the education levels with corresponding number of respondents and percentage of respondents. Of only 97 respondents, 1% held a elementary school level of education, 18% held a high school level of education, 7% held a technical school level of education, 27% held a 2 years of college level of education, 23% held a 4 years of college level of education, and 25% held over 4 years of college level of education.

Table 3.1-21. Education Levels of Respondents.

	Study Area
Number of Respondents with a Elementary School Level of Education	1
Number of Respondents with a High School Level of Education	17
Number of Respondents with a Technical School Level of Education	7
Number of Respondents with a 2 Years of College Level of Education	26
Number of Respondents with a 4 Years of College Level of Education	22
Number of Respondents with a Over 4 Years of College Level of Education	24
Percentage of Respondents with a Elementary School Level of Education	1.03%
Percentage of Respondents with a High School Level of Education	17.53%
Percentage of Respondents with a Technical School Level of Education	7.22%
Percentage of Respondents with a 2 Years of College Level of Education	26.80%
Percentage of Respondents with a 4 Years of College Level of Education	22.68%
Percentage of Respondents with a Over 4 Years of College Level of Education	24.74%

Household Income Levels of Respondents

The greatest number of respondents had a household income level of \$26,000 to \$75,000 per year.

Shown in Table 3.1-22 are the household income levels with corresponding number of respondents and percentage of respondents. Of only 97 respondents, 5% had a household income level below \$10,000 per year, 18% had a household income level of \$10,000 to \$25,000 per year, 29% had a household income level of \$26,000 to \$50,000 per year, 35% had a household income level of \$51,000 to \$75,000 per year, 3% had a household income level of \$76,000 to \$100,000 per year, and 10% had a household income level of over \$100,000 per year.

Table 3.1-22. Household Income Levels of Respondents.

	Study Area
Number of Respondents with a Household Income Level Below \$10,000 per Year	5
Number of Respondents with a Household Income Level of \$10,000 - \$25,000 per Year	17
Number of Respondents with a Household Income Level of \$26,000 - \$50,000 per Year	28
Number of Respondents with a Household Income Level of \$51,000 - \$75,000 per Year	34
Number of Respondents with a Household Income Level of \$76,000 - \$100,000 per Year	3
Number of Respondents with a Household Income Level of Over \$100,000 per Year	10
Percentage of Respondents with a Household Income Level Below \$10,000 per Year	5.15%
Percentage of Respondents with a Household Income Level of \$10,000 - \$25,000 per Year	17.53%
Percentage of Respondents with a Household Income Level of \$26,000 - \$50,000 per Year	28.87%
Percentage of Respondents with a Household Income Level of \$51,000 - \$75,000 per Year	35.05%
Percentage of Respondents with a Household Income Level of \$76,000 - \$100,000 per Year	3.09%
Percentage of Respondents with a Household Income Level of Over \$100,000 per Year	10.31%

3.2 Estimation of the Expenditure Function

Expenditures of camping and day use visitors at each of the sites are calculated using an expenditure function. Specification of the expenditure function and estimation of the expenditure function are as follows.

Specification of the Expenditure Function

The expenditure function is an important ingredient of the modern theory of consumer behavior. It shows the minimal expenditures necessary to achieve a given utility level for a particular set of prices. The properties of the expenditure function in the areas of theoretical and applied analysis of consumer behavior are developed in the studies by Barton and Bohm (1982), Deaton and Muelbauer (1980), Hicks (1946), Samuelson (1947), Silberberg (1978), Theil (1975), and Varian (1992). Let $E(P, U)$ be an expenditure function, where P is a vector of commodity prices and U is a given level of utility. The expenditure function is the solution to the following problem:

$$E(P, U) = \text{Min } PX \quad (3.2-1)$$

such that $U(X) \geq U$

where X is a vector of non-negative quantities of goods. The solution to this optimization problem is the expenditure function that gives the minimum cost of achieving the fixed level of utility. For the expenditure function $E(P, U)$ to be well behaved, it must have the following properties: (i) $E(P, U)$ is non decreasing in P , (ii) $E(P, U)$ is homogeneous of the degree 1 in P , (iii) $E(P, U)$ is concave in P , (iv) $E(P, U)$ is continuous in P , for $P > 0$, and (v) if $X(P, U)$ is the expenditure-minimizing bundle necessary to achieve utility level U at prices P , then $X(P, U) = \delta E(P, U) / \delta P$ assuming the derivative exists and that $P > 0$.

The application of the expenditure function in empirical studies of consumer behavior requires the availability of observed market prices on goods and the existence of a well-behaved utility function. In the area of demand for recreation activities, there are no market-based transactions to determine observed market prices. Consequently, the notion of a regular utility function has to be modified in developing the expenditure function for the recreation activities. Let F be a vector of the time spent on a series of recreational activities by an individual at a particular site. The indirect utility function V for recreational activities for this individual is:

$$V = V(F, S, I) \quad (3.2-2)$$

where S is a vector of site characteristics that captures the substitutability of visits across various sites and I is the total budget allocated by an individual to participate in all the recreational activities included in F . The expenditure function E dual to the indirect utility function in (3.2-2) is the minimum expenditure required for the individual to participate in all the recreational activities in F , given the site characteristics in S . The expenditure function E derived from (3.2-2) is:

$$E = I = V^{-1}(F, S) \quad (3.2-3)$$

The expenditure function in (3.2-3) can also be modified to include the variable of the total number of visitors to the site. Let N be the total number of visitors. Then the expenditures function is:

$$E = V^{-1} (F, S, N) \quad (3.2-4)$$

The specification of the expenditure function in (3.2-4) is an empirical issue and it could be determined upon a estimation model selection technique, e.g., the Box-Cox estimation technique. One notable feature of the expenditure function in (3.2-4) is that it can be used to estimate expenditures of recreational activities at a particular site.

The expenditure function in (3.2-4) is used to evaluate the expenditures of recreational activities at the following six sites in California and Nevada: Upper Truckee River, Prosser Reservoir, Stampede Reservoir, Boca Reservoir, Lower Truckee River, and Pyramid Lake. The attributes of the characteristics of each site are captured by including dummy variable for each site in S. The definition of the dummy variables included in S are: UTR = 1 if the visitation site is Upper Truckee River and 0 otherwise; PR = 1 if the visitation site is Prosser Reservoir and 0 otherwise; SR = 1 if the visitation site is Stampede Reservoir and 0 otherwise; BR = 1 if the visitation site is Boca Reservoir and 0 otherwise; LTR = 1 if the visitation site is Lower Truckee River and 0 otherwise; and, PL = 1 if the visitation site is Pyramid Lake and 0 otherwise. The hours spent on each of the following eleven recreational activities are included in F. The activities were determined according to their availability and popularity at the sites. The activities are: picnicking, camping, fishing, swimming, boating, fishing from boat, water skiing, jet skiing, rafting, kayaking, biking, hiking, and other activities. To capture the effect of the type of visitor at a given site on their expenditures, i.e., camping versus day use, a dummy variable D, defined as D = 1 if camping visitor and 0 if day use visitor, is included in the expenditure function in (3.2-4). Following the categorization of expenditures on the recreation survey, the expenditures by a visitor to a given site are identified as licenses, camping fees, hotel or motel, restaurant, groceries, equipment and supplies, rental, fuel, and other. Using the above specification of the variables, the expenditure function in (3.2-4) can now be presented as:

$$E_i = V^{-1} (UTR, PR, SR, BR, LTR, PL, D, \sum_{j=1}^{13} F_j, N); i = 1, \dots, 6 \quad (3.2-5)$$

The functional form specification of the expenditure function in (3.2-5) is an empirical issue and it will be determined using the Box-Cox flexible functional form technique. The Box-Cox specification of the expenditure function in (3.2-5) is:

$$\frac{E_i^\lambda - 1}{\lambda} = \beta_1 UTR + \beta_2 PR + \beta_3 SR + \beta_4 BR + \beta_5 LTR + \beta_6 PL + \beta_7 D \quad (3.2-6)$$

$$+ \sum_{j=1}^{20} \beta_j \left(\frac{F_j^\lambda - 1}{\lambda} \right) + \beta_{21} \left(\frac{N^\lambda - 1}{\lambda} \right) + U$$

where U is the stochastic error term, β is the slope parameter, and λ is the transformation parameter. The transformation parameter may take a wide range of values that would determine the particular functional form that the variable subject to the Box-Cox transformation will assume. For example, one gets a logarithmic transformation for a variable if λ is equal to zero. All of the coefficients of the expenditure function in (3.2-5), including λ , will be estimated using the estimation of the following log-likelihood function:

$$L(\lambda, \beta, \sigma^2; E, X) = -\frac{T}{2} \ln(2\pi\sigma^2) - \frac{1}{2\sigma^2} (E^\lambda - X^\lambda B) / (E^\lambda - X^\lambda B) \quad (3.2-7)$$

$$+ \ln(J); \text{ and } J = \det \left[\frac{\partial E^\lambda}{\partial E} \right] = \prod_{t=1}^T E_t^{\lambda-1}$$

where X is a vector of observations on all the exogenous variables, B is a vector of all the slope parameters to be estimated, and T is the number of observations.

Estimation of the Expenditure Function

The data collected through the recreation survey for the six sites is used to estimate the expenditure function in (3.2-6). A total number of 151 out of the 162 complete questionnaires are used in the estimation. The initial diagnosis of the data revealed that there are a large number of zeros on most of the recreational activities and a number of expenditure categories making the estimation of the expenditure function in its generalized form in (3.2-6) impossible. A number of alternatives to combine some of the recreational activities are tried to estimate a modified form of the expenditure function in (3.2-6). All of these attempts resulted into some difficulties in estimation of the expenditure function in (3.2-6).

The final modified form of the expenditure function in (3.2-6) that provides meaningful estimation results is:

$$\frac{E^\lambda - 1}{\lambda} = \beta_1 UTR + \beta_2 PR + \beta_3 SR + \beta_4 BR + \beta_5 LTR + \beta_6 PL + \beta_7 D \quad (3.2-8)$$

$$+ \beta_8 \left(\frac{F^\lambda - 1}{\lambda} \right) + \beta_9 \left(\frac{N^\lambda - 1}{\lambda} \right) + U$$

The expenditure function expressed in simple notation becomes:

$$\begin{aligned} \ln E = & \beta_1 UTR + \beta_2 PR + \beta_3 SR + \beta_4 BR + \beta_5 LTR + \beta_6 PL + \beta_7 D \quad (3.2-9) \\ & + \beta_8 \ln F + \beta_9 \ln N + U \end{aligned}$$

where E is the sum of the nine expenditure categories per day, F is the sum of the hours spent per day by a visitor on the thirteen categories of recreational activities, and N is the group size. The Ln is an abbreviation for natural logarithm.

Using the survey observations on the variables E, F, N, the six location dummy variables, and the type of visitor dummy variable, the expenditure function in (3.2-8) or (3.2-9) is estimated having the following results.

$$\begin{aligned} \text{LnE} = & 3.6366\text{UTR} + 4.2217\text{PR} + 3.5447\text{SR} + 2.8709\text{BR} + 2.7218\text{LTR} & (3.2-10) \\ & (7.80) \quad (8.31) \quad (8.15) \quad (8.21) \quad (8.51) \\ & + 3.3791\text{PL} - 0.6129\text{D} + 0.2188\text{LnF} + 0.45664\text{LnN} \\ & (7.56) \quad (-2.30) \quad (1.268) \quad (3.255) \end{aligned}$$

The numbers in the parentheses are the asymptotic t-ratios for 142 degrees of freedom. The adjusted R^2 is 0.1483 for the 151 observations. The 162 observations were edited down to 151. Observations that were deleted were observations having a zero for total expenditures, or a zero for total recreation activity hours, or a zero for group size. The camping and day use visitor expenditure function observations are given in Table 3.2-1.

The maximum likelihood (ML) ratio test is then used to check the validity of alternative functional specifications of the expenditure function for specific value of λ , i.e., logarithmic ($\lambda = 0$) and linear ($\lambda = 1$) functional forms. Let S denote the parameter space under the Box-Cox specification and s denote the subspace of S restricted by the null hypothesis (H^0). The ML ratio test to test for a given functional form under H^0 is a large sample test and can be conducted as follows:

$$d = -2 [L (S) - L (s)] \quad (3.2-11)$$

where $L (S)$ is the maximum of the log likelihood function under S and $L (s)$ is the maximum value of the log likelihood function under s. If H^0 is true, the statistic d has the limiting chi-squared (χ^2) with n degrees of freedom, where n is the number of restrictions imposed by H^0 .

The maximum likelihood estimation of λ in (3.2-8) is 0.07 with the maximum of the log likelihood function $L(S)$ of -803.568 . Using estimates of the maximum log likelihood function of λ , $L(s)$ for the logarithmic and linear specifications of the expenditure function, the test statistic in (3.2-11) is calculated. The test results provide evidence to accept $H^0: \lambda = 0$ and to reject $H^0: \lambda = 1$ against the alternative hypothesis that $H^0: \lambda = 0.07$. In other words, the final functional specification of the expenditure function is in logarithmic functional form.

The estimated expenditure function predicts the logarithm of the average expenditures per day at a particular site for both camping and day use visitors for given values of the logarithm of their hours of non-camping recreation activity and the logarithm of their group size. Then the average expenditures per day are determined by taking the anti-log of the logarithm of the average expenditures. This procedure is shown below by site.

Upper Truckee River

Camping Visitor Group Expenditures per Day

$$\begin{aligned} \text{LnE} &= 3.6366(1) + 4.2217(0) + 3.5447(0) + 2.8709(0) + 2.7218(0) + 3.3791(0) \\ &\quad - 0.6129(1) + 0.2188\text{Ln}(5.50) + 0.45664\text{Ln}(3.47) \end{aligned}$$

$$\text{LnE} = 3.6366 - 0.6129 + 0.2188(1.70) + 0.45664(1.24)$$

$$\text{LnE} = 3.9619$$

$$E = \$52.56$$

Day Use Visitor Group Expenditures per Day

$$\begin{aligned} \text{LnE} &= 3.6366(1) + 4.2217(0) + 3.5447(0) + 2.8709(0) + 2.7218(0) + 3.3791(0) \\ &\quad - 0.6129(0) + 0.2188\text{Ln}(3.00) + 0.45664\text{Ln}(5.50) \end{aligned}$$

$$\text{LnE} = 3.6366 + 0.2188(1.10) + 0.45664(1.70)$$

$$\text{LnE} = 4.6536$$

$$E = \$104.96$$

Prosser Reservoir

Camping Visitor Group Expenditures per Day

$$\begin{aligned} \text{LnE} &= 3.6366(0) + 4.2217(1) + 3.5447(0) + 2.8709(0) + 2.7218(0) + 3.3791(0) \\ &\quad - 0.6129(1) + 0.2188\text{Ln}(5.25) + 0.45664\text{Ln}(3.50) \end{aligned}$$

$$\text{LnE} = 4.2217 - 0.6129 + 0.2188(1.66) + 0.45664(1.25)$$

$$\text{LnE} = 4.5427$$

$$E = \$93.95$$

Day Use Visitor Group Expenditures per Day

$$\begin{aligned} \text{LnE} &= 3.6366(0) + 4.2217(1) + 3.5447(0) + 2.8709(0) + 2.7218(0) + 3.3791(0) \\ &\quad - 0.6129(0) + 0.2188\text{Ln}(3.33) + 0.45664\text{Ln}(3.33) \end{aligned}$$

$$\text{LnE} = 4.2217 + 0.2188(1.20) + 0.45664(1.20)$$

$$\text{LnE} = 5.0322$$

$$E = \$153.27$$

Camping visitor data for Prosser Reservoir was not available. The non-camping recreation activity hours and group size for camping visitors was taken from Boca Reservoir data.

Stampede Reservoir

Camping Visitor Group Expenditures per Day

$$\begin{aligned} \text{LnE} &= 3.6366(0) + 4.2217(0) + 3.5447(1) + 2.8709(0) + 2.7218(0) + 3.3791(0) \\ &\quad - 0.6129(1) + 0.2188\text{Ln}(6.15) + 0.45664\text{Ln}(5.45) \end{aligned}$$

$$\text{LnE} = 3.5447 - 0.6129 + 0.2188(1.82) + 0.45664(1.70)$$

$$\text{LnE} = 4.1063$$

$$E = \$60.72$$

Day Use Visitor Group Expenditures per Day

$$\begin{aligned} \text{LnE} &= 3.6366(0) + 4.2217(0) + 3.5447(1) + 2.8709(0) + 2.7218(0) + 3.3791(0) \\ &\quad - 0.6129(0) + 0.2188\text{Ln}(5.67) + 0.45664\text{Ln}(3.89) \end{aligned}$$

$$\text{LnE} = 3.5447 + 0.2188(1.73) + 0.45664(1.36)$$

$$\text{LnE} = 4.5443$$

$$E = \$94.10$$

Boca Reservoir

Camping Visitor Group Expenditures per Day

$$\begin{aligned} \text{LnE} &= 3.6366(0) + 4.2217(0) + 3.5447(0) + 2.8709(1) + 2.7218(0) + 3.3791(0) \\ &\quad - 0.6129(1) + 0.2188\text{Ln}(5.25) + 0.45664\text{Ln}(3.50) \end{aligned}$$

$$\text{LnE} = 2.8709 - 0.6129 + 0.2188(1.66) + 0.45664(1.25)$$

$$\text{LnE} = 3.1921$$

$$E = \$24.34$$

Day Use Visitor Group Expenditures per Day

$$\begin{aligned} \text{LnE} &= 3.6366(0) + 4.2217(0) + 3.5447(0) + 2.8709(1) + 2.7218(0) + 3.3791(0) \\ &\quad - 0.6129(0) + 0.2188\text{Ln}(5.08) + 0.45664\text{Ln}(4.68) \end{aligned}$$

$$\text{LnE} = 2.8709 + 0.2188(1.62) + 0.45664(1.54)$$

$$\text{LnE} = 3.9286$$

$$E = \$50.84$$

Lower Truckee River

Camping Visitor Group Expenditures per Day

$$\text{LnE} = 3.6366(0) + 4.2217(0) + 3.5447(0) + 2.8709(0) + 2.7218(1) + 3.3791(0) \\ - 0.6129(1) + 0.2188\text{Ln}(3.00) + 0.45664\text{Ln}(2.00)$$

$$\text{LnE} = 2.7218 - 0.6129 + 0.2188(1.10) + 0.45664(0.69)$$

$$\text{LnE} = 2.6647$$

$$E = \$14.36$$

Day Use Visitor Group Expenditures per Day

$$\text{LnE} = 3.6366(0) + 4.2217(0) + 3.5447(0) + 2.8709(0) + 2.7218(1) + 3.3791(0) \\ - 0.6129(0) + 0.2188\text{Ln}(3.96) + 0.45664\text{Ln}(2.29)$$

$$\text{LnE} = 2.7218 + 0.2188(1.38) + 0.45664(0.83)$$

$$\text{LnE} = 3.4028$$

$$E = \$30.05$$

Pyramid Lake

Camping Visitor Group Expenditures per Day

$$\begin{aligned}\text{LnE} &= 3.6366(0) + 4.2217(0) + 3.5447(0) + 2.8709(0) + 2.7218(0) + 3.3791(1) \\ &\quad - 0.6129(1) + 0.2188\text{Ln}(5.90) + 0.45664\text{Ln}(3.20)\end{aligned}$$

$$\text{LnE} = 3.3791 - 0.6129 + 0.2188(1.77) + 0.45664(1.16)$$

$$\text{LnE} = 3.6831$$

$$E = \$39.77$$

Day Use Visitor Group Expenditures per Day

$$\begin{aligned}\text{LnE} &= 3.6366(0) + 4.2217(0) + 3.5447(0) + 2.8709(0) + 2.7218(0) + 3.3791(1) \\ &\quad - 0.6129(0) + 0.2188\text{Ln}(6.14) + 0.45664\text{Ln}(5.00)\end{aligned}$$

$$\text{LnE} = 3.3791 + 0.2188(1.82) + 0.45664(1.61)$$

$$\text{LnE} = 4.5125$$

$$E = \$91.15$$

The above camping and day use visitor expenditure function values are presented by site in Table 3.2-2. These values are not directly comparable to the survey data because of editing the observations from 162 to 151 and estimating the values with the expenditure function.

Table 3.2-1. Camping and Day Use Visitor Expenditure Function Observations.

Observation Number	Year	Site	Questionnaire Number	Visitor Type	Expenditures	Number of Days	Expenditures per Day	Upper Truckee River UTR	Prosser Reservoir PR	Stampede Reservoir SR	Boon Reservoir BR	Lower Truckee River LTR	Pyramid Lake PL	Camping Visitor	Activity Hours	Group Size
1	1993	UTR	1	CP	267.00	7.0	38.14	1	0	0	0	0	0	1	2.5	4.0
2	1993	UTR	2	CP	240.00	10.0	24.00	1	0	0	0	0	0	1	6.0	4.0
3	1993	UTR	3	CP	100.00	2.0	50.00	1	0	0	0	0	0	1	3.0	4.0
4	1993	UTR	4	CP	290.00	2.0	145.00	1	0	0	0	0	0	1	6.0	4.0
5	1993	UTR	5	CP	183.50	3.0	61.17	1	0	0	0	0	0	1	5.0	2.0
6	1993	UTR	6	CP	83.00	7.0	11.86	1	0	0	0	0	0	1	8.0	2.0
7	1993	UTR	7	CP	50.00	1.0	50.00	1	0	0	0	0	0	1	2.0	6.0
8	1993	UTR	8	CP	71.00	1.0	71.00	1	0	0	0	0	0	1	7.0	4.0
9	1993	UTR	9	CP	36.00	3.0	12.00	1	0	0	0	0	0	1	2.0	4.0
10	1993	UTR	10	CP	198.00	5.0	39.60	1	0	0	0	0	0	1	8.0	2.0
11	1993	UTR	11	CP	78.00	2.0	39.00	1	0	0	0	0	0	1	2.0	4.0
12	1993	UTR	12	CP	223.00	4.0	55.75	1	0	0	0	0	0	1	11.0	6.0
13	1993	UTR	13	CP	290.00	14.0	20.71	1	0	0	0	0	0	1	14.0	2.0
14	1993	UTR	14	CP	75.00	1.0	75.00	1	0	0	0	0	0	1	4.0	2.0
15	1993	UTR	15	CP	317.00	10.0	31.70	1	0	0	0	0	0	1	2.0	2.0
16	1993	UTR	1	DU	450.00	0.0	450.00	1	0	0	0	0	0	0	3.0	7.0
17	1993	UTR	2	DU	540.00	0.0	540.00	1	0	0	0	0	0	0	3.0	4.0
18	1993	PR	1	DU	37.90	0.0	37.90	0	1	0	0	0	0	0	6.0	2.0
19	1993	PR	2	DU	54.00	0.0	54.00	0	1	0	0	0	0	0	2.0	1.0
20	1993	PR	3	DU	732.00	0.0	732.00	0	1	0	0	0	0	0	4.0	8.0
21	1993	PR	4	DU	268.00	0.0	268.00	0	1	0	0	0	0	0	3.0	5.0
22	1993	PR	5	DU	24.50	0.0	24.50	0	1	0	0	0	0	0	3.0	2.0
23	1993	PR	6	DU	623.00	0.0	623.00	0	1	0	0	0	0	0	2.0	2.0
24	1993	SR	1	CP	145.00	3.0	48.33	0	0	1	0	0	0	1	3.0	8.0
25	1993	SR	2	CP	66.00	3.0	22.00	0	0	1	0	0	0	1	8.0	4.0
26	1993	SR	3	CP	177.50	2.0	88.75	0	0	1	0	0	0	1	4.0	4.0
27	1993	SR	4	CP	137.00	2.0	68.50	0	0	1	0	0	0	1	2.0	2.0
28	1993	SR	5	CP	163.00	3.0	54.33	0	0	1	0	0	0	1	2.0	3.0
29	1993	SR	6	CP	180.00	3.0	60.00	0	0	1	0	0	0	1	9.0	7.0
30	1993	SR	7	CP	421.00	7.0	60.14	0	0	1	0	0	0	1	9.0	9.0
31	1993	SR	8	CP	110.90	2.0	55.45	0	0	1	0	0	0	1	7.0	2.0
32	1993	SR	9	CP	500.00	2.0	250.00	0	0	1	0	0	0	1	5.0	14.0
33	1993	SR	10	CP	239.00	3.0	79.67	0	0	1	0	0	0	1	4.0	8.0
34	1993	SR	11	CP	76.00	3.0	25.33	0	0	1	0	0	0	1	5.0	1.0
35	1993	SR	12	CP	56.00	2.0	28.00	0	0	1	0	0	0	1	5.0	2.0
36	1993	SR	13	CP	91.00	5.0	18.20	0	0	1	0	0	0	1	5.0	2.0
37	1993	SR	14	CP	325.00	4.0	81.25	0	0	1	0	0	0	1	5.0	2.0
38	1993	SR	15	CP	315.00	3.0	105.00	0	0	1	0	0	0	1	13.0	10.0
39	1993	SR	16	CP	312.00	2.0	156.00	0	0	1	0	0	0	1	8.0	5.0
40	1993	SR	17	CP	167.20	2.0	83.60	0	0	1	0	0	0	1	6.0	3.0
41	1993	SR	18	CP	76.00	1.0	76.00	0	0	1	0	0	0	1	1.5	2.0
42	1993	SR	19	CP	90.95	2.0	45.48	0	0	1	0	0	0	1	5.0	6.0
43	1993	SR	20	CP	722.00	10.0	72.20	0	0	1	0	0	0	1	12.0	19.0
44	1993	SR	21	CP	48.00	3.0	16.00	0	0	1	0	0	0	1	5.0	2.0
45	1993	SR	22	CP	239.00	8.0	29.88	0	0	1	0	0	0	1	3.0	4.0
46	1993	SR	23	CP	240.00	2.0	120.00	0	0	1	0	0	0	1	10.0	8.0
47	1993	SR	24	CP	266.00	7.0	38.00	0	0	1	0	0	0	1	6.5	5.0
48	1993	SR	25	CP	123.00	6.0	20.50	0	0	1	0	0	0	1	8.0	4.0
49	1993	SR	26	CP	169.00	6.0	28.17	0	0	1	0	0	0	1	2.0	2.0
50	1993	SR	27	CP	77.00	2.0	38.50	0	0	1	0	0	0	1	13.0	2.0
51	1993	SR	28	CP	199.00	2.0	99.50	0	0	1	0	0	0	1	4.0	12.0
52	1993	SR	29	CP	249.00	3.0	83.00	0	0	1	0	0	0	1	5.0	13.0
53	1993	SR	30	CP	90.00	2.0	45.00	0	0	1	0	0	0	1	5.0	2.0
54	1993	SR	31	CP	361.00	7.0	51.57	0	0	1	0	0	0	1	10.0	4.0
55	1993	SR	32	CP	65.50	5.0	13.10	0	0	1	0	0	0	1	5.0	2.0
56	1993	SR	33	CP	230.00	3.0	76.67	0	0	1	0	0	0	1	8.0	7.0
57	1993	SR	1	DU	43.00	0.0	43.00	0	0	1	0	0	0	0	3.0	4.0
58	1993	SR	2	DU	204.00	0.0	204.00	0	0	1	0	0	0	0	5.0	8.0
59	1993	SR	3	DU	15.00	0.0	15.00	0	0	1	0	0	0	0	4.0	4.0

Table 3.2-1. Camping and Day Use Visitor Expenditure Function Observations (continue).

Observation Number	Year	Site	Questionnaire Number	Visitor Type	Expenditures	Number of Days	Expenditures per Day	Upper Truckee River UTR	Promer Reservoir PR	Stampede Reservoir SR	Boca Reservoir BR	Lower Truckee River LTR	Pyramid Lake PL	Camping Visitor	Activity Hours	Group Size
60	1993	BR	4	DU	271.00	0.0	271.00	0	0	1	0	0	0	0	8.0	2.0
61	1993	SR	5	DU	158.00	0.0	158.00	0	0	1	0	0	0	0	5.0	2.0
62	1993	SR	6	DU	137.00	0.0	137.00	0	0	1	0	0	0	0	5.0	2.0
63	1993	SR	7	DU	60.00	0.0	60.00	0	0	1	0	0	0	0	10.0	4.0
64	1993	SR	8	DU	35.00	0.0	35.00	0	0	1	0	0	0	0	8.0	2.0
65	1993	SR	9	DU	150.00	0.0	150.00	0	0	1	0	0	0	0	3.0	7.0
66	1993	BR	1	CP	63.00	2.0	31.50	0	0	0	1	0	0	1	7.0	4.0
67	1993	BR	2	CP	175.00	10.0	17.50	0	0	0	1	0	0	1	3.0	2.0
68	1993	BR	3	CP	124.00	2.0	62.00	0	0	0	1	0	0	1	7.0	4.0
69	1993	BR	4	CP	100.00	14.0	7.14	0	0	0	1	0	0	1	4.0	4.0
70	1993	BR	1	DU	30.00	0.0	30.00	0	0	0	1	0	0	0	5.0	5.0
71	1993	BR	2	DU	60.00	0.0	60.00	0	0	0	1	0	0	0	6.0	9.0
72	1993	BR	3	DU	70.00	0.0	70.00	0	0	0	1	0	0	0	8.0	4.0
73	1993	BR	4	DU	30.00	0.0	30.00	0	0	0	1	0	0	0	4.0	2.0
74	1993	BR	5	DU	465.00	0.0	465.00	0	0	0	1	0	0	0	6.0	2.0
75	1993	BR	6	DU	110.00	0.0	110.00	0	0	0	1	0	0	0	2.0	18.0
76	1993	BR	7	DU	73.00	0.0	73.00	0	0	0	1	0	0	0	5.0	3.0
77	1993	BR	8	DU	30.00	0.0	30.00	0	0	0	1	0	0	0	2.0	2.0
78	1993	BR	9	DU	136.00	0.0	136.00	0	0	0	1	0	0	0	8.0	4.0
79	1993	BR	10	DU	10.00	0.0	10.00	0	0	0	1	0	0	0	6.0	18.0
80	1993	BR	11	DU	12.00	0.0	12.00	0	0	0	1	0	0	0	5.0	2.0
81	1993	BR	12	DU	12.00	0.0	12.00	0	0	0	1	0	0	0	5.0	4.0
82	1993	BR	13	DU	10.00	0.0	10.00	0	0	0	1	0	0	0	4.0	1.0
83	1993	BR	14	DU	46.50	0.0	46.50	0	0	0	1	0	0	0	5.0	2.0
84	1993	BR	15	DU	129.00	0.0	129.00	0	0	0	1	0	0	0	6.0	5.0
85	1993	BR	16	DU	41.00	0.0	41.00	0	0	0	1	0	0	0	8.0	3.0
86	1993	BR	17	DU	20.00	0.0	20.00	0	0	0	1	0	0	0	2.0	3.0
87	1993	BR	18	DU	32.00	0.0	32.00	0	0	0	1	0	0	0	3.0	6.0
88	1993	BR	19	DU	70.00	0.0	70.00	0	0	0	1	0	0	0	6.0	7.0
89	1993	BR	20	DU	25.00	0.0	25.00	0	0	0	1	0	0	0	3.0	6.0
90	1993	BR	21	DU	1910.00	0.0	1910.00	0	0	0	1	0	0	0	8.0	3.0
91	1993	BR	22	DU	42.50	0.0	42.50	0	0	0	1	0	0	0	5.0	2.0
92	1993	BR	23	DU	220.00	0.0	220.00	0	0	0	1	0	0	0	2.0	10.0
93	1993	BR	24	DU	42.00	0.0	42.00	0	0	0	1	0	0	0	8.0	4.0
94	1993	BR	25	DU	25.00	0.0	25.00	0	0	0	1	0	0	0	4.0	3.0
95	1993	BR	26	DU	18.00	0.0	18.00	0	0	0	1	0	0	0	2.0	2.0
96	1993	BR	27	DU	20.00	0.0	20.00	0	0	0	1	0	0	0	5.0	1.0
97	1993	BR	28	DU	60.00	0.0	60.00	0	0	0	1	0	0	0	5.0	4.0
98	1993	BR	29	DU	40.00	0.0	40.00	0	0	0	1	0	0	0	6.0	8.0
99	1993	BR	30	DU	30.00	0.0	30.00	0	0	0	1	0	0	0	4.0	7.0
100	1993	BR	31	DU	223.00	0.0	223.00	0	0	0	1	0	0	0	9.0	1.0
101	1993	BR	32	DU	150.00	0.0	150.00	0	0	0	1	0	0	0	6.0	7.0
102	1993	BR	33	DU	10.00	0.0	10.00	0	0	0	1	0	0	0	3.0	3.0
103	1993	BR	34	DU	10.00	0.0	10.00	0	0	0	1	0	0	0	4.0	1.0
104	1993	BR	35	DU	24.00	0.0	24.00	0	0	0	1	0	0	0	5.0	3.0
105	1993	BR	36	DU	37.00	0.0	37.00	0	0	0	1	0	0	0	6.0	10.0
106	1993	BR	37	DU	0.50	0.0	0.50	0	0	0	1	0	0	0	1.0	2.0
107	1993	BR	38	DU	200.00	0.0	200.00	0	0	0	1	0	0	0	12.0	5.0
108	1993	BR	39	DU	90.00	0.0	90.00	0	0	0	1	0	0	0	5.0	2.0
109	1993	BR	40	DU	300.00	0.0	300.00	0	0	0	1	0	0	0	4.0	3.0
110	1993	LTR	1	CP	35.00	2.0	17.50	0	0	0	0	1	0	1	3.0	2.0
111	1993	LTR	1	DU	1.00	0.0	1.00	0	0	0	0	1	0	0	4.0	1.0
112	1993	LTR	2	DU	94.00	0.0	94.00	0	0	0	0	1	0	0	4.0	5.0
113	1993	LTR	3	DU	151.00	0.0	151.00	0	0	0	0	1	0	0	7.0	2.0
114	1993	LTR	4	DU	23.00	0.0	23.00	0	0	0	0	1	0	0	4.0	1.0
115	1993	LTR	5	DU	1.00	0.0	1.00	0	0	0	0	1	0	0	7.0	2.0
116	1993	LTR	6	DU	45.00	0.0	45.00	0	0	0	0	1	0	0	4.0	4.0
117	1993	LTR	7	DU	13.50	0.0	13.50	0	0	0	0	1	0	0	5.0	1.0
118	1993	LTR	8	DU	20.00	0.0	20.00	0	0	0	0	1	0	0	3.0	2.0

Table 3.2-1. Camping and Day Use Visitor Expenditure Function Observations (continue).

Observation Number	Year	Site	Questionnaire Number	Visitor Type	Expenditure	Number of Days	Expenditure per Day	Upper Truckee River UTR	Promer Reservoir PR	Stampede Reservoir SR	Boon Reservoir BR	Lower Truckee River LTR	Pyramid Lake PL	Camping Visitor	Activity Hours	Group Size
119	1993	LTR	9	DU	21.00	0.0	21.00	0	0	0	0	1	0	0	4.0	1.0
120	1993	LTR	10	DU	34.00	0.0	34.00	0	0	0	0	1	0	0	2.0	4.0
121	1993	LTR	11	DU	775.00	0.0	775.00	0	0	0	0	1	0	0	1.0	1.0
122	1993	LTR	12	DU	44.00	0.0	44.00	0	0	0	0	1	0	0	3.0	1.0
123	1993	LTR	13	DU	52.00	0.0	52.00	0	0	0	0	1	0	0	3.0	1.0
124	1993	LTR	14	DU	0.50	0.0	0.50	0	0	0	0	1	0	0	2.0	1.0
125	1993	LTR	15	DU	70.00	0.0	70.00	0	0	0	0	1	0	0	3.0	1.0
126	1993	LTR	16	DU	21.50	0.0	21.50	0	0	0	0	1	0	0	4.0	1.0
127	1993	LTR	17	DU	28.50	0.0	28.50	0	0	0	0	1	0	0	2.0	5.0
128	1993	LTR	18	DU	182.00	0.0	182.00	0	0	0	0	1	0	0	6.0	10.0
129	1993	LTR	19	DU	22.00	0.0	22.00	0	0	0	0	1	0	0	3.0	2.0
130	1993	LTR	20	DU	14.00	0.0	14.00	0	0	0	0	1	0	0	4.0	2.0
131	1993	LTR	21	DU	21.50	0.0	21.50	0	0	0	0	1	0	0	6.0	1.0
132	1993	LTR	22	DU	73.00	0.0	73.00	0	0	0	0	1	0	0	3.0	2.0
133	1993	LTR	23	DU	23.00	0.0	23.00	0	0	0	0	1	0	0	5.0	2.0
134	1993	LTR	24	DU	42.00	0.0	42.00	0	0	0	0	1	0	0	6.0	2.0
135	1993	PL	1	CP	320.00	4.0	80.00	0	0	0	0	0	1	1	1.0	2.0
136	1993	PL	2	CP	75.00	3.0	25.00	0	0	0	0	0	1	1	7.0	5.0
137	1993	PL	3	CP	170.00	2.0	85.00	0	0	0	0	0	1	1	7.0	2.0
138	1993	PL	4	CP	41.00	1.0	41.00	0	0	0	0	0	1	1	4.0	2.0
139	1993	PL	5	CP	87.00	1.0	87.00	0	0	0	0	0	1	1	12.0	2.0
140	1993	PL	6	CP	162.00	4.0	40.50	0	0	0	0	0	1	1	10.0	3.0
141	1993	PL	7	CP	148.00	2.0	70.00	0	0	0	0	0	1	1	6.0	5.0
142	1993	PL	8	CP	75.00	3.0	25.00	0	0	0	0	0	1	1	8.0	1.0
143	1993	PL	9	CP	193.00	6.0	32.50	0	0	0	0	0	1	1	3.0	4.0
144	1993	PL	10	CP	180.00	4.0	45.00	0	0	0	0	0	1	1	1.0	6.0
145	1993	PL	1	DU	70.00	0.0	70.00	0	0	0	0	0	1	0	5.0	2.0
146	1993	PL	2	DU	20.00	0.0	20.00	0	0	0	0	0	1	0	7.0	3.0
147	1993	PL	3	DU	61.00	0.0	61.00	0	0	0	0	0	1	0	8.0	5.0
148	1993	PL	4	DU	45.00	0.0	45.00	0	0	0	0	0	1	0	5.0	3.0
149	1993	PL	5	DU	45.00	0.0	45.00	0	0	0	0	0	1	0	7.0	10.0
150	1993	PL	6	DU	42.00	0.0	42.00	0	0	0	0	0	1	0	5.0	5.0
151	1993	PL	7	DU	220.00	0.0	220.00	0	0	0	0	0	1	0	6.0	7.0

Table 3.2-2. Camping and Day Use Visitor Expenditure Function Values.

	Upper Truckee River	Prosser Reservoir	Stampede Reservoir	Boca Reservoir	Lower Truckee River	Pyramid Lake
Camping Visitor Group Expenditures per Day	\$52.56	\$93.95	\$60.72	\$24.34	\$14.36	\$39.77
Day Use Visitor Group Expenditures per Day	\$104.96	\$153.27	\$94.10	\$50.84	\$30.05	\$91.15

3.3. Formulation of the Model Equations

Model formulation incorporates the above descriptive statistics and expenditure function values. The variable that drives the model is the end of the month reservoir storage levels at Prosser, Stampede, and Boca Reservoirs. Relative to the storage levels at these reservoirs, the model calculates the annual number of camping and day use visitors at the reservoirs and the annual expenditures of the camping and day use visitors.

There are eleven functions within the model. Using only end of the month reservoir storage levels as the input into the model, the functions then generate the following data.

Visitation Relative to End of the Month Reservoir Storage Levels
Annual Visitation Relative to End of the Month Reservoir Storage Levels
Annual Number of Camping Visitors
Annual Number of Day Use Visitors
Annual Number of Camping Visitor Groups
Annual Number of Day Use Visitor Groups
Annual Camping Visitor Expenditures
Annual Day Use Visitor Expenditures
Annual Number of Camping and Day Use Visitors
Annual Camping and Day Use Visitor Expenditures
Annual Camping and Day Use Visitor Expenditures by Category

Each of the functions calculate data either by use of a single equation or multiple equations. Simultaneously, data is generated by one function and inputted into another function and so on. Throughout the model, there are twenty-seven equations with thirty-nine variables.

Visitation Relative to End of the Month Reservoir Storage Levels

The visitation relative to end of the month reservoir storage levels is derived by assigning a scale value to the end of the month reservoir storage level and then calculating a percentage of visitation corresponding to the assigned scale value. Each of these functions are based on data taken from the survey.

The scale values for reservoir storage levels are shown in Table 3.3-1. Scale values for Prosser Reservoir and Stampede Reservoir range from high to low or 4 to 1. These scale values correspond to reservoir storage levels at Prosser Reservoir from 29,840 acre-feet to 11,000 acre-feet and storage levels at Stampede Reservoir from 226,000 acre-feet to 80,000 acre-feet. Scale values for Boca Reservoir range from 5 to 1 and correspond to reservoir storage levels from 41,100 acre-feet to less than 22,000 acre-feet. These reservoir storage levels are stated in the survey questionnaire.

The end of the month reservoir storage level is assigned a scale value through the following equation.

$$\text{If } A_i \geq B_{it} \geq C_i \text{ storage level, then scale value } D_{it} = \alpha_i + \beta_i (B_{it}) \quad (3.3-1)$$

where:

- A_i is the high storage level for reservoir i
- B_{it} is the end of the month storage level for reservoir i in month t
- C_i is the low storage level for reservoir i
- D_{it} is the scale value for the end of the month storage level for reservoir i in month t
- α_i is the scale value constant term for reservoir i
- β_i is the scale value slope coefficient term for reservoir i

This equation is formulated to linearly interpolate a end of the month storage level for a reservoir during any month to a scale value.

Separate equations for reservoir storage levels are formulated for Prosser, Stampede, and Boca Reservoirs. These equations are provided below by reservoir.

Prosser Reservoir

If $29,840 \geq B_{it} \geq 28,000$ storage level, then scale value $D_{it} = - 12.2174 + .000543 (B_{it})$
If $27,999 \geq B_{it} \geq 19,000$ storage level, then scale value $D_{it} = - .1111 + .000111 (B_{it})$
If $18,999 \geq B_{it} \geq 11,000$ storage level, then scale value $D_{it} = -.3750 + .000125 (B_{it})$

Stampede Reservoir

If $226,000 \geq B_{it} \geq 170,000$ storage level, then scale value $D_{it} = - .03571 + .000018 (B_{it})$

If $169,999 \geq B_{it} \geq 130,000$ storage level, then scale value $D_{it} = - 1.2500 + .000025 (B_{it})$

If $129,999 \geq B_{it} \geq 80,000$ storage level, then scale value $D_{it} = - .60000 + .000020 (B_{it})$

Boca Reservoir

If $41,100 \geq B_{it} \geq 38,000$ storage level, then scale value $D_{it} = - 8.258 + .00032 (B_{it})$

If $37,999 \geq B_{it} \geq 33,000$ storage level, then scale value $D_{it} = - 3.600 + .00020 (B_{it})$

If $32,999 \geq B_{it} \geq 22,000$ storage level, then scale value $D_{it} = 0 + .00009 (B_{it})$

If $21,999 \geq B_{it} \geq 0$ storage level, then scale value $D_{it} = 1.000 + .00005 (B_{it})$

End of the month reservoir storage levels for Prosser, Stampede, and Boca Reservoirs for April through October and Other Months are given in Table 3.3-2. April through October is considered to be the recreation season in a given year. Other Months are January, February, March, November, and December of the given year. The reservoir storage levels are taken in total for April through October and as an average for the Other Months. The scale values for these end of the month reservoir storage levels are calculated using the above equations and shown by reservoir in Table 3.3-3.

The percentage of visitation corresponding to the scale value of an end of the month reservoir storage level is based on the indicated number of visits per respondent for reservoir storage levels taken from the survey.

The indicated number of visits per respondent for reservoir storage levels are provided in Table 3.3-4. For Prosser Reservoir, the number of visits per respondent at levels 1 to 3 is 5.67 and at level 4 is .50. The percentages of visitation are 100% for levels 1 to 3 and 8.82% for level 4. Likewise for Stampede Reservoir, the number of visits per respondent at levels 1, 2, 3, and 4 are 1.82, 1.85, 1.39, and .87. The percentages of visitation are 100%, 101.42%, 76.34%, and 47.69%. Number of visits per respondent for Boca Reservoir at levels 1, 2, 3, 4, and 5 are 11.09, 9.11, 8.15, 4.46, and .37. The percentages of visitation are 100%, 82.16%, 73.53%, 40.19%, and 3.33%.

The percentage of visitation corresponding to the scale value is then calculated through the following equation.

$$\text{If } E_i \geq D_{it} \geq F_i \text{ scale value, then visitation } G_{it} = \alpha_i + \beta_i (D_{it}) \quad (3.3-2)$$

where:

- E_i is the high scale value for reservoir i
- D_{it} is the scale value for the end of the month storage level for reservoir i in month t
- F_i is the low scale value for reservoir i
- G_{it} is the percentage of visitation corresponding to the scale value for the end of the month storage level for reservoir i in month t
- α_i is the percentage of visitation constant term for reservoir i
- β_i is the percentage of visitation slope coefficient term for reservoir i

This equation is formulated to linearly interpolate a scale value for an end of the month storage level for a reservoir during any month to a percentage of visitation.

Separate equations for scale value and reservoir storage levels are formulated for Prosser, Stampede, and Boca Reservoirs. These equations are provided below by reservoir.

Prosser Reservoir

$$\text{If } 4 \geq D_{it} \geq 3 \text{ scale value, then visitation } G_{it} = - 1.4 + .6 (D_{it})$$

$$\text{If } 3 \geq D_{it} \geq 2 \text{ scale value, then visitation } G_{it} = .4 + 0 (D_{it})$$

$$\text{If } 2 \geq D_{it} \geq 1 \text{ scale value, then visitation } G_{it} = .2 + .1 (D_{it})$$

Stampede Reservoir

$$\text{If } 4 \geq D_{it} \geq 3 \text{ scale value, then visitation } G_{it} = 1.0492 - .0123 (D_{it})$$

$$\text{If } 3 \geq D_{it} \geq 2 \text{ scale value, then visitation } G_{it} = .2716 - .2469 (D_{it})$$

$$\text{If } 2 \geq D_{it} \geq 1 \text{ scale value, then visitation } G_{it} = .0976 + .2839 (D_{it})$$

Boca Reservoir

$$\text{If } 5 \geq D_{it} \geq 4 \text{ scale value, then visitation } G_{it} = .1080 + .1784 (D_{it})$$

$$\text{If } 4 \geq D_{it} \geq 3 \text{ scale value, then visitation } G_{it} = .4764 + .0863 (D_{it})$$

$$\text{If } 3 \geq D_{it} \geq 2 \text{ scale value, then visitation } G_{it} = .2646 + .3333 (D_{it})$$

$$\text{If } 2 \geq D_{it} \geq 1 \text{ scale value, then visitation } G_{it} = - .3354 + .3687 (D_{it})$$

Visitation relative to end of the month reservoir storage levels at Prosser, Stampede, and Boca Reservoirs for April through October and Other months are given in Table 3.3-5. The percentages of visitation for the end of the month reservoir storage levels are calculated using the above equations. Again, percentages of visitation correspond to scale values which in turn correspond to end of the month reservoir storage levels.

Survey year visitation relative to end of the month reservoir storage levels are the same because of end of the month reservoir storage levels. The percentages of visitation are shown in Table 3.3-6. Visitation would differ under alternative reservoir storage levels.

Table 3.3-1. Scale Values for Reservoir Storage Levels.

	Promer Reservoir	Stampede Reservoir	Boca Reservoir
Reservoir Storage Level 1 in Acre-feet	29,840	226,000	41,100
Reservoir Storage Level 2 in Acre-feet	28,000	170,000	38,000
Reservoir Storage Level 3 in Acre-feet	19,000	130,000	33,000
Reservoir Storage Level 4 in Acre-feet	11,000	80,000	22,000
Reservoir Storage Level 5 in Acre-feet			<22,000
Scale Value for Reservoir Storage Level 1	4.00	4.00	5.00
Scale Value for Reservoir Storage Level 2	3.00	3.00	4.00
Scale Value for Reservoir Storage Level 3	2.00	2.00	3.00
Scale Value for Reservoir Storage Level 4	1.00	1.00	2.00
Scale Value for Reservoir Storage Level 5			1.00

Table 3.3-2. End of the Month Reservoir Storage Levels.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
April End of the Month Reservoir Storage Level in Acre-Feet	9,767	80,186	26,763
May End of the Month Reservoir Storage Level in Acre-Feet	16,414	113,577	37,473
June End of the Month Reservoir Storage Level in Acre-Feet	20,957	166,955	38,557
July End of the Month Reservoir Storage Level in Acre-Feet	22,110	177,424	38,084
August End of the Month Reservoir Storage Level in Acre-Feet	21,691	174,288	34,582
September End of the Month Reservoir Storage Level in Acre-Feet	14,394	172,442	23,927
October End of the Month Reservoir Storage Level in Acre-Feet	10,050	170,696	16,419
Other Months Average End of the Month Reservoir Storage Level in Acre-Feet	9,854	113,263	9,561
January End of the Month Reservoir Storage Level in Acre-Feet	9,827	73,944	5,247
February End of the Month Reservoir Storage Level in Acre-Feet	9,723	75,751	4,396
March End of the Month Reservoir Storage Level in Acre-Feet	9,642	76,677	2,955
November End of the Month Reservoir Storage Level in Acre-Feet	9,981	170,433	17,042
December End of the Month Reservoir Storage Level in Acre-Feet	10,098	169,510	18,163

Table 3.3-3. Scale Values for End of the Month Reservoir Storage Levels.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Scale Value for April End of the Month Reservoir Storage Level	0.85	1.00	2.41
Scale Value for May End of the Month Reservoir Storage Level	1.68	1.67	3.89
Scale Value for June End of the Month Reservoir Storage Level	2.22	2.92	4.08
Scale Value for July End of the Month Reservoir Storage Level	2.34	3.16	3.93
Scale Value for August End of the Month Reservoir Storage Level	2.30	3.10	3.32
Scale Value for September End of the Month Reservoir Storage Level	1.42	3.07	2.15
Scale Value for October End of the Month Reservoir Storage Level	0.88	3.04	1.82
Scale Value for Other Months End of the Month Reservoir Storage Level	0.86	1.67	1.48

Table 3.3-4. Indicated Number of Visits per Respondent for Reservoir Storage Levels.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Visits per Respondent for Reservoir Storage Level 1	5.67	1.82	11.09
Number of Visits per Respondent for Reservoir Storage Level 2	5.67	1.85	9.11
Number of Visits per Respondent for Reservoir Storage Level 3	5.67	1.39	8.15
Number of Visits per Respondent for Reservoir Storage Level 4	0.50	0.87	4.46
Number of Visits per Respondent for Reservoir Storage Level 5			0.37
Percentage of Visitation for Reservoir Storage Level 1	100.00%	100.00%	100.00%
Percentage of Visitation for Reservoir Storage Level 2	100.00%	101.42%	82.16%
Percentage of Visitation for Reservoir Storage Level 3	100.00%	76.34%	73.53%
Percentage of Visitation for Reservoir Storage Level 4	8.82%	47.69%	40.19%
Percentage of Visitation for Reservoir Storage Level 5			3.33%

Table 3.3-5. Visitation Relative to End of the Month Reservoir Storage Levels.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Visitation Relative to April End of the Month Reservoir Storage Level	28.46%	38.26%	53.82%
Visitation Relative to May End of the Month Reservoir Storage Level	36.77%	57.22%	81.25%
Visitation Relative to June End of the Month Reservoir Storage Level	40.00%	99.35%	83.59%
Visitation Relative to July End of the Month Reservoir Storage Level	40.00%	101.04%	81.55%
Visitation Relative to August End of the Month Reservoir Storage Level	40.00%	101.11%	76.26%
Visitation Relative to September End of the Month Reservoir Storage Level	34.24%	101.15%	45.31%
Visitation Relative to October End of the Month Reservoir Storage Level	28.81%	101.18%	33.60%
Visitation Relative to Other Months End of the Month Reservoir Storage Level	28.57%	57.04%	20.95%

Table 3.3-6. Survey Year Visitation Relative to End of the Month Reservoir Storage Levels.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Visitation Relative to April End of the Month Reservoir Storage Level	28.46%	38.26%	53.82%
Visitation Relative to May End of the Month Reservoir Storage Level	36.77%	57.22%	81.25%
Visitation Relative to June End of the Month Reservoir Storage Level	40.00%	99.35%	83.59%
Visitation Relative to July End of the Month Reservoir Storage Level	40.00%	101.04%	81.55%
Visitation Relative to August End of the Month Reservoir Storage Level	40.00%	101.11%	76.26%
Visitation Relative to September End of the Month Reservoir Storage Level	34.24%	101.15%	45.31%
Visitation Relative to October End of the Month Reservoir Storage Level	28.81%	101.18%	33.60%
Visitation Relative to Other Months End of the Month Reservoir Storage Level	28.57%	57.04%	20.95%

Annual Visitation Relative to End of the Month Reservoir Storage Levels

The annual visitation relative to end of the month reservoir storage levels is derived by weighting the scale values for the end of the month reservoir storage levels for the reservoir by the expected annual visitation to the reservoir for the year and then calculating a annual percentage of visitation.

The scale values are weighted by survey year annual visitation by respondents to reservoirs and expected annual visitation to the reservoirs for the year.

The survey year annual visitation by respondents to the reservoirs is shown in Table 3.3-7. The expected annual visitation is calculated through the following equation.

$$H_{it} = \frac{G_{it} (H_{it}^0)}{G_{it}^0} \quad (3.3-3)$$

where:

H_{it}	is the expected annual visitation to reservoir i in month t
G_{it}	is the percentage of visitation corresponding to the scale value for the end of the month storage level for reservoir i in month t
H_{it}^0	is the survey year annual visitation by respondents to reservoir i in month t
G_{it}^0	is the survey year percentage of visitation corresponding to the scale value for the end of the month storage level for reservoir i in month t

The expected annual visitation is shown in Table 3.3-8. These values are the same as the values for the survey year since the end of the month reservoir storage levels are the same. The expected annual visitation would differ under alternative reservoir storage levels.

The weights for the expected annual visitation are then calculated through the following equation.

$$I_{it} = \frac{H_{it}}{\sum H_{it}} \quad (3.3-4)$$

where: I_{it} is the weight of the expected annual visitation to reservoir i in month t
 H_{it} is the expected annual visitation to reservoir i in month t

These weights are shown in Table 3.3-9. These weights show the annual pattern of visitation to the reservoirs.

The annual scale values for the reservoirs are then calculated through the following equation.

$$D_i = \sum_t D_{it} (I_{it}) \quad (3.3-5)$$

where: D_i is the annual scale value for reservoir i
 D_{it} is the scale value for the end of the month storage level for reservoir i in month t
 I_{it} is the weight of the expected annual visitation to reservoir i in month t

The weighted scale values are shown by month and by reservoir in Table 3.3-10. The summation of these weighted scale values is the annual scale value. Corresponding to a annual scale value is a annual percentage of visitation.

The annual percentage of visitation corresponding to the annual scale value is then calculated through the following equation.

$$\text{If } E_i \geq D_i \geq F_i \text{ scale value, then visitation } G_i = \alpha_i + \beta_i (D_i) \quad (3.3-6)$$

where:

- E_i is the high scale value for reservoir i
- D_i is the annual scale value for reservoir i
- F_i is the low scale value for reservoir i
- G_i is the annual percentage of visitation corresponding to the annual scale value for reservoir i
- α_i is the annual percentage of visitation constant term for reservoir i
- β_i is the annual percentage of visitation slope coefficient term for reservoir i

This equation is formulated to linearly interpolate an annual scale value to an annual percentage of visitation.

Separate equations for annual scale value and reservoir storage levels are formulated for Prosser, Stampede, and Boca Reservoirs. These equations are provided below by reservoir.

Prosser Reservoir

$$\text{If } 4 \geq D_i \geq 3 \text{ scale value, then visitation } G_i = - 1.4 + .6 (D_i)$$

$$\text{If } 3 \geq D_i \geq 2 \text{ scale value, then visitation } G_i = .4 + 0 (D_i)$$

$$\text{If } 2 \geq D_i \geq 1 \text{ scale value, then visitation } G_i = .2 + .1 (D_i)$$

Stampede Reservoir

$$\text{If } 4 \geq D_i \geq 3 \text{ scale value, then visitation } G_i = 1.0492 - .0123 (D_i)$$

$$\text{If } 3 \geq D_i \geq 2 \text{ scale value, then visitation } G_i = .2716 - .2469 (D_i)$$

$$\text{If } 2 \geq D_i \geq 1 \text{ scale value, then visitation } G_i = .0976 + .2839 (D_i)$$

Boca Reservoir

$$\text{If } 5 \geq D_i \geq 4 \text{ scale value, then visitation } G_i = .1080 + .1784 (D_i)$$

$$\text{If } 4 \geq D_i \geq 3 \text{ scale value, then visitation } G_i = .4764 + .0863 (D_i)$$

$$\text{If } 3 \geq D_i \geq 2 \text{ scale value, then visitation } G_i = .2646 + .3333 (D_i)$$

$$\text{If } 2 \geq D_i \geq 1 \text{ scale value, then visitation } G_i = - .3354 + .3687 (D_i)$$

Annual visitation relative to end of the month reservoir storage levels for Prosser, Stampede, and Boca Reservoirs are given in Table 3.3-11. An annual percentage of visitation corresponds to an annual scale value which in turn corresponds to end of the month reservoir storage levels.

Survey year annual visitation relative to end of the month reservoir storage levels are the same because of end of the month reservoir storage levels being the same. The annual percentages of visitation are shown in Table 3.3-12. Annual visitation would differ under alternative reservoir storage levels.

Table 3.3-7. Survey Year Annual Visitation by Respondents by Month by Reservoir.

	Promer Reservoir	Stampede Reservoir	Boca Reservoir
Number of Respondents that Visit during April	3	10	14
Number of Respondents that Visit during May	3	16	28
Number of Respondents that Visit during June	3	25	36
Number of Respondents that Visit during July	4	26	42
Number of Respondents that Visit during August	6	46	46
Number of Respondents that Visit during September	3	20	31
Number of Respondents that Visit during October	3	10	19
Number of Respondents that Visit during Other Months	1	0	6
Total	26	153	222

Table 3.3-8. Expected Annual Visitation by Month by Reservoir.

	Promer Reservoir	Stampede Reservoir	Boca Reservoir
Expected Visitation during April	3	10	14
Expected Visitation during May	3	16	28
Expected Visitation during June	3	25	36
Expected Visitation during July	4	26	42
Expected Visitation during August	6	46	46
Expected Visitation during September	3	20	31
Expected Visitation during October	3	10	19
Expected Visitation during Other Months	1	0	6
Total	26	153	222

Table 3.3-9. Weights for Expected Annual Visitation by Month by Reservoir.

	Promer Reservoir	Stampede Reservoir	Boca Reservoir
Weight for expected Visitation during April	11.54%	6.54%	6.31%
Weight for expected Visitation during May	11.54%	10.46%	12.61%
Weight for expected Visitation during June	11.54%	16.34%	16.22%
Weight for expected Visitation during July	15.38%	16.99%	18.92%
Weight for expected Visitation during August	23.08%	30.07%	20.72%
Weight for expected Visitation during September	11.54%	13.07%	13.96%
Weight for expected Visitation during October	11.54%	6.54%	8.56%
Weight for expected Visitation during Other Months	3.85%	0.00%	2.70%

Table 3.3-10. Annual Scale Values by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Weighted Scale Value for April End of the Month Reservoir Storage Level	0.10	0.07	0.15
Weighted Scale Value for May End of the Month Reservoir Storage Level	0.19	0.17	0.49
Weighted Scale Value for June End of the Month Reservoir Storage Level	0.26	0.48	0.66
Weighted Scale Value for July End of the Month Reservoir Storage Level	0.36	0.54	0.74
Weighted Scale Value for August End of the Month Reservoir Storage Level	0.53	0.93	0.69
Weighted Scale Value for September End of the Month Reservoir Storage Level	0.16	0.40	0.30
Weighted Scale Value for October End of the Month Reservoir Storage Level	0.10	0.20	0.16
Weighted Scale Value for Other Months End of the Month Reservoir Storage Level	0.03	0.00	0.04
Annual Scale Value	1.74	2.79	3.23

Table 3.3-11. Annual Visitation Relative to End of the Month Reservoir Storage Levels.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Annual Visitation Relative to the End of the Month Reservoir Storage Levels	37.36%	95.97%	75.53%

Table 3.3-12. Survey Year Annual Visitation Relative to End of the Month Reservoir Storage Levels.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Annual Visitation Relative to the End of the Month Reservoir Storage Levels	37.36%	95.97%	75.53%

Annual Number of Camping Visitors

The annual number of camping visitors to the reservoirs is derived by taking the survey year number of camping visitors for the campgrounds at the reservoirs and multiplying by the ratio of annual visitation for the given year to the annual visitation for survey year. The annual number of camping visitors is distributed monthly by the weights of the expected annual visitation to show the annual pattern of visitation.

The survey year number of camping visitors for the campgrounds at the reservoirs are taken from U.S. Forest Service data. This data is shown in Table 3.3-13. There are ten campgrounds in the area. Four campgrounds are near Prosser Reservoir. Another three campgrounds are near Stampede Reservoir. And the remaining three campgrounds are near Boca Reservoir. The annual number of camping visitors is provided for each campground.

The annual number of camping visitors for the given year is calculated through the following equation.

$$J_i = J_i^0 \frac{G_i}{G_i^0} \quad (3.3-7)$$

where:

- J_i is the annual number of camping visitors for reservoir i
- J_i^0 is the survey year annual number of camping visitors for reservoir i
- G_i is the annual percentage of visitation corresponding to the annual scale value for reservoir i
- G_i^0 is the survey year annual percentage of visitation corresponding to the annual scale value for reservoir i

The equation is formulated so that if the annual percentage of visitation for the given year is greater than the survey year annual percentage of visitation then the annual number of camping visitors for the given year is also greater. Likewise if the annual percentage of visitation for the given year is less than the survey year annual percentage of visitation then the annual number of camping visitors for the given year is also less.

The annual number of camping visitors by reservoir are shown in Table 3.3-14.

The annual number of camping visitors are then distributed by the weights for expected annual visitation to show the annual number of camping visitors by month. This is done through the following equation.

$$K_{it} = J_i (I_{it}) \quad (3.3-8)$$

where: K_{it} is the number of annual camping visitors to reservoir i in month t
 J_i is the annual number of camping visitors for reservoir i
 I_{it} is the weight of the expected annual visitation to reservoir i in month t

The annual number of camping visitors by month to the reservoirs are shown in Table 3.3-15. Together the annual number of camping visitors by month show the annual pattern of visitation to the reservoir by camping visitors.

Table 3.3-13. Annual Number of Camping Visitors by Campground by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Camping Visitors for Lakeside Campground	0		
Number of Camping Visitors for Prosser Family Campground	30,062		
Number of Camping Visitors for Prosser Ranch Campground	7,754		
Number of Camping Visitors for Annie McCloud Campground	0		
Number of Camping Visitors for Davies Creek Campground		2,221	
Number of Camping Visitors for Emigrant Campground /1		2,300	
Number of Camping Visitors for Logger Campground		41,357	
Number of Camping Visitors for Boca Campground			0
Number of Camping Visitors for Boca Rest Campground			58,853
Number of Camping Visitors for Beyington Mill Campground			6,960
Total Number of Camping Visitors for Campgrounds	37,816	45,878	65,813

1. Estimate provided by host at campground.

Table 3.3-14. Annual Number of Camping Visitors by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Annual Number of Camping Visitors	37,816	45,878	65,813

Table 3.3-15. Annual Number of Camping Visitors by Month by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Camping Visitors during April	4,363	2,999	4,150
Number of Camping Visitors during May	4,363	4,798	8,301
Number of Camping Visitors during June	4,363	7,496	10,672
Number of Camping Visitors during July	5,818	7,796	12,451
Number of Camping Visitors during August	8,727	13,793	13,637
Number of Camping Visitors during September	4,363	5,997	9,190
Number of Camping Visitors during October	4,363	2,999	5,633
Number of Camping Visitors during Other Months	1,454	0	1,779
Annual Number of Camping Visitors	37,816	45,878	65,813

Annual Number of Day Use Visitors

The annual number of day use visitors to the reservoirs is derived by multiplying the annual number of camping visitors to the reservoirs by the ratio of day use visitors to camping visitors taken from the survey.

The ratio of day use visitors to camping visitors is calculated through the following equations.

$$L_i = M_i (N_i) \quad (3.3-9)$$

$$O_i = (P_i (Q_i)) R_i \quad (3.3-10)$$

$$S_i = \frac{L_i}{O_i} \quad (3.3-11)$$

where:

- L_i is the number of day use visitors to reservoir i
- M_i is the number of day use respondents at reservoir i
- N_i is the average group size of day use respondents at reservoir i
- O_i is the number of camping visitors to reservoir i
- P_i is the number of camping respondents at reservoir i
- Q_i is the average group size of camping respondents at reservoir i
- R_i is the average number of days spent by camping respondents at reservoir i
- S_i is the ratio of day use visitors to camping visitors to reservoir i

The ratios of day use visitors to camping visitors by reservoir are given in Table 3.3-16. However the ratio calculated for Boca Reservoir is used for Prosser and Stampede Reservoirs.

The annual number of day use visitors is then calculated through the following equation.

$$T_i = J_i (S_i) \quad (3.3-12)$$

where:

- T_i is the annual number of day use visitors for reservoir i
- J_i is the annual number of camping visitors for reservoir i
- S_i is the ratio of day use visitors to camping visitors to reservoir i

The annual number of day use visitors by reservoir are shown in Table 3.3-17.

The annual number of day use visitors are then distributed by the weights for expected annual visitation to show the annual number of day use visitors by month. This is done through the following equation.

$$U_{it} = T_i (I_{it}) \quad (3.3-13)$$

where: U_{it} is the number of annual day use visitors to reservoir i in month t
 T_i is the annual number of day use visitors for reservoir i
 I_{it} is the weight of the expected annual visitation to reservoir i in month t

The annual number of day use visitors by month to the reservoirs are shown in Table 3.3-18. Together the annual number of day use visitors by month show the annual pattern of visitation to the reservoir by day use visitors.

Table 3.3-16. Ratio of Day Use Visitors to Camping Visitors by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Day Use Respondents	6.00	10.00	41.00
Average Group Size of Day Use Respondents	3.33	3.50	4.71
Number of Day Use Visitors	19.98	35.00	193.11
Number of Camping Respondents	0.00	36.00	5.00
Average Group Size of Camping Respondents	N.A.	5.14	3.20
Average Number of Days Spent by Camping Respondents	N.A.	3.69	6.40
Number of Camping Visitors	0.00	682.80	102.40
Ratio of Day Use Visitors to Camping Visitors	N.A.	N.A.	1.89
Ratio of Day Use Visitors to Camping Visitors /1	1.89	1.89	1.89

1. The Boca Reservoir ratio is used for both Prosser and Stampede Reservoirs.

Table 3.3-17. Annual Number of Day Use Visitors by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Annual Number of Day Use Visitors	71,315	86,519	124,113

Table 3.3-18. Annual Number of Day Use Visitors by Month by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Day Use Visitors during April	8,229	5,655	7,827
Number of Day Use Visitors during May	8,229	9,048	15,654
Number of Day Use Visitors during June	8,229	14,137	20,126
Number of Day Use Visitors during July	10,972	14,703	23,481
Number of Day Use Visitors during August	16,457	26,012	25,717
Number of Day Use Visitors during September	8,229	11,310	17,331
Number of Day Use Visitors during October	8,229	5,655	10,622
Number of Day Use Visitors during Other Months	2,743	0	3,354
Annual Number of Day Use Visitors	71,315	86,519	124,113

Annual Number of Camping Visitor Groups

The annual number of camping visitor groups to the reservoirs is derived by dividing the annual number of camping visitors by month by the group size. This is done through the following equation.

$$V_{it} = \frac{K_{it}}{Q_i} \quad (3.3-14)$$

where: V_{it} is the annual number of camping visitor groups to reservoir i in month t
 K_{it} is the number of annual camping visitors to reservoir i in month t
 Q_i is the average group size of camping respondents at reservoir i

The annual number of camping visitor groups by month to the reservoirs are shown in Table 3.3-19.

Table 3.3-19. Annual Number of Camping Visitor Groups by Month by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Camping Visitor Groups during April	1,310	583	1,297
Number of Camping Visitor Groups during May	1,310	933	2,594
Number of Camping Visitor Groups during June	1,310	1,458	3,335
Number of Camping Visitor Groups during July	1,747	1,517	3,891
Number of Camping Visitor Groups during August	2,621	2,684	4,262
Number of Camping Visitor Groups during September	1,310	1,167	2,872
Number of Camping Visitor Groups during October	1,310	583	1,760
Number of Camping Visitor Groups during Other Months	437	0	556
Annual Number of Camping Visitor Groups	11,356	8,926	20,567

Annual Number of Day Use Visitor Groups

The annual number of day use visitor groups to the reservoirs is derived by dividing the annual number of day use visitors by month by the group size. This is done through the following equation.

$$W_{it} = \frac{U_{it}}{N_i} \quad (3.3-15)$$

where: W_{it} is the annual number of day use visitor groups to reservoir i in month t
 U_{it} is the number of annual day use visitors to reservoir i in month t
 N_i is the average group size of day use respondents at reservoir i

The annual number of day use visitor groups by month to the reservoirs are shown in Table 3.3-20.

Table 3.3-20. Annual Number of Day Use Visitor Groups by Month by Reservoir.

	Proser Reservoir	Stampede Reservoir	Boca Reservoir
Number of Day Use Visitor Groups during April	2,471	1,616	1,662
Number of Day Use Visitor Groups during May	2,471	2,585	3,324
Number of Day Use Visitor Groups during June	2,471	4,039	4,273
Number of Day Use Visitor Groups during July	3,295	4,201	4,985
Number of Day Use Visitor Groups during August	4,942	7,432	5,460
Number of Day Use Visitor Groups during September	2,471	3,231	3,680
Number of Day Use Visitor Groups during October	2,471	1,616	2,255
Number of Day Use Visitor Groups during Other Months	824	0	712
Annual Number of Day Use Visitor Groups	21,416	24,720	26,351

Annual Camping Visitor Expenditures

The annual camping visitor expenditures by reservoir are the summation of the annual number of camping visitor groups per month multiplied by the camping visitor group expenditure function value. This is done through the following equations.

$$X_{it} = V_{it} (Y_i) \quad (3.3-16)$$

$$Z_i = \sum X_{it} \quad (3.3-17)$$

where: X_{it} is the annual camping visitor expenditures for reservoir i in month t
 V_{it} is the annual number of camping visitor groups to reservoir i in month t
 Y_i is the camping visitor group expenditure function value for reservoir i
 Z_i is the annual camping visitor expenditures for reservoir i

The camping visitor group expenditure function values for each reservoir are shown in Table 3.3-21. The annual camping visitor expenditures by month by reservoir are shown in Table 3.3-22.

The annual camping visitor expenditures are proportioned by the amount of expenditure indicated by category by respondent for the reservoir. This is done through the following equation.

$$AA_{ci} = Z_i (AB_{ci}) \quad (3.3-18)$$

where: AA_{ci} is the annual camping visitor expenditures by category c for reservoir i
 Z_i is the annual camping visitor expenditures for reservoir i
 AB_{ci} is the proportion of the amount of expenditure by category c for reservoir i by camping respondents

The annual camping visitor expenditures by category by reservoir are shown in Table 3.3-23.

Table 3.3-21. Camping Visitor Group Expenditure Function Values by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Camping Visitor Group Expenditure per Day	\$93.95	\$60.72	\$24.34

Table 3.3-22. Annual Camping Visitor Expenditures by Month by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boca Reservoir
Camping Visitor Expenditures during April	123,105	35,423	31,569
Camping Visitor Expenditures during May	123,105	56,676	63,137
Camping Visitor Expenditures during June	123,105	88,557	81,177
Camping Visitor Expenditures during July	164,140	92,099	94,706
Camping Visitor Expenditures during August	246,211	162,944	103,726
Camping Visitor Expenditures during September	123,105	70,845	69,902
Camping Visitor Expenditures during October	123,105	35,423	42,843
Camping Visitor Expenditures during Other Months	41,035	0	13,529
Annual Camping Visitor Expenditures	\$1,066,912	\$541,967	\$500,590

Table 3.3-23. Annual Camping Visitor Expenditures by Category by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boon Reservoir
Average Expenditures on Licenses by Camping Respondents	N.A.	16.18	17.40
Average Expenditures on Camping Fees by Camping Respondents	N.A.	48.47	0.00
Average Expenditures on Hotel or Motel by Camping Respondents	N.A.	0.00	0.00
Average Expenditures on Restaurant by Camping Respondents	N.A.	8.58	0.00
Average Expenditures on Groceries by Camping Respondents	N.A.	70.39	46.00
Average Expenditures on Equipment and Supplies by Camping Respondents	N.A.	15.08	0.40
Average Expenditures on Rental by Camping Respondents	N.A.	0.00	0.00
Average Expenditures on Fuel by Camping Respondents	N.A.	40.42	16.60
Average Expenditures on Other by Camping Respondents	N.A.	0.00	12.00
Average Total Expenditures by Camping Respondents	90	\$199.12	\$92.40
Average Expenditures on Licenses by Camping Respondents /1	18.83%	8.13%	18.83%
Average Expenditures on Camping Fees by Camping Respondents	0.00%	24.34%	0.00%
Average Expenditures on Hotel or Motel by Camping Respondents	0.00%	0.00%	0.00%
Average Expenditures on Restaurant by Camping Respondents	0.00%	4.31%	0.00%
Average Expenditures on Groceries by Camping Respondents	49.78%	35.35%	49.78%
Average Expenditures on Equipment and Supplies by Camping Respondents	0.43%	7.57%	0.43%
Average Expenditures on Rental by Camping Respondents	0.00%	0.00%	0.00%
Average Expenditures on Fuel by Camping Respondents	17.97%	20.30%	17.97%
Average Expenditures on Other by Camping Respondents	12.99%	0.00%	12.99%
Average Total Expenditures by Camping Respondents	100.00%	100.00%	100.00%
Annual Camping Visitor Expenditures on Licenses	200,912	44,039	94,267
Annual Camping Visitor Expenditures on Camping Fees	0	131,926	0
Annual Camping Visitor Expenditures on Hotel or Motel	0	0	0
Annual Camping Visitor Expenditures on Restaurant	0	23,353	0
Annual Camping Visitor Expenditures on Groceries	531,147	191,588	249,212
Annual Camping Visitor Expenditures on Equipment and Supplies	4,619	41,045	2,167
Annual Camping Visitor Expenditures on Rental	0	0	0
Annual Camping Visitor Expenditures on Fuel	191,675	110,016	89,933
Annual Camping Visitor Expenditures on Other	138,560	0	65,012
Annual Camping Visitor Expenditures	\$1,066,912	\$541,967	\$500,590

1. The Boon Reservoir expenditure categories are used for Prosser Reservoir.

Annual Day Use Visitor Expenditures

The annual day use visitor expenditures by reservoir are the summation of the annual number of day use visitor groups per month multiplied by the day use visitor group expenditure function value. This is done through the following equations.

$$AC_{it} = W_{it} (AD_i) \quad (3.3-19)$$

$$AE_i = \sum AC_{it} \quad (3.3-20)$$

where: AC_{it} is the annual day use visitor expenditures for reservoir i in month t
 W_{it} is the number of annual day use visitor groups to reservoir i in month t
 AD_i is the day use visitor group expenditure function value for reservoir i
 AE_i is the annual day use visitor expenditures for reservoir i

The day use visitor group expenditure function values for each reservoir are shown in Table 3.3-24. The annual day use visitor expenditures by month by reservoir are shown in Table 3.3-25.

The annual day use visitor expenditures are proportioned by the amount of expenditure indicated by category by respondent for the reservoir. This is done through the following equation.

$$AF_{ci} = AE_i (AG_{ci}) \quad (3.3-21)$$

where: AF_{ci} is the annual day use visitor expenditures by category c for reservoir i
 AE_i is the annual day use visitor expenditures for reservoir i
 AG_{ci} is the proportion of the amount of expenditure by category c for reservoir i by day use respondents

The annual day use visitor expenditures by category by reservoir are shown in Table 3.3-26.

Table 3.3-24. Day Use Visitor Group Expenditure Function Values by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boon Reservoir
Day Use Visitor Group Expenditure per Day	\$153.27	\$94.10	\$50.84

Table 3.3-25. Annual Day Use Visitor Expenditures by Month by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boon Reservoir
Day Use Visitor Expenditures during April	378,741	152,034	84,484
Day Use Visitor Expenditures during May	378,741	243,254	168,969
Day Use Visitor Expenditures during June	378,741	380,084	217,245
Day Use Visitor Expenditures during July	504,987	395,287	253,453
Day Use Visitor Expenditures during August	757,481	699,354	277,591
Day Use Visitor Expenditures during September	378,741	304,067	187,072
Day Use Visitor Expenditures during October	378,741	152,034	114,657
Day Use Visitor Expenditures during Other Months	126,247	0	36,208
Annual Day Use Visitor Expenditures	\$3,282,418	\$2,326,113	\$1,339,680

Table 3.3-26. Annual Day Use Visitor Expenditures by Category by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boon Reservoir
Average Expenditures on Licenses by Day Use Respondents	23.73	38.60	9.40
Average Expenditures on Camping Fees by Day Use Respondents	0.00	0.00	7.32
Average Expenditures on Hotel or Motel by Day Use Respondents	1.00	16.00	32.68
Average Expenditures on Restaurant by Day Use Respondents	41.67	15.00	12.68
Average Expenditures on Groceries by Day Use Respondents	41.67	22.40	27.29
Average Expenditures on Equipment and Supplies by Day Use Respondents	4.50	3.76	5.76
Average Expenditures on Rental by Day Use Respondents	162.50	0.00	0.00
Average Expenditures on Fuel by Day Use Respondents	14.83	20.20	17.78
Average Expenditures on Other by Day Use Respondents	0.00	1.50	7.32
Average Total Expenditures by Day Use Respondents	\$289.90	\$117.46	\$120.23
Average Expenditures on Licenses by Day Use Respondents	8.19%	32.86%	7.82%
Average Expenditures on Camping Fees by Day Use Respondents	0.00%	0.00%	6.09%
Average Expenditures on Hotel or Motel by Day Use Respondents	0.34%	13.62%	27.18%
Average Expenditures on Restaurant by Day Use Respondents	14.37%	12.77%	10.55%
Average Expenditures on Groceries by Day Use Respondents	14.37%	19.07%	22.70%
Average Expenditures on Equipment and Supplies by Day Use Respondents	1.55%	3.20%	4.79%
Average Expenditures on Rental by Day Use Respondents	56.05%	0.00%	0.00%
Average Expenditures on Fuel by Day Use Respondents	5.12%	17.20%	14.79%
Average Expenditures on Other by Day Use Respondents	0.00%	1.28%	6.09%
Average Total Expenditures by Day Use Respondents	100.00%	100.00%	100.00%
Annual Day Use Visitor Expenditures on Licenses	268,685	764,413	104,741
Annual Day Use Visitor Expenditures on Camping Fees	0	0	81,564
Annual Day Use Visitor Expenditures on Hotel or Motel	11,323	316,855	364,142
Annual Day Use Visitor Expenditures on Restaurant	471,812	297,052	141,289
Annual Day Use Visitor Expenditures on Groceries	471,812	443,597	304,083
Annual Day Use Visitor Expenditures on Equipment and Supplies	50,952	74,461	64,182
Annual Day Use Visitor Expenditures on Rental	1,839,920	0	0
Annual Day Use Visitor Expenditures on Fuel	167,914	400,030	198,116
Annual Day Use Visitor Expenditures on Other	0	29,705	81,564
Annual Day Use Visitor Expenditures	\$3,282,418	\$2,326,113	\$1,339,680

Annual Number of Camping and Day Use Visitors

The annual number of camping and day use visitors by reservoir is the summation of the annual number of camping visitors and the annual number of day use visitors. This is done through the following equations.

$$AH_{it} = K_{it} + U_{it} \quad (3.3-22)$$

$$AI_i = \sum AH_{it} \quad (3.3-23)$$

where:

AH_{it}	is the annual number of camping and day use visitors for reservoir i in month t
K_{it}	is the number of annual camping visitors to reservoir i in month t
U_{it}	is the number of annual day use visitors to reservoir i in month t
AI_i	is the annual number of camping and day use visitors for reservoir i

The annual number of camping and day use visitors by month by reservoir are shown in Table 3.3-27.

Table 3.3-27. Annual Number of Camping and Day Use Visitors by Month by Reservoir.

	Pronser Reservoir	Stampede Reservoir	Boon Reservoir
Number of Camping and Day Use Visitors during April	12,592	8,653	11,977
Number of Camping and Day Use Visitors during May	12,592	13,845	23,955
Number of Camping and Day Use Visitors during June	12,592	21,633	30,799
Number of Camping and Day Use Visitors during July	16,789	22,499	35,932
Number of Camping and Day Use Visitors during August	25,184	39,806	39,354
Number of Camping and Day Use Visitors during September	12,592	17,307	26,521
Number of Camping and Day Use Visitors during October	12,592	8,653	16,255
Number of Camping and Day Use Visitors during Other months	4,197	0	5,133
Annual Number of Camping and Day Use Visitors	109,131	132,397	189,926

Annual Camping and Day Use Visitor Expenditures

The annual camping and day use visitor expenditures by reservoir is the summation of the annual camping visitor expenditures and the annual day use visitor expenditures. This is done through the following equations.

$$AJ_{it} = X_{it} + AC_{it} \quad (3.3-24)$$

$$AK_i = \sum AJ_{it} \quad (3.3-25)$$

where: AJ_{it} is the annual camping and day use visitor expenditures for reservoir i in month t
 X_{it} is the annual camping visitor expenditures for reservoir i in month t
 AC_{it} is the annual day use visitor expenditures for reservoir i in month t
 AK_i is the annual camping and day use visitor expenditures for reservoir i

The annual camping and day use visitor expenditures by month by reservoir are shown in Table 3.3-28.

Table 3.3-28. Annual Camping and Day Use Visitor Expenditures by Month by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boon Reservoir
Camping and Day Use Visitor Expenditures during April	501,846	187,456	116,053
Camping and Day Use Visitor Expenditures during May	501,846	299,930	232,106
Camping and Day Use Visitor Expenditures during June	501,846	468,641	298,422
Camping and Day Use Visitor Expenditures during July	669,128	487,386	348,159
Camping and Day Use Visitor Expenditures during August	1,003,692	862,299	381,317
Camping and Day Use Visitor Expenditures during September	501,846	374,913	256,975
Camping and Day Use Visitor Expenditures during October	501,846	187,456	157,501
Camping and Day Use Visitor Expenditures during Other months	167,282	0	49,737
Annual Camping and Day Use Visitor Expenditures	\$4,349,330	\$2,868,081	\$1,840,270

Annual Camping and Day Use Visitor Expenditures by Category

The annual camping and day use visitor expenditures by category by reservoir is the summation of the annual camping visitor expenditures by category and the annual day use visitor expenditures by category. This is done through the following equations.

$$AL_{ci} = AA_{ci} + AF_{ci} \quad (3.3-26)$$

$$AM_i = \sum AL_{ci} \quad (3.3-27)$$

where: AL_{ci} is the annual camping and day use visitor expenditures by category c for reservoir i
 AA_{ci} is the annual camping visitor expenditures by category c for reservoir i
 AF_{ci} is the annual day use visitor expenditures by category c for reservoir i
 AM_i is the annual camping and day use visitor expenditures for reservoir i

The annual camping and day use visitor expenditures by category by reservoir are shown in Table 3.3-29.

Table 3.3-29. Annual Camping and Day Use Visitor Expenditures by Category by Reservoir.

	Prosser Reservoir	Stampede Reservoir	Boon Reservoir
Annual Camping and Day Use Visitor Expenditures on Licenses	469,597	808,452	199,008
Annual Camping and Day Use Visitor Expenditures on Camping Fees	0	131,926	81,564
Annual Camping and Day Use Visitor Expenditures on Hotel or Motel	11,323	316,855	364,142
Annual Camping and Day Use Visitor Expenditures on Restaurant	471,812	320,405	141,289
Annual Camping and Day Use Visitor Expenditures on Groceries	1,002,959	635,186	553,294
Annual Camping and Day Use Visitor Expenditures on Equipment and Supplies	55,570	115,506	66,349
Annual Camping and Day Use Visitor Expenditures on Rental	1,839,920	0	0
Annual Camping and Day Use Visitor Expenditures on Fuel	359,589	510,045	288,049
Annual Camping and Day Use Visitor Expenditures on Other	138,560	29,705	146,576
Annual Camping and Day Use Visitor Expenditures	\$4,349,330	\$2,868,081	\$1,840,270

4. Input-Output Model Component

The input-output model component of the regional economic impact model serves the purpose of estimating the economic impact on the regional economy from a selected sectoral change in economic activity. Development of this component involved definition of the region, collection of the control total data, and derivation of the model tables.

4.1 Definition of the Region

The region is outlined by the hydrologic boundaries of the Truckee River Basin. Within the region, there is an economic area, a population base, and economic sectors.

Economic Area

The economic area within the region is defined at state, county, and city levels. At the state level, the economic area covers part of eastern California and part of western Nevada. At the county level, parts of Sierra county, Nevada county, Placer county, El Dorado county, and Alpine county lie within the California portion of the area. Similarly, in Nevada, parts of Pershing county, Washoe county, Lyon county, Carson City (an independent city), and Douglas county lie within the area. At the city level, Reno and Sparks in Washoe county, are the major cities in the area followed by Carson City, South Lake Tahoe in El Dorado county, Truckee in Nevada county, and, Tahoe City in Placer county.

Population Base

The population base is only that portion of county population that lives within the region. This amount is determined from county subdivision level data taken from the *Census of Population* published by the Bureau of the Census. The data includes all persons.

Population in and out of the region by county is shown in Tables 4.1-1 through 4.1-5 for California and in Tables 4.1-7 through 4.1-12 for Nevada. County summaries are given in Table 4.1-6 for California and Table 4.1-13 for Nevada. From the California counties, some 50,358 persons live within the region and from the Nevada counties, some 266,023 persons live within the region.

Population in the region by county and by state is also presented in Table 4.1-14. Total population in the region is 316,381 persons. Of this amount, 16% is from the California counties and 84% is from the Nevada counties. Washoe county alone accounts for 254,020 persons or 80% of the total population in the region.

Table 4.1-1. Population In and Out of the Region for Sierra County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
East Sierra	2,029	0	2,029
West Sierra	0	1,289	1,289
Total	2,029	1,289	3,318
Percentage of Population	61.15%	38.85%	100.00%

Table 4.1-2. Population In and Out of the Region for Nevada County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Donner-Truckee	9,420	0	9,420
Grass Valley	0	56,269	56,269
Nevada City	0	12,821	12,821
Total	9,420	69,090	78,510
Percentage of Population	12.00%	88.00%	100.00%

Table 4.1-3. Population In and Out of the Region for Placer County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Auburn	0	37,159	37,159
Colfax-Summit	0	15,546	15,546
Foresthill-Back Country	0	4,699	4,699
Lake Tahoe	9,257	0	9,257
Loomis Basin-Folsom Lake	0	44,931	44,931
Roeville	0	47,395	47,395
West Valley	0	13,809	13,809
Total	9,257	163,539	172,796
Percentage of Population	5.36%	94.64%	100.00%

Table 4.1-4. Population In and Out of the Region for El Dorado County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
North El Dorado	0	24,396	24,396
Placerville	0	14,105	14,105
South El Dorado	0	57,842	57,842
South Lake Tahoe	29,652	0	29,652
Total	29,652	96,343	125,995
Percentage of Population	23.53%	76.47%	100.00%

Table 4.1-5. Population In and Out of the Region for Alpine County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Markleeville	0	1,113	1,113
Total	0	1,113	1,113
Percentage of Population	0.00%	100.00%	100.00%

Table 4.1-6. Population In and Out of the Region by County for California.

County	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Sierra	2,029	1,289	3,318
Nevada	9,420	69,090	78,510
Placer	9,257	163,539	172,796
El Dorado	29,652	96,343	125,995
Alpine	0	1,113	1,113
Total	50,358	331,374	381,732
Percentage of Population	13.19%	86.81%	100.00%

Table 4.1-7. Population In and Out of the Region for Washoe County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Flanigan	790	0	790
Gerlach	0	647	647
Incline Village	7,567	0	7,567
New Washoe City	10,109	0	10,109
Pyramid Lake	1,438	0	1,438
Reno-Sparks	231,651	0	231,651
Verdi	2,465	0	2,465
Total	254,020	647	254,667
Percentage of Population	99.75%	0.25%	100.00%

Table 4.1-8. Population In and Out of the Region for Pershing County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Imlay	0	1,104	1,104
Lovelock	0	3,232	3,232
Total	0	4,336	4,336
Percentage of Population	0.00%	100.00%	100.00%

Table 4.1-9. Population In and Out of the Region for Storey County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Clark	700	0	700
Virginia City	0	1,826	1,826
Total	700	1,826	2,526
Percentage of Population	27.71%	72.29%	100.00%

Table 4.1-10. Population In and Out of the Region for Lyon County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Dayton	0	4,321	4,321
Fernley	5,188	0	5,188
Silver Springs	0	3,261	3,261
Smith	0	1,139	1,139
Yerington	0	6,092	6,092
Total	5,188	14,813	20,001
Percentage of Population	25.94%	74.06%	100.00%

Table 4.1-11. Population In and Out of the Region for Carson City.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Carson City	0	40,443	40,443
Total	0	40,443	40,443
Percentage of Population	0.00%	100.00%	100.00%

Table 4.1-12. Population In and Out of the Region for Douglas County.

County Subdivision	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Gardnerville-Minden	0	15,639	15,639
Genoa-Jacks Valley	0	4,158	4,158
Pine Nut	0	296	296
Topaz Lake	0	1,429	1,429
Zephyr Cove	6,115	0	6,115
Total	6,115	21,522	27,637
Percentage of Population	22.13%	77.87%	100.00%

Table 4.1-13. Population In and Out of the Region by County for Nevada.

County	County Population in the Region <i>all persons</i>	County Population out of the Region <i>all persons</i>	Total County Population <i>all persons</i>
Washoe	254,020	647	254,667
Pershing	0	4,336	4,336
Storey	700	1,826	2,526
Lyon	5,188	14,813	20,001
Carson City	0	40,443	40,443
Douglas	6,115	21,522	27,637
Total	266,023	83,587	349,610
Percentage of Population	76.09%	23.91%	100.00%

Table 4.1-14. Population for the Region by County and by State.

County	California Population in the Region <i>all persons</i>	Nevada Population in the Region <i>all persons</i>	Total Population in the Region <i>all persons</i>	Percentage of Population
Sierra	2,029		2,029	0.64%
Nevada	9,420		9,420	2.98%
Placer	9,257		9,257	2.93%
El Dorado	29,652		29,652	9.37%
Alpine	0		0	0.00%
Washoe		254,020	254,020	80.29%
Pershing		0	0	0.00%
Storey		700	700	0.22%
Lyon		5,188	5,188	1.64%
Carson City		0	0	0.00%
Douglas		6,115	6,115	1.93%
Total	50,358	266,023	316,381	100.00%
Percentage of Population	15.92%	84.08%	100.00%	

Economic Sectors

There are twenty economic sectors within the economy of the region. A sector is an aggregation of individual business enterprises, firms, establishments, or activities which produce the same or similar products, or which purchase the same inputs to use in production. Each economic sector is listed with a definition in Table 4.1-15. These sectors include agriculture sectors and non-agriculture sectors. The agriculture sectors are livestock production, dairy production, alfalfa hay production, other hay production, and barley production. The non-agriculture sectors are agricultural services, gold mining, other mining, construction, manufacturing, transportation and communications, utilities, trade, eating, drinking, and lodging, finance, insurance, and real estate, services, hotels, gaming, and recreation, health, local government, and households. Agricultural services is included in the non-agriculture sectors because it isn't a agriculture production sector in the sense of producing a crop or commodity. Their sector definitions are based on standard industrial codes taken from the *Standard Industrial Classification Manual*. This manual is published by the Executive Office of the President, Office of Management and Budget.

State government is not included as one of the twenty sectors mentioned above. In splitting the state and local government sector apart an adjustment factor was necessary. This factor is based on the state and local government employment data by state given in Table 4.1-16 and the distribution of state and local government employment by state presented in Table 4.1-17.

Table 4.1-15. Economic Sector Definitions.

Economic Sector	Definition
1 Livestock Production	Livestock production sector accounts for cattle production.
2 Dairy Production	Dairy production sector accounts for milk production.
3 Alfalfa Hay Production	Alfalfa hay production sector accounts for alfalfa hay production.
4 Other Hay Production	Other hay production sector accounts for hay production other than alfalfa hay.
5 Barley Production	Barley production sector accounts for barley production.
6 Agricultural Services	Agricultural services sector accounts for veterinary services, and, landscape and horticultural services.
7 Gold Mining	Gold mining sector accounts for mining of gold and silver ore.
8 Other Mining	Other mining sector accounts for mining geothermal energy, distamaceous earth, clay, and gravel.
9 Construction	Construction sector accounts for general building, heavy construction, and special trade contractors.
10 Manufacturing	Manufacturing sector accounts for manufacturing of food products, wood products, furniture, paper products, printing, publishing, chemical products, petroleum products, plastic products, stone products, clay products, glass products, fabricated metal products, industry equipment, electronic equipment, transportation equipment, and instruments.
11 Transportation and Communications	Transportation and communications sector accounts for railroad transportation, trucking, warehousing, air transportation, passenger transit, transportation services, and communications.
12 Utilities	Utilities sector accounts for electric, gas, and sanitary services.
13 Trade	Trade sector accounts for wholesale and retail trade. Wholesale trade is trade of durable and non-durable goods. Retail trade is trade of building materials, garden supplies, general merchandise stores, food stores, automotive dealers, service stations, apparel stores, and furniture stores.
14 Eating, Drinking, and Lodging	Eating, drinking, and lodging sector accounts for non-casino restaurants, bars, hotels, and motels.
15 Finance, Insurance, and Real Estate	Finance, insurance, and real estate sector accounts for depository institutions, non-depository institutions, security brokers, commodity brokers, insurance carriers, insurance agents, insurance brokers, real estate, and investment offices.
16 Services	Services sector accounts for personal services, business services, repair services, motion pictures, recreation, legal services, educational services, social services, museums, membership organizations, engineering services, and management services.
17 Hotels, Gaming, and Recreation	Hotels, gaming, and recreation sector accounts for casinos.
18 Health	Health sector accounts for medical and dental services.
19 Local Government	Local government sector accounts for local government activities of public administration, police protection, fire protection, public works, school district, finance, taxation, human resource programs, environmental quality programs, housing programs, and economic programs.
20 Households	Household sector accounts for consumers.

Table 4.1-16. State and Local Government Employment by State.

	California <i>jobs</i>	Nevada <i>jobs</i>
Local Government	1,183,867	38,434
State Government	348,258	16,857
State and Local Government	1,532,125	55,291

Table 4.1-17. Distribution of State and Local Government Employment by State.

	California <i>jobs</i>	Nevada <i>jobs</i>
Local Government	77.27%	69.51%
State Government	22.73%	30.49%
State and Local Government	100.00%	100.00%

4.2. Collection of the Control Total Data

Control total data was collected for output, employment, income, population, housing, agriculture water use, commercial water use, and residential water use.

Output

Output is the total gross output for each economic sector. Total gross output includes total value of sales and additions to inventories. Output is also referred to as the total value of intermediate plus final goods produced in the economy. The opposite of output is total gross outlay. Total gross outlay includes total value of purchases and depletion's from inventories. Total gross outlay is commonly called input.

Output by Agriculture Sector

Data to estimate the output by agriculture sector was provided by the California Department of Food and Agriculture and the Nevada Agricultural Statistics Service.

Output for the livestock, dairy, alfalfa hay, other hay, and barley production were taken from *California Livestock and Crop Report* and the *Nevada Agricultural Statistics Bulletin*. Livestock and dairy production are value of production based on marketing receipts from sales of cattle and milk. Alfalfa hay, other hay, and barley production are value of production based on crop yields and season prices.

The estimated value of production by commodity for both California and Nevada are provided in Tables 4.2-1 through 4.2-5. Output by agriculture sector for the region by state is then given in Table 4.2-6. Within the region the total agriculture production output for California is \$2,092,000 and \$3,123,153 for Nevada. Total agriculture output for the region is \$5,215,455.

Table 4.2-1. Value of Livestock Production for the Region by State.

	California	Nevada	Total
Acres of Pasture	7,217	7,334	14,551
Number of Beef Cows per Acre	0.50	0.50	
Number of Beef Cows	3,609	3,667	7,276
Calf Crop Percentage	0.90	0.90	
Average Weight of Calves	600	600	
Average Price of Calves per Pound	0.85	0.85	
Value of Production	\$1,656,302	\$1,683,153	\$3,339,455

Table 4.2-2. Value of Dairy Production for the Region by State.

	California	Nevada	Total
Number of Dairy Cows	0	500	500
Pounds of Milk per Cow	0	16,000	
Average Price of Milk per Hundredweight	0.00	12.00	
Value of Production	\$0	\$960,000	\$960,000

Table 4.2-3. Value of Alfalfa Hay Production for the Region by State.

	California	Nevada	Total
Acres of Alfalfa Hay	300	500	800
Tons per Acre	4.00	4.00	
Price per Ton	100.00	100.00	
Value of Production	\$120,000	\$200,000	\$320,000

Table 4.2-4. Value of Other Hay Production for the Region by State.

	California	Nevada	Total
Acres of Other Hay	2,000	2,000	4,000
Tons per Acre	2.00	2.00	
Price per Ton	70.00	70.00	
Value of Production	\$280,000	\$280,000	\$560,000

Table 4.2-5. Value of Barley Production for the Region by State.

	California	Nevada	Total
Acres of Barley	200	0	200
Tons per Acre	2.00	0.00	
Price per Ton	90.00	0.00	
Value of Production	\$36,000	\$0	\$36,000

Table 4.2-6. Output by Agriculture Sector for the Region by State.

Agriculture Sector	California \$	Nevada \$	Total \$
1 Livestock Production	1,656,302	1,683,153	3,339,455
2 Dairy Production	0	960,000	960,000
3 Alfalfa Hay Production	120,000	200,000	320,000
4 Other Hay Production	280,000	280,000	560,000
5 Barley Production	36,000	0	36,000
Total	\$2,092,302	\$3,123,153	\$5,215,455

Output by Non-Agriculture Sector

Data to estimate the output by non-agriculture sector was provided by IMPLAN, the Nevada Department of Taxation, U.S. Department of Commerce, Bureau of the Census, and Bureau of Economic Analysis.

Output for all the non-agriculture sectors for the California counties was taken entirely from IMPLAN data. However, output for the non-agriculture sectors in the Nevada counties were taken from all sources. Output for agricultural services was taken from IMPLAN. Gold mining and other mining output are gross proceeds of mines taken from *Nevada Net Proceeds of Minerals*. This is a report published by the Nevada Department of Taxation. Construction output is the dollar value of construction business taken from the *Census of Construction Industries*. The dollar value of manufacturing shipments is the output for manufacturing. This is taken from the *Census of Manufacturers*. Transportation and communications and utilities industry output are taken from IMPLAN. Output for trade is all wholesale and retail trade sales except for sales to eating and drinking places. These are taken from the *Census of Wholesale Trade* and *Census of Retail Trade*. The trade output is marginalized to 25% to reflect that only the mark-up on items remains in the region. Hotels, gaming, and recreation output is total receipts from hotels with greater than 25 rooms taken from the *Census of Service Industries*. Output for eating, drinking, and lodging is the total receipts from hotels with fewer than 25 rooms and sales to eating and drinking places. This is taken from the *Census of Service Industries* and *Census of Retail Trade*. Finance, insurance, and real estate output is taken from IMPLAN. The insurance portion of the output is marginalized to 11% to represent that only a portion of the insurance premium stays in the region. Output for services is total receipts for services less total receipts for hotels and health services. This is taken from the *Census of Service Industries*. Output for health is total receipts for health services taken from the *Census of Service Industries*. Local government output is expenditures by local government taken from *Census of Governments*. Output for households is wages, salaries, other labor income, proprietors income, dividends, interest, rent, and government transfer payments. These are taken from the *Regional Economic Information System* of the Bureau of Economic Analysis.

All the data for the output of the non-agriculture sectors in the California and Nevada counties needed to be adjusted to the region. For California, the output data was taken from IMPLAN at the county level and was adjusted to the region by the portion of county population that lives within the region. For Nevada, the output data was given at the state level. This data was adjusted to the county level by the portion of county industry earnings taken from *Regional Economic Information System* of the Bureau of Economic Analysis. The county level data was then adjusted to the region based on the portion of county population that lives within the region. Also the state and local government sector output needed to be adjusted to only a local government sector output

for the California and Nevada counties. This was done by using the percentage of local government employment mention above in Tables 4.1-16 and 4.1-17.

For the California counties, output by non-agriculture sector by county is shown in Table 4.2-7. This output was adjusted to the region using the population percentage for the region by county in Table 4.2-8. The state and local government sector output was adjusted to only a local government sector output using the local government employment percentage for the region by county given in Table 4.2-9. The output for the non-agriculture sectors for the region by county is then presented in Table 4.2-10.

The total output for the non-agriculture sectors for the region by county for California is \$1,988,979,271. El Dorado county generates \$1,027,501,153 in output and is followed by Placer county with \$494,028,807, Nevada county with \$397,731,745, and Sierra county with \$69,717,566. Alpine county doesn't generate any output within the region.

For the Nevada counties, output by non-agriculture sector by county is shown in Table 4.2-11. This output was adjusted to the region using the population percentage for the region by county in Table 4.2-12. The state and local government sector output was adjusted to only a local government sector output using the local government employment percentage for the region by county given in Table 4.2-13. The output for the non-agriculture sectors for the region by county is then presented in Table 4.2-14.

The total output for the non-agriculture sectors for the region by county for Nevada is \$15,863,076,554. Washoe county generates \$15,252,709,168 in output and is followed by Douglas county with \$432,003,277, Lyon county with \$159,955,163, and Storey county with \$18,408,947. Pershing county and Carson City do not generate any output within the region.

Output by non-agriculture sector for the region by state is given in Table 4.2-15. Total output for both states is \$17,852,055,825. Of this amount, \$1,988,979,271 is generated in California and \$15,863,076,554 is generated in Nevada.

Table 4.2-7. Output by Non-Agriculture Sector by County for California.

Non-Agriculture Sector	Sierra County \$	Nevada County \$	Placer County \$	El Dorado County \$	Alpine County \$	Total \$
6 Agricultural Services	205,004	5,812,850	34,768,350	14,477,052	373,277	55,636,533
7 Gold Mining	1,657,487	478,645	3,844,210	456,323	1,807,838	8,244,503
8 Other Mining	3,529,581	10,324,510	17,226,020	11,432,467	873,854	43,386,432
9 Construction	5,636,936	432,735,100	1,052,699,000	573,352,169	3,748,892	2,068,172,097
10 Manufacturing	23,228,780	397,622,900	833,776,500	259,813,966	2,130,323	1,516,572,469
11 Transportation and Communications	6,981,680	34,746,420	374,392,200	73,793,737	249,050	490,163,087
12 Utilities	615,584	46,638,520	199,325,900	82,443,690	856,087	329,879,781
13 Trade	2,578,238	177,657,300	510,319,000	269,764,680	2,378,338	962,697,556
14 Eating, Drinking, and Lodging	923,340	48,517,400	181,397,200	106,708,900	926,495	338,473,335
15 Finance, Insurance, and Real Estate	5,005,943	413,655,100	1,215,435,000	606,545,408	2,286,682	2,242,928,133
16 Services	9,469,890	274,931,900	705,719,600	358,931,178	4,515,586	1,353,568,154
17 Hotels, Gaming, and Recreation	948,150	34,127,440	99,645,470	107,697,319	13,706,220	256,124,599
18 Health	948,778	166,873,900	462,333,400	191,448,320	374,667	821,979,065
19 State and Local Government Sector	13,049,650	87,733,150	239,144,700	157,017,000	2,979,543	499,924,043
20 Household Sector /1	42,195,516	1,202,940,384	3,346,131,873	1,587,787,317	20,994,684	6,200,049,774
Total	116,974,557	3,334,795,519	9,276,158,423	4,401,669,526	58,201,536	17,187,799,561

1. The county totals for the household sector were adjusted upward to the same proportion of the county total as for the county totals for the household sector for Nevada.

Table 4.2-8. Population Percentage for the Region by County for California.

	Sierra County	Nevada County	Placer County	El Dorado County	Alpine County
Population Percentage	61.15%	12.00%	5.36%	23.53%	0.00%

Table 4.2-9. Local Government Employment Percentage for the Region by County for California.

	Sierra County	Nevada County	Placer County	El Dorado County	Alpine County
Employment Percentage	77.27%	77.27%	77.27%	77.27%	77.27%

Table 4.2-10. Output by Non-Agriculture Sector for the Region by County for California.

Non-Agriculture Sector	Sierra County \$	Nevada County \$	Placer County \$	El Dorado County \$	Alpine County \$	Total \$
6 Agricultural Services	125,363	697,453	1,862,605	3,407,068	0	6,092,488
7 Gold Mining	1,013,575	57,430	205,941	107,392	0	1,384,339
8 Other Mining	2,158,385	1,238,783	922,830	2,690,547	0	7,010,545
9 Construction	3,447,059	51,921,598	56,395,024	134,934,232	0	246,697,913
10 Manufacturing	14,204,700	47,708,670	44,666,943	61,145,313	0	167,725,626
11 Transportation and Communications	4,269,388	4,169,039	20,056,880	17,366,815	0	45,862,122
12 Utilities	376,438	5,595,910	10,678,256	19,402,518	0	36,053,121
13 Trade	1,576,626	21,316,161	27,338,729	63,487,141	0	113,718,656
14 Eating, Drinking, and Lodging	564,634	5,821,346	9,717,782	25,113,158	0	41,216,921
15 Finance, Insurance, and Real Estate	3,061,199	49,632,289	65,113,092	142,746,017	0	260,552,597
16 Services	5,790,960	32,987,626	37,806,699	84,471,823	0	161,057,108
17 Hotels, Gaming, and Recreation	579,806	4,094,771	5,338,191	25,345,775	0	35,358,543
18 Health	580,190	20,022,317	24,768,052	45,055,959	0	90,426,518
19 Local Government Sector	6,166,138	8,133,891	9,899,336	28,553,284	0	52,752,650
20 Household Sector	25,803,105	144,334,460	179,258,448	373,674,110	0	723,070,123
Total	69,717,566	397,731,745	494,028,807	1,027,501,153	0	1,988,979,271
Total with State Government	71,531,458	400,124,491	496,940,893	1,035,900,669	0	2,004,497,511

Table 4.2-11. Output by Non-Agriculture Sector by County for Nevada.

Non-Agriculture Sector	Washoe County \$	Pershing County \$	Storey County \$	Lyon County \$	Carson City \$	Douglas County \$	Total \$
6 Agricultural Services	45,028,752	878,000	0	3,358,000	4,357,000	3,660,000	57,281,752
7 Gold Mining	47,634,393	87,052,000	9,554,000	6,414,000	15,000	24,000	150,693,393
8 Other Mining	5,386,970	9,845,000	1,081,000	725,000	2,000	3,000	17,042,970
9 Construction	1,151,593,588	3,379,000	1,698,000	64,792,000	181,662,000	126,659,000	1,529,783,588
10 Manufacturing	1,130,876,426	5,224,000	5,253,000	122,549,000	384,229,000	155,739,000	1,803,870,426
11 Transportation and Communications	686,062,413	1,240,000	0	17,456,000	27,105,000	20,470,000	752,333,413
12 Utilities	386,761,880	12,326,000	0	20,675,000	38,223,000	13,770,000	471,755,880
13 Trade	1,305,554,404	7,726,000	3,302,000	26,306,000	130,739,000	45,881,000	1,519,508,404
14 Eating, Drinking, and Lodging	235,137,545	3,924,000	5,832,000	5,958,000	33,597,000	24,351,000	308,799,545
15 Finance, Insurance, and Real Estate	1,094,172,000	1,794,000	0	18,994,000	84,858,000	112,479,000	1,312,297,000
16 Services	1,014,656,682	3,902,000	6,156,000	35,651,000	155,209,000	104,358,000	1,319,932,682
17 Hotels, Gaming, and Recreation	1,210,728,991	656,000	0	778,000	28,631,000	536,582,000	1,777,375,991
18 Health	572,526,698	683,000	0	3,982,000	49,062,000	15,182,000	641,435,698
19 State and Local Government Sector	910,056,918	15,365,644	6,183,086	43,793,740	402,569,521	74,116,468	1,452,085,377
20 Household Sector	5,772,837,000	77,434,000	29,256,000	258,586,000	874,455,000	741,779,000	7,754,347,000
Total	15,569,014,659	231,428,644	68,315,086	630,017,740	2,394,713,521	1,975,053,468	20,868,543,118

Table 4.2-12. Population Percentage for the Region by County for Nevada.

	Washoe County	Pershing County	Storey County	Lyon County	Carson City	Douglas County
Population Percentage	99.75%	0.00%	27.71%	25.94%	0.00%	22.13%

Table 4.2-13. Local Government Employment Percentage for the Region by County for Nevada.

	Washoe County	Pershing County	Storey County	Lyon County	Carson City	Douglas County
Employment Percentage	69.51%	69.51%	69.51%	69.51%	69.51%	69.51%

Table 4.2-14. Output by Non-Agriculture Sector for the Region by County for Nevada.

Economic Sector	Washoe County \$	Parahing County \$	Storey County \$	Lyon County \$	Carson City \$	Douglas County \$	Total \$
6 Agricultural Services	44,914,353	0	0	871,022	0	809,817	46,595,191
7 Gold Mining	47,513,374	0	2,647,585	1,663,708	0	5,310	51,829,978
8 Other Mining	5,373,284	0	299,565	188,056	0	664	5,861,568
9 Construction	1,148,667,881	0	470,546	16,806,204	0	28,024,742	1,193,969,373
10 Manufacturing	1,128,003,352	0	1,455,701	31,787,621	0	34,459,022	1,195,705,696
11 Transportation and Communications	684,319,422	0	0	4,527,860	0	4,529,220	693,376,502
12 Utilities	385,779,283	0	0	5,362,827	0	3,046,769	394,188,879
13 Trade	1,302,237,548	0	915,044	6,823,435	0	10,151,692	1,320,127,719
14 Eating, Drinking, and Lodging	234,540,161	0	1,616,152	1,545,428	0	5,387,935	243,089,676
15 Finance, Insurance, and Real Estate	1,091,392,177	0	0	4,926,797	0	24,887,256	1,121,206,230
16 Services	1,012,078,873	0	1,705,938	9,247,407	0	23,090,392	1,046,122,611
17 Hotels, Gaming, and Recreation	1,207,653,046	0	0	201,803	0	118,724,859	1,326,579,708
18 Health	571,072,152	0	0	1,032,879	0	3,359,190	575,464,221
19 Local Government Sector	630,993,573	0	1,191,053	7,896,260	0	11,399,385	651,480,271
20 Household Sector	5,758,170,689	0	8,107,363	67,073,855	0	164,127,025	5,997,478,931
Total	15,252,709,168	0	18,408,947	159,955,163	0	432,003,277	15,863,076,554
Total with State Government	16,051,815,607	0	18,931,338	165,776,518	0	448,914,607	16,685,438,070

Table 4.2-15. Output by Non-Agriculture Sector for the Region by State.

Non-Agriculture Sector	California \$	Nevada \$	Total \$
6 Agricultural Services	6,092,488	46,595,191	52,687,679
7 Gold Mining	1,384,339	51,829,978	53,214,316
8 Other Mining	7,010,545	5,861,568	12,872,113
9 Construction	246,697,913	1,193,969,373	1,440,667,287
10 Manufacturing	167,725,626	1,195,705,696	1,363,431,322
11 Transportation and Communications	45,862,122	693,376,502	739,238,624
12 Utilities	36,053,121	394,188,879	430,242,000
13 Trade	113,718,656	1,320,127,719	1,433,846,375
14 Eating, Drinking, and Lodging	41,216,921	243,089,676	284,306,597
15 Finance, Insurance, and Real Estate	260,552,597	1,121,206,230	1,381,758,827
16 Services	161,057,108	1,046,122,611	1,207,179,719
17 Hotels, Gaming, and Recreation	35,358,543	1,326,579,708	1,361,938,251
18 Health	90,426,518	575,464,221	665,890,740
19 Local Government	52,752,650	651,480,271	704,232,921
20 Households	723,070,123	5,997,478,931	6,720,549,054
Total	1,988,979,271	15,863,076,554	17,852,055,825

Output by Economic Sector

Output by economic sector for the region by state is presented in Table 4.2-16. The agriculture sectors are combined with the non-agriculture sectors. Total output for the region is \$17,857,271,279. Of this amount, \$1,991,071,572 is generated in California and \$15,866,199,707 is generated in Nevada.

Table 4.2-16. Output by Economic Sector for the Region by State.

Economic Sector	California \$	Nevada \$	Total \$
1 Livestock Production	1,656,302	1,683,153	3,339,455
2 Dairy Production	0	960,000	960,000
3 Alfalfa Hay Production	120,000	200,000	320,000
4 Other Hay Production	280,000	280,000	560,000
5 Barley Production	36,000	0	36,000
6 Agricultural Services	6,092,488	46,595,191	52,687,679
7 Gold Mining	1,384,339	51,829,978	53,214,316
8 Other Mining	7,010,545	5,861,568	12,872,113
9 Construction	246,697,913	1,193,969,373	1,440,667,287
10 Manufacturing	167,725,626	1,195,705,696	1,363,431,322
11 Transportation and Communications	45,862,122	693,376,502	739,238,624
12 Utilities	36,053,121	394,188,879	430,242,000
13 Trade	113,718,656	1,320,127,719	1,433,846,375
14 Eating, Drinking, and Lodging	41,216,921	243,089,676	284,306,597
15 Finance, Insurance, and Real Estate	260,552,597	1,121,206,230	1,381,758,827
16 Services	161,057,108	1,046,122,611	1,207,179,719
17 Hotels, Gaming, and Recreation	35,358,543	1,326,579,708	1,361,938,251
18 Health	90,426,518	575,464,221	665,890,740
19 Local Government	52,752,650	651,480,271	704,232,921
20 Households	723,070,123	5,997,478,931	6,720,549,054
Total	1,991,071,572	15,866,199,707	17,857,271,279

Employment

Employment is the number of full-time and part-time employees. Employment is measured by the number of jobs by place of work by economic sector.

Employment by Agriculture Sector

Data to estimate the employment by agriculture sector was provided by IMPLAN and the Bureau of Economic Analysis.

Employment for agriculture sectors in the California counties were taken from IMPLAN to correspond to the output numbers mentioned above. Employment for the Nevada counties were taken from the *Regional Economic Information System* of the Bureau of Economic Analysis.

The employment by agriculture sector for the region by state is shown in Table 4.2-17. Total employment is 101 jobs. Of these jobs, 39 jobs are in California and 62 jobs are in Nevada.

Table 4.2-17. Employment by Agriculture Sector for the Region by State.

Economic Sector	California jobs	Nevada jobs	Total jobs
1 Livestock Production	31	32	63
2 Dairy Production	0	21	21
3 Alfalfa Hay Production	2	4	6
4 Other Hay Production	5	5	10
5 Barley Production	1	0	1
Total	39	62	101

Employment by Non-Agriculture Sector

Data to estimate the employment by non-agriculture sector was provided by IMPLAN and the Bureau of Economic Analysis.

Employment for the non-agriculture sectors in the California counties were again taken from IMPLAN to correspond to the output numbers mentioned above. Employment for the Nevada counties were again taken from the *Regional Economic Information System* of the Bureau of Economic Analysis.

For the California counties, employment by non-agriculture sector by county is shown in Table 4.2-18. This employment was adjusted to the region using the population percentage for the region by county in Table 4.2-8. The state and local government sector employment was adjusted to only a local government sector employment using the local government employment percentage for the region by county given in Table 4.2-9. The employment by non-agriculture sector for the region by county is then presented in Table 4.2-19.

The total employment for the non-agriculture sectors for the region by county for California is 19,620 jobs. El Dorado county has 10,355 jobs followed by Placer county with 4,589 jobs, Nevada county with 3,887 jobs, and Sierra county with 789 jobs. Alpine county didn't have any jobs within the region.

For the Nevada counties, employment by non-agriculture sector by county is shown in Table 4.2-20. This employment was adjusted to the region using the population percentage for the region by county in Table 4.2-12. The state and local government sector employment was adjusted to only a local government sector employment using the local government employment percentage for the region by county given in Table 4.2-13. The employment by non-agriculture sector for the region by county is then presented in Table 4.2-21.

The total employment for the non-agriculture sectors for the region by county for Nevada is 168,400 jobs. Washoe county has 161,640 jobs followed by Douglas county with 4,800 jobs, Lyon county with 1,733 jobs, and Storey county with 227 jobs. Pershing county and Carson City did not have any jobs within the region.

Employment by non-agriculture sectors for the region by state is given in Table 4.2-22. Total employment for both states is 188,020 jobs. Of this amount, 19,620 jobs are in California and 168,400 jobs are in Nevada.

Table 4.2-18. Employment by Non-Agriculture Sector by County for California.

Non-Agriculture Sector	Sierra County jobs	Nevada County jobs	Placer County jobs	El Dorado County jobs	Alpine County jobs	Total jobs
6 Agricultural Services	5	169	877	395	7	1,453
7 Gold Mining	8	2	21	2	6	39
8 Other Mining	7	34	76	93	1	211
9 Construction	70	5,023	11,314	6,244	44	22,695
10 Manufacturing	198	3,169	7,579	2,220	8	13,174
11 Transportation and Communications	177	427	3,172	784	4	4,564
12 Utilities	3	167	562	271	4	1,007
13 Trade	114	4,953	12,646	7,123	39	24,875
14 Eating, Drinking, and Lodging	35	1,732	6,262	3,694	29	11,752
15 Finance, Insurance, and Real Estate	8	4,027	10,061	4,554	9	18,659
16 Services	243	5,294	13,465	6,620	95	25,717
17 Hotels, Gaming, and Recreation	30	1,443	3,700	3,974	416	9,563
18 Health	25	3,535	8,933	3,907	7	16,407
19 State and Local Government Sector	476	3,130	9,052	5,329	123	18,110
20 Household Sector	0	0	0	0	0	0
Total	1,399	33,105	87,720	45,210	792	168,226

Table 4.2-19. Employment by Non-Agriculture Sector for the Region by County for California.

Non-Agriculture Sector	Sierra County <i>jobs</i>	Nevada County <i>jobs</i>	Placer County <i>jobs</i>	El Dorado County <i>jobs</i>	Alpine County <i>jobs</i>	Total <i>jobs</i>
6 Agricultural Services	3	20	47	93	0	163
7 Gold Mining	5	0	1	0	0	7
8 Other Mining	4	4	4	22	0	34
9 Construction	43	603	606	1,469	0	2,721
10 Manufacturing	121	380	406	522	0	1,430
11 Transportation and Communications	108	51	170	185	0	514
12 Utilities	2	20	30	64	0	116
13 Trade	70	594	677	1,676	0	3,018
14 Eating, Drinking, and Lodging	21	208	335	869	0	1,434
15 Finance, Insurance, and Real Estate	5	483	539	1,072	0	2,099
16 Services	149	635	721	1,558	0	3,063
17 Hotels, Gaming, and Recreation	18	173	198	935	0	1,325
18 Health	15	424	479	919	0	1,837
19 Local Government Sector	225	290	375	969	0	1,859
20 Household Sector	0	0	0	0	0	0
Total	789	3,887	4,589	10,355	0	19,620
Total with State Government	856	3,972	4,699	10,640	0	20,167

Table 4.2-20. Employment by Non-Agriculture Sector by County for Nevada.

Non-Agriculture Sector	Washoe County <i>jobs</i>	Pershing County <i>jobs</i>	Storey County <i>jobs</i>	Lyon County <i>jobs</i>	Carson City <i>jobs</i>	Douglas County <i>jobs</i>	Total <i>jobs</i>
6 Agricultural Services	1,132	17	0	91	140	142	1,522
7 Gold Mining	1,442	618	145	156	48	13	2,422
8 Other Mining	163	70	16	18	6	2	275
9 Construction	9,404	28	22	718	1,556	1,182	12,910
10 Manufacturing	9,211	56	18	1,276	3,583	1,333	15,477
11 Transportation and Communications	8,103	12	0	267	322	285	8,989
12 Utilities	2,515	66	0	174	250	105	3,110
13 Trade	32,613	356	125	954	3,924	1,556	39,528
14 Eating, Drinking, and Lodging	3,743	115	141	138	643	526	5,306
15 Finance, Insurance, and Real Estate	13,015	35	0	478	1,611	1,842	16,981
16 Services	30,735	231	258	1,602	4,800	3,253	40,879
17 Hotels, Gaming, and Recreation	22,135	23	0	21	534	10,095	32,808
18 Health	17,593	41	0	182	1,539	480	19,835
19 State and Local Government Sector	14,743	333	134	871	6,834	1,263	24,178
20 Household Sector	0	0	0	0	0	0	0
Total	166,547	2,001	859	6,946	25,790	22,077	224,220

Table 4.2-21. Employment by Non-Agriculture Sector for the Region by County for Nevada.

Non-Agriculture Sector	Washoe County jobs	Pershing County jobs	Storey County jobs	Lyon County jobs	Carson City jobs	Douglas County jobs	Total jobs
6 Agricultural Services	1,129	0	0	24	0	31	1,184
7 Gold Mining	1,438	0	40	40	0	3	1,522
8 Other Mining	163	0	4	5	0	0	172
9 Construction	9,380	0	6	186	0	262	9,834
10 Manufacturing	9,188	0	5	331	0	295	9,819
11 Transportation and Communications	8,082	0	0	69	0	63	8,215
12 Utilities	2,509	0	0	45	0	23	2,577
13 Trade	32,530	0	35	247	0	344	33,156
14 Eating, Drinking, and Lodging	3,734	0	39	36	0	116	3,925
15 Finance, Insurance, and Real Estate	12,982	0	0	124	0	408	13,513
16 Services	30,657	0	71	416	0	720	31,864
17 Hotels, Gaming, and Recreation	22,079	0	0	5	0	2,234	24,318
18 Health	17,548	0	0	47	0	106	17,702
19 Local Government Sector	10,222	0	26	157	0	194	10,599
20 Household Sector	0	0	0	0	0	0	0
Total	161,640	0	227	1,733	0	4,800	168,400
Total with State Government	166,124	0	238	1,802	0	4,885	173,048

Table 4.2-22. Employment by Non-Agriculture Sector for the Region by State.

Non-Agriculture Sector	California jobs	Nevada jobs	Total jobs
6 Agricultural Services	163	1,184	1,347
7 Gold Mining	7	1,522	1,529
8 Other Mining	34	172	206
9 Construction	2,721	9,834	12,555
10 Manufacturing	1,430	9,819	11,248
11 Transportation and Communications	514	8,215	8,729
12 Utilities	116	2,577	2,693
13 Trade	3,018	33,156	36,174
14 Eating, Drinking, and Lodging	1,434	3,925	5,359
15 Finance, Insurance, and Real Estate	2,099	13,513	15,612
16 Services	3,063	31,864	34,927
17 Hotels, Gaming, and Recreation	1,325	24,318	25,643
18 Health	1,837	17,702	19,539
19 Local Government	1,859	10,599	12,458
20 Households	0	0	0
Total	19,620	168,400	188,020

Employment by Economic Sector

Employment by economic sector for the region by state is presented in Table 4.2-23. The agriculture sectors are combined with the non-agriculture sectors. Total employment for the region is 188,121 jobs. Of this amount, 19,659 jobs are in California and 168,462 jobs are in Nevada.

Table 4.2-23. Employment by Economic Sector for the Region by State.

Economic Sector	California jobs	Nevada jobs	Total jobs
1 Livestock Production	31	32	63
2 Dairy Production	0	21	21
3 Alfalfa Hay Production	2	4	6
4 Other Hay Production	5	5	10
5 Berley Production	1	0	1
6 Agricultural Services	163	1,184	1,347
7 Gold Mining	7	1,522	1,529
8 Other Mining	34	172	206
9 Construction	2,721	9,834	12,555
10 Manufacturing	1,430	9,819	11,248
11 Transportation and Communications	514	8,215	8,729
12 Utilities	116	2,577	2,693
13 Trade	3,018	33,156	36,174
14 Eating, Drinking, and Lodging	1,434	3,925	5,359
15 Finance, Insurance, and Real Estate	2,099	13,513	15,612
16 Services	3,063	31,864	34,927
17 Hotels, Gaming, and Recreation	1,325	24,318	25,643
18 Health	1,837	17,702	19,539
19 Local Government	1,859	10,599	12,458
20 Households	0	0	0
Total	19,659	168,462	188,121

Income

Income is personal income in the form of wages, salaries, other labor income, proprietors income, dividends, interest, rent, and government transfer payments. Income is measured by earnings by place of work by economic sector.

Income by Economic Sector

Data to estimate the income by economic sector was provided by IMPLAN.

Income coefficients were calculated for each economic sector for the California and Nevada counties using IMPLAN. An income coefficient is interpreted as the amount of income created per dollar of output. The income coefficients by economic sector for the region by state are shown in Table 4.2-24.

The income by economic sector for the region by state are presented in Table 4.2-25. Total income created is \$6,720,549,054. Of this amount, \$723,070,123 is created in California and \$5,997,478,931 is created in Nevada. These numbers match the households output for the economic sectors for the region by state shown in Table 4.2-16.

Table 4.2-24. Income Coefficients by Economic Sector for the Region by State.

Economic Sector	California	Nevada
1 Livestock Production	0.16178555	0.16178555
2 Dairy Production	0.00000000	0.22500000
3 Alfalfa Hay Production	0.40625000	0.40625000
4 Other Hay Production	0.37857143	0.37857143
5 Barley Production	0.30555556	0.00000000
6 Agricultural Services	0.42301852	0.42301852
7 Gold Mining	0.31215470	0.31215470
8 Other Mining	0.26017713	0.26017713
9 Construction	0.28854721	0.28854721
10 Manufacturing	0.26369049	0.26369049
11 Transportation and Communications	0.40103999	0.40103999
12 Utilities	0.12544132	0.12544132
13 Trade	0.48690061	0.48690061
14 Eating, Drinking, and Lodging	0.33365810	0.33365810
15 Finance, Insurance, and Real Estate	0.13871607	0.13871607
16 Services	0.39651269	0.39651269
17 Hotels, Gaming, and Recreation	0.32280030	0.32280030
18 Health	0.42231663	0.42231663
19 Local Government	0.37108700	0.37108700
20 Households	0.47183814	0.46100076

Table 4.2-25. Income by Economic Sector for the Region by State.

Economic Sector	California \$	Nevada \$	Total \$
1 Livestock Production	267,966	272,310	540,275
2 Dairy Production	0	216,000	216,000
3 Alfalfa Hay Production	48,750	81,250	130,000
4 Other Hay Production	106,000	106,000	212,000
5 Barley Production	11,000	0	11,000
6 Agricultural Services	2,577,235	19,710,629	22,287,864
7 Gold Mining	432,128	16,178,971	16,611,099
8 Other Mining	1,823,983	1,525,046	3,349,029
9 Construction	71,183,994	344,516,531	415,700,525
10 Manufacturing	44,227,653	315,296,223	359,523,876
11 Transportation and Communications	18,392,545	278,071,705	296,464,250
12 Utilities	4,522,551	49,447,574	53,970,125
13 Trade	55,369,683	642,770,987	698,140,670
14 Eating, Drinking, and Lodging	13,752,359	81,108,840	94,861,199
15 Finance, Insurance, and Real Estate	36,142,833	155,529,324	191,672,157
16 Services	63,861,187	414,800,891	478,662,078
17 Hotels, Gaming, and Recreation	11,413,749	428,220,333	439,634,081
18 Health	38,188,623	243,028,112	281,216,735
19 Local Government	19,575,822	241,755,859	261,331,681
20 Households	341,172,061	2,764,842,347	3,106,014,408
Total	723,070,123	5,997,478,931	6,720,549,054

Population

Population is all persons.

Population by Economic Sector

A ratio of population for the region to employment for the region by state is calculated and shown in Table 4.2-26. Population reported as all persons for California and Nevada was taken from Table 4.2-14. Employment reported as the number of jobs for California and Nevada were taken from Tables 4.2-19 and 4.2-21. The ratio of population to employment for the region is 1.64 persons to 1 job. Likewise, the ratios of population to employment for California is 2.49 persons to 1 job, and for Nevada is 1.54 persons to 1 job. These ratios are then used to calculate population for the economic sectors for the region by state.

Population by economic sector for the region by state are shown in Table 4.2-27. Total population is 307,874 persons. Of this amount, there are 48,995 persons in California and 258,879 persons in Nevada.

Table 4.2-26. Ratio of Population for the Region to Employment for the Region by State.

	California	Nevada	Total
Population as All Persons	50,358	266,023	316,381
Employment as Number of Jobs /1	20,206	173,110	193,316
Ratio of Population to Employment	2.49225904	1.53672446	1.63659871

1. Employment is with state government.

Table 4.2-27. Population by Economic Sector for the Region by State.

Economic Sector	California all persons	Nevada all persons	Total all persons
1 Livestock Production	77	49	126
2 Dairy Production	0	32	32
3 Alfalfa Hay Production	5	6	11
4 Other Hay Production	12	8	20
5 Barley Production	2	0	2
6 Agricultural Services	407	1,820	2,227
7 Gold Mining	17	2,339	2,355
8 Other Mining	86	265	350
9 Construction	6,782	15,112	21,894
10 Manufacturing	3,563	15,088	18,652
11 Transportation and Communications	1,281	12,624	13,904
12 Utilities	288	3,960	4,249
13 Trade	7,521	50,952	58,474
14 Eating, Drinking, and Lodging	3,574	6,031	9,605
15 Finance, Insurance, and Real Estate	5,231	20,767	25,997
16 Services	7,634	48,966	56,600
17 Hotels, Gaming, and Recreation	3,302	37,370	40,672
18 Health	4,579	27,203	31,782
19 Local Government	4,633	16,288	20,921
20 Households	0	0	0
Total	48,995	258,879	307,874

Housing

Housing is occupied housing units with households. Housing units are either single-units, multi-units of less than ten units per structure, or multi-units of ten or more units per structure. Households are either family or non-family households.

Housing by Economic Sector

Data to estimate housing by economic sector was provided by the U.S. Department of Commerce, Bureau of the Census.

Housing units, occupied housing units, and households were taken from the *Census of Housing*. Housing units are single-units, multi-units of less than ten units per structure, and multi-units of ten or more units per structure. Occupied housing units are the same but are occupied with households. Households are either family and non-family households. Housing units are measured as the number of dwellings by housing unit type and households are measured as the number of households by household type.

Housing units are analyzed in Tables 4.2-28 through 4.2-34. Housing units by type by county and for the region for California are shown in Tables 4.2-28 and 4.2-29. Housing units by type by county and for the region for Nevada are shown in Tables 4.2-30 and 4.2-31. As were output and employment, the housing units by county are also adjusted by the county population percentage to estimate the housing units for the region. Housing units by type for the region by state are given in Table 4.2-32. This table is followed by the distribution of housing units by type for the region by state and by the ratio of housing units for the region to population for the region by state presented in Tables 4.2-33 and 4.2-34.

Occupied housing units are analyzed in Tables 4.2-35 through 4.2-41. Occupied housing units by type by county and for the region for California are shown in Tables 4.2-35 and 4.2-36. Occupied units by type by county and for the region for Nevada are shown in Tables 4.2-37 and 4.2-38. As were output and employment, the occupied housing units by county are also adjusted by the county population percentage to estimate the housing units for the region. Occupied housing units by type for the region by state are given in Table 4.2-39. This table is followed by the distribution of occupied housing units by type for the region by state and by the ratio of occupied housing units for the region to population for the region by state presented in Tables 4.2-40 and 4.2-41.

Households are analyzed in Tables 4.2-42 through 4.2-48. Households by type by county and for the region for California are shown in Tables 4.2-42 and 4.2-43. Households by type by county and for the region for Nevada are shown in Tables 4.2-44 and 4.2-45. As were output and employment, the households by county are also adjusted

by the county population percentage to estimate the households for the region. Households by type for the region by state are given in Table 4.2-46. This table is followed by the distribution of households by type for the region by state and by the ratio of households for the region to population for the region by state presented in Tables 4.2-47 and 4.2-48.

The ratio of households for the region to population for the region by state shown in Table 4.2-48 are used to calculate housing for the economic sectors for the region by state. Housing is based on population. For California, there are 18,966 households and a population of 50,358 persons for a ratio of .377 households per person. For Nevada, there are 106,651 households and a population of 266,023 persons for a ratio of .401 households per person. For both states combined, there are 125,616 households and a population of 316,381 persons for a ratio of .397 households per person. The population by economic sector provided in Table 4.2-27 is then multiplied by these ratios to calculate housing for the economic sectors shown in Table 4.2-49.

Housing by economic sector for the region by state are shown in Table 4.2-49. Housing is estimated as the number of dwellings. Total housing for the region is 122,239 dwellings. Of this amount, there are 18,452 dwellings in California and 103,787 dwellings in Nevada.

Table 4.2-28. Housing Units by Type by County for California.

Type	Sierra County <i>dwellings</i>	Nevada County <i>dwellings</i>	Placer County <i>dwellings</i>	El Dorado County <i>dwellings</i>	Alpine County <i>dwellings</i>	Total <i>dwellings</i>
Single Units	1,741	30,554	61,447	48,300	878	142,921
Multi-Units of Less than Ten per Structure	390	5,751	12,539	10,815	372	29,866
Multi-Units of Ten or More per Structure	35	1,042	3,894	2,335	69	7,374
Total	2,166	37,346	77,879	61,451	1,319	180,161

Table 4.2-29. Housing Units by Type for the Region by County for California.

Type	Sierra County <i>dwellings</i>	Nevada County <i>dwellings</i>	Placer County <i>dwellings</i>	El Dorado County <i>dwellings</i>	Alpine County <i>dwellings</i>	Total <i>dwellings</i>
Single Units	1,065	3,666	3,292	11,367	0	19,390
Multi-Units of Less than Ten per Structure	238	690	672	2,545	0	4,145
Multi-Units of Ten or More per Structure	21	125	209	550	0	904
Total	1,325	4,481	4,172	14,462	0	24,440

Table 4.2-30. Housing Units by Type by County for Nevada.

Type	Washoe County <i>dwellings</i>	Pershing County <i>dwellings</i>	Storey County <i>dwellings</i>	Lyon County <i>dwellings</i>	Carson City <i>dwellings</i>	Douglas County <i>dwellings</i>	Total <i>dwellings</i>
Single Units	59,687	933	692	4,666	8,929	9,911.36	84,819
Multi-Units of Less than Ten per Structure	33,658	960	392	4,038	5,022	3,457.45	47,527
Multi-Units of Ten or More per Structure	18,848	15	1	17	2,677	790.92	22,350
Total	112,193	1,908	1,085	8,722	16,628	14,160	154,696

Table 4.2-31. Housing Units by Type for the Region by County for Nevada.

Type	Washoe County <i>dwellings</i>	Pershing County <i>dwellings</i>	Storey County <i>dwellings</i>	Lyon County <i>dwellings</i>	Carson City <i>dwellings</i>	Douglas County <i>dwellings</i>	Total <i>dwellings</i>
Single Units	59,535	0	192	1,210	0	2,193	63,130
Multi-Units of Less than Ten per Structure	33,572	0	109	1,047	0	765	35,493
Multi-Units of Ten or More per Structure	18,801	0	0	5	0	175	18,980
Total	111,908	0	301	2,262	0	3,133	117,604

Table 4.2-32. Housing Units by Type for the Region by State.

Type	California <i>dwelling</i> s	Nevada <i>dwelling</i> s	Total <i>dwelling</i> s
Single Units	19,390	63,130	82,520
Multi-Units of Less than Ten per Structure	4,145	35,493	39,639
Multi-Units of Ten or More per Structure	904	18,980	19,885
Total	24,440	117,604	142,044

Table 4.2-33. Distribution of Housing Units by Type for the Region by State.

Type	California	Nevada	Total
Single Units	79.34%	53.68%	58.09%
Multi-Units of Less than Ten per Structure	16.96%	30.18%	27.91%
Multi-Units of Ten or More per Structure	3.70%	16.14%	14.00%
Total	100.00%	100.00%	100.00%

Table 4.2-34. Ratio of Housing Units for the Region to Population for the Region by State.

	California	Nevada	Total
Housing Units	24,440	117,604	142,044
Population as All Persons	50,358	266,023	316,381
Ratio of Housing Units to Population	0.48531914	0.44208212	0.44896411

Table 4.2-35. Occupied Housing Units by Type by County for California.

Type	Sierra County <i>dwellings</i>	Nevada County <i>dwellings</i>	Placer County <i>dwellings</i>	El Dorado County <i>dwellings</i>	Alpine County <i>dwellings</i>	Total <i>dwellings</i>
Single Units	1,074	25,160	50,576	36,820	300	113,930
Multi-Units of Less than Ten per Structure	240	4,736	10,320	8,245	127	23,668
Multi-Units of Ten or More per Structure	21	858	3,205	1,780	23	5,888
Total	1,336	30,754	64,101	46,845	450	143,486

Table 4.2-36. Occupied Housing Units by Type for the Region by County for California.

Type	Sierra County <i>dwellings</i>	Nevada County <i>dwellings</i>	Placer County <i>dwellings</i>	El Dorado County <i>dwellings</i>	Alpine County <i>dwellings</i>	Total <i>dwellings</i>
Single Units	657	3,019	2,709	8,665	0	15,051
Multi-Units of Less than Ten per Structure	147	568	553	1,940	0	3,208
Multi-Units of Ten or More per Structure	13	103	172	419	0	707
Total	817	3,690	3,434	11,025	0	18,966

Table 4.2-37. Occupied Housing Units by Type by County for Nevada.

Type	Washoe County <i>dwelling</i> s	Perahing County <i>dwelling</i> s	Storey County <i>dwelling</i> s	Lyon County <i>dwelling</i> s	Carson City <i>dwelling</i> s	Douglas County <i>dwelling</i> s	Total <i>dwelling</i> s
Single Units	54,420	789	642	4,109	8,536	7,421	75,917
Multi-Units of Less than Ten per Structure	30,688	812	363	3,556	4,800	2,589	42,808
Multi-Units of Ten or More per Structure	17,185	13	1	15	2,559	592	20,366
Total	102,294	1,614	1,006	7,680	15,895	10,602	139,091

Table 4.2-38. Occupied Housing Units by Type for the Region by County for Nevada.

Type	Washoe County <i>dwelling</i> s	Perahing County <i>dwelling</i> s	Storey County <i>dwelling</i> s	Lyon County <i>dwelling</i> s	Carson City <i>dwelling</i> s	Douglas County <i>dwelling</i> s	Total <i>dwelling</i> s
Single Units	54,282	0	178	1,066	0	1,642	57,168
Multi-Units of Less than Ten per Structure	30,610	0	101	922	0	573	32,206
Multi-Units of Ten or More per Structure	17,142	0	0	4	0	131	17,277
Total	102,034	0	279	1,992	0	2,346	106,651

Table 4.2-39. Occupied Housing Units by Type for the Region by State.

Type	California <i>dwelling</i> s	Nevada <i>dwelling</i> s	Total <i>dwelling</i> s
Single Units	15,051	57,168	72,218
Multi-Units of Less than Ten per Structure	3,208	32,206	35,414
Multi-Units of Ten or More per Structure	707	17,277	17,984
Total	18,966	106,651	125,616

Table 4.2-40. Distribution of Occupied Housing Units by Type for the Region by State.

Type	California	Nevada	Total
Single Units	79.36%	53.60%	57.49%
Multi-Units of Less than Ten per Structure	16.92%	30.20%	28.19%
Multi-Units of Ten or More per Structure	3.73%	16.20%	14.32%
Total	100.00%	100.00%	100.00%

Table 4.2-41. Ratio of Occupied Housing Units for the Region to Population for the Region by State.

	California	Nevada	Total
Occupied Housing Units	18,966	106,651	125,616
Population as All Persons	50,358	266,023	316,381
Ratio of Occupied Housing Units to Population	0.37661598	0.40090819	0.39704163

Table 4.2-42. Households by Type by County for California.

Type	Sierra County <i>households</i>	Nevada County <i>households</i>	Placer County <i>households</i>	El Dorado County <i>households</i>	Alpine County <i>households</i>	Total <i>households</i>
Family Households	929	22,872	47,749	34,990	335	106,875
Non-Family Households	407	7,882	16,352	11,855	115	36,611
Total	1,336	30,754	64,101	46,845	450	143,486

Table 4.2-43. Households by Type for the Region by County for California.

Type	Sierra County <i>households</i>	Nevada County <i>households</i>	Placer County <i>households</i>	El Dorado County <i>households</i>	Alpine County <i>households</i>	Total <i>households</i>
Family Households	568	2,744	2,558	8,235	0	14,105
Non-Family Households	249	946	876	2,790	0	4,861
Total	817	3,690	3,434	11,025	0	18,966

Table 4.2-44. Households by Type by County for Nevada.

Type	Washoe County <i>households</i>	Perahing County <i>households</i>	Storey County <i>households</i>	Lyon County <i>households</i>	Carson City <i>households</i>	Douglas County <i>households</i>	Total <i>households</i>
Family Households	74,613	1,130	691	5,629	10,618	7,888	100,569
Non-Family Households	27,681	484	315	2,051	5,277	2,714	38,522
Total	102,294	1,614	1,006	7,680	15,895	10,602	139,091

Table 4.2-45. Households by Type for the Region by County for Nevada.

Type	Washoe County <i>households</i>	Perahing County <i>households</i>	Storey County <i>households</i>	Lyon County <i>households</i>	Carson City <i>households</i>	Douglas County <i>households</i>	Total <i>households</i>
Family Households	74,424	0	192	1,460	0	1,745	77,821
Non-Family Households	27,610	0	87	532	0	601	28,830
Total	102,034	0	279	1,992	0	2,346	106,651

Table 4.2-46. Households by Type for the Region by State.

Type	California <i>households</i>	Nevada <i>households</i>	Total <i>households</i>
Family Households	14,105	77,821	91,926
Non-Family Households	4,861	28,830	33,691
Total	18,966	106,651	125,616

Table 4.2-47. Distribution of Households by Type for the Region by State.

Type	California	Nevada	Total
Family Households	74.37%	72.97%	73.18%
Non-Family Households	25.63%	27.03%	26.82%
Total	100.00%	100.00%	100.00%

Table 4.2-48. Ratio of Households for the Region to Population for the Region by State.

	California	Nevada	Total
Households	18,966	106,651	125,616
Population as All Persons	50,358	266,023	316,381
Ratio of Households to Population	0.37661595	0.40090819	0.39704163

Table 4.2-49. Housing by Economic Sector for the Region by State.

Economic Sector	California <i>dwellings</i>	Nevada <i>dwellings</i>	Total <i>dwellings</i>
1 Livestock Production	29	20	49
2 Dairy Production	0	13	13
3 Alfalfa Hay Production	2	2	4
4 Other Hay Production	5	3	8
5 Barley Production	1	0	1
6 Agricultural Services	153	730	883
7 Gold Mining	6	938	944
8 Other Mining	32	106	138
9 Construction	2,554	6,059	8,613
10 Manufacturing	1,342	6,049	7,391
11 Transportation and Communications	482	5,061	5,543
12 Utilities	109	1,588	1,696
13 Trade	2,833	20,427	23,260
14 Eating, Drinking, and Lodging	1,346	2,418	3,764
15 Finance, Insurance, and Real Estate	1,970	8,325	10,295
16 Services	2,875	19,631	22,506
17 Hotels, Gaming, and Recreation	1,244	14,982	16,226
18 Health	1,725	10,906	12,630
19 Local Government	1,745	6,530	8,275
20 Households	0	0	0
Total	18,452	103,787	122,239

Agriculture Water Use

Agriculture water use is the combined use of irrigation water for crops and pasture and stock water for livestock.

Agriculture Water Use by Economic Sector

Data to estimate agriculture water use was provided by the State of California Department of Water Resources, U.S. District Court Water Master, and Department of Animal Science at the University of Nevada, Reno.

Irrigation water supply from Truckee River sources are actual water rights taken from the *Middle Fork of the Feather River Decree* and the *Orr Ditch Decree*. Stock water requirements were taken from *Livestock Feeds and Feeding*. Irrigation water supply is measured in acre-feet and stock water requirements are in gallons converted to acre-feet.

Irrigation water use is analyzed in Tables 4.2-50 through 4.2-53. Irrigation water supply from Truckee River sources for the region by state are shown in Table 4.2-50. For California, the irrigation water supply is 34,489 acre-feet. For Nevada, the irrigation water supply is 39,071 acre-feet. The total for the region is 73,560 acre-feet. Shown in Table 4.2-51 is the irrigated acreage per crop for the region by state. For California, the irrigated acreage is 9,717 acres. For Nevada, the irrigated acreage is 9,834 acres. Of the 19,551 acres, there were 14,551 acres in pasture, 800 acres in alfalfa hay, 4,000 acres in other hay, and 200 acres in barley. The application of irrigation water per crop for the region by state provided in Table 4.2-52 is 3.55 acre-feet per acre for California, 3.97 acre-feet per acre for Nevada, and 3.76 acre-feet per acre for the region. Irrigation water use per crop for the region by state is then given in Table 4.2-53. For the region, 54,754 acre-feet irrigated pasture, 3,051 irrigated alfalfa hay, 15,045 irrigated other hay, and 710 acre-feet irrigated barley.

Livestock water use is analyzed in Tables 4.2-54 through 4.2-56. Livestock water requirements per cow by state are shown in Table 4.2-54. On a daily basis, a beef cow requires 15 gallons of water per day and a dairy cow requires 25 gallons per day. Likewise, on an annual basis, a beef cow requires 5,475 gallons per year and a dairy cow requires 9,125 gallons per year. This in terms of acre-feet, a beef cow requires .016 acre-feet per year and a dairy cow requires .028 acre-feet per year. Number of cows for the region by state are provided in Table 4.2-55. Assuming two beef cows per acre of pasture, there are approximately 3,609 beef cows in California and 3,667 beef cows in Nevada for a total of 7,276 beef cows in the region. Dairy cows are only in Nevada and are estimated to be 500 cows. Livestock water use per cow for the region by state is then

given in Table 4.2-56. The beef cows use 122 acre-feet per year and the dairy cows use 14 acre-feet per year.

Agriculture water use by economic sector for the region by state are presented in Table 4.2-57. Agriculture water use for the region is 54,876 acre-feet per year for livestock production, 14 acre-feet per year for dairy production, 3,051 acre-feet for alfalfa hay production, 15,045 acre-feet for other hay production, and 710 acre-feet for barley production. Total agriculture water use for the region is 73,696 acre-feet per year.

Table 4.2-50. Irrigation Water Supply from Truckee River Sources for the Region by State.

Truckee River Sources	California <i>acre-feet</i>	Nevada <i>acre-feet</i>	Total <i>acre-feet</i>
Little Truckee River	5,292		5292
Webber Creek and Tributaries	29,197		29197
Ditches from Truckee River		15,477	15477
Pumps from Truckee River		1,231	1231
Creeks		18,796	18796
Reservoir from Creek		948	948
Drain		2,619	2619
Total	34,489	39,071	73,560

Table 4.2-51. Irrigated Acreage per Crop for the Region by State.

Crop	California <i>acres</i>	Nevada <i>acres</i>	Total <i>acres</i>
Pasture	7,217	7,334	14,551
Alfalfa Hay	300	500	800
Other Hay	2,000	2,000	4,000
Barley	200	0	200
Total	9,717	9,834	19,551

Table 4.2-52. Application of Irrigation Water per Crop for the Region by State.

Crop	California <i>acre-feet / acre</i>	Nevada <i>acre-feet / acre</i>	Total <i>acre-feet / acre</i>
Pasture	3.54934651	3.97305267	3.76246739
Alfalfa Hay	3.54934651	3.97305267	3.76246739
Other Hay	3.54934651	3.97305267	3.76246739
Barley	3.54934651	3.97305267	3.76246739