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**DIRECT AND INDIRECT ECONOMIC EFFECTS OF  
HUNTING AND FISHING IN COLORADO — 1981**

by

**John R. McKean  
Kenneth C. Nobe**

**January 1984**

**Contract Report for  
Colorado Division of Wildlife  
6060 Broadway, Denver, Colorado 80216**

**with funding assistance by  
U.S. Bureau of Land Management**

**COLORADO WATER RESOURCES**



**RESEARCH INSTITUTE**

**Colorado State University  
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**Technical Report 44**

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Department of Economics  
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## Chapter I

### INTRODUCTION

The purpose of this report is to provide estimates of the direct and indirect economic effects on the Colorado economy from sportsman expenditures. Sportsmen attracted by the bountiful fish or game found in certain regions of Colorado make expenditures in the areas where they hunt or fish and in other metropolitan areas of Colorado which provide the goods and services which they desire. Sport-related businesses, in turn, require inputs from local supplying industries who in turn expand their local purchases. These secondary spending impacts constitute the indirect and induced (labor input) effects on the local economy due to sportsman purchases.

Spending by purchase category by hunters and fishers estimated by the 1981 Colorado Sportsman Survey\* will be aggregated to match the industry categories of several economic input-output models available for regions of Colorado. These data will be used to construct weighted average business sales multipliers and employment multipliers by type of game and for resident or non-resident sportsmen. To the extent allowed by available input-output models, the multipliers will be region-specific. The thirteen state planning regions in Colorado are shown in Figure I.

Direct purchases by sportsmen in Colorado for 1981 have been estimated from the 1981 Colorado Sportsmen Survey. Total direct spending in Colorado by sportsmen in 1981 was more than one billion dollars. Table 1 shows that residents of Colorado accounted for about

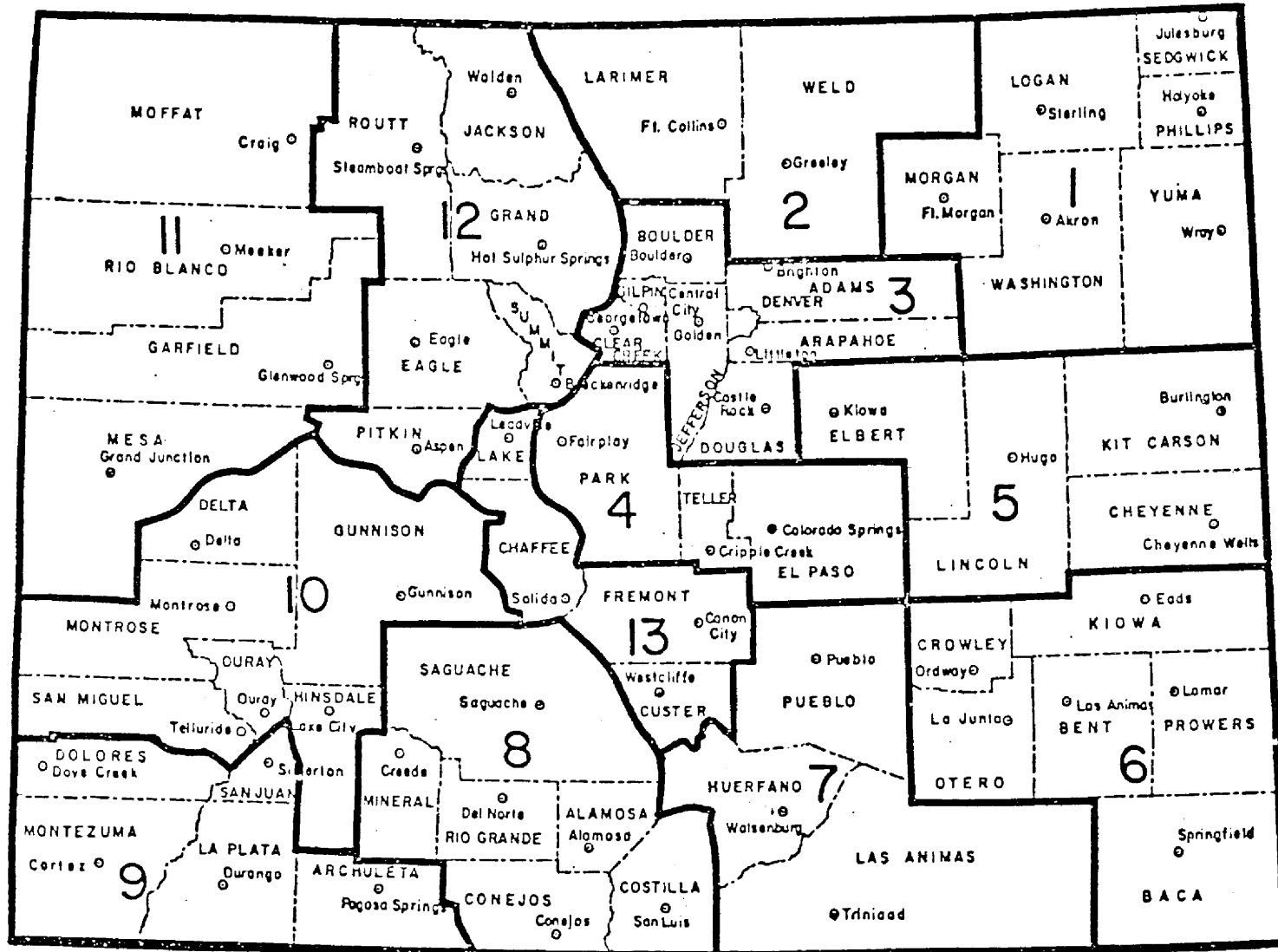
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\*The 1981 Colorado Sportsman Survey form is shown in appendix I.

TABLE 1  
TOTAL AND AVERAGE TOTAL SPORTSMEN EXPENDITURES IN COLORADO  
BY ACTIVITY PARTICIPATION IN 1981

Activity	Resident		Nonresident		Total
	Total	Per Capita	Total	Per Capita	
Antelope	\$ 12,522,987	\$ 971	\$ 21,210	\$ 101	\$ 12,544,197
Bighorn Sheep	NA <sup>1</sup> (245,332)	---	0 ( 0)	---	NA <sup>1</sup> /(245,332)
Bear	2,723,805	315	730,673	257	3,454,478
Deer	84,750,530	647	76,412,856	1,378	161,163,386
Elk	97,301,775	722	77,553,632	1,312	174,855,407
Mtn Lion	NA <sup>a</sup> /(147,928)	---	NA <sup>a</sup> /(142,136)	---	NA <sup>1</sup> /(290,064)
Fishing	514,574,387	1,119	24,252,732	1,226	538,827,119
Small Game	108,072,920	995	1,696,360	365	109,769,280
Total	\$ 820,339,664		\$ 180,809,599		\$ 1,001,149,263
Percent		81.9		18.1	100.0

a/ Bighorn Sheep and Mountain Lion total spending only made up about 0.07 percent of total spending in 1973. The number in brackets are based on the assumption that the spending shares for Sheep and Mountain Lion have remained unchanged within resident and within nonresident fixed and variable classification since 1970.



Division of Planning  
 524 Social Services Building  
 Denver, Colorado 80203

Figure 1. State Planning and Management Regions

82 percent of purchases while non-residents made up the remaining 18 percent of sportsmen purchases. Table 1 also shows the distribution of spending by type of game. Fishing, with \$539 million of spending, accounted for almost 54 percent of sportsman spending. Elk hunting, deer hunting and small game, in that order, accounted for the bulk of the remaining 46 percent of sportsman spending.

Tables 2 and 3 show the total and average purchases by sportsmen for each major type of game and divided into variable and fixed costs.\* Variable costs in the 1981 Sportsman Survey were defined as those purchases which varied with the amount of hunting or fishing activity engaged in for the year. For example, the amount of fuel used would vary with the number of trips taken. Fixed costs, on the other hand, include those purchases (typically for capital goods) which might be used for the entire season or in the case of hunting and fishing equipment, vehicles, cabins and the like, might be used for many seasons. Since some of these latter items were multipurpose and could be used for non-sportsman activities, respondents were required to estimate the share of time each fixed cost item was utilized for sportsman activity (only for the type of sportsman activity relevant to their own survey questionnaire). Many of the respondents had little or no fixed cost spending to report, but those purchases which did occur in 1981 were quite large. It is assumed that the sample results represent the typical rate of purchases of fixed cost items by sportsman. It must be noted however, that previous surveys of sportsman spending in Colorado conducted by Colorado State University researchers in 1968 and 1973 show that fixed cost spending by sportsmen in Colorado is highly variable over time. Outside

\* Spending distributions with maximum detail are shown in Appendix IV.

TABLE 2

VARIABLE AND FIXED AND AVERAGE VARIABLE AND AVERAGE FIXED  
RESIDENT SPORTSMEN EXPENDITURES IN COLORADO BY ACTIVITY PARTICIPATION IN 1981

Activity	Variable Costs		Fixed Costs		Total Expenditures
	Total	Per Capita	Total	Per Capita	
Antelope	\$ 1,302,597	\$101	\$ 11,220,390	\$870	\$ 12,522,987
Bighorn Sheep	NA <sup>b</sup> (61,939)	--	NA <sup>b</sup> (183,393)	--	245,332
Bear	907,935	105	1,815,870	210	2,723,805
Deer	18,338,600	140	66,411,930	507	84,750,530
Elk	18,463,079	137	78,838,696	585	97,301,775
Mountain Lion	NA <sup>b</sup> (94,476)	--	NA <sup>b</sup> (53,452)	--	147,928
Fishing	137,955,600	300	376,618,787	819	514,574,387
Small Game	23,352,440	215	84,720,480	780	108,072,920
Total	\$200,476,666		\$619,862,998		\$820,339,664
Percent	24.4		75.6		100.0

a/ See Appendix B for definition.

b/ Bighorn Sheep and Mountain Lion total spending only made up about 0.07 percent of total spending in 1973. The number in brackets are based on the assumption that the spending shares for Sheep and Mountain Lion have remained unchanged within resident and within nonresident fixed and variable classification since 1970.

TABLE 3

VARIABLE AND FIXED AND AVERAGE VARIABLE AND AVERAGE FIXED NON-RESIDENT  
SPORTSMEN EXPENDITURES IN COLORADO BY ACTIVITY PARTICIPATION IN 1981

Activity	Variable Costs <sup>a/</sup>		Fixed Costs <sup>b/</sup>		Total Expenditures
	Total	Per Capita	Total	Per Capita	
Antelope	\$ 21,210	\$101 <sup>c/</sup>			\$ 21,210
Bighorn Sheep					
Bear	297,990	105 <sup>c/</sup>	NA <sup>b(432,683)</sup>	152	730,673
Deer	26,228,796	473	50,184,060	905	76,412,856
Elk	27,131,949	459	50,421,683	853	77,553,632
Mountain Lion	NA <sup>b(119,622)</sup>	--	NA <sup>b(22,514)</sup>	--	142,136
Fishing	9,534,924	482	14,717,808	774	24,252,732
Small Game	998,675	215 <sup>c/</sup>	NA <sup>b(697,685)</sup>	150	1,696,360
Total	\$64,333,166		\$116,476,433		\$180,809,599
Percent	35.6		64.4		100.0

a/ See Appendix B for definition.

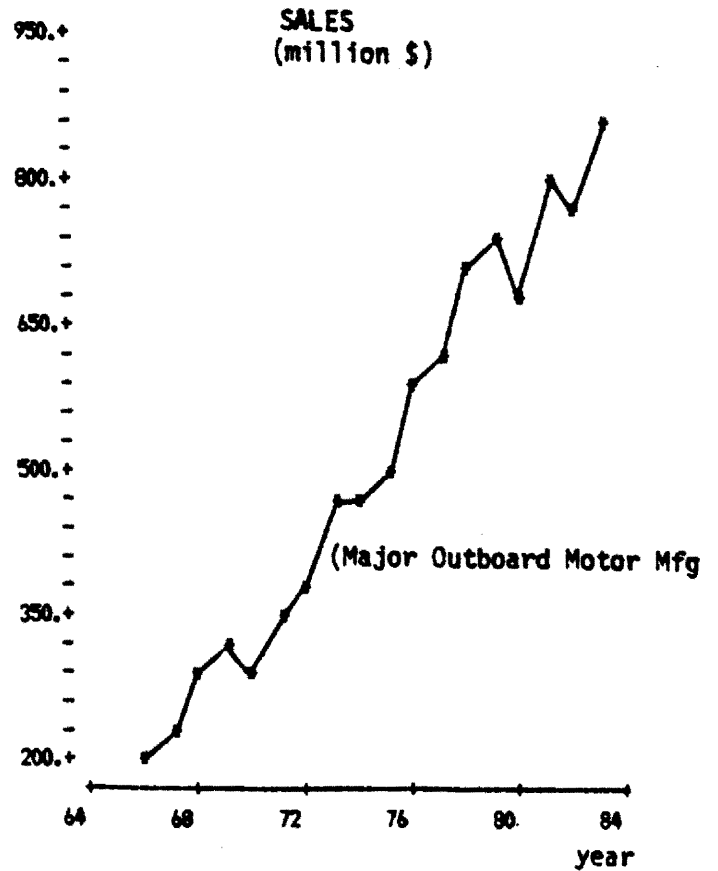
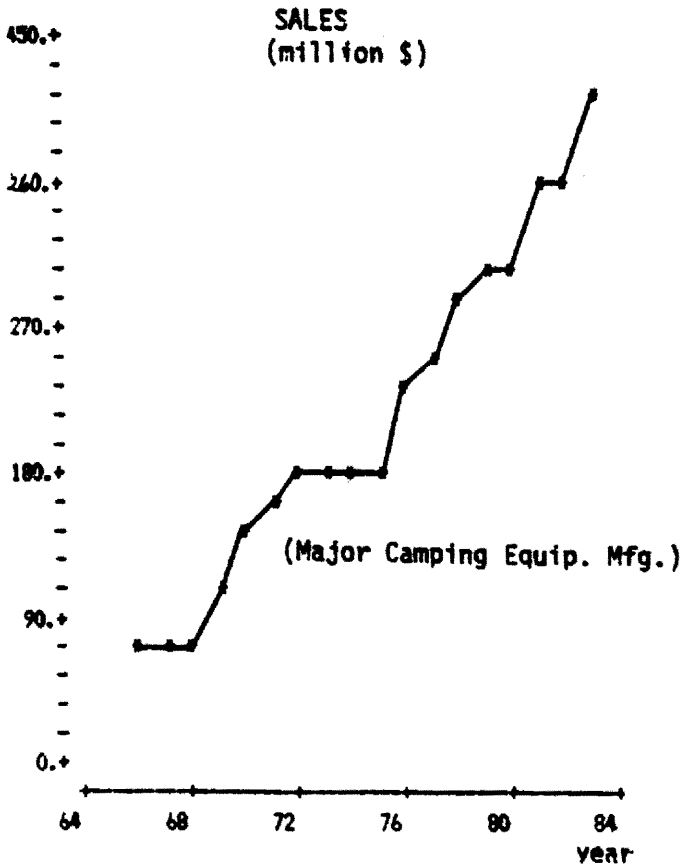
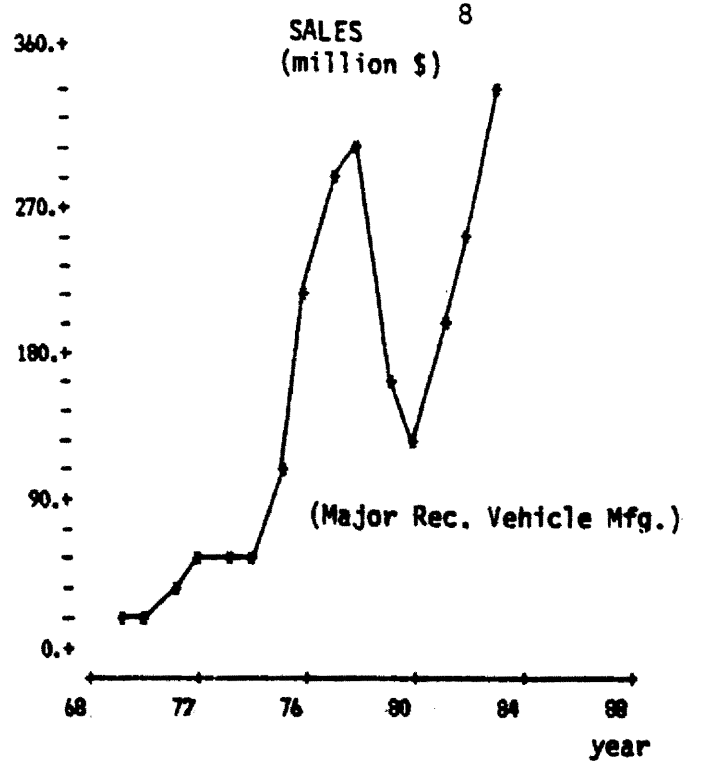
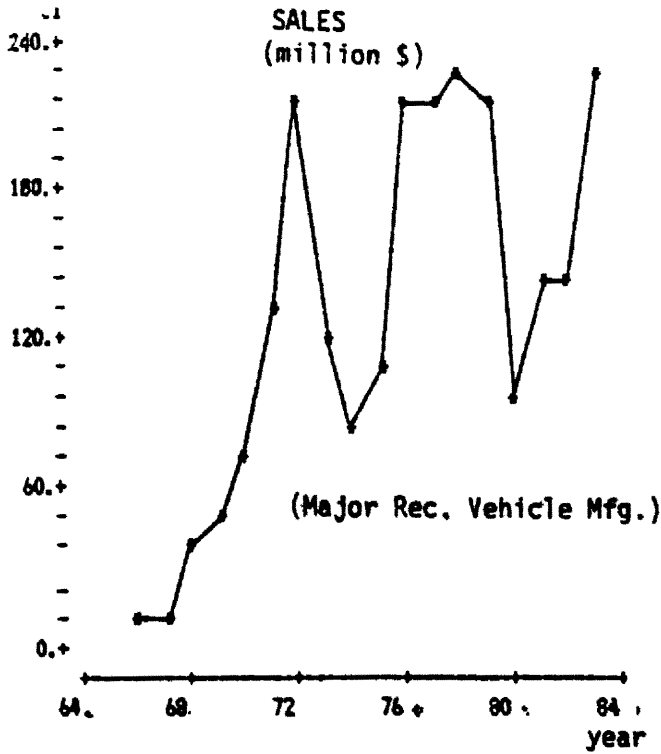
b/ The numbers in brackets are based on the assumption that the spending shares for small game fixed cost, Antelope fixed cost, Bear fixed cost, and Mountain Lion variable and fixed cost have remained unchanged since 1973.

c/ Average spending by residents was assumed for non-residents.

influences like the recent large fluctuations in interest rates and the oil scarcity and embargo strongly affect sales of certain sportsman fixed cost items such as recreational vehicles, and camp trailers. The extreme variability of sales for these items is shown by the graphs in Figure II. The four graphs in Figure II provide a comparison of the variability of sales over time of major capital goods items purchased by sportsmen to the relatively smooth rate of increase of sales of lower cost items. The two upper graphs show sales in millions of dollars for the period 1964 to 1984 (estimated) for expensive fixed cost sportsmen purchases such as motor homes, trailers and similar goods. The lower right hand graph is for outboard motor sales for the same time period 1964-84. Outboard motors are less expensive than trailers and motor homes and the rate of sales over time is much more stable. The lower left hand graph shows sales of relatively low cost sporting goods such as camp lanterns, sleeping bags, or tents. These low cost items show the greatest stability of sales over time. The large downturns in sales shown particularly in the top two graphs for recreational vehicles and trailers coincide with the oil embargo in 1973 and high interest rates in 1980. Skyrocketing fuel prices, scarcity and expectations of fuel rationing had disastrous effects on motorized recreational vehicle sales in 1973 and high interest rates had a similar effect on sales in the 1980's.

Tables 4 and 5 show resident and non-resident sportsmen spending (fixed and variable) for three time points; 1968, 1973 and 1981. These expenditures have been deflated by the Denver Consumer Price Index to show the change in real spending by sportsmen over time. It is noticeable that per capita real spending actually declines from 1968 to 1973 in





Source: The Value Line Investment Survey

TABLE 4

RESIDENT SPORTSMEN EXPENDITURES IN CONSTANT<sup>a/</sup> DOLLARS FOR 1968, 1973 AND 1981

Activity	1968			1973			1981		
	Variable Costs		Sportsmen Population	Variable Costs		Sportsmen Population	Variable Costs		Sportsmen Population
	Total	Per Capita		Total	Per Capita		Total	Per Capita	
Fishing	\$42,331,842	\$133.39	317,354	\$47,874,285	\$116.22	411,911	\$ 61,719,545	\$134.21	459,852
Deer	8,159,446	76.38	106,827	8,893,549	67.51	131,728	8,234,296	62.86	130,990
Elk	5,705,216	106.11	53,767	7,737,406	88.68	87,255	8,290,463	61.52	134,767
Small Game	8,619,358	51.57	167,139	7,668,383	57.13	134,236	10,485,582	96.54	108,616

Activity	1968			1973			1981		
	Fixed Costs		Sportsmen Population	Fixed Costs		Sportsmen Population	Fixed Costs		Sportsmen Population
	Total	Per Capita		Total	Per Capita		Total	Per Capita	
Fishing	\$75,126,595	\$236.84	317,354	\$96,585,770	\$234.49	411,911	\$169,107,264	367.74	459,852
Deer	17,072,023	159.81	106,827	19,291,556	146.45	131,728	29,819,914	227.65	130,990
Elk	7,433,288	138.25	53,767	14,453,556	165.64	87,255	35,399,711	262.67	134,767
Small Game	13,665,285	81.76	167,139	14,010,663	104.37	134,236	38,040,717	350.23	108,616

<sup>a/</sup>Current dollar figures were deflated by the Denver Consumer Price Index.

TABLE 5

NONRESIDENT SPORTSMEN EXPENDITURES IN CONSTANT<sup>a/</sup> DOLLARS FOR 1968, 1973 AND 1981

Activity	1968			1973			1981		
	Variable Costs		Sportsmen Population	Variable Costs		Sportsmen Population	Variable Costs		Sportsmen Population
	Total	Per Capita		Total	Per Capita		Total	Per Capita	
Fishing	\$18,143,507	\$122.29	148,365	\$20,121,603	\$106.24	189,406	\$ 4,281,318	\$216.42	19,782 <sup>c/</sup>
Deer	7,493,657	163.59	45,808	7,427,261	153.51	48,382	11,777,108	212.39	55,452
Elk	2,674,225	181.53	14,732	5,580,674	194.24	28,731	12,182,636	206.10	59,111
Small Game	227,334	62.73	3,624	226,836	75.66	2,998	448,419	96.54	4,645

Activity	1968			1973			1981		
	Fixed Costs		Sportsmen Population	Fixed Costs		Sportsmen Population	Fixed Costs		Sportsmen Population
	Total	Per Capita		Total	Per Capita		Total	Per Capita	
Fishing	\$16,517,191	\$111.32	148,365	\$ 4,082,406	\$ 21.55	189,406	\$ 6,580,222	\$332.64	19,782 <sup>c/</sup>
Deer	8,344,164	182.15	45,808	1,662,900	34.37	48,382	22,533,366	406.36	55,452
Elk	3,442,574	233.68	14,732	694,471	24.18	28,731	22,640,062	383.01	59,111
Small Game	394,509	108.86	3,624	38,476	12.83	2,998	313,271 <sup>b/</sup>	67.35 <sup>b/</sup>	4,645

<sup>a/</sup>Current dollar figures were deflated by the Consumer Price Index.

<sup>b/</sup>Based on 1973 spending shares.

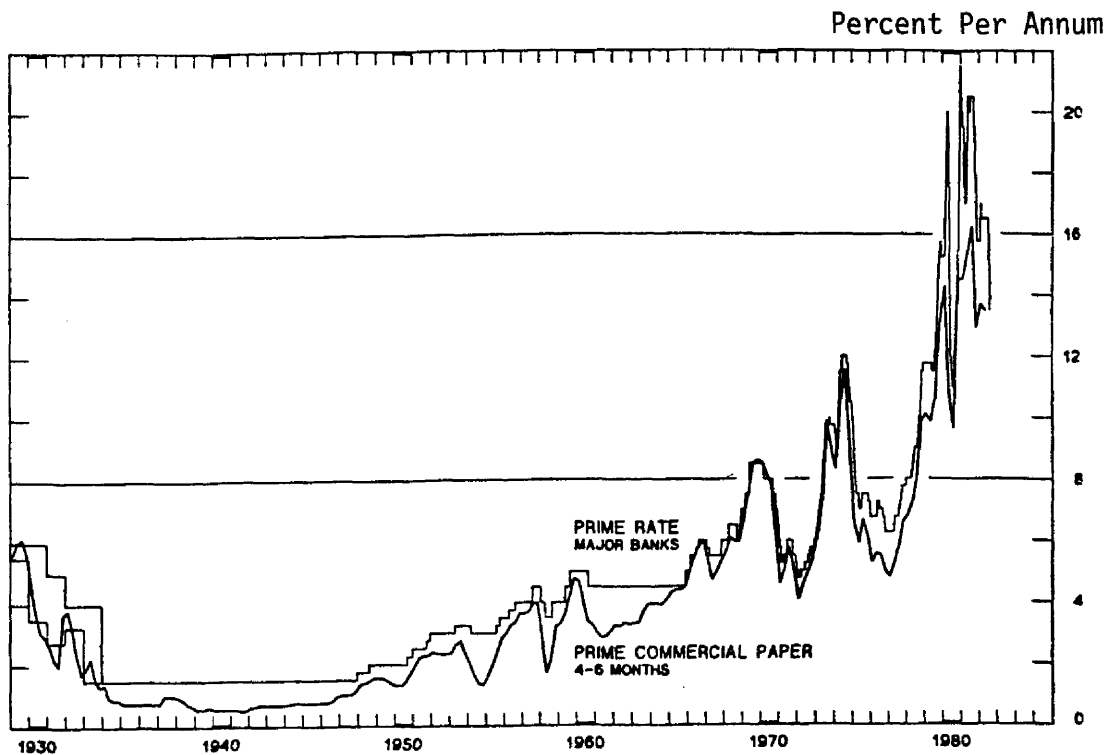
<sup>c/</sup>Season license holders only (excludes 161,395 two-day and 56,725 ten-day license holders).

many cases. This decline is particularly large for fixed cost expenditures by non-resident sportsmen. The 1973 survey of sportsmen in Colorado apparently was strongly affected by the oil embargo and oil scarcity of 1973. Since only three time points are available from our surveys, it is not possible to determine a typical average spending pattern by sportsmen. A strong upward trend is indicated by comparing earlier years to 1981 spending, but comparison of 1981 to 1973 would appear to greatly overstate the upward trend.

Furthermore, it remains to be seen whether or not the spending estimated for 1981 is typical. It is possible, for example, that 1981 spending reflects pent up demand from earlier years which remained unsatisfied until interest rates fell from their historic highs. The recent extreme variability in interest charges is shown in figure III.

Figure III

Short-term Interest Rates - Business Borrowing - Prime Rate, Effective Date of Change; Prime Paper, Quarterly Averages



The 1981 Colorado Sportsman Survey asked sportsmen how much they spent in Colorado (by region) in thirteen fixed cost categories and thirteen variable cost spending categories. These spending classifications are shown in Table 6. The fixed cost items are relatively high cost items which usually have multiple use. Respondents were required to indicate the percentage that each fixed cost item was used for the type of game that was reported on their survey. These percentages were multiplied times the reported fixed cost purchases to estimate the spending relevant to their sportsman activity. Variable cost spending for hunting and fishing included those purchases which varied directly with the amount of sportsman activity. Fuel or transportation cost, motel costs, auto repair and similar costs rise proportionately with the number of trips and the amount of time spent hunting or fishing. Table 6 also shows the reconciliation of the survey spending categories to the typical industry sector categories contained in the economic input-output models used to derive the business sales multipliers and employment multipliers for Colorado State planning regions.

The following chapter provides a brief introduction to the nature and use of input-output models to estimate the direct and indirect economic impacts of exports from a region.

TABLE 6

## ASSIGNMENT OF SPORTSMEN SURVEY EXPENDITURE CATEGORIES TO I-0 SECTORS

<u>Fixed or Multipurpose Spending</u>	<u>I-0 Sector</u>	<u>Variable Cost Spending</u>	<u>I-0 Sector</u>
1. family vehicle	AUTO+GAS	1. transportation	TRANSPORT
2. recreation vehicle	"	2. communication	COMMUNICATION
3. cabin	REAL ESTATE	3. auto dealers	AUTO+GAS
4. land	"	4. gas stations	"
5. trailer	AUTO+GAS	5. eating places	RESTAURANTS
6. camper	"	6. hotel-motel	LODGING
7. boat	OTHER RETAIL	7. campgrounds	"
8. guns	"	8. retail	OTHER RETAIL
9. ammunition	"	9. entertainment	OTHER SERVICES
10. fishing poles	"	10. health services	HEALTH SERVICES
11. horses	AGRICULTURE	11. other services	OTHER SERVICES
12. dogs	OTHER RETAIL	12. city-county govt	LOCAL GOVERNMENT
13. misc	"	13. individuals	HOUSEHOLDS

## Chapter II

### AN OVERVIEW OF THE ECONOMIC I-O TECHNIQUE\*

#### An Introduction to Input-Output Economics

Economic analysis is used by both public and private decision makers to trace how the market allocates scarce resources into the goods and services that consumers want most. Among the different types of evaluative techniques being employed in the world today, input-output analysis is one of the most important and most powerful. The purpose of this introduction is to describe briefly the nature of the input-output method.

#### The Structure of Input-Output Analysis

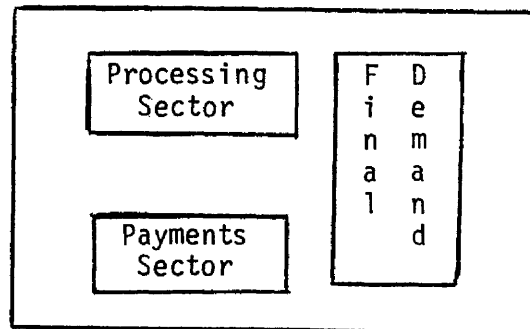
An input-output study is essentially a set of double-entry books for an economy -- a mapping of interconnections among various lines of business in some particular area. Input-output data are usually organized to show the yearly dollar volume of purchases by each industry from every other industry.

The heart of the input-output system lies in the basic "transactions table" which consists of three major segments -- a processing sector, a final demand sector, and a payments sector. The processing sector consists of all firms classified according to several industry lines and includes only transactions among local producers. The payments sector shows amounts paid to taxes, profits, rents and imports. The final demand sector reflects ultimate end use (rather than intermediate processing): consumption; investment; government purchases, and exports.

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\* The input-output model is described in more detail in Appendix II.

## TRANSACTIONS TABLE

Is Input-Output New?

Conceptually, the input-output technique is not new. A crude forerunner to input-output relations was developed by the French economist Francois Quesnay in 1758. His Tableau Economique (economic table) attempted to diagram the flow of money and goods in a nation. Quesnay, a physician, was inspired by Harvey's discovery in 1616 of the human circulatory system to diagram his economic table.

In 1936, Professor Wassily W. Leontief, a Harvard economist, published the results of the first empirical input-output study. This pioneering project, which described the structure of the United States economy for 1919, has been followed by others for the years 1947, 1958, 1968, and 1972. Leontief won the Nobel Prize in Economics in 1973 for his input-output work.

Basic Input-Output Relations

Business activity in any area -- a community, a state, a region, or a nation -- is composed of many separate transactions done by many distinct producing and distributing enterprises. Since market similarities exist among some firms, it is possible to classify them into industries



according to types of business. For example, the sales of all irrigated farm operations might be summed to represent all the firms which fall into that sector. This procedure is necessary because it helps to simplify the number of relationships which have to be made for the analysis. Moreover, based on the observation that part of the output of one business necessarily becomes an input to other businesses, the connections showing firms buying and selling from one another are recorded as "gross flows" in a transactions-among-sectors table.

TABLE 7. TRANSACTIONS-AMONG-SECTORS  
(Condensed for Brevity)

	Farm.	Manuf.	Trade	Final Demand	Total
Farming	8	6	6	20	40
Manufacturing	4	2	3	11	20
Trade	4	1	2	23	30
Payments Sector	24	11	19		
TOTAL	40	20	30		90

The categories of suppliers are shown on the left side of the table while purchase categories are listed at the top. Reading across a row traces the dollars of output that each industry sells to other industries. Reading down a column traces dollars worth of inputs a given industry buys from other businesses.

Consider the processing sector inside the outlined rectangle in Table 7. Reading across the first row, farming's total sales (output) are \$40 million. Eight million worth is sold to farmers; \$6 million to trade, and \$6 million to manufacturers. Reading down the first column

traces farm purchases (inputs), or how farmers use their total revenue generated from farming operations (the \$40 million) to buy from suppliers and pay them for goods and services. Purchases among farmers are \$8 million; \$4 million go for manufactured goods; \$4 million go for trade, and \$24 million is spent for taxes, rent or profits. Imports are shown as the final row entry. Each industry, even including labor, can be similarly analyzed.

In addition to the processing sector, input-output tables include an autonomous or "final demand" sector. Final demand is sales for end use. This sector includes non-local government, new investments, and exports. Changes in the amount of final demand "drive" the regional economy. This is because exports are the ultimate sale toward which most business activity is directly or indirectly oriented. Thus an increase of exports stimulates the local economy. Finally, the "payments sector" is included in the table so that payments to the factors of production for their role in the region's economy can be shown: labor is paid wages; capital receives interest; land is paid rent; and entrepreneurship is paid profit. These payments are known as "value added." As you read down the column of input-output Table 7 for farming, \$24 million is paid to value added plus imports.

### Derived Tables

The next table is one of "direct requirements" and shows the dollar information of Table 7 in percentage terms or as "cents worth of inputs" that each industry needs to produce another dollar's worth of output. The percentage (or ratios) are found by dividing each dollar figure by its column total. To see direct requirements, read down an industry column. Thus, for each dollar of output, farmers buy 20¢ from each other, 10¢ from

trade, and 10¢ from manufacturing (or, a total of 40¢ worth from industries in the local economy). Another 60¢ is purchased in the form of wages, interest, rent, taxes, profit and imports. This table is used to project how an industry in an economy will react immediately to changes in final demand.

TABLE 8. DIRECT REQUIREMENTS

	Farm.	Manuf.	Trade
Farming	.20	.30	.20
Manufacturing	.10	.10	.10
Trade	.10	.05	.07
Payments Sector	.60	.55	.63
TOTAL REQUIREMENT	1.00	1.00	1.00

The immediate impacts computed in the direct requirements table are followed by even longer term effects which can be found by calculating "total requirements." Successive rounds of production and demand arise because suppliers need local inputs to make and sell their outputs. For example, from Table 8, if farmers increase output by \$1, they must buy 10¢ worth of inputs from trade. In turn, trade must buy inputs from other industries, and so on. In this way, many direct requirements reciprocate through an economy. Direct plus indirect effects are calculated by using a high-speed computer to determine the cumulative influences of each industry group on the other, as shown in Table 9.

Direct plus indirect effects are interpreted as follows: As farming increases its output by \$1 to satisfy final demand, sales among farms

rise to \$1.34, manufacturers ultimately will supply 17¢ worth of inputs (and trade will supply 15¢ worth). These figures are greater than corresponding "direct requirements" because industries depend on one another. Indeed, finding the quantitative nature and extent of this "interdependence" is the real purpose of input-output analysis. The direct plus indirect effects table is a matrix inverse which results as a solution to the set of simultaneous equations which describe the dollar flows shown in Table 7.

TABLE 9. DIRECT PLUS INDIRECT EFFECTS

	Farm.	Manuf.	Trade
Farming	1.34	.47	.34
Manufacturing	.17	1.17	.16
Trade	.15	.11	1.11
Multiplier:	1.66	1.75	1.61

---

A closely related task in input-output is to calculate "multipliers" which specify the cumulative effects that an increase in final demand has on all industries combined. Multipliers are found by adding the values of "total requirements" in each column (as in the bottom row of Table 9). Multipliers are greatest in industries having the most output-creating power inside an economy. In Table 9, the value of the Manufacturing Multiplier is 1.75; thus, every \$1 of Manufacturing output

for final demand ultimately generates \$1.75 worth of goods in Manufacturing sector. As this additional output is created, income and employment will also rise (which will reinforce growth in the processing sector economy).

#### Where are Input-Output Data Obtained?

In order to be able to construct a transactions table, and compute the direct and total requirements table, the input-output economist must obtain detailed income and outlay distributions from businesses, governments, and consumers. This task involves many hours of research, sometimes via mail questionnaires, but mainly via personal interviews, and sometimes via gleaning figures from business and governmental publications, and even newspapers. Not only must the raw data be collected, but a system of cross-checking and verification must be established to make sure figures used are valid and reliable. The structure of the input-output model whereby sales by sector must equal purchases provides a final consistency check on industry totals.

#### GLOSSARY OF TERMS

Final Demand: Final demand is the dollar value of goods and services purchased by the final consumer during a specified accounting period. The final demand sectors are non-local governments, exports, and capital formation.

Intermediate Demand: Contrasted to final demand, intermediate demand is the dollar value of goods and services which are sold by one producer to another and which are further processed before being delivered to the final user.

Basic Industry or Basic Sector: Those industries or industries aggregated into economic sectors which typically ship a significant portion of their output outside the region. Basic industry serves the final demand or driving sector.

"Driving" Sectors: The "driving" sectors of the regional economy are the components of final demand. Production in the regional economy occurs in response to (is "driven" by) the levels of final demand.

Business Multiplier: The business multiplier estimates the total dollar value of production generated in an economy in response to a one-dollar increase in the final demand for the output of a specific economic sector.

Income Multiplier: These multipliers are estimates of the total change in household income which results from a one dollar change in final demand for the output of any specific sector of the regional economy. (Income multipliers are sometimes reported per dollar of direct household income.)

Employment Multiplier: The employment multipliers estimate the total employment generated in the regional economy in response to an increase in final demand for the output of any specific sector.

Growth Scenario: Growth scenario refers to a set of assumed futures, relating specifically to growth in final demand, from which are derived estimates of economic activity, employment, and income in the regional economy.

Induced Impact: Induced impacts are the impacts on economic activity, employment, and household income which result from increased household spending.

Provisional Forecast: These forecasts are estimates of future value of economic variables which are conditioned by the specified levels of growth in final demand. It is assumed that the relationship between final demand and the economic variables to be projected is known and remains constant over the forecasting period.

#### Nonresident Sportsman Spending Multiplier Computation

Calculation of spending multipliers for sportsmen is complicated by the lack of a specific sportsman category in the several available regional input-output models for Colorado. Since sportsmen may purchase goods from many common types of business establishments, it is not possible to identify a sportsman business sector unless information like that collected by our recent 1981 Colorado Sportsmen Survey is available. Thus, most regional economic models do not specify an industry or sector for sportsmen purchases. As expected, our sportsman survey revealed that purchases by sportsmen are distributed over a number of the economic sectors identified in regional input-output models. Each of these economic sectors has a distinct economic multiplier in a given region of Colorado. The size of the multiplier is influenced by the degree of dependence of the economic sector on local labor and other local inputs. Larger and more developed economies tend to be more self sufficient and can provide a larger share of inputs locally. This implies that multipliers will be larger in a highly developed region such as Denver than they would in a sparsely populated section of the state. The regional differences in the economic multipliers means that a given amount of sportsman spending will have a larger impact in Denver than it would in a less

developed region. Thus it is necessary to examine the multiplier effects on a regional basis within Colorado.

The economic multiplier for sportsmen spending for a particular region of Colorado can be calculated by using the percentage distribution of sportsman purchases (from our 1981 sportsman survey) to weight the economic multipliers for each of the industries selling to sportsmen. Since the distribution of sportsmen spending by industry will vary by type of game, a different weighted average multiplier can also be calculated for each major game type as shown in our 1981 sportsmen survey.

#### Resident Sportsmen Spending Multiplier Computation

It is often useful to calculate the economic effects of shifts in resident sportsman spending within Colorado. For instance, a survey of local sportsmen who frequent a given region might reveal that degradation in local hunting conditions (such as might occur due to resource development) would induce some sportsmen to travel to other areas to obtain desired hunting experiences. It must also be assumed that unsatisfied sportsmen will in fact shift their spending outside of the region rather than simply make other types of purchases inside the region in lieu of hunting. If an estimate of the loss in local purchases by sportsmen can be obtained, then a multiplier can be applied to this loss of sales to find the direct plus indirect impacts on the regional economy. The economic multiplier which is appropriate for a change in purchases by residents of a region is smaller than the multiplier applied to changes in sales to nonresidents (export sales).



The following exposition addresses the methodology and the calculations necessary to estimate local spending multipliers. The reader may find that a review of the methodology concerning direct plus indirect effects as shown in Appendix II is useful in conjunction with the following explanation.

Each of the columns of the direct plus indirect effects table (Table 9) shows the total requirements from the sectors listed at the left in order that the sector listed at the column head deliver an added dollar of sales to final demand (exports). The sum of a given column of the direct plus indirect effects table shows the total business activity (sales) among industries and households in the region generated by a dollar of sales to exports by the sector shown at the column head. Column sums are termed business multipliers. If instead, the direct plus indirect effects of changes in a given industry's sales to local purchasers (resident sportsmen) is desired, then an adjustment must be made to the business multipliers. The desired local sales multiplier will show the direct plus indirect effects on the local economy (sales) when a given industry changes its local sales (i.e., changes occur in resident sportsman purchases).

The justification for reducing business multipliers to indicate the direct plus indirect effects of changes in local sales is as follows. Define the business multiplier for a given sector as:

$$B_i = \frac{\Delta (\text{direct plus indirect sales})_{\text{all sectors}}}{\Delta (\text{export sales})_{\text{sector } i}} \quad (\Delta \text{ denotes change})$$

The main diagonal element in column  $i$  of the direct plus indirect effects table (table 9) is:

$$MDE_i = \frac{\Delta (\text{direct plus indirect sales})_{\text{sector } i}}{\Delta (\text{export sales})_{\text{sector } i}}$$

and thus dividing  $B_i$  by  $MDE_i$  and canceling like terms results in:

$$\text{Local Sales Multiplier}_i = \frac{(\text{direct plus indirect sales})_{\text{all sectors}}}{(\text{direct plus indirect sales})_{\text{sector } i}}$$

The above definitions and resultant cancellation of terms is made possible by the fact that, in the input-output model, sales and purchases must always be equal for processing sectors. Thus, some of the elements above might normally be termed purchases rather than sales but changes in sales will always equal changes in purchases for any given processing sector. The effect of changes in local sales by a given sector on total sales in the region can be found by dividing the business multiplier for that sector by the main diagonal element of the direct plus indirect effects table from the column appropriate for the sector. It is clear that a local sales multiplier for a given industry will always be less than or equal to the business multiplier since the denominator of the local sales multiplier contains both the direct and indirect sales by the given industry while the denominator of the business multiplier contains only a unit of export sales (\$1).

It should be noted at this point that, had we originally structured the input-output model so that households were included as part of final demand rather than part of the processing sectors, then the adjustment described here would be unnecessary. The estimated sportsman business multipliers would then apply equally to exports and to households since both would have been exogenous in the model. Following this approach

would have seriously understated the estimated sportsman business multipliers since the effects of induced consumer spending would have been neglected. Only when modeling undeveloped economies where workers commute to other regions would the assumption that household spending is exogenously determined be appropriate. In undeveloped regions household income and spending may be determined by economic forces from outside of the region.

In order to convert our sportsman business multipliers to local sportsman spending multipliers each column sum for the relevant columns of the direct plus indirect effects table for a given regional model must be divided by its respective main diagonal element. The main diagonal element is easily identified since it is the only number that equals or exceeds unity. The main diagonal elements used to adjust the business multipliers to show the impact of local spending shifts in each regional economy are shown in Table 10. Examination of Table 10 reveals that for most regions outside Denver, the main diagonal element of the direct plus indirect effects table is very close to unity. Thus, in many cases, the adjustment is numerically quite small.

The adjusted multipliers can be aggregated to find the resident sportsman multiplier for each of the 13 planning regions in a manner analogous to that used on the sportsman business multipliers. The local sales multipliers must be weighted by the share of resident spending in each of the sectors which sell to sportsmen.

TABLE 10

## DIVISORS TO CONVERT I-0 BUSINESS MULTIPLIERS TO RESIDENT PURCHASES MULTIPLIERS

<u>Eastern Colorado</u> <u>High Plains</u>		<u>North Front</u> <u>Range</u>		<u>Denver Region</u>		<u>North Central</u> <u>Colorado</u>	
<u>Sector</u>	<u>Devisor</u>	<u>Sector</u>	<u>Devisor</u>	<u>Sector</u>	<u>Devisor</u>	<u>Sector</u>	<u>Devisor</u>
Animals	1.10	Eat-Drink	1.01	Livestock	1.43	Ag/Livestock	1.22
Fuel	1.01	Other Retail	1.06	Trade	1.51	Gas-Auto	1.10
Auto Dealer	1.00	FIRE*	1.04	Service	1.22	Eat-Drink	1.01
Eat-Drink	1.01	Health Services	1.04	Trans/Comm/P.U.	1.10	Other Retail	1.06
Other Retail	1.04	Other Services	1.05	Households	1.19	FIRE*	1.10
FIRE*	1.01	Hotel-Motel	1.00			Health Services	1.02
Services	1.05	Communications	1.02			Recreation	1.00
Other Services	1.02	Transport	1.00			Other Services	1.06
Communication	1.01	Local Gov	1.02			Hotel-Motel	1.00
Transport	1.02	Households	1.16			Trans/Comm/P.U.	1.03
Local Gov	1.03					Local Gov	1.01
Households	1.12					Households	1.21
		<u>Northwest</u> <u>Colorado</u>		<u>Southwest</u> <u>Colorado</u>			
		<u>Sector</u>	<u>Devisor</u>	<u>Sector</u>	<u>Devisor</u>		
		Livestock	1.08	Livestock	1.04		
		Gas-Auto	1.05	Gas-Auto	1.01		
		Food-Lodge	1.02	Eat-Drink	1.01		
		Other Retail	1.04	Other Retail	1.06		
		FIRE*	1.19	FIRE*	1.16		
		Health Services	1.06	Health Services	1.07		
		Recreation	1.00	Other Services	1.03		
		Other Services	1.04	Lodging	1.00		
		Trans/Comm/P.U.	1.02	Transport	1.02		
		Local Gov	1.05	Communication	1.01		
		Households	1.16	Local Gov	1.03		
				Households	1.18		

\*FIRE is finance, insurance, and real estate.

## CHAPTER III

Available Input-Output Models for Regions in Colorado

A number of regional input-output models have recently been constructed in Colorado. These models provide a source of economic multiplier estimates. Table 11 lists and describes the regional models which are available at Colorado State University

TABLE 11

## Recently Constructed Regional Input-Output Models in Colorado

<u>File Name</u>	<u>Description of Input-Output Model</u> <sup>a/</sup>
MRRB	Moffat, Routt and Rio Blanco Counties, Colorado Survey Based Input-Output Model 18 Processing Sectors (including HOUSEHOLDS) 25 Total Sectors
KREM	Grand and Jackson Counties, Colorado Survey Based Input-Output Model 19 Processing Sectors (including HOUSEHOLDS) 25 Total Sectors
Durango	La Plata and Montezuma Counties, Colorado Survey Based Input-Output Model 24 Processing Sectors (including HOUSEHOLDS) 30 Total Sectors
UMSC	Eagle, Garfield, Mesa, Pitkin and Summit Counties, Colorado Survey Based Input-Output Model 38 Processing Sectors (including HOUSEHOLDS) 45 Total Sectors
TELLER	Woodland Park, Colorado Survey Based Input-Output Model 20 Processing Sectors (including HOUSEHOLDS) 26 Total Sectors
GREELEY	City of Greeley, Colorado Survey Based Input-Output Model 20 Processing Sectors (including HOUSEHOLDS) 23 Total Sectors

TABLE 11 (Continued)

<u>File Name</u>	<u>Description of Input-Output Model</u> <sup>a/</sup>
ESTES	City of Estes Park, Colorado Survey Based Input-Output Model 17 Processing Sectors (including HOUSEHOLDS) 24 Total Sectors
GILPIN	Gilpin County, Colorado Survey Based Input-Output Model 16 Processing Sectors (including HOUSEHOLDS) 23 Total Sectors
OGMAR	Counties above the Ogallala Aquifer in Eastern Colorado. Baca, Cheyenne, Kiowa, Kit Carson, Lincoln, Logan, Phillips, Prowers, Sedgwick, Washington and Yuma Counties Survey Based Input-Output Model 40 Processing Sectors (including HOUSEHOLDS) 44 Total Sectors
MESA	Mesa County, Colorado Survey Based Input-Output Model 31 Processing Sectors (including HOUSEHOLDS) 37 Total Sectors
NW4	Garfield, Moffat, Rio Blanco and Routt Counties in Northwest Colorado. Survey Based Input-Output Model 27 Processing Sectors (including HOUSEHOLDS) 33 Total Sectors

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a/ These models were constructed at the Economics Department, Colorado State University and are maintained on the Bureau of Land Management computer at Denver Federal Center.

TITLES OF REPORTS DOCUMENTING AVAILABLE MODELS

- MRRB                    The Economy of Moffat, Routt and Rio Blanco Counties, Colorado, Description and Analysis, Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Colorado, Technical Report No. 23, January 1981. John McKean and Joe Weber.
- KREM                    An Input-Output Study of the Kremmling Region of Western Colorado, Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Colorado, Report No. 27, March 1981. John McKean and Joe Weber.
- DURANGO                (Report forthcoming)
- UMSC                    An Input-Output Study of the Upper Colorado Main Stem Region of Western Colorado, Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Colorado, Technical Report No. 22, January 1981. John McKean and Joe Weber.
- TELLER                 (SEE ESTES)
- GREELEY                Interindustry Model of Greeley, Colorado, for the Study of Space Heating Energy Requirements, Colorado State University Experiment Station Special Series 19, 1982, John McKean, Joe Weber and Ray Ericson.
- ESTES                    An Interindustry Analysis of Three Front Range Foothills Communities: Estes Park, Gilpin County, and Woodland Park, Colorado, Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Colorado, Technical Report No. 37, July 1982. John McKean, Warren Trock and David Senf.
- GILPIN                  (SEE ESTES)
- OGMAR                    An Economic Input-Output Study of the High Plains Region of Eastern Colorado, Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Colorado, Technical Report No. 29, February 1982. John McKean, Ray Ericson and Joe Weber.

TITLES OF REPORTS DOCUMENTING AVAILABLE MODELS (Continued)

- OGMAR (Continued)      Projected Population, Employment, and Economic Output in Colorado's Eastern High Plains, 1979-2020, Colorado Water Resources Institute, Colorado State University, Fort Collins, Colorado, Technical Report No. 33, February 1982. John McKean.
- MESA                      The Economies of Mesa County and Garfield, Moffat, Rio Blanco, and Routt Counties, Colorado, Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Colorado, Technical Report No. 35, April 1981. John McKean, Joe Weber and Ray Ericson.
- NW4                        (SEE MESA)



The available regional input-output models for Colorado do not describe geographic areas which coincide with the state planning regions. In particular, a paucity of data are available for south central Colorado and no recent model is available for the Denver region. (The model of Colorado for 1970 can be used as a source of economic multipliers for Denver since Denver dominates the state model.) The Colorado model also lacks the detail which is available in the newer regional models constructed in Colorado. Estimates of multipliers in the Denver region based on the 1970 Colorado model may be imprecise because of the age of the model and due to the aggregation and omission of certain sectors in the 1970 Colorado model. Never-the-less, the Colorado input-output model is much more accurate for assessing economic multipliers in Denver than would be any of the alternative models for other regions in Colorado. The high state of development of the Denver economy results in much greater local self sufficiency and thus the Denver multipliers are much higher.

Table 12 shows the selection of regional input-output models used to derive the economic multipliers judged most appropriate for each of the state planning regions in Colorado. The table also shows a rough evaluation of the probable degree of accuracy of the available multiplier estimates to describe the actual economic interdependencies in each of the state planning regions. The appropriateness of the available economic model to describe a given planning region will depend on the similarity of the structure of the economy to that described by the model, similarity in relative size of the economy and the currency of the data used to construct the model. Tables III-1 to III-20 in

appendix III show distributions of employment by industry sector for counties and state planning regions in Colorado and also the distribution of employment by economic sector for the available regional input-output models in Colorado. Similarity both the percentage distribution of employment by sector and absolute size of the economy of a given planning region and the economic input-output model used as a source of multiplier estimates is desired. The degree to which the economic structure varies among the 13 state planning regions is shown in Table 13.

TABLE 12

## Application of Regional I-0 Models in Colorado for State Planning Regions

<u>State Planning Region</u>	<u>Geographic Descriptor</u>	<u>Source of I-0 Multipliers</u>	<u>Expected Accuracy of I-0 for Planning Region</u>
1	N.E. High Plains	Colorado Eastern High Plains I-0	Excellent (1978 data)
2	N. Front Range	Greeley City I-0	Good (1978 data)
3	Denver Area	Colorado I-0	Poor (1970 data)
4	Central Front Range	Colorado I-0	Poor (1970 data)
5	Central East High Plains	Colorado Eastern High Plains I-0	Excellent (1978 data)
6	S.E. High Plains	Colorado Eastern High Plains I-0	Excellent (1978 data)
7	S. Central	Colorado Eastern High Plains I-0	Good (1978 data)
8	S.W. Central	S.W. Colorado I-0	Good (1981 data)
9	S.W. Colorado	S.W. Colorado I-0	Excellent (1981 data)
10	West S. Central	S.W. Colorado I-0	Fair (1981 data)
11	N.W. Colorado	4-county N.W. I-0	Excellent (1980 data)
12	N. Central	Kremmling I-0	Good (1978 data)
13	S. Central	S.W. Colorado I-0	Fair (1981 data)

TABLE 13

## Percentage Distribution of Employment by Sector for State Planning Regions\*\*

Planning Region Sector	(PERCENT)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Ag	2.7	1.7	0.6	0.5	2.6	2.7	0.5	12.1	0.2	2.3	0.7	0.7	0.4
Mines	3.4	0.9	3.1	0.3	0.6	1.0	0.2	0.8	2.4	8.1	9.7	4.3	2.1
Const	5.8	6.8	5.8	6.4	2.6	2.6	4.9	4.0	10.5	6.6	12.1	13.2	4.2
Mfg	11.0	20.8	15.5	17.1	5.7	11.9	15.6	5.3	4.1	8.2	5.8	1.9	8.9
Trans-Ut	6.1	3.8	6.6	4.4	4.2	4.9	4.8	3.7	4.2	7.9	6.9	2.8	3.4
Wholesale	9.4	4.1	7.1	2.9	10.1	6.3	3.4	4.7	3.8	3.1	4.1	1.1	1.6
Retail	20.8	19.3	17.0	20.5	20.9	19.7	20.2	16.2	22.4	22.4	21.0	27.2	16.7
FIRE***	4.4	4.4	6.9	5.0	3.7	4.0	4.4	4.9	3.6	4.4	4.1	9.1	3.0
Service	15.3	13.5	21.0	22.3	16.2	15.1	21.5	22.3	26.0	14.5	18.5	28.7	36.3
Loc Gov	18.1	22.5	12.4	12.2	30.4	24.9	14.1	22.1	19.0	18.9	11.8	9.4	21.2
State Gov	1.4			1.8			7.0				2.5	0.4	
Fed Gov	1.7	2.1	3.9	6.5	2.9	6.9	3.4	3.8	3.8	3.4	2.8	1.3	2.3
Total * Employment	20,358	90,543	845,463	113,348	5,004	13,960	44,584	11,296	18,180	17,906	55,337	6,712	16,597

\*Workers covered by unemployment insurance, 4th quarter, 1981

\*\*State planning regions are shown in figure 1 on page 3.

\*\*\*Finance, insurance and real estate.

### Interpretation of the Regional Multipliers

The selected business activity multipliers for sectors selling to sportsmen are shown in Table 14. These multipliers measure the direct plus indirect plus induced business activity (total sales receipts) in various regions of Colorado for each dollar of exports by the respective sectors listed on the table. The interpretation of the business multiplier is shown by the following example using the Northwest Colorado I-O Model (Garfield, Moffat, Rio Blanco and Routt Counties). As the exports by the recreation sector expand by one dollar there will be a direct expansion of output by the recreation sector of one dollar. Sectors which provide inputs for the recreation sector, for example households, wholesale, utilities, etc., will increase their sales to the recreation sector. Further, indirect business sales increases will occur in sectors which supply production inputs to those sectors which supply the recreation sector with inputs. This process continues as the stimulus for the economy spreads through the supplying sectors in NW Colorado. Thus, each dollar of exports by the recreation sector expands into two dollars of total sales in the NW Colorado region.

### Employment Multipliers

Employment data were obtained directly from the Colorado Division of Employment and are based on the standard industrial classification definitions of the sectors in the models. The units in the employment multiplier analysis are numbers of workers per \$1 million of exports.

To assess the total employment impacts of exogenous changes in final consumption requires the use of the direct plus indirect plus induced production requirements per dollar of output delivered to final demand.

The interpretation of the employment multiplier is shown by the following example using the NW Colorado Regional I-O Model (Garfield, Moffat, Rio Blanco and Routt counties.) As the final demand for the output of the sportsman sector expands by \$1 million there will be a direct expansion of employment in the sectors selling to sportsmen. The magnitude of the direct and indirect employment impacts shows the total employment generated in the regional economy as the sectors selling to sportsmen increase their exports. Sectoral multipliers for selected input-output models for several regions of Colorado are shown in Table 14. For the recreation sector for example, an increased delivery of \$1 million to final demand would lead to the employment of an additional 56 persons in the NW Colorado region. All of the remaining entries have the same interpretation for the respective sectors. The leading sectors in terms of direct and indirect employment generation in the NW Colorado economy are: local government, food and lodging, recreation, other retail and gas-auto. Expansion of exports in these sectors generates the largest change in the total employment in the NW Colorado region. In order to calculate a business and employment multiplier that is appropriate for sportsmen spending in each state planning region, a method of weighting sectoral multipliers must be established. The input-output sectors which sell to sportsmen are auto-gas, real estate, other retail, ranching, transport, communication, restaurants, lodging, other services, health services, local government and households.

The assignment of the 1981 Sportsmen Survey spending classifications to the input was shown previously in Table 6. The detailed sportsmen

TABLE 14

Selected Business and Employment Multipliers From  
Regional I-O Models in Colorado

Eastern Colorado High Plains			Denver Region			North Central Colorado			North West Colorado		
Sector	Business Multiplier	Employment Multiplier	Sector	Business Multiplier	Employment Multiplier	Sector	Business Multiplier	Employment Multiplier	Sector	Business Multiplier	Employment Multiplier
Other Animals	2.25	25	Livestock	3.18	99	Ag/Livestock	2.67	38	Livestock	2.16	37
Retail Fuel	1.87	47	Trade	2.65	70	Gas-Auto	1.52	20	Gas-Auto	2.05	40
Auto Dealer	2.33	75	Service	2.45	86	Eat-Drink	1.73	62	Food-Lodge	2.08	74
Food-Drink	2.04	113	Households	2.20	40	Other/Retail	1.42	19	Other Retail	2.10	47
Other Retail	2.07	48				FIRE <sup>b/</sup>	2.04	30	FIRE <sup>d/</sup>	1.53	16
Ins.-R.E. <sup>a/</sup>	1.15	9	Source: (14)			Health Services	2.19	56	Health Service	2.16	49
Health Service	2.04	113				Recreation	1.90	43	Recreation	2.00	56
Other Service	1.41	24				Other Services	2.14	61	Other Services	1.79	36
Communication	1.60	31				Hotel-Motel	2.58	96	Trans/Comm/P.U. <sup>e/</sup>	1.74	12
Transport	1.66	25				Trans/Comm/P.U. <sup>c/</sup>	2.46	52	Local Gov	2.63	99
Local Gov	2.71	61				Local Gov	2.09	69	Households	1.80	16
Households	1.67	17				Households	2.31	23			

a/ Insurance and Real Estate

b/ Finance, Insurance and Real Estate

c/ Transportation, Communication, and Public Utilities

d/ Finance, Insurance and Real Estate

e/ Transportation, Communication, and Public Utilities

South West Colorado		
Sector	Business Multiplier	Employment Multiplier
Livestock	2.74	37
Gas-Auto	1.63	11
Eat-Drink	1.71	45
Other Retail	1.59	16
FIRE <sup>f/</sup>	1.50	13
Health Service	2.42	52
Other Service	2.17	51
Lodging	2.14	66
Transport	2.07	34
Communication	1.50	14
Local Gov	3.01	85
Households	2.24	17

f/ Finance, Insurance, and Real Estate

survey spending data are aggregated to achieve a percentage distribution of sportsman spending by I-0 Model sector. The percentage distribution of sportsman spending by sector is used to weight sector multipliers to estimate the sportsman business and employment multipliers in each state planning region. The spending share weights are calculated separately for non-resident and resident sportsman and by type of game. Data limitations preclude farther disaggregation by region. The spending distributions are shown in Tables 15-20.\*

#### Regional Multipliers Versus State-Wide Multipliers

Regional multipliers in Colorado do not measure the total impact on the Colorado state economy since they treat purchases in Colorado which are outside the region of concern as imports.

If the impact on the total state economy is desired then the sportsman multiplier for Denver derived from the 1970 Colorado input-output model can be used as a lower bound approximation. The multiplier effect on the total state economy will be much larger than the effect in a small region of the state, because of the greater variety and amount of business activities that are available when the impact region is expanded to include the whole state. Economic and employment multiplier estimates by region and by sportsman activity category are presented in the following chapter.

\*Actual spending distributions with maximum detail are shown in Appendix IV.



TABLE 15  
 PERCENT OF SPENDING FOR ANTELOPE HUNTING DISTRIBUTED  
 BY I-O SECTOR FOR RESIDENT AND NONRESIDENT

	<u>Resident</u>	<u>Non-Resident</u>
Livestock	0	0
Gas-Auto	79.5	69.6
Eat-Drink	1.2	2.8
Other Retail	16.4	22.9
FIRE	0.4	0
Health Services	0	0
Other Services	0.3	0
Hotel-Motel	0.3	2.6
Transport	1.6	1.9
Communicat	0.2	0.2
Local Gov	0.1	0
Households	<u>0</u>	<u>0</u>
Total	100.0	100.0

Source: Estimated from data collected in the 1981 Colorado Sportsman Survey

TABLE 16

PERCENT OF SPENDING FOR BEAR HUNTING DISTRIBUTED  
BY I-O SECTOR FOR RESIDENT AND NONRESIDENT

	<u>Resident</u>	<u>Non-Resident</u>
Livestock	8.8	N.A.
Gas-Auto	33.7	
Eat-Drink	4.1	
Other Retail	44.9	
FIRE	3.6	
Health Services	---	
Other Services	1.1	
Hotel-Motel	0.1	
Transport	1.0	
Communicat	0.4	
Local Gov	0.1	
Households	<u>2.2</u>	
Total	100.0	

Source: Estimated from data collected in the 1981 Colorado Sportsman Survey

TABLE 17  
 PERCENT OF SPENDING FOR DEER HUNTING DISTRIBUTED  
 BY I-O SECTOR FOR RESIDENT AND NONRESIDENT

	<u>Resident</u>	<u>Non-Resident</u>
Livestock	1.4	1.4
Gas-Auto	47.0	52.7
Eat-Drink	2.1	4.3
Other-Retail	32.8	20.9
FIRE	12.3	9.8
Health Services	0.1	0.1
Other Services	0.6	2.0
Hotel-Motel	0.4	3.5
Transport	2.8	2.0
Communicat	0.2	0.6
Local Gov	0.2	0.6
Households	<u>0.1</u>	<u>2.1</u>
Total	100.0	100.0

Source: Estimated from data collected in the 1981 Colorado Sportsman Survey

TABLE 18  
 PERCENT OF SPENDING FOR ELK HUNTING DISTRIBUTED  
 BY I-O SECTOR FOR RESIDENT AND NONRESIDENT

	<u>Resident</u>	<u>Non-Resident</u>
Livestock	0.1	0.2
Gas-Auto	62.9	42.6
Eat-Drink	2.2	3.4
Other-Retail	30.9	32.1
FIRE	0	10.5
Health Services	0.1	0
Other Services	0.7	1.0
Hotel-Motel	0.3	1.7
Transport	2.4	1.6
Communicat	0.3	1.6
Local Gov	0.1	1.6
Households	<u>0</u>	<u>3.7</u>
Total	100.0	100.0

Source: Estimated from data collected in the 1981 Colorado Sportsman Survey

TABLE 19  
 PERCENT OF SPENDING FOR FISHING DISTRIBUTED  
 BY I-O SECTOR AND BY RESIDENT AND NONRESIDENT

	<u>Resident</u>	<u>Non-Resident</u>
Livestock	0.4	0.1
Gas-Auto	59.7	42.9
Eat-Drink	3.0	4.4
Other-Retail	20.2	24.4
FIRE	9.2	6.2
Health Services	0.1	0.1
Other Services	0.8	13.0
Hotel-Motel	1.6	5.7
Transport	3.6	2.8
Communicat	0.1	0.2
Local Gov	1.0	0.1
Households	<u>0.3</u>	<u>0.1</u>
Total	100.0	100.0

Source: Estimated from data collected in the 1981 Colorado Sportsman Survey

TABLE 20  
 PERCENT OF SPENDING FOR SMALL GAME HUNTING DISTRIBUTED  
 BY I-O SECTOR FOR RESIDENT AND NONRESIDENT

	<u>Resident</u>	<u>Non-Resident</u>
Livestock	0.4	0
Gas-Auto	66.8	72.4
Eat-Drink	2.8	0.9
Other Retail	25.0	26.1
FIRE	0	0
Health Services	0	0
Other Services	1.0	0
Hotel-Motel	1.0	0
Transport	2.2	0.6
Communicat	0.3	0
Local Gov	0.2	0
Households	<u>0.3</u>	<u>0</u>
Total	100.0	100.0

Source: Estimated from data collected in the 1981 Colorado Sportsman Survey

Table 21

Economic Multipliers for Sportsman Spending  
in Colorado by Region and by Game Type  
(resident/non-resident)\*

<u>State Planning Region</u>	<u>Antelope</u>	<u>Bear</u>	<u>Deer</u>	<u>Elk</u>	<u>Fish</u>	<u>Small Game</u>
	2.06	2.01	1.94	2.03	1.89	2.03
Eastern High Plains	2.06	N.A.	2.05	1.98	1.03	2.11
	1.43	1.46	1.65	1.71	1.48	1.48
North Front Range	1.48	N.A.	1.80	1.76	1.60	1.43
	1.76	1.81	1.80	1.75	1.74	1.78
Denver Region	2.64	N.A.	2.61	2.59	2.59	2.65
	1.39	1.51	1.49	1.41	1.49	1.42
North Central	1.62	N.A.	1.67	1.67	1.71	1.50
	1.95	1.96	1.90	1.96	1.89	1.96
North West	2.06	N.A.	1.96	2.00	2.00	2.06
	1.62	1.67	1.58	1.60	1.63	1.62
South West	1.67	N.A.	1.69	1.70	1.73	1.62

\*The first number shown for each region and game category is the multiplier for spending by residents of the region. The second number shown for each region and game category is for spending by persons not residing in the region. These numbers differ because of the adjustment described in the text which reduces the resident spending multipliers relative to the non-resident spending multipliers. The multiplier adjustment is offset, in part, by a tendency for non-residents to distribute their spending among industries which have higher spending multipliers.

SOURCE: The multipliers are constructed from weighted averages of industry estimates obtained from existing input-output studies as documented and explained in the text.

Table 22

Employment Multipliers for Sportsman Spending  
in Colorado by Region and by Game Type  
(resident/non-resident)\*

	<u>Antelope</u>	<u>Bear</u>	<u>Deer</u>	<u>Elk</u>	<u>Fish</u>	<u>Small Game</u>
<u>State Planning</u>						
<u>Region</u>						
Eastern High Plains	57.85 57.77	49.92 N.A.	54.29 61.40	55.86 50.32	59.56 71.10	56.50 57.86
North Front Range	23.31 25.64	23.41 N.A.	34.79 40.60	50.32 36.95	25.64 31.94	25.06 22.68
Denver Region	46.90 71.37	49.51 N.A.	50.47 72.24	46.50 71.32	47.93 74.00	46.92 70.00
North Central	19.39 23.60	22.22 N.A.	21.93 27.53	20.35 25.81	23.22 32.95	21.09 20.31
North West	30.18 42.85	40.71 N.A.	37.69 40.77	40.39 40.58	38.38 43.64	40.42 41.87
South West	12.84 14.97	17.33 N.A.	14.75 17.88	14.12 17.32	15.83 22.97	14.65 12.75

\*The first number shown for each region and game category is the multiplier for employment per million dollars of spending by residents of the region. The second number shown for each region and game category is for employment per million dollars of spending by persons not residing in the region. These numbers differ because of the adjustment described in the text which reduces the resident employment multipliers relative to the non-resident employment multipliers. The multiplier adjustment is offset, in part, by a tendency for non-residents to distribute their spending among industries which have higher employment multipliers.

SOURCE: The employment multipliers are constructed from weighted averages of industry estimates obtained from existing input-output studies as documented and explained in the text.



TABLE 23

REGIONAL DISTRIBUTION OF TOTAL SPORTSMEN EXPENDITURES IN COLORADO BY ACTIVITY PARTICIPATION IN 1981  
(Thousands of Dollars)

Activity	Map Area <sup>b/</sup>													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Antelope	210	744	8,293	246	221	154	128	441	0	0	1,051	687	369	12,544
Bear	0	612	743	9	0	26	9	138	348	40	452	446	199	3,022
Deer	925	3,093	54,867	4,825	169	755	1,647	1,937	16,049	26,952	19,450	10,062	2,943	143,674
Elk	550	2,091	99,771	9,699	110	267	5,981	6,193	10,247	9,560	5,413	15,764	2,819	168,465
Fishing	1,283	41,419	264,513	50,808	1,121	2,840	13,085	18,796	10,772	35,225	38,389	54,347	19,213	551,811
Small Game	10,733	18,699	50,285	584	516	10,602	4,001	239	397	1,008	2,404	3,021	2,671	105,160
TOTAL <sup>a/</sup>	13,701	66,658	478,472	66,171	2,137	14,644	24,851	27,744	37,813	72,785	67,159	84,327	28,214	984,676

<sup>a/</sup>Total may not equal totals in Table 1 because of rounding and exclusion of items not distributed by the survey.

<sup>b/</sup>Map areas are defined in Figure 1 on page 5.

TABLE 24

REGIONAL DISTRIBUTION OF TOTAL RESIDENT EXPENDITURES IN COLORADO BY ACTIVITY PARTICIPATION IN 1981  
(Thousands of Dollars)

Activity	Map Area <sup>b/</sup>													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Antelope	206	741	8,306	242	216	154	123	437	0	0	1,049	689	360	12,523
Bear	0	611	742	8	0	25	8	138	347	40	451	445	197	3,012
Deer	702	2,982	27,062	4,693	31	710	1,277	1,295	3,448	20,582	13,258	6,012	2,734	84,786
Elk	462	3,600	11,711	19,925	122	499	6,598	4,563	5,300	9,523	6,483	21,618	5,420	95,814
Fishing	1,272	41,188	244,788	50,539	1,088	2,573	11,896	15,758	9,282	32,129	37,638	51,974	18,896	519,021
Small Game	10,585	18,374	49,412	573	506	10,417	3,931	235	358	989	2,361	2,967	2,623	103,361
Total <sup>a/</sup>	13,227	67,496	342,021	75,980	1,963	14,368	23,833	22,426	18,765	63,263	61,240	83,705	30,230	818,517

<sup>a/</sup> Table may not equal totals in Table 1 because of rounding and exclusion of items not distributed by the survey.

<sup>b/</sup> Map areas are defined in Figure 1 on page 5.

TABLE 25

REGIONAL DISTRIBUTION OF TOTAL NONRESIDENT SPORTSMEN EXPENDITURES  
BY ACTIVITY PARTICIPATION IN 1981  
(Thousands of Dollars)

Activity	Map Area <sup>c/</sup>													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Antelope	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bear	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Deer	223	111	27,805	132	138	45	370	642	12,601	6,370	6,192	4,050	209	58,888
Elk	324	346	44,714	43	50	29	2,782	3,980	7,678	4,944	2,270	5,288	190	72,638
Fishing	11	231	19,725	269	33	267	1,189	3,038	1,490	3,096	751	2,373	317	32,790
Small Game	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total <sup>b/</sup>	558	688	92,244	444	221	341	4,341	7,660	21,769	14,410	9,213	11,711	716	164,316

<sup>a/</sup>The nonresident spending for this activity participation is very small and the sample cannot be distributed accurately on a regional basis.

<sup>b/</sup>Totals may not equal totals in Table 1 because of rounding and exclusion of items not distributed by the survey.

<sup>c/</sup>Map areas are defined in Figure 1 on page 5.

Thus, it must be assumed that no close substitutes for sportsman activities in the regions where a multiplier impact for resident sportsman spending is calculated. To the extent that other local purchases are substituted for sportsman-related purchases when sportsman activities are restricted, the estimated resident multipliers overstate the negative impact on the economy of the restriction in sportsman activities. Conversely, if resident sportsmen are projected to expand their participation in hunting and fishing in the region, it must be assumed that they reduce their spending on imports to the region or reduce their rate of saving in order to infuse new spending into the local economy. If they simply transfer spending from their previous local purchases in order to spend more on local goods and services related to hunting and fishing then no multiplier impact will exist. Application of a multiplier to resident sportsman spending under the latter conditions is incorrect. Sportsmen activities may have few close substitutes in many regions of Colorado. Furthermore, excellent opportunities for sportsman activities may be obtained in neighboring regions within and outside Colorado. Given these conditions, it may be appropriate to assume that sportsmen would indeed travel to areas outside the region for which the multiplier impact is being measured in order to engage in sportsman activities if they were prevented from hunting or fishing within their region of residence, and would not simply forego sportsman activities and spend an equivalent amount on other local goods and services. Only a few types of consumer spending can be assumed to have no good local substitutes and the widespread application of multipliers to spending by residents is to be avoided.

The spending multipliers shown in Table 21 may be applied to the spending estimates in Tables 24 and 25 to find the total impact of the 1981

sportsman spending. For example, spending in region 12 (north central) by resident fishermen was about 52 million dollars in 1981 (Table 24). From Table 21 the multiplier for spending in the North Central region of Colorado is 1.48. Thus the total direct plus indirect plus induced spending in region 12 due to fishing is  $\$52 \text{ million} \times 1.48 = \$77.0 \text{ million}$ . The direct plus indirect plus induced employment caused by the \$52 million of spending in region 12 by resident fishers will create  $52 \times 25.64 = 1,333$  jobs in planning region 12 (using Table 22). Non-resident fishers spent about \$2.4 million in region 12 as shown by Table 25 and Table 21 shows a spending multiplier of 1.71 for fishers in the North Central region. Thus non-residents create a total of  $\$2.4 \times 1.71 = \$4.10 \text{ million}$  in planning region 12. The employment impact of non-resident fishers in region 12 is estimated to be  $2.4 \times 32.95 = 79$  workers using the employment multiplier for non-resident fishers as shown in Table 22. In like manner, the impact on a given state planning region due to any particular type of sportsman activity or any combination of activities can be calculated. If a combination of activities is desired, one simply calculates the impacts of each activity on the region and accumulates the impacts to find the total effect.

The total effect on spending and employment in Colorado is also of interest to planners and business persons in Colorado. Unfortunately, an accurate and current input-output model for Colorado is not available. To estimate the state multipliers, the 1974 model which has been used here to approximate the Denver region can be used. Multiplier estimates based on the out-of-date 1974 model are likely to be understated and will provide conservative projections of total impacts of sportsman expenditures on the Colorado economy. Tables 26 and 27 present the direct and direct plus

indirect plus induced spending in Colorado due to sportsman activities. For example, in Table 26, total direct purchases by fishers residing in Colorado is \$515 million and total spending in Colorado due to resident fishing activity is over \$895 million. (Again it must be assumed that Colorado fishers will not be willing to substitute other Colorado goods for the fishing activity in order to apply the multiplier effect of 1.74 shown in Table 26.) Table 27 shows similar multiplier effects on each category of sportsman activity by non-residents. The multipliers for non-residents are essentially export multipliers and need no further assumptions to achieve validity. The maximum spending impact of sportsman activities in Colorado would be the sum of the totals on Tables 26 and 27 which amount to \$1.899 billion. If a more conservative approach is used, one can total only the direct spending by residents and the direct plus indirect plus induced spending for non-residents (exports) which amounts to about \$1.285 billion. Thus, total spending impacts of hunting and fishing range from 1.3 to nearly 2 billion dollars depending upon the extent to which sportsmen are unwilling to substitute other local purchases for sportsman activities.

The employment impacts from hunting and fishing in Colorado are shown in Tables 28 and 29. Once again, the application of employment multipliers to resident spending is only valid to the extent to which sportsmen are unwilling to substitute other local purchases for their sportsmen activities. A total employment impact on Colorado of over 52,000 jobs can be attributed to hunting and fishing activities at a maximum. If only the direct employment effects are counted for resident sportsmen (about 28 workers per million dollars of spending) then the total employment due to resident spending will

be reduced from 39,038 to 22,827 workers. The sum of direct employment caused by resident sportsmen and direct plus indirect plus induced employment caused by non-resident sportsmen will sum to 35,857. Thus the range of employment in Colorado due to sportsmen activities will lie between 36,000 and 52,000 depending on the extent to which close substitutes exist for sportsmen activities inside Colorado.

Table 26

Direct, Indirect, and Induced Spending in Colorado  
Due to Hunting and Fishing by Residents

<u>Activity</u>	<u>Direct Spending</u> (thousands of \$)	<u>Multiplier</u>	<u>Total Spending</u> (thousands of \$)
Antelope	12,523	1.76	22,040
Bear	2,724	1.81	4,930
Deer	84,751	1.80	152,552
Elk	97,302	1.75	170,279
Fish	514,574	1.74	895,359
Small Game	<u>103,361*</u>	<u>1.78</u>	<u>183,983</u>
Total	815,235	1.75 **	1,429,143

\*Includes bighorn sheep and mountain lion

\*\*Average multiplier for all activities is  $1,429,143 / 864,336 = 1.75$ .

SOURCE: Direct spending is obtained from Table 1.



Table 27

Direct, Indirect, and Induced Spending in Colorado  
Due to Hunting and Fishing by Non-Residents

<u>Activity</u>	<u>Direct Spending</u> (thousands of \$)	<u>Multiplier</u>	<u>Total Spending</u> (thousands of \$)
Antelope	21	2.64	55
Bear	731	2.60*	1,900
Deer	76,413	2.61	199,438
Elk	77,554	2.59	200,865
Fish	24,253	2.59	62,815
Small Game**	<u>1,838</u>	<u>2.65</u>	<u>4,870</u>
Total	180,810	2.60 <sup>***</sup>	469,943

\*A value of 2.60 is used since survey data are not available to construct a weighted average multiplier.

\*\*Includes mountain lion.

\*\*\*Average multiplier for all activities is  $469,943 / 176,297 = 2.60$ .

SOURCE: Direct spending is obtained from Table 1.

Table 28

Direct, Indirect, and Induced Employment in Colorado  
Due to Hunting and Fishing by Residents  
(full-time-equivalent workers)

<u>Activity</u>	<u>Direct Spending</u>	<u>Multiplier</u>	<u>Total Employment</u>
Antelope	12,523	46.90	587
Bear	2,724	49.51	135
Deer	84,751	50.47	4,277
Elk	97,302	46.50	4,525
Fish	514,574	47.93	24,664
Small Game	<u>103,361</u>	<u>46.92</u>	<u>4,850</u>
Total	815,235		39,038

SOURCE: Direct spending is obtained from Table 1.

Table 29

Direct, Indirect, and Induced Employment in Colorado  
 Due to Hunting and Fishing by Non-Residents  
 (full-time-equivalent workers)

<u>Activity</u>	<u>Direct Spending</u> (thousands of \$)	<u>Multipliers</u>	<u>Total Employment</u>
Antelope	21	71.37	2
Bear	731	72.00*	53
Deer	76,413	72.24	5,520
Elk	77,554	71.32	5,531
Fish	24,253	74.00	1,795
Small Game	<u>1,838</u>	<u>70.00</u>	<u>129</u>
Total	180,810		13,030

\*A value of 72.00 is used since survey data are not available to construct a weighted average multiplier.

SOURCE: Direct spending is obtained from Table 1.

APPENDIX I

Survey Forms for the 1981 Colorado Sportsman Survey

## START OF QUESTIONNAIRE

- Q-1 What is your total personal cost for fuel and related travel costs per trip to travel to and from the fishing site which you visited most often in 1980?  
\$ \_\_\_\_\_ PER TRIP
- Q-2 What type of vehicle or transport did you use to travel from your residence to the fishing site(s)? (please circle main vehicle type)
1. ECONOMY CAR OR TRUCK
  2. 4-WHEEL DRIVE FULL SIZE
  3. ECONOMY 4-WHEEL DRIVE
  4. FULL-SIZE SEDAN OR PICKUP
  5. BUS
  6. TRAIN
  7. COMMERCIAL PLANE
  8. PRIVATE OR RENTAL PLANE
  9. MOTORCYCLE
  10. OTHER (please specify) \_\_\_\_\_
- Q-3 What was the miles per gallon achieved by the vehicle most used in your fishing trips? (excluding bus, train or commercial plane)  
MILES PER GALLON \_\_\_\_\_
- Q-4 We are concerned that rising costs of fuel and related items may change your fishing activities in Colorado in the future. In Question 1 you indicated how much it cost you, personally, per trip to travel to and from your Colorado fishing site. (site visited most often in 1980)
- Please indicate how high this cost figure would have to be to cause you to stop going to the fishing site which you visited in 1980.  
COST TO STOP VISITING 1980 SITE \$ \_\_\_\_\_ PER TRIP
- Q-5 Please show the purchase price of multipurpose items purchased in 1980, the percent share of total use of the item for fishing, and the county code for the place of purchase. If the item was purchased outside Colorado, please write OUTSIDE. A map on the back of the cover letter shows the county codes for Colorado.

<u>Multipurpose Items Purchased in 1980 Used for Fishing</u>	<u>Purchase Price</u>	<u>% Used for Fishing</u>	<u>County Code Number (See Map)</u>
Family Vehicle (car or truck)	_____	_____	_____
Recreational Vehicle	_____	_____	_____
Cabin	_____	_____	_____
Land	_____	_____	_____
Trailer (any type)	_____	_____	_____
Camper for Pickup	_____	_____	_____
Boats and Boat Equipment	_____	_____	_____
Fishing Poles and Reels	_____	_____	_____
Related Equipment (bait, etc.)	_____	_____	_____
Horses	_____	_____	_____
Miscellaneous (please list below)	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Q-6 PERSONAL SPENDING FOR FISHING IN 1980 (exclude purchases shown in Question 5)  
 Please show your personal expenditures for Colorado fishing in the first column. Use the remaining columns to show the Colorado counties where the purchases were made. The last column is for purchases outside Colorado. Please show only your share of costs if you fished in a group.

PURCHASE CATEGORY	DOLLARS IN COLORADO	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	NON-COLO. PURCHASE
Transportation	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Communication	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Auto Dealers	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Gas Stations	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Eating Places	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Hotel-Motel	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Campgrounds	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Retail Stores	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Entertainment	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Health Services	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Other Services	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
City, County Gov.	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
State Gov.	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Fed. Gov.	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
Individuals	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$
All Other	\$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	ID \$	\$

EXPLANATION OF PURCHASE CATEGORIES

- Transportation - trucking, bus service, taxi, train, airplane, non-government shipping services, storage services
- Communication - telephone, telegraph
- Auto Dealers - auto sales, auto rental, auto repair, parts, fuel
- Gas Stations - fuel, auto service or repair, parts, rentals, etc.
- Eating Places - restaurants, fast food places, delivered prepared food, taverns, bars
- Hotel-Motel - hotels, motels, rooming houses, other commercial rooms for rent
- Campgrounds - commercial campgrounds, trailer parks
- Retail Stores - groceries, candy stores, bakeries, variety, hardware, furniture, fuel, gifts, sporting goods, catalog stores, general merchandise, jewelry, souvenir shops, leather and apparel stores, auto parts not purchased from gas stations or auto dealers
- Entertainment - movies, ski tows, tours, opera, theatres, golf courses, sports clubs, museums, photography studios
- Health Services - doctors, public and private hospitals, clinics, dentists, other medical services
- Other Services - laundry, non-auto leasing, non-auto repairs, clubs, horses, meat processing, taxidermy
- City and County Government - fees, fines, permits, books, maps, taxes, licenses
- State Government - fees, fines, permits, books, maps, taxes, licenses
- Federal Government - fees, fines, permits, books, maps, taxes, licenses
- Individuals - access across private land, casual labor, baby-sitting, private guide service
- All Other Industry - purchases direct from manufacturer or wholesaler, banking charges, real estate broker fees

Q-7 We are interested in knowing about each fishing trip you took in 1980, both inside and outside Colorado. Please list the COLORADO COUNTY IDENTIFICATION NUMBER or name of state and nearest city or county if the trip was outside Colorado.

Information on Each Fishing Trip During 1980 Season

TRIP NUMBER	Fishing Site COLORADO COUNTY IDENTIFICATION NUMBER or State and nearest city or county if non-Colo.	ROUND TRIP DISTANCE	NUMBER OF DAYS FISHED	NUMBER IN PARTY
1				
2				
3				
4				
5				
6				

Q-8 We are interested in your previous fishing activity both inside and outside Colorado. For each fishing trip in 1979 (or most recent year), please list the COLORADO COUNTY IDENTIFICATION NUMBER. Please list the name of the state and nearest city or county if the trip was outside Colorado.

Information on Each Fishing Trip During 1979 Season (or most recent year)

TRIP NUMBER	Fishing Site COLORADO COUNTY IDENTIFICATION NUMBER or State and nearest city or county if non-Colo.	ROUND TRIP DISTANCE	NUMBER OF DAYS FISHED	NUMBER IN PARTY
1				
2				
3				
4				
5				
6				

- Q-9 Did you tow a trailer, or a vehicle or use a camper on your fishing trips?  
If so, please indicate below. (please circle all which apply)
1. PICKUP WITH CAMPER
  2. PICKUP WITH SHELL
  3. ANOTHER VEHICLE (such as 4-WD)
  4. CAMP TRAILER
  5. LARGE TRAVEL TRAILER
  6. MOTORCYCLE, SNOWMOBILE OR HORSE TRAILER
- Q-10 If you own property in Colorado (land, cabin, etc.) which is used for fishing, please complete the following:  
Location of Property, COUNTY CODE NUMBER \_\_\_\_\_  
Cabin Size in Square Feet Floor Space \_\_\_\_\_ SQ. FT.  
Amount of Land in Acres \_\_\_\_\_ ACRES
- Q-11 If you could sell your fishing right for fishing in the site which you visited most in 1980, what would you charge per year?  
\$ \_\_\_\_\_ PER YEAR
- Q-12 If the site where you fished most in 1980 was unavailable for fishing, how many additional round trip miles would you be willing to travel to obtain a similar quality of fishing experience?  
EXTRA ROUND TRIP MILES \_\_\_\_\_
- Q-13 If you knew that your chance of catching fish could be increased by 10 percent by traveling to a more distant site, how many additional round-trip miles would you be willing to travel?  
EXTRA ROUND TRIP MILES \_\_\_\_\_
- Q-14 Did you fish primarily on: (circle one)
1. FEDERAL LAND
  2. STATE LAND
  3. PRIVATELY OWNED LAND
  4. DON'T KNOW
  5. OTHER (please explain) \_\_\_\_\_
- Q-15 If you fished on federal land, was it: (circle one)
1. FOREST SERVICE
  2. BUREAU OF LAND MANAGEMENT
- Q-16 Please indicate your feeling about crowding in the area where you fished in 1980. (circle one)
1. FISHER CROWDING WAS NOT A PROBLEM
  2. AREA WAS TOO CROWDED, BUT WILL STILL FISH THERE
  3. AREA TOO CROWDED, WILL TRY A DIFFERENT AREA IN COLORADO
  4. AREA TOO CROWDED, WILL NOT FISH IN COLORADO NEXT YEAR BECAUSE OF CROWDING
- Q-17 How many other fishing parties did you see in your fishing area per day?  
NUMBER OF OTHER PARTIES SEEN \_\_\_\_\_ PER DAY
- Q-18 Please note the following reasons why you fish. (circle a number for each reason - 10 is the highest rating)
- |   |   |   |   |   |   |   |   |   |    |                         |
|---|---|---|---|---|---|---|---|---|----|-------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | TROPHY                  |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | FOOD                    |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | SPORT                   |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | SIGHTING WILD ANIMALS   |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | OTHER (please describe) |
-



- Q-19 Please indicate your total number of years of fishing experience for all kinds of fish both inside and outside of Colorado.  
FISHING EXPERIENCE \_\_\_\_\_ YEARS
- Q-20 How many persons are there living with you in your household (including yourself)?  
NUMBER OF PERSONS \_\_\_\_\_
- Q-21 How many persons living with you in your household (including yourself) like to fish?  
NUMBER OF PERSONS \_\_\_\_\_
- Q-22 What was your age the first time you ever went on a fishing trip?  
AGE \_\_\_\_\_ YEARS
- Q-23 What is your age now?  
AGE \_\_\_\_\_ YEARS
- Q-24 How many days did you spend in all outdoor sports and recreation both inside and outside Colorado in 1980?  
NUMBER OF DAYS \_\_\_\_\_
- Q-25 Are you presently: (please circle number which applies most)
1. AN EMPLOYEE
  2. SELF EMPLOYED
  3. RETIRED
  4. UNEMPLOYED
  5. FULL-TIME HOMEMAKER
  6. A STUDENT
  7. OTHER (please specify) \_\_\_\_\_
- Q-26 If you are employed, which of the following most closely describes your occupation? (circle one)
1. FARM WORKER
  2. SERVICE WORKER
  3. GENERAL LABOR
  4. OPERATIVE
  5. CRAFTSMAN
  6. CLERICAL
  7. SALESWORKER
  8. MANAGER-ADMINISTRATOR
  9. PROFESSIONAL-TECHNICAL
- Q-27 Please enter your U. S. Post Office ZIP Code for the place where you lived during fishing season in 1980.  
ZIP CODE OF RESIDENCE \_\_\_\_\_
- Q-28 How would you classify your spending for fishing in comparison to your household income? (please circle number)
1. A VERY SMALL PART
  2. A SMALL PART
  3. A SIGNIFICANT PART
  4. AN IMPORTANT PART
  5. A VERY IMPORTANT PART

Q-29 What was your household income (family) from all sources, before taxes, in 1980?

(please circle number)

- |                      |                                      |
|----------------------|--------------------------------------|
| 1. LESS THAN \$2,000 | 16. 30,000 to 31,999                 |
| 2. 2,000 to 3,999    | 17. 32,000 to 33,999                 |
| 3. 4,000 to 5,999    | 18. 34,000 to 35,999                 |
| 4. 6,000 to 7,999    | 19. 36,000 to 37,999                 |
| 5. 8,000 to 9,999    | 20. 38,000 to 39,999                 |
| 6. 10,000 to 11,999  | 21. 40,000 to 41,999                 |
| 7. 12,000 to 13,999  | 22. 42,000 to 43,999                 |
| 8. 14,000 to 15,999  | 23. 44,000 to 45,999                 |
| 9. 16,000 to 17,999  | 24. 46,000 to 47,999                 |
| 10. 18,000 to 19,999 | 25. 48,000 to 49,999                 |
| 11. 20,000 to 21,999 | 26. 50,000 to 51,999                 |
| 12. 22,000 to 23,999 | 27. 52,000 to 53,999                 |
| 13. 24,000 to 25,999 | 28. 54,000 to 55,999                 |
| 14. 26,000 to 27,999 | 29. 56,000 to 57,999                 |
| 15. 28,000 to 29,999 | 30. 58,000 to 59,999                 |
|                      | 31. If above 59,999 (please specify) |
-

START OF QUESTIONNAIRE

Q-1 What is your total personal cost for fuel and related travel costs per trip to travel to and from the deer hunting site which you visited most often in 1980?

\$ \_\_\_\_\_ PER TRIP

Q-2 What type of vehicle or transport did you use to travel from your residence to the deer hunting site(s)? (please circle main vehicle type)

1. ECONOMY CAR OR TRUCK
2. 4-WHEEL DRIVE FULL SIZE
3. ECONOMY 4-WHEEL DRIVE
4. FULL-SIZE SEDAN OR PICKUP
5. BUS
6. TRAIN
7. COMMERCIAL PLANE
8. PRIVATE OR RENTAL PLANE
9. MOTORCYCLE
10. OTHER (please specify \_\_\_\_\_)

Q-3 What was the miles per gallon achieved by the vehicle most used in your deer hunting trips? (excluding bus, train or commercial plane)

MILES PER GALLON \_\_\_\_\_

Q-4 We are concerned that rising costs of fuel and related items may change your hunting activities in Colorado in the future. In Question 1 you indicated how much it cost you, personally, per trip to travel to and from your Colorado hunting site. (site visited most often in 1980)

Please indicate how high this cost figure would have to be to cause you to stop going to the hunting site which you visited in 1980.

COST TO STOP VISITING 1980 SITE \$ \_\_\_\_\_ PER TRIP

Q-5 Please show the purchase price of multipurpose items purchased in 1980, the percent share of total use of the item for deer hunting, and the county code for the place of purchase. If the item was purchased outside Colorado, please write OUTSIDE. A map on the back of the cover letter shows the county codes for Colorado.

<u>Multipurpose Items Purchased in 1980 Used for Deer Hunting</u>	<u>Purchase Price</u>	<u>% Used for Deer Hunting</u>	<u>County Code Number (See Map)</u>
Family Vehicle (car or truck)	_____	_____	_____
Recreational Vehicle	_____	_____	_____
Cabin	_____	_____	_____
Land	_____	_____	_____
Trailer (any type)	_____	_____	_____
Camper for Pickup	_____	_____	_____
Camping Equipment	_____	_____	_____
Boats and Boat Equipment	_____	_____	_____
Firearms or Archery Equipment	_____	_____	_____
Related Equipment (ammunition, etc.)	_____	_____	_____
Horses or Dogs	_____	_____	_____
Miscellaneous (Please list below)	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Q-6 PERSONAL SPENDING FOR DEER HUNTING IN 1980 (exclude purchases shown in Question 5)

Please show your personal expenditures for Colorado deer hunting in the first column. Use the remaining columns to show the Colorado counties where the purchases were made. The last column is for purchases outside Colorado. Please show only your share of costs if you hunted with a group.

PURCHASE CATEGORY	DOLLARS IN COLORADO	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	COUNTY ID, DOLLARS	NON-COLO. PURCHASE		
Transportation	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Communication	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Auto Dealers	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Gas Stations	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Eating Places	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Hotel-Motel	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Campgrounds	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Retail Stores	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Entertainment	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Health Services	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Other Services	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
City, County Gov.	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
State Gov.	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Fed. Gov.	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
Individuals	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$
All Other	\$	ID	\$	ID	\$	ID	\$	ID	\$	ID	\$	\$

EXPLANATION OF PURCHASE CATEGORIES

- Transportation - trucking, bus service, taxi, train, airplane, non-government shipping services, storage services
- Communication - telephone, telegraph
- Auto Dealers - auto sales, auto rental, auto repair, parts, fuel
- Gas Stations - fuel, auto service or repair, parts, rentals, etc.
- Eating Places - restaurants, fast food places, delivered prepared food, taverns, bars
- Hotel-Motel - hotels, motels, rooming houses, other commercial rooms for rent
- Campgrounds - commercial campgrounds, trailer parks
- Retail Stores - groceries, candy stores, bakeries, variety, hardware, furniture, fuel, gifts, sporting goods, catalog stores, general merchandise, jewelry, souvenir shops, leather and apparel stores, auto parts not purchased from gas stations or auto dealers
- Entertainment - movies, ski tows, tours, opera, theatres, golf courses, sports clubs, museums, photography studios
- Health Services - doctors, public and private hospitals, clinics, dentists, other medical services
- Other Services - laundry, non-auto leasing, non-auto repairs, clubs, horses, meat processing, taxidermy
- City and County Government - fees, fines, permits, books, maps, taxes, licenses
- State Government - fees, fines, permits, books, maps, taxes, licenses
- Federal Government - fees, fines, permits, books, maps, taxes, licenses
- Individuals - access across private land, casual labor, baby-sitting, private guide service
- All Other Industry - purchases direct from manufacturer or wholesaler, banking charges, real estate broker fees

Q-7 We are interested in knowing about each deer hunting trip you took in 1980, both inside and outside Colorado. Please list the COLORADO COUNTY IDENTIFICATION NUMBER or name of state and nearest city or county if the trip was outside Colorado.

Information on Each Deer Hunting Trip During 1980 Season

TRIP NUMBER	Hunting Site COLORADO COUNTY IDENTIFICATION NUMBER or State and nearest city or county if non-Colo.	ROUND TRIP DISTANCE	NUMBER OF DAYS HUNTED	NUMBER IN PARTY
1				
2				
3				
4				
5				
6				

Q-8 We are interested in your previous deer hunting activity both inside and outside Colorado. For each deer hunting trip in 1979 (or most recent year), please list the COLORADO COUNTY IDENTIFICATION NUMBER. Please list the name of state and nearest city or county if the trip was outside Colorado.

Information on Each Deer Hunting Trip During 1979 Season (or most recent year)

TRIP NUMBER	Hunting Site COLORADO COUNTY IDENTIFICATION NUMBER or State and nearest city or county if non-Colo.	ROUND TRIP DISTANCE	NUMBER OF DAYS HUNTED	NUMBER IN PARTY
1				
2				
3				
4				
5				
6				

- Q-9 Did you tow a trailer, or a vehicle or use a camper on your hunting trips?  
If so, please indicate below. (please circle all which apply)
1. PICKUP WITH CAMPER
  2. PICKUP WITH SHELL
  3. ANOTHER VEHICLE (such as 4-WD)
  4. CAMP TRAILER
  5. LARGE TRAVEL TRAILER
  6. MOTORCYCLE, SNOWMOBILE OR HORSE TRAILER
- Q-10 If you own property in Colorado (land, cabin, etc.) which is used for deer hunting, please complete the following:  
Location of Property, COUNTY CODE NUMBER \_\_\_\_\_  
Cabin Size in Square Feet Floor Space \_\_\_\_\_ SQ. FT.  
Amount of Land in Acres \_\_\_\_\_ ACRES
- Q-11 If you could sell your hunting right for hunting deer in the site which you visited in 1980, what would you charge per year?  
\$ \_\_\_\_\_ PER YEAR
- Q-12 If you killed a deer in 1980, please answer the following question.  
If you hadn't killed a deer in 1980, how many hunting trips would you have taken assuming that you never killed a deer?  
HUNTING TRIPS \_\_\_\_\_
- Q-13 The deer hunting season was limited to a few days in 1980. How many more deer hunting trips would you have taken in 1980 if the season had not been limited to a certain number of days?  
HUNTING TRIPS \_\_\_\_\_
- Q-14 If the site where you hunted deer in 1980 was unavailable for hunting, how many additional round trip miles would you be willing to travel to obtain a similar quality of hunting experience?  
EXTRA ROUND TRIP MILES \_\_\_\_\_
- Q-15 If you knew that your chance of shooting a deer could be increased by 10 percent by traveling to a more distant site, how many additional round-trip miles would you be willing to travel?  
EXTRA ROUND TRIP MILES \_\_\_\_\_
- Q-16 How many opportunities to shoot a deer in Colorado did you have in 1980?  
SHOOTING OPPORTUNITIES \_\_\_\_\_
- Q-17 What is your usual number of deer shooting opportunities?  
SHOOTING OPPORTUNITIES \_\_\_\_\_
- Q-18 Did you hunt primarily on: (circle one)
1. FEDERAL LAND
  2. STATE LAND
  3. PRIVATELY OWNED LAND
  4. DON'T KNOW
  5. OTHER ( please explain) \_\_\_\_\_
- Q-19 If you hunted on federal land, was it: (circle one)
1. FOREST SERVICE
  2. BUREAU OF LAND MANAGEMENT

- Q-20 Please indicate your feeling about hunter crowding in the area where you hunted deer in 1980. (circle one)
1. HUNTER CROWDING WAS NOT A PROBLEM
  2. AREA WAS TOO CROWDED, BUT WILL STILL HUNT THERE
  3. AREA TOO CROWDED, WILL TRY A DIFFERENT AREA IN COLORADO
  4. AREA TOO CROWDED, WILL NOT HUNT IN COLORADO NEXT YEAR BECAUSE OF CROWDING
- Q-21 Did the presence of livestock, fences, or a shortage of animal feed due to livestock grazing reduce your deer hunting opportunities in the region where you hunted in 1980? (please circle)
1. YES, VERY MUCH
  2. SOME
  3. SLIGHTLY
  4. NOT AT ALL
- Q-22 How many other hunting parties did you see in your hunting area per day?  
NUMBER OF OTHER PARTIES SEEN \_\_\_\_\_ PER DAY
- Q-23 How many shots did you hear fired per day while deer hunting? (exclude your own)  
SHOTS HEARD \_\_\_\_\_ PER DAY
- Q-24 Please note the following reasons why you hunt deer. (circle a number for each reason - 10 is the highest rating)
- |   |   |   |   |   |   |   |   |   |    |                         |
|---|---|---|---|---|---|---|---|---|----|-------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | TROPHY                  |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | FOOD                    |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | SPORT                   |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | SIGHTING WILD ANIMALS   |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | OTHER (please describe) |
- 
- Q-25 Did you kill a deer in Colorado this season (1980). (circle one)
1. YES, I KILLED A DEER IN COLORADO IN 1980
  2. NO, I DIDN'T KILL A DEER IN COLORADO
- Q-26 If you did kill a deer in Colorado in 1980, please indicate the place where you killed it using the COLORADO COUNTY IDENTIFICATION CODE (see map).  
COUNTY CODE WHERE KILLED \_\_\_\_\_
- Q-27 Please indicate the number of deer which you have killed prior to 1980.  
(both inside and outside Colorado)  
DEER KILLED PRIOR TO 1980 \_\_\_\_\_
- Q-28 Please indicate your total number of years of hunting experience for all kinds of game both inside and outside of Colorado.  
HUNTING EXPERIENCE \_\_\_\_\_ YEARS
- Q-29 Did you kill a deer outside Colorado in 1980. (circle one)
1. YES, I KILLED A DEER OUTSIDE COLORADO
  2. NO, I DIDN'T KILL A DEER OUTSIDE COLORADO
- Q-30 How many persons are there living with you in your household (including yourself)?  
NUMBER OF PERSONS \_\_\_\_\_
- Q-31 How many persons living with you in your household (including yourself) like to hunt?  
NUMBER OF PERSONS \_\_\_\_\_

- Q-32 What was your age the first time you ever went on a hunting trip:  
AGE \_\_\_\_\_ YEARS
- Q-33 What is your age now?  
AGE \_\_\_\_\_ YEARS
- Q-34 How many days did you spend in all outdoor sports and recreation both inside and outside Colorado in 1980?  
NUMBER OF DAYS \_\_\_\_\_
- Q-35 Are you presently: (please circle number which applies most)
1. AN EMPLOYEE
  2. SELF EMPLOYED
  3. RETIRED
  4. UNEMPLOYED
  5. FULL-TIME HOMEMAKER
  6. A STUDENT
  7. OTHER \_\_\_\_\_
- Q-36 If you are employed, which of the following most closely describes your occupation? (circle one)
1. FARM WORKER
  2. SERVICE WORKER
  3. GENERAL LABOR
  4. OPERATIVE
  5. CRAFTSMAN
  6. CLERICAL
  7. SALESWORKER
  8. MANAGER-ADMINISTRATOR
  9. PROFESSIONAL-TECHNICAL
- Q-37 Please enter your U. S. Post Office ZIP code for the place where you lived during deer hunting season in 1980.  
ZIP CODE OF RESIDENCE \_\_\_\_\_
- Q-38 How would you classify your spending for deer hunting in comparison to your household income? (please circle number)
1. A VERY SMALL PART
  2. A SMALL PART
  3. A SIGNIFICANT PART
  4. AN IMPORTANT PART
  5. A VERY IMPORTANT PART
- Q-39 What was your household income (family) from all sources, before taxes, in 1980? (please circle number)
- |                      |                                      |
|----------------------|--------------------------------------|
| 1. LESS THAN \$2,000 | 16. 30,000 to 31,999                 |
| 2. 2,000 to 3,999    | 17. 32,000 to 33,999                 |
| 3. 4,000 to 5,999    | 18. 34,000 to 35,999                 |
| 4. 6,000 to 7,999    | 19. 36,000 to 37,999                 |
| 5. 8,000 to 9,999    | 20. 38,000 to 39,999                 |
| 6. 10,000 to 11,999  | 21. 40,000 to 41,999                 |
| 7. 12,000 to 13,999  | 22. 42,000 to 43,999                 |
| 8. 14,000 to 15,999  | 23. 44,000 to 45,999                 |
| 9. 16,000 to 17,999  | 24. 46,000 to 47,999                 |
| 10. 18,000 to 19,999 | 25. 48,000 to 49,999                 |
| 11. 20,000 to 21,999 | 26. 50,000 to 51,999                 |
| 12. 22,000 to 23,999 | 27. 52,000 to 53,999                 |
| 13. 24,000 to 25,999 | 28. 54,000 to 55,999                 |
| 14. 26,000 to 27,999 | 29. 56,000 to 57,999                 |
| 15. 28,000 to 29,999 | 30. 58,000 to 59,999                 |
|                      | 31. If above 59,999 (please specify) |

END OF QUESTIONNAIRE



## APPENDIX II

## FURTHER EXPLANATION OF THE ECONOMIC I-O MODEL

Introduction

Modern day input-output analysis is the culmination of the work begun by Francois Quesnay in the Tableau Economique published in 1958 and later extensions by Leon Walras (Elements d' e'conomique politique pure, 1874), Gustav Cassel and Vilfredo Pareto. The culmination is found in the statement of an interdependent production model developed in the 1930s by W. W. Leontief of Harvard.<sup>1,2/</sup>

Advantages of an Input-Output Model

Economists and regional scientists generally agree that the interindustry or I-O Model most effectively describes and analyzes a region's economy. This technique is unique because it simultaneously accounts for all the components of the regional economy so that growth in each sector is consistent with that in all other sectors. It is practical since it can help analyze almost every facet of the regional economy; thus, a new model isn't needed each time a new phenomenon is studied.

I-O models are flexible and versatile. Although a linear model may seem overly simplistic, in fact, the limits of its application are set mainly by a researcher's inventiveness and by data availability.

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<sup>1/</sup>Leontief, "Quantitative Input-Output Relations in the Economic System of the United States," The Review of Economics and Statistics, XVIII, August 1936.

<sup>2/</sup>Miernyk, The Elements of Input-Output Analysis, New York: Random House, Inc., 1965.

Computerizing the I-0 Model allows analysts to study alternative scenarios quickly in response to fast-changing resource development. The I-0 Model clearly delineates each component that is basic in each industry. By disaggregating each industry's purchases and sales, the I-0 Model allows a significant degree of accuracy in estimating multiplier effects.

The method also can supply predictions for each industry and local government. It provides useful information for measuring changes in local services, both public and private, and the accompanying public finance requirements and fiscal problems. In particular, the I-0 Model's industry-by-industry forecasts cover numerous variables closely associated with industry output, e.g. employment, energy use, water use, population, pollution, etc.

#### The Basic Model

The key to Leontief's analytical system is the construction of the input-output, or transactions, table which shows the flow of commodities from each of a number of producing sectors for intermediate and final consumption. From this basic description of the flows among economic sectors are developed two other critical tables: the table of direct factor requirements and the table of direct and indirect requirements. Each of these is discussed below.

The transactions table. Table 1 depicts a highly simplified, aggregated version of a hypothetical transactions table for a regional economy. The basic data are described in three major portions of the table termed the processing sector, the final demands sector, and the payments sector.

TABLE 1: HYPOTHETICAL TRANSACTIONS TABLE

		Purchasing Sector			Final Demand	Total Output
		$X_1$	$X_2$	$X_3$		
Producing Sector	$X_1$	1.00	2.25	.20	1.55	5.00
	$X_2$	2.00	6.00	1.00	16.00	25.00
	$X_3$	.20	3.00	1.80	15.00	20.00
Payments Sector		1.80	13.75	17.00	3.00	35.55
Total Outlays		5.00	25.00	20.00	35.55	85.55

In Table 1, the Sectors denoted  $X_1$ ,  $X_2$ , and  $X_3$  are the producing sectors of the processing sector of the economy (the portion of the table bounded by double lines). Each of these sectors may deliver its output for intermediate use, i.e., a sale from  $X_1$  at the left of the table to  $X_1$ ,  $X_2$ , or  $X_3$  at the column heads, and also to the final demand or final consumption sectors. Thus, in our example,  $X_1$  delivers or sells \$1.00 of its own output to itself, \$2.25 worth of output to sector  $X_2$ , and \$.20 worth of output to sector  $X_3$ . Sector  $X_1$  also sells \$1.55 worth of output to final consumption.

Any column within the transactions table describes the purchases made by each sector at the column head from each of the producing sectors as well as the purchase of primary inputs. Thus, sector  $X_2$  purchases \$2.25 worth of output from  $X_1$ , \$6.00 worth of output from itself, \$3.00 worth of output from  $X_3$ , and \$13.75 worth of primary inputs. The system is basically double entry accounting in which every sale constitutes a purchase, and we purposely double count. The entries in the column headed "total output" are the sum of the corresponding row entries.

Similarly, the entries in the total outlays row are the sum of the corresponding column entries. Since each sale and each purchase are accounted for, the column and row totals for sectors  $X_1$ ,  $X_2$ , and  $X_3$  are equal.<sup>3/</sup>

We simply have restricted our example to an aggregate final demand and payments sector. The final demand sector would generally consist of sales to households, sales to governments, sales to export markets, inventory change, and investment. The payments sector would consist of payments to households in the form of wages and salaries, payments of taxes to governments, depreciation, rents, interest, dividends, and payments for imports. The extent of disaggregation in these sectors and in the processing sector will depend largely upon the purposes of the study, the availability of data, and the time and money available to the researcher.

Once the basic economic data presented in the transaction table have been collected, the second table of the model, the direct or technical coefficients table, can be computed.

The technical coefficients table. Table 2 is the table of direct coefficients for our hypothetical example. The entries in this table are to be interpreted as the requirements from each of the producing sectors at the left of the table in order for each sector at the top to produce one dollar's worth of output.

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<sup>3/</sup>Equality between column and row totals for disaggregated final demand and payments sectors is not required. However, in aggregate the equality between the sum of payments and the sum of final demands must hold

TABLE 2: DIRECT COEFFICIENTS PER DOLLAR OUTPUT

Producing Sector		Purchasing Sector		
		$X_1$	$X_2$	$X_3$
		$X_1$	.20	.09
$X_2$	.40	.24	.05	
$X_3$	.04	.12	.09	

The entries in this table are computed by dividing each column entry in the processing sector of the transactions table, Table 1, by the respective column total. Thus, for each dollar of output produced by  $X_1$ ,  $X_1$  requires  $\$1.00/\$5.00 = \$.20$  from itself,  $\$2.00/\$5.00 = \$.40$  from  $X_2$ , and  $\$.20/\$5.00 = \$.04$  from  $X_3$ . Each of the other columns has a like interpretation.

The information on final demands and total outputs obtained from Table 1 can be combined with the information contained in Table 2 to obtain the system of equations expressed in equation (1) below:

$$1. \quad X_1 = .20 X_1 + .09 X_2 + .01 X_3 + Y_1$$

$$X_2 = .40 X_1 + .24 X_2 + .05 X_3 + Y_2$$

$$X_3 = .04 X_1 + .12 X_2 + .09 X_3 + Y_3$$

where  $X_1$ ,  $X_2$ , and  $X_3$  are the total outputs of the three sectors,  $Y_1$ ,  $Y_2$ , and  $Y_3$  are the respective deliveries to final demand by the three sectors. The coefficients are the entries in that direct coefficients table.

In matrix notation our system becomes that shown in equation (2):

$$2. \quad \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} .20 & .09 & .01 \\ .40 & .24 & .05 \\ .04 & .12 & .09 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \end{bmatrix}$$

or more simply stated as in (3):

$$3. \quad \underline{X} = A\underline{X} + \underline{Y}$$

where  $\underline{X}$  is the vector of total outputs,  $A$  is the matrix of direct coefficients, and  $\underline{Y}$  is the vector of final demands.

Proceeding to a solution for  $Y$  from (2) above we may write:

$$4. \quad \begin{aligned} X_1 - .20 X_1 - .09 X_2 - .01 X_3 &= Y_1 \\ -.40 X_1 + X_2 - .24 X_2 - .05 X_3 &= Y_2 \\ -.04 X_1 - .12 X_2 + X_3 - .09 X_3 &= Y_3 \end{aligned}$$

or:

$$5. \quad \begin{aligned} (1 - .20) X_1 - .09 X_2 - .01 X_3 &= Y_1 \\ -.40 X_1 + (1 - .24) X_2 - .05 X_3 &= Y_2 \\ -.04 X_1 - .12 X_2 + (1 - .09) X_3 &= Y_3 \end{aligned}$$

Again, writing the above system in matrix form we have equation (6):

$$6. \quad \begin{bmatrix} (1 - .20 - .09 - .01) \\ -.40 (1 - .24) - .05 \\ .04 - .12 (1 - .09) \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \end{bmatrix}$$

The matrix on the left of equation (6) is the Leontief matrix as shown in equations (7) and (8) below:

$$7. \quad \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} .20 & .09 & .01 \\ .40 & .24 & .05 \\ .04 & .12 & .09 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \end{bmatrix}$$

which in matrix notation reduces to:

$$8. \quad (I - A) \underline{X} = \underline{Y}$$

where  $I$  is the identity matrix,  $(I - A)$  is the Leontief matrix and  $A$ ,  $\underline{X}$ , and  $\underline{Y}$  are as defined previously.

Direct Plus Indirect Requirements: Business Multipliers. We now have the ingredients necessary to solve the Leontief system in terms of quantities of outputs required to sustain final demand. This is done through the use of matrix inversion techniques which need not be dealt with here.<sup>4/</sup> The mechanical process followed is, first, to find the inverse of the Leontief or (I-A) matrix. This matrix, identified as  $(I-A)^{-1}$ , is defined as a matrix C which, in our example, is given in Table 3 below.

TABLE 3: HYPOTHETICAL DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND

		$X_1$	$X_2$	$X_3$
	$X_1$	1.3319	.1614	.0235
	$X_2$	.7110	1.4135	.0855
	$X_3$	.1523	.1935	1.1112
Business Multipliers		2.1952	1.7684	1.2202

Each element in Table 3 represents the total direct and indirect requirements from each sector at the left of the table which are necessary in order for the sector at the top of the table to deliver an increase of one dollar of output to final demand. Thus, if there is an increase of one dollar in the final demand for the output of sector  $X_1$ , there will be a total direct and indirect production increase of \$1.33 in sector  $X_1$ , a direct and indirect impact of \$.71 in sector  $X_2$ , and a direct and indirect impact of \$.15 for the output of sector  $X_3$ . Using the information contained in Table 3 with the previous information, we premultiply both sides of (8) above by the Leontief inverse as in (9) below.

<sup>4/</sup> See Miernyk, op.cit., Chapter 7.

$$9. (I-A)^{-1} (I-A) \underline{\bar{X}} = (I-A)^{-1} \underline{\bar{Y}}$$

which reduces to:

$$10. \underline{\bar{X}} = (I-A)^{-1} \underline{\bar{Y}}$$

or:

$$\begin{aligned} 11. X_1 &= 1.3319 Y_1 + .1614 + .0235 Y_3 \\ X_2 &= .7710 Y_1 + 1.4135 Y_2 + .0855 Y_3 \\ X_3 &= .1523 Y_1 + .1935 Y_2 + 1.1112 Y_3 \end{aligned}$$

Table 3 illustrates the concept of economic interdependence referred to earlier. An alteration in the quantities of any good demanded may be expected to stimulate production in other sectors, which, in turn, stimulates still more production elsewhere in the economy. Table 3 shows the magnitudes of all direct and indirect effects after the initial stimulation of demand has worked itself out. The column sums of Table 3 are termed "business multipliers."

If, for example, Column two represented the ranch livestock industry in a regional economy, then the column two total would be the business multiplier for ranch-livestock. This multiplier would show that for each dollar of added sales by ranch livestock to final demand (exports from the region or sales to government) a total of \$1.76 in additional spending would occur within the regional economy.

Employment Multipliers. Employment multipliers are closely related to business multipliers. If the direct labor input requirement, per dollar of sales, are measured for each industry, it is simply a matter of multiplication



to find the employment effects of a change in output for each sector. Suppose that the direct labor inputs per dollar of sales are .00006 for sector 1, .00002 for sector 2, and .00001 for sector 3.

For each added \$100,000 of sales to final demand by livestock, Table 3 shows that sales by sector 1 rise by  $(100,000)(.1614) = \$16,140$ ; sales by sector 2 rise by  $(100,000)(1.4135) = \$141,350$  (which includes \$100,000 sold to final demand); and sector 3 sells an added \$19,350.

Employment will rise by  $(.00006)(16,140) + (.00002)(141,350) + (.00001)(19,350) = 4$  workers.

#### Survey vs. Non-Survey Models

Attempts often are made to shortcut the survey process required to develop the input-output model's transactions table. Adjusting national I-O Models is not likely to be sufficient although this does not rule out generating non-survey multipliers; the analysis' degree of importance and the time allowed for it must determine the effort expended to achieve acceptable results. In such cases, judgment of local regional economists may be adequate. Perhaps the worst danger from proliferation of low quality I-O Models comes from indiscriminate use by persons neither familiar with their limitations nor aware of the economic nature of the regions that they are analyzing.

Survey and non-survey I-O models comparison indicates that many non-survey models should not be used to make forecasts with important policy implications. The degree of error inherent in survey-based models makes their application for long-run projection suspect. Introduction of additional error through non-survey techniques may make such

models unusable. In addition the kind of detail provided by non-survey models is not adequate for local impact analysis. Local service and government sectors and other unique local sectors cannot be estimated by non-survey techniques. The few factors that might be accurately estimated from national models usually can be surveyed at little added cost.

### Design and Application of the Input-Output Survey

#### Questionnaire Design and Use

Previous experience has shown that a questionnaire, alone, should not be used to obtain primary data. No firm accounts for expenditure and revenue patterns on a Standard Industrial Classification (SIC) basis, the language ultimately employed in an interindustry model. Rather, a firm's books are designed around process or product activities. The use of a questionnaire, either by mail or by interview, presupposes adequate translation from a firm's accounting language into SIC codes.

Accordingly, all interviews should be conducted in a basic accounting language tailored to the individual firms involved and were translated to SIC classification. The sample questionnaire represents the format for the final translation by the researcher.

Not all interviews can be conducted as planned. For example, some firms want legal advice before participating while others do not want to reveal information in the form desired. A questionnaire, therefore, is designed for use as an interview focal point and as an item that can be left with a firm. The total survey may be conducted over a period of many months.

The questionnaire's cover sheet briefly explains the research and solicits information about the firm's product lines, number of employees and level of capacity utilization. Outlay patterns, both cash flow and

non-cash flow, are requested on the second sheet. Information on sales distribution is solicited on the third sheet. Sales and outlay patterns are grouped by economic sector and are regionalized according to location within or outside the study region. A typical input-output survey form is shown on the following pages.

Information gathered on the outlay and sales patterns for any given enterprise is tabulated to conform to sector delineations and regional descriptions desired for a particular region. Care is exercised at this step to assure a balance between outlays and sales. Any anomalies are checked and corrected before proceeding further.

The next step is to aggregate questionnaire forms within a sector and to expand the information to represent gross flows. Typically, industry wage totals obtained from state reports are used to expand survey data using the survey ratio of sales to wages. The gross flows identified in this manner provide the industry sales totals for the initial transactions statement. Where possible, estimated industry sales totals are benchmarked against secondary sources. These secondary sources are described in the following section.

#### Typical Data Sources by Sector (in Colorado)

This section is devoted to the presentation of an annotated bibliography of the information sources which have been found superior in Colorado. A number of alternative sources were available which were not used.

Agricultural Production      SIC 01,02,07

Colorado. Department of Agriculture. Colorado Crop and Livestock Reporting Service. Colorado Agricultural Statistics. Annual.

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## VOLUNTARY QUESTIONNAIRE

### Albany, Sweetwater, and Carbon Counties Inter-Industry Analysis

This questionnaire is designed to enable you to provide us, in as simple a form as possible, a detailed account of your firm's purchases and sales in 1978. The specific focus of the analysis is the component of that activity occurring in Albany, Sweetwater, and Carbon counties.

This information will be handled in strictest confidence. Your responses will be aggregated with those of other firms in your economy sector, eliminating the possibility that any single firm's responses will be identifiable. Participation on your part is voluntary.

1. We are particularly interested in obtaining data which are a reasonable representation of your firm's current operation. Data for a fiscal or calendar year 1978 or later are preferred. In the event that data are not available in this form, please use any consecutive twelve months since 1977 (please indicate).
2. You may indicate sales and purchases in dollar amounts or percentages.
3. When exact data are not available, please use estimates. If it is not possible to provide information for certain questions, please indicate.

Name of Firm: \_\_\_\_\_

What is your major product(s) or service(s)? If convenient, list the appropriate SIC classification(s). \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

What was the total number of employees you had at any one time in 1978?

Full Time: \_\_\_\_\_ Part Time: \_\_\_\_\_

TABLE 4 (continued)

## SALES ANALYSIS

DEMAND SOURCE: SECTORS TO WHICH YOU SELL	SALES IN SWEETWATER, CARBON, AND ALBANY COS. (\$ or % of Total)	SALES TO OTHER WYO. COUNTIES (\$ or % of Total)	SALES OUTSIDE WYOMING (\$ or % of Total)
1. AGRICULTURE, LIVESTOCK AND FORESTRY			
2. COAL MINES AND RELATED SERVICES			
3. OIL AND NATURAL GAS PRODUCERS			
4. ALL OTHER MINING AND RELATED SERVICE OPERATORS			
5. ALL CONSTRUCTION (including sand and gravel)			
6. ALL MANUFACTURING (includes processed foods, lumber, chemicals, oil refining, stone, glass, metals, machines, transportation equipment, office equipment, furniture)			
7. ALL TRANSPORTATION AND COMMUNICATION (includes radio, t.v., advertising, cable subscriptions, telephone)			
8. ELECTRICITY AND GAS UTILITIES			
9. WHOLESALE TRADE (wholesaling intermediaries)			
10. RETAIL TRADE (all retail trade)			
11. FINANCE, INSURANCE AND REAL ESTATE (interest earned, insurance premiums, real estate commissions and management fees, fees and charges by brokers).			
12. ALL OTHER SERVICES (lodging, legal, personal, leasing, amusement, data processing, business, repair, etc.)			
13. HEALTH SERVICES (medical, dental, hospitals, laboratories, patient care facilities)			
14. EDUCATIONAL SERVICES (primary, secondary, college, technical, professional, libraries)			
15. WATER, SEWAGE, TRASH REMOVAL			
16. LOCAL AND COUNTY GOVERNMENT (taxes, permits, licenses)			
17. HOUSEHOLDS (direct sales for private consumption)			
18. WYOMING STATE GOVERNMENT			
19. FEDERAL GOVERNMENT			
20. TOTAL SALES			

At what level of capacity did your establishment operate during 1978? LEVEL OF CAPACITY UTILIZATION \_\_\_\_\_ %  
 What is your establishment's total water use for all phases of your operations? (Note: Please use any unit of measurements; e.g., gallons per day, 1000 gallons per day, one foot per year, etc.)

TOTAL WATER INTAKE: \_\_\_\_\_

Please estimate the dollar value of your depletion allowance for 1978.

DEPLETION ALLOWANCE: \_\_\_\_\_

TABLE 4 (continued)

## PURCHASES ANALYSIS

SUPPLY SOURCE: SECTORS FROM WHICH YOU PURCHASE OR PAY EXPENSES	PURCHASES IN SWEET- WATER, CARBON AND ALBANY COUNTIES (\$ or % of Total)	PURCHASES FROM OTHER WYOMING COUNTIES (\$ or % of Total)	PURCHASES OUT- SIDE WYOMING (\$ or % of Total)
1. AGRICULTURE, LIVESTOCK AND FORESTRY			
2. COAL MINES AND RELATED SERVICES			
3. OIL AND NATURAL GAS PRODUCERS			
4. ALL OTHER MINING AND RELATED SERVICE OPERATORS			
5. ALL CONSTRUCTION			
6. ALL MANUFACTURING (includes processed foods, lumber, chemicals, oil refining, stone, glass, metals, machines, transportation equipment, office equipment, furniture)			
7. ALL TRANSPORTATION AND COMMUNICATION (includes radio, t.v., advertising, cable subscriptions, telephone)			
8. ELECTRICITY AND GAS UTILITIES			
9. WHOLESALE TRADE (wholesaling intermediaries)			
10. RETAIL TRADE (all retail trade)			
11. FINANCE, INSURANCE, AND REAL ESTATE (interest payments, insurance premiums, real estate commissions, and management fees, fees and charges by brokers)			
12. ALL OTHER SERVICES (lodging, legal, personal, leasing, amusement, data processing, business, repair, etc.)			
13. HEALTH SERVICES (medical, dental, hospitals, laboratories, patient care facilities)			
14. EDUCATIONAL SERVICES (primary, secondary, college, technical, professional, libraries)			
15. WATER, SEWAGE, TRASH REMOVAL			
16. LOCAL AND COUNTY GOVERNMENT (taxes, permits, licenses)			
17. HOUSEHOLDS (payments subject to withholdings)			
18. WYOMING STATE GOVERNMENT (taxes, permits, licenses)			
19. FEDERAL GOVERNMENT (taxes, permits, license fees, employers FICA, unemployment insurance)			
20. RENTS, DIVIDENDS, RETAINED EARNINGS			
21. DEPRECIATION ALLOWANCE			
22. TOTAL PURCHASES			

Please indicate the value of your establishment's net inventory change in 1978 (this may be a positive or negative).  
NET INVENTORY CHANGE: \$ \_\_\_\_\_.

Colorado State University. Cooperative Extension Service Data.  
Department of Economics.

Industry survey data.

U. S. Department of Commerce. Bureau of the Census. Census of Agriculture: 1974. Volume 1, Area Reports, part 41, Colorado, Section 2, County Data. Washington, D. C.: Government Printing Office, 1972.

Special consideration must be given to the estimation of hay sales and livestock sales. These are not available in appropriate form from Colorado Agricultural Statistics.

Coal Production SIC 12

Colorado. Department of Natural Resources. Division of Mines. A Summary of Mineral Industry Activities in Colorado. Part I: Coal. Annual.

Colorado. Public Utilities Commission. File.

Hebb, D. H. and M. S. Curtin. "Colorado Coal: A Production and Shipment Director." (U.S. Department of Interior, Bureau of Mines.) Golden, Colorado: Colorado School of Mines Mineral Economics Institute, 1977. (Photocopy reproduction.)

Industry survey data.

Data on tonnage and labor days are available in the Division of Mines publication on a mine-by-mine basis. The PUC files, the Hebb-Curtin study, and survey information provide the data used in estimating price.

Metal Mining, Oil and Natural Gas Production, and Nonmetal Mining  
SIC 10,13,14

Colorado. Department of Natural Resources. Oil and Gas Conservation Commission. Oil and Gas Statistics. Annual.

Industry survey data.

Perderson, John A. and Oded Rudawsky. "The Role of Minerals and Energy in the Colorado Economy." (U. S. Bureau of Mines Grant No. G-0122090.) Golden, Colorado: Department of Mineral Economics, Colorado School of Mines, 1974. (Photocopy reproduction.)

Total gross output values for metal mining, oil and natural gas production, and nonmetal mining are taken from the State of Colorado publications. Interindustry flows are estimated by using the Pederson-Rudawsky study adjusted and updated with information gained in independent surveys and using both Nelson and Wholesale Price Indices.

Construction SIC 15,16,17

Colorado. Department of Labor and Employment. Files.

Industry survey data.

Information gained by interviews with contractors is used to calculate a ratio between contract value and outlay for labor on a two-digit SIC level. This ratio is then applied to the annualized employment and wage data provided by the Colorado Department of Labor and Employment to estimate total gross output.

Manufacturing SIC 20,23,25,27,28,29,32,33,34,35,38,39

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Industry survey data.

Information gained by interviews is used to calculate a ratio between total gross output value and outlay for labor on a two-digit SIC level. This ratio is then applied to the annualized employment and wage data provided by the Colorado Department of Labor and Employment to estimate total gross output at the two-digit level.



Transportation and Communication      SIC 40,41,42,45,47,48

Colorado. Department of Labor and Employment. Files.

Colorado. Public Utilities Commission. Files.

Colorado. State Auditor. Files.

Industry survey data.

Information pertinent to railroad and telephone communications is gained from filed PUC reports and survey. Because of the nature of the accounting systems employed by the firms involved, a significant amount of prorating is required to allocate the data to approximate the study region.

Where the airports are operated by local public authorities, the relevant information is obtained from reports filed with the Colorado State Auditor.

Data on employment and earnings for components other than rail and air transportation sectors are obtained from the Colorado Department of Labor and Employment and the survey provides an estimation for the output level.

Electric and Natural Gas Utilities      SIC 491,492,493

Colorado. Department of Labor and Employment. Files.

Colorado. Public Utilities Commission. Files.

Colorado. State Auditor. Files.

Industry survey data.

A certain amount of prorating and imputation is also involved in this sector to match the geographic location of activity to the study region. Electric activities under the control of local public authorities are

identified by examining reports filed with the State Auditor. Information gained from the Colorado Department of Labor and Employment and from interviews provides cross checks throughout the estimation of the activities of this sector.

Wholesale Trade      SIC 50,51; also

Retail Trade        SIC 52,53,54,55,56,57,58,59

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Industry survey data.

Interviews conducted for the study are used to determine the basic outlay patterns for the trade sectors. Convention dictates that the trade sectors are entered in the interindustry model at the level of gross margins. The reasoning behind this is to facilitate showing the direct economic links between producers and users. The absence of margining would interject the huge trade sector dollar turnover between producers and consumers. Thus, the output of local producers is first distributed to the various sectors in accordance with survey findings. Then, where the output, e.g., milk products, ordinarily goes first to trade sector, e.g., grocery stores, before going to a regional user, e.g., households in the model, the sale is made directly. A margin on the sale is attributed to the trade sector. Merchandise imports by the trade sectors are prorated and assigned to the

various regional sectors based on the relative volumes of purchases from the trade sectors.

Finance, Insurance, and Real Estate      SIC 60,61,62,63,64,65,66

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Regulatory Agencies. Division of Insurance. Insurance Industry in Colorado: Statistical Report. Annual.

Colorado. Department of Revenue. Annual Report. Annual.

County Clerk Office, respective counties. Files.

Federal Credit Banks of Wichita. Files.

Federal Home Loan Bank Board. Combined Financial Statements - Member Savings and Loan Associations of the Federal Home Loan Bank System. Annual.

Industry survey data.

Sheshunoff & Company, Inc. The Banks of Colorado. (A private publication.) Annual.

The output value of the finance sector is entered in the interindustry model as the estimated value of interest charges incurred within the region.

Interest earnings by commercial banks are readily identified in the Sheshunoff publication; likewise, the Federal Credit Banks of Wichita provide data relevant to the operations of the Production Credit Association and Federal Land Bank Association. Regional information on the activities of savings and loan associations is not readily available so that data published for Colorado in the Federal Home Loan Bank Board's Combined Financial Statements are prorated by a wage and salary formula for the study region. Survey data are used both as a cross check to published data and to estimate

financing from outside the region, e.g., certain school bonds, Rural Electrification Association loans, insurance company loans, and so forth.

Information gained in interviews with several major insurance companies suggests that a precise accounting for insurance premiums paid on per country basis is a near impossibility. Another difficulty observed is with respect to loss claims; specifically, in a small region the losses incurred by any one economic sector cannot be predicted with any certainty. Thus, the insurance sector is handled as follows.

Gross insurance premiums paid in the study region are approximated by prorating premiums paid in the State of Colorado by a personal adjusted gross income figure. Premiums paid in Colorado are reported in the State Division of Insurance's Statistical Report; personal income is reported in the Department of Revenue's Annual Report. The state loss experience ratio is then used to split gross premiums paid; the loss portion is charged to the transfer account in the model and the balance is charged as gross output of the insurance sector. Accordingly, the transfer row collects the portion of premiums paid that subsequently reimburses for losses and the transfer account column distributes the same to contractors, auto dealers, health practitioners, and so forth.

Information on documentary fees paid for real estate transactions can be secured from the county clerks in the respective counties. The fee information is used to estimate the gross value of transactions and survey information is used to estimate the commissions which make up the gross output of the real estate sector.

Survey information provides the means to construct the distribution of the total gross outlays in the finance, insurance, and real estate sector.

Services SIC 70,72,73,74,75,76,78,79,81,86,89

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Industry survey data.

U.S. Department of Commerce. Bureau of the Census. Census of Selected Service Industries, 1972: Area Series, Colorado, 72-A-6. Washington, D.C.: Government Printing Office, 1974.

Sales by the hotels and other lodging facilities sector were estimated by annualizing the pertinent information reported in the Department of Revenue's Annual Report.

Estimation of the output value of service sectors (excluding lodging) is accomplished as follows. The Census of Selected Service Industries provides information on output and employment in the study counties and the entire state for 1972. Census disclosure requirements cause a considerable amount of data aggregation to take place at the county level. Thus, by using Department of Labor and Employment data for the respective counties and Colorado productivity ratios, calculated for the Census, the reported county output data are disaggregated on a three-digit SIC basis. Outlay distributions are estimated from information gained by interviews.

The ski industry was surveyed and a separate sector designed accordingly. (In the Colorado Upper Mainstem Study.)

Health SIC 80

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Colorado. State Auditor. Files.

Industry survey data.

Health facilities owned by local public authorities have current financial

statements on file with the State Auditor. The deliveries of services in nursing home situations are obtained from survey.

Education SIC 82

Colorado. Department of Education. Files.

Colorado. Department of Education. Revenues and Expenditures: Colorado School Districts. Annual.

Industry survey data.

Information on public school districts is published on an annual basis in Revenues and Expenditures. Information on colleges and universities and Colorado State Extension Services can be secured directly.

Water, Sewer, and Trash SIC 494,495,496,497; also

Local and County Roads; also

Local and County Government; also

Local and County Taxes

Colorado. State Auditor. Files.

Industry survey data.

The yearly audit reports for all local and county government authorities are examined and that data contained therein are aggregated. Information gained in select interviews facilitates the distribution of the various sectors' outlays.

Households

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Colorado. Public Employees Retirement Association. Files.

Community Services Administration. Federal Outlays in Colorado. Annual. (Prior to fiscal 1975 published by Office of Economic Opportunity.)

Industry survey data.

U.S. Department of Commerce. Bureau of the Census. Census of the Population, 1970: General Social and Economic Characteristics, Final Report, Colorado, PC (1)-C7. Washington, D.C.: Government Printing Office, 1972.

U.S. Department of the Treasury. Internal Revenue Service.  
Statistics of Income 1969, ZIP Code Area Data from Individual  
Income Tax Returns. Washington, D.C.: Government Printing  
Office, 1972.

Household income is shown as emanating from wages and salaries subject to withholding, proprietorship, partnership, and Sub-Chapter S Corporation income, interest, rent and dividend income, and transfer payments.

The Department of Revenue's Annual Report publishes personal adjusted income figures on a county basis.

Audit reports for the respective counties provides information on the level of payments made to households by the five counties' departments of social services. An estimate of payments by the Colorado Public Employees Retirement Association is based on information provided by the Association. The value of transfer payments made by the U.S. Government is approximated by the reported information in Federal Outlays. Life insurance distributions are estimated in accordance with the procedure previously described in the insurance section.

Payments made to the household account by the respective regional economic sectors reflect an estimate of wages paid subject to withholding. For most of the private enterprise portion of the economy, this estimate reflects the place of work data base provided by the Colorado Department of Labor and Employment files. Estimates on the earnings of agricultural, railroad, and government employees reflect the information sources peculiar to those sectors. The household-on-household cell is imputed by taking the domestic employment figure from the Census of Population and annualizing an assumed wage rate. The transfer column entry for households is a closing entry. Essentially it is an entry that brings non-wage and salary income to the household sector.

Households are not surveyed to gain information on their outlay patterns. Rather, there is a reliance on the sales information provided by regional producers. Accordingly, the import figure aside from the post marginal trade sector merchandise, for households is largely a residual value.

State Government; also

Federal Government

Colorado. Department of Education. Revenues and Expenditures: Colorado School Districts. Annual.

Colorado. Department of Highways. Colorado's Annual Highway Report. Annual.

Colorado. Department of Natural Resources. Division of Wildlife. Colorado Big Game Harvest. Annual.

Colorado. Department of Natural Resources. State Board of Land Commissioners. Summary of Transactions. Annual.

Colorado. Department of Planning and Budget. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Colorado. State Auditor. Files.

Colorado. Public Employees Retirement Association. Files.

Colorado. Public Utilities Commission. Files.

Community Services Administration. Federal Outlays in Colorado. Annual. (Prior to fiscal 1975 published by Office of Economic Opportunity.)

Sheshunoff & Company, Inc. The Banks of Colorado. (A private publication.) Annual.

U.S. Department of the Treasury. Bureau of Government Financial Operations. Combined Statement on Receipts, Expenditures, and Balances of the United States Government. Washington, D.C.: Government Printing Office. Annual.

U.S. Department of the Treasury. Internal Revenue Service. Statistics of Income 1969, ZIP Code Area Data from Individual Income Tax Returns. Washington, D.C.: Government Printing Office, 1972.

Total gross output for the government sectors is defined in terms of the estimate of revenues from all sources. For private enterprise in the



endogenous portion of the model, an estimate is made of income and payroll tax liabilities and fees and royalties paid by each respective sector. There is no real cross check against these estimates because neither Colorado nor the U.S. Government reports business tax liabilities on a county basis. Further, previous research experience has demonstrated that prorating the reported state level of collections (reported in the Treasury's Combined Statement of Receipts, Expenditures, and Balances and the Department of Revenue's Annual Report) by such factors as population or personal income produces questionable results.

Personal tax and fee liabilities are much more readily estimated by using such publications as the Department of Revenue's Annual Report, the Division of Wildlife's Big Game Harvest, and the IRS's ZIP Code Area Data. The exports by the State of Colorado include estimates of sales taxes.

For the U.S. Government, the publication Federal Outlays is used as a first approximation of expenditures. Select interviews with the larger agencies, such as the U.S. Forest Service, Bureau of Land Management, and U.S. Postal Service, provide the information to estimate agency operating expenditure patterns. Information on direct payments for such things as schools, interest on government securities held by commercial banks, highways, and local government activities is taken from the Colorado Department of Education's Revenues and Expenditures, Sheshunoff's The Banks of Colorado, Colorado's Annual Highway Report, and files in the Colorado State Auditor's Office.

State of Colorado expenditures are first approximated by information contained in regionalized budgets provided by the Department of Planning and Budget. This information is on a state planning region basis and is designed for State analysis for the yearly budget, so modification is necessary on an

agency basis. Contacts are made with the larger agencies such as the Division of Wildlife and the State Department of Highways to accommodate this requirement.

#### Transfer Account

The transfer account is an accounting device that allows for two unique and distinctive characteristics that are not found in conventional regional interindustry studies. First, the assumption that transfer payments cancel in the net is dropped. Second, the model handles financial balances in such a manner as to give rise to a definition of regional income more analogous to the definition of national income.

#### Investment

Survey information is used to estimate the investment column and mineral research and development column. The value of these investments is then set against the value of the profit and depreciation rows. Out of the net difference, the estimate of entrepreneurial income is taken and closed to households; the residual after accounting for entrepreneurial income is treated as a regional capital shortage.

#### Employment

Colorado. Department of Labor and Employment. Files.

No single source or agency seems to be able to provide an adequate estimate of annualized full-time equivalent employment in agriculture. Consequently, using Colorado State University farm and ranch survey data collected for the study, Impacts of Federal Grazing on the Economy of Colorado, and wage rates published in the Colorado Agricultural Statistics, full-time employment equivalents are imputed. Employment by government agencies is estimated by using survey information.

Caution is exercised to the fact that employment levels are defined in the I-0 models do not approximate employment levels as defined in some

commonly distributed publications. The Colorado Manpower Review, for example, publishes county estimates on the resident adjusted labor force. Aside from the definitional difference, and the fact that employment by industry is not reported for low population counties, the current method used to estimate the resident adjusted labor force is extremely questionable. The reader is referred to the January 1977 Manpower Review for a complete discussion on this matter.

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## APPENDIX III

Distribution of employment by Sector for Colorado Counties and State Planning Regions and Distribution of Employment by Sector for Selected Regional Input-Output Models in Colorado.



TABLE III-1

Colorado I-0 Model Detailed  
Employment by Sector (1970)

<u>Sector</u>	<u>Employment (1970)</u>	<u>Percent</u>
1. Natural Gas	1,972	0.3
2. Livestock	29,489	4.5
3. Irr Agriculture	19,901	3.0
4. Dry Agriculture	4,329	0.7
5. Food Processing	21,447	3.3
6. Metal Minerals	6,216	0.9
7. Pet Products	4,255	0.6
8. Industrial Mineral Products	4,877	0.7
9. Coal Minerals	1,142	0.2
10. Mineral Services	2,317	0.4
11. Pipeline	268	0.0
12. Petroleum Refinery	719	0.1
13. Primary Metals	7,667	1.2
14. Electric Gen	1,805	0.3
15. Fabricated Metal	20,192	3.1
16. Electronics	13,746	2.1
17. Tran/Comm/PU	45,414	6.9
18. Textiles	6,210	0.9
19. Paper	1,331	0.2
20. Printing	9,387	1.4
21. Chemicals	8,839	1.3
22. Wood Products	4,002	0.6
23. Manufacturing Nec	5,582	0.9
24. Trade	162,603	24.8
25. Services	96,777	14.8
26. Elementary-Secondary Education	39,888	6.1
27. University Education	39,967	6.1
28. Household	NA	
29. Local Government	NA	
30. State-Federal Government	NA	
	} 95,029*	14.5*
TOTAL	560,342	99.9

\*Based on 1981 distribution (655,3 )

TABLE III-2

Denver Employment by Sector in 1981  
and Colorado I-0 Employment by Aggregated Sector in 1970

<u>Sector</u>	Sector in 1970		<u>1970 Employment</u>	<u>Percent</u>
	<u>1981 Employment</u>	<u>Percent</u>		
1. Ag-Forestry	1,524	0.4	53,719	8.2
2. Mines	17,526	4.2	20,779	3.2
3. Construction	18,380	4.4	NA	
4. Manufacturing	44,203	10.6	99,122	15.1
5. Transportation/Utilities	39,682	9.5	47,487	7.2
6. Trade	95,531	22.8	162,603	24.8
7. Fire	38,122	9.1	NA	
8. Services	102,983	24.6	176,632	27.0
9. Government	<u>60,718</u>	<u>14.5</u>	<u>95,029</u>	<u>14.5</u>
Total	418,669	100.1	655,371	100.0

TABLE III-3  
 Greeley I-0 Model  
 Projected Employment for 1983 by Sector

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<u>Sector</u>	<u>Workers</u>	<u>Percent</u>
1. Food Processing	598	2.2
2. Printing-Publishing	323	1.2
3. Manufacturing, N.E.C	1,638	5.9
4. Construction	1,301	4.7
5. Transportation	336	1.2
6. Communication	495	1.8
7. Electricity	149	0.5
8. Natural Gas	88	0.3
9. Water and Sanitation	37	0.1
10. Wholesale	1,312	4.8
11. Retail	5,090	18.5
12. Restaurants	1,926	7.0
13. Hotel-Motel	153	0.6
14. F.I.R.E.	1,464	5.3
15. Health Services	3,814	13.8
16. Services, N.E.C.	1,804	6.5
17. Schools	1,842	6.7
18. Colleges	3,363	12.2
19. Local Government	1,321	4.8
20. Households	316	1.1
21. State-Federal Government	<u>207</u>	<u>0.8</u>
Total	27,577	100.0

TABLE III-4

Eastern Colorado High Plains I-0 Model  
Employment by Sector

<u>Sector</u>	<u>Workers</u>	<u>Percent</u>	
1. Irrigated Corn	1,172	3.9	} 32.6
2. Irrigated Wheat	110	0.4	
3. Irrigated Sorghum	65	0.2	
4. Dry Wheat	1,329	4.4	
5. Dry Sorghum	68	0.2	
6. Other-Irrigated	389	1.3	
7. Other-Dry	146	0.5	
8. Feedlots	3,539	11.8	
9. Range Cattle	2,654	8.8	
10. Other-Animals	318	1.1	
11. Food Processing	965	3.2	
12. Printing	169	0.6	
13. Machine-Manufacturing	295	1.0	
14. Stone/Clay	67	0.2	
15. Other-Manufacturing	165	0.5	
16. Oil/Gas-Pr	550	1.8	
17. Construction	931	3.1	
18. Wholesale-Machinery	535	1.8	
19. Wholesale-Farm	698	2.3	
20. Other-Wholesale	705	2.3	
21. Retail-Fuel	474	1.6	
22. Wholesale-Fuel	155	0.5	
23. Auto-Dealer	560	1.9	
24. Drink-Eat	2,083	6.9	
25. Other Retail	2,247	7.5	
26. Agricultural-Service	127	0.4	
27. Finance	739	2.5	
28. Insurance/Re	229	0.8	
29. Education	2,751	9.1	
30. Health	1,647	5.5	
31. Other-Services	1,042	3.5	
32. Postal-Service	127	0.4	
33. Communication	322	1.1	
34. Transportation	625	2.1	
35. Gas-Petroleum Distribution	161	0.5	
36. Electric	201	0.7	
37. Wat-Ice/Sanitation	52	0.2	
38. Local Government	1,042	3.5	
39. Households	--		
40. State Government	272	0.9	
41. Federal Government	367	1.2	
Total	30,093	100.2	

TABLE III-5

Garfield, Moffat, Rio Blanco, and Routt  
County I-O Model Employment by Sector

<u>Sector</u>	<u>Employment</u>	<u>Percent</u>
1. Irrigated-Agriculture	211	0.7
2. Dry-Agriculture	207	0.7
3. Livestock	1,760	6.2
4. Coal-Mining	2,318	8.2
5. Other-Mining	126	0.4
6. Oil/Gas-Pr	176	0.6
7. Oil/Gas-Services	888	3.1
8. Loc-Construction	2,681	9.5
9. Food-Prac	34	0.1
10. Stone/Clay	75	0.3
11. Other-Manufacturing	467	1.6
12. Transportation/Comm	1,621	5.7
13. Elect-Gen	511	1.8
14. Utilities	197	0.7
15. Wat/Sew/Tr	25	0.1
16. Wholesale	658	2.3
17. Gas/Auto	764	2.7
18. Food/Lodge	2,917	10.3
19. Other-Ret	2,070	7.3
20. F/I/R/E	1,292	4.6
21. Health-Ser	918	3.2
22. Education	2,210	7.8
23. Ski-Tows	439	1.5
24. Other-Ser	1,127	4.0
25. Local Roads	499	1.8
26. Local Government	3,139	11.1
27. Households	266	0.9
28. State Government	183	0.6
29. Federal Government	566	2.0
Total	28,345	99.8

TABLE III-6

S. W. Colorado I-D Model  
Employment by Sector

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<u>Sector</u>	<u>Workers</u>	<u>Percent</u>
1. Livestock	458	3.0
2. Other-Agr	850	5.5
3. O/G-Mines	274	1.8
4. Construction	1,219	7.9
5. Processors	166	1.1
6. Log-Mills	251	1.6
7. Print/Pus	144	0.9
8. Other-Mfb	278	1.8
9. Transportation	359	2.3
10. Communication	200	1.3
11. Utilities	224	1.4
12. Wat/Sew/Tr	28	0.2
13. Wholesale	460	3.0
14. Gab/Auto	359	2.3
15. Eat/Drink	1,243	8.0
16. Other-Ret	1,594	10.3
17. F/I/R/E	582	3.8
18. Lodging	1,114	7.2
19. Health-Ser	1,069	6.9
20. Educat-Ser	1,524	9.9
21. Other-Ser	1,246	8.1
22. Local Roads	207	1.3
23. Local Government	910	5.9
24. State Government	334	2.2
25. Federal Government	<u>360</u>	<u>3.3</u>
Total	15,453	100.0

TABLE III-7  
 Kremmling Region I-0 Model  
 Employment by Sector

<u>Sector</u>	<u>Employment (1978)</u>	<u>Percent</u>
1. Ag/Livestock	81	2.4
2. Min/Oil/Gas	19	0.6
3. Coal-Mines	92	2.7
4. Construction	215	6.4
5. Wood-Production	234	6.9
6. Mfg/Nec	33	1.0
7. Trans/Comm	74	2.2
8. Elec/Gs-Ut	35	1.0
9. Wat/San	16	0.5
10. G/Aut-01r	105	3.1
11. Eat/Dr	392	11.6
12. Trade-Nec	312	9.3
13. Fin/Ins/Re	152	4.5
14. Hotel/Motel	339	10.1
15. Recreation	307	9.1
16. Medical	98	2.9
17. Service -Nec	181	5.4
18. Education	255	7.6
19. Local-Roads	58	1.7
20. Local-Government	196	5.8
21. State-Government	28	0.8
22. Federal-Government	146	4.3
Total	3,368	99.9

TABLE III-8

Employment by I-0 Sector  
By County and Total for State Planning Region 1

	Logan	Morgan	Phillips	Sedgwick	Wash.	Yuma	Total
1. Ag	142	235	66	8	31	69	551
2. Mines	232	378	0	0	8	79	697
3. Construction	375	588	41	0	44	134	1,182
4. Mfg	926	1,209	64	0	13	36	2,248
5. Tran Ut	617	319	69	32	94	103	1,234
6. Wholesale	548	719	141	86	111	303	1,908
7. Retail	1,630	1,365	199	267	193	589	4,243
8. F/I/R/E	275	341	53	28	48	142	887
9. Service	1,388	1,024	100	297	109	208	3,126
10. Local Government	1,109	1,093	329	263	305	587	3,686
11. State Government	68	165	6	7	9	23	278
12. Federal Government	<u>99</u>	<u>96</u>	<u>27</u>	<u>22</u>	<u>51</u>	<u>53</u>	<u>348</u>
Total	7,408	7,531	1,095	1,011	1,015	2,326	20,388

SOURCE: Colorado Division of Employment, Report 1 Colorado and Wages Covered by Unemployment Insurance, 4th quarter 1981.



TABLE III-9

Employment by I-0 Sector  
By County and Total for  
State Planning Region 2

	<u>Larimer</u>	<u>Weld</u>	
1. Agriculture	356	1,200	1,556
2. Mines	139	685	824
3. Construction	3,463	2,736	6,199
4. Manufacturing	12,556	6,283	18,839
5. Trans-Ut	1,596	1,844	3,440
6. Wholesale	1,535	2,153	3,688
7. Retail	10,957	6,480	17,437
8. F/I/R/E	2,269	1,758	4,027
9. Services	7,204	5,058	12,262
10. Local Government	11,824	8,567	20,391
11. State Government			
12. Federal Government			
	<u>1,536</u>	<u>344</u>	<u>1,880</u>
Total	53,435	37,107	90,543

SOURCE: Colorado Division of Employment, Report 1 Colorado and Wages Covered by unemployment Insurance, 4th quarter 1981.

TABLE III-10

## EMPLOYMENT BY I-O SECTOR BY COUNTY AND TOTAL FOR STATE PLANNING REGION 3

	<u>Adams</u>	<u>Arapahoe</u>	<u>Boulder</u>	<u>Clear Creek</u>	<u>Denver</u>	<u>Douglas</u>	<u>Gilpin</u>	<u>Jefferson</u>	<u>Total</u>
Ag	779	1,208	661	*	1,524	177	0	1,026	5,375
Mines	869	4,734	346	*	17,526	40	19	2,876	26,410
Const.	4,977	9,976	3,877	24	18,380	894	0	10,743	48,871
Mfg.	14,328	12,369	28,804	34	44,203	588	9	31,114	131,449
Trans-Ut.	6,212	3,794	2,401	91	39,692	146	*	3,284	55,610
Wholesale	7,194	7,317	2,306	32	39,039	241	0	3,690	59,819
Retail	15,611	29,160	15,147	511	56,492	909	130	26,123	144,083
FIRE	2,556	8,760	2,856	53	38,122	196	*	5,378	57,921
Services	9,450	26,138	15,670	2,060	102,983	662	50	20,772	177,785
Loc. Gov.	8,630	14,269	17,843	311	25,295	1,257	93	13,503	105,169
State Gov.	1,053			29	20,031		4	2,251	
Fed. Gov.	<u>3,327</u>	<u>2,078</u>	<u>2,683</u>	<u>30</u>	<u>15,392</u>	<u>60</u>	<u>9</u>	<u>9,392</u>	<u>32,971</u>
Total	74,986	119,804	92,593	3,175	418,669	5,173	314	130,153	845,463

\*/ Employment in this industry is too small to release due to violation of confidentiality. The employment for this industry is included with Services.

TABLE III-11

Employment by I-O Sector By County and  
Total for State Planning Region 4

	El Paso	Park	Teller	Total
1. Agriculture	576	0	7	583
2. Mines	151	96	62	309
3. Construction	7,064	57	135	7,256
4. Manufacturing	19,278	10	66	19,354
5. Trans-Ut	4,898	*	66	4,964
6. Wholesale	3,273	5	12	3,290
7. Retail	22,730	158	347	23,235
8. F/I/R/E	5,602	31	78	5,711
9. Services	25,079	100	140	25,319
10. Local Government	13,023	395	439	13,857
11. State Government	2,052	7	6	2,065
12. Federal Government	<u>7,325</u>	<u>52</u>	<u>28</u>	<u>7,405</u>
Total	111,051	910	1,385	113,348

SOURCE: Colorado Division of Employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981.

\*Employment in this industry is too small to release due to violation of confidentiality. The employment for this industry is included with Services.

TABLE III-12

Employment by I-O Sector By County and  
Total for State Planning Region 5

	Cheyenne	Elbert	Kit Carson	Lincoln	Total
1. Agriculture	*	22	74	32	128
2. Mines	32	*	*	0	32
3. Construction	8	30	74	16	128
4. Manufacturing	*	122	97	68	287
5. Trans-Ut	50	24	85	53	212
6. Wholesale	32	36	313	123	504
7. Retail	89	88	399	472	1,048
8. F/I/R/E	32	34	77	43	186
9. Service	90	45	533	142	810
10. Local Government	186	368	545	370	1,523
11. State Government	5		18	31	
12. Federal Government	<u>22</u>	<u>31</u>	<u>54</u>	<u>39</u>	<u>146</u>
Total	546	801	2,270	1,390	5,004

SOURCE: Colorado Division of Employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981.

\*Employment in this industry is too small to release due to violation of confidentiality. The employment for this industry is included with Services.

TABLE III-13

Employment by I-0 Sector by County and  
Total for State Planning Region 6

	Baca	Bent	Crowley	Kiowa	Otero	Prowers	Total
1. Ag	10	0	*	17	228	124	379
2. Mines	*	0	0	*	0	138	138
3. Const.	14	26	32	*	188	98	358
4. Manuf.	19	63	*	13	934	637	1,666
5. Trans-Ut	34	34	15	24	400	172	679
6. Whlse	131	*	*	20	394	340	885
7. Retail	255	179	75	52	1,155	1,038	2,754
8. F/I/R/E	47	32	19	*	261	199	558
9. Service	79	52	83	48	1,279	564	2,105
10. Local Gov.	407	382	162	190	1,342	865	3,480
11. St. Gov.	6	12				114	
12. Fed. Gov.	<u>47</u>	<u>716</u>	<u>15</u>	<u>22</u>	<u>111</u>	<u>47</u>	<u>958</u>
Total	1,050	1,495	400	386	6,292	4,336	13,960

SOURCE: Colorado Division of Employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981.

\*Employment in this industry is too small to release due to violation of confidentiality. The employment for this industry is included with Services.

TABLE III-14

Employment by I-O Sector by County and  
Total for State Planning Region 7

	Huerfano	Las Animas	Pueblo	Total
1. Agriculture	8	21	197	226
2. Mines	*	*	78	78
3. Construction	61	126	1,986	2,173
4. Manufacturing	35	109	6,802	6,946
5. Trans-Ut	20	65	2,073	2,158
6. Wholesale	41	141	1,327	1,509
7. Retail	277	684	8,030	8,991
8. F/I/R/E	59	127	1,774	1,960
9. Service	271	1,294	8,039	9,604
10. Local Government	366	827	5,097	6,290
11. State Government	54	303	2,757	3,114
12. Federal Government	<u>26</u>	<u>85</u>	<u>1,424</u>	<u>1,535</u>
Total	1,217	3,782	39,584	44,584

SOURCE: Colorado Division of Employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981.

\*Employment in this industry is too small to release due to violation of confidentiality. The employment for this industry is included with Services.

TABLE III-15

Employment by I-O Sector by County and Total for State Planning Region 8

	Alamosa	Conjos	Costilla	Mineral	Rio Grande	Saguache	Total
1. Agriculture	144	110	292	6	661	164	1,371
2. Mines	5	80	0	*	*		85
3. Construction	231	15	5	*	163	42	456
4. Manufacturing	152	130	*	*	292	24	598
5. Trans-Ut	241	15	*	0	165	*	421
6. Wholesale	142	23	*	0	333	28	526
7. Retail	1,042	113	36	40	525	75	1,831
8. F/I/R/E	278	35	49	*	116	79	557
9. Service	905	206	83	588	621	119	2,522
10. Local Government	962	392	190	74	428	296	2,500
11. State Government		11	17	58	66	6	
12. Federal Government	<u>149</u>	<u>46</u>	<u>21</u>	<u>16</u>	<u>157</u>	<u>40</u>	<u>429</u>
Total	4,253	1,176	693	702	3,527	873	11,296

SOURCE: Colorado Division of Employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981.

\* Employment in this industry is too small to release due to violation of confidentiality. The employment for this industry is included with Services.

TABLE III-16

## Employment by I-O Sector by County and Total for State Planning Region 9

	Archuleta	Dolores	La Plata	Montezuma	San Juan	Total
1. Agriculture	*	0	39	5	0	44
2. Mines	72	*	87	270	*	429
3. Construction	121	*	815	977	*	1,913
4. Manufacturing	39	7	486	218	*	750
5. Trans-Ut	25	*	433	311	*	769
6. Wholesale	*	*	370	315	0	685
7. Retail	257	71	2,596	1,064	91	4,079
8. F/I/R/E	*	*	471	189	*	660
9. Service	360	153	3,195	544	467	4,719
10. Local Government	228	213	1,828	1,003	65	3,449
11. State Government	10	4		36	62	
12. Federal Government	42	7	371	260	3	683
Total	1,154	456	10,691	5,191	623	18,180

SOURCE: Colorado Division of employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981.

\* Employment in this industry is too small to release due to violation of confidentiality. The employment for this industry is included with Service.



TABLE III-17

Employment by I-O Sector by County and Total for State Planning Region 10

	Delta	Gunnison	Hinsdale	Montrose	Ouray	San Miguel	Total
1. Agriculture	295	12	0	110	0	*	412
2. Mines	282	410	0	641	40	75	1,448
3. Construction	284	383	12	422	21	67	1,189
4. Manufacturing	476	202	*	784	7	4	1,473
5. Trans-Ut	273	155	*	980	*	10	1,418
6. Wholesale	190	53	0	318	0	*	561
7. Retail	988	1,196	21	1,399	122	286	4,012
8. F/I/R/E	214	214	7	293	22	45	795
9. Service	687	752	14	857	54	225	2,589
10. Local Government	1,095	887	37	824	114	211	3,392
11. State Government	49		30	130	5	10	
12. Federal Government	<u>176</u>	<u>88</u>	<u>6</u>	<u>299</u>	<u>8</u>	<u>35</u>	<u>612</u>
Total	5,008	4,352	91	7,058	393	968	17,906

SOURCE: Colorado Division of employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981

\* Employment in this industry is too small to release due to violation of confidentiality. The employment in this industry is included with Service.

TABLE III-18

## Employment by I-0 Sector by County and Total for State Planning Region 11

	Garfield	Mesa	Moffat	Rio Blanco	Total
1. Agriculture	74	253	44	*	371
2. Mines	143	2,758	671	1,806	5,378
3. Construction	1,758	3,947	651	317	6,673
4. Manufacturing	247	2,793	147	34	3,221
5. Trans-Ut	967	1,944	571	361	3,843
6. Wholesale	249	1,702	265	52	2,268
7. Retail	2,379	7,959	960	330	11,628
8. F/I/R/E	530	1,502	185	70	2,287
9. Service	2,006	7,320	716	172	10,214
10. Local Government	2,104	3,044	670	704	6,522
11. State Government	90	1,244	33	35	1,402
12. Federal Government	190	1,091	214	35	1,530
Total	10,736	35,557	5,127	3,917	55,337

SOURCE: Colorado Division of employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981

\* Employment in this industry is too small to release due to violation of confidentiality. The employment in this industry is included with Service.

TABLE III-19

Employment by I-0 Sector by County and Total for State Planning Region 12

	Eagle	Grand	Jackson	Pitkin	Routt	Summit	Total
1. Ag	54	34	*	76	48	30	242
2. Mines	*	*	74	638	828	*	1,540
3. Const.	1,317	432	77	929	1,180	825	4,760
4. Mfg.	307	98	*	153	94	38	690
5. Trans-Ut.	154	75	11	156	505	108	1,009
6. Wholesale	83	35	*	*	166	103	387
7. Retail	2,669	915	72	2,770	1,401	1,931	9,758
8. FIRE	744	266	*	1,236	536	486	3,268
9. Services	2,603	965	219	2,468	1,479	2,569	10,303
10. Loc. Gov.	822	504	124	707	674	556	3,387
11. State Gov.	35	22	6	4	34	26	127
12. Fed. Gov.	<u>97</u>	<u>116</u>	<u>30</u>	<u>50</u>	<u>129</u>	<u>40</u>	<u>462</u>
Total	8,885	3,462	613	9,187	7,074	6,712	35,933

SOURCE: Colorado Division of Employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981

\* Employment in this industry is too small to release due to violation of confidentiality. The employment in this industry is included with Service.

TABLE III-20

## Employment by I-0 Sector by County and Total for State Planning Region 13

	Custer	Chaffee	Fremont	Lake	Total
1. Ag	*	19	39	*	58
2. Mines	0	101	232	*	333
3. Const.	26	312	271	67	676
4. Mfg.	32	126	1,255	23	1,436
5. Trans-Ut.	*	107	306	140	553
6. Wholesale	*	88	137	26	251
7. Retail	46	835	1,367	447	2,695
8. FIRE	12	137	239	88	476
9. Services	68	457	1,658	3,659	5,842
10. Loc. Gov.	98	641	1,947	408	3,413
11. State Gov.	3	300		16	
12. Fed. Gov.	<u>15</u>	<u>109</u>	<u>196</u>	<u>44</u>	<u>364</u>
Total	302	3,231	7,648	4,916	16,097

SOURCE: Colorado Division of Employment, Report 1, Colorado and Wages Covered by Unemployment Insurance, 4th Quarter 1981

\* Employment in this industry is too small to release due to violation of confidentiality. The employment in this industry is included with Service.

## APPENDIX IV

Detailed Spending by Hunters and Fishers for variable and Fixed Cost Items

TABLE IV-1

## 1981 Per Hunter Variable Costs of Deer Hunting in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Transportation	\$18	13.03	\$ 26	5.54
Communication	1	0.81	8	1.61
Auto dealers	4	2.60	5	1.15
Gas stations	40	28.74	75	15.85
Eating places	13	9.51	57	12.07
Hotel-motel	2	1.43	33	7.05
Campgrounds	1	0.56	5	1.03
Retail stores	39	28.10	76	16.12
Entertainment	1	0.88	10	2.19
Health services	1	0.41	1	0.16
Other services	2	1.79	17	3.49
Local government	1	0.72	28	5.99
State government	13	9.12	90	18.90
Federal government	2	1.46	4	0.82
Individuals	0	0.36	28	5.87
All other	<u>1</u>	<u>0.50</u>	<u>10</u>	<u>2.15</u>
	\$139	100.02	\$473	99.99

Source: Colorado Sportsman Survey (a sample of 295 resident and 320 non-resident deer hunters).

TABLE IV-2

## 1981 Per Hunter Fixed Costs of Deer Hunting in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Family vehicle	\$153	30.08	\$278	30.74
Recreational vehicle	80	15.70	150	16.58
Cabin	19	3.69	129	14.28
Land	59	11.63	-	0.03
Trailer	11	2.10	105	11.59
Camper	6	1.14	35	3.84
Camp equipment	16	3.12	31	3.37
Boats and equipment	5	0.92	1	0.05
Firearms or archery equipment	101	19.75	97	10.74
Ammunition and related equip.	23	4.42	29	3.17
Horses or dogs	9	1.77	18	2.03
Miscellaneous	<u>29</u>	<u>5.70</u>	<u>32</u>	<u>3.59</u>
	\$511	100.02	\$905	100.01

Source: Colorado Sportsman Survey (a sample of 295 resident and 320 non-resident deer hunters).

TABLE IV-3

1981 Per Hunter Variable Costs of Elk Hunting in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Transportation	\$ 17	12.45	\$ 19	4.13
Communication	1	0.55	19	4.19
Auto dealers	3	2.44	5	1.08
Gas stations	46	33.98	71	15.43
Eating places	15	11.54	40	8.76
Hotel-motel	2	1.12	18	4.00
Campgrounds	1	0.43	1	0.27
Retail stores	24	18.00	59	12.92
Entertainment	2	1.12	7	1.45
Health services	1	0.58	0	0
Other services	4	2.74	5	1.07
Local government	1	0.46	19	4.13
State government	16	11.65	135	29.29
Federal government	0	0.12	4	0.93
Individuals	0	0.17	44	9.55
All other	<u>4</u>	<u>2.64</u>	<u>13</u>	<u>2.80</u>
	\$137	99.99	\$459	100.00

Source: Colorado Sportsman Survey (a sample of 113 resident and 82 non-resident elk hunters).



TABLE IV-4  
1981 Per Hunter Fixed Costs of Elk Hunting in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Family vehicle	\$283	48.29	\$343	40.23
Recreational vehicle	81	13.86	46	5.36
Cabin	0	0	25	2.93
Land	0	0	98	11.44
Trailer	22	3.69	19	2.17
Camper	9	1.52	16	1.92
Camp equipment	35	6.00	30	3.54
Boats and equipment	1	0.25	0	0
Firearms or archery equipment	128	21.89	159	18.61
Ammunition and related equip.	14	2.48	25	2.98
Horses or dogs	1	0.14	2	0.26
Miscellaneous	<u>11</u>	<u>1.88</u>	<u>90</u>	<u>10.56</u>
	\$585	100.00	\$853	100.00

Source: Colorado Sportsman Survey (a sample of 113 resident and 82 non-resident elk hunters).

TABLE IV-5

## 1981 Per Hunter Variable Costs of Antelope Hunting in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Transportation	\$ 16	14.26	N.A.	N.A.
Communication	1	1.37		
Auto dealers	0	0		
Gas stations	42	38.70		
Eating places	11	10.53		
Hotel-motel	2	1.53		
Campgrounds	1	0.78		
Retail stores	15	14.07		
Entertainment	1	0.71		
Health services	0	0		
Other services	2	1.58		
Local government	1	1.13		
State government	13	12.82		
Federal government	1	0.42		
Individuals	0	0		
All other	<u>2</u>	<u>2.10</u>		
	\$108	100.00		

Source: Colorado Sportsman Survey (a sample of 39 resident antelope hunters).

TABLE IV-6

## 1981 Per Hunter Fixed Costs of Antelope Hunting in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Family vehicle	\$591	67.99	N.A.	N.A.
Recreational vehicle	116	13.31		
Cabin	0	0		
Land	4	0.47		
Trailer	15	1.71		
Camper	3	0.31		
Camp equipment	8	0.97		
Boats and equipment	0	0		
Firearms or archery equip.	121	13.88		
Ammunition and related equip.	1	0.11		
Horses or dogs	0	0		
Miscellaneous	<u>11</u>	<u>1.25</u>		
	\$870	100.00		

Source: Colorado Sportsman Survey (a sample of 39 resident antelope hunters).

TABLE IV-7

1981 Per Hunter Variable Costs of Small Game Hunting  
in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Transportation	\$ 22	10.27	N.A.	N.A.
Communication	3	1.38		
Auto dealers	1	0.36		
Gas stations	96	44.52		
Eating places	27	12.64		
Hotel-motel	9	3.94		
Campgrounds	2	0.68		
Retail stores	32	14.82		
Entertainment	9	4.01		
Health services	1	0.23		
Other services	1	0.64		
Local government	2	0.95		
State government	5	2.41		
Federal government	2	1.08		
Individuals	3	1.44		
All other	<u>1</u>	<u>0.64</u>		
	\$216	100.00		

Source: Colorado Sportsman Survey (a sample of 203 resident small game hunters).

TABLE IV-8

## 1981 Per Hunter Fixed Costs of Small Game Hunting in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Family vehicle	\$300	38.49	N.A.	N.A.
Recreational vehicle	138	17.77		
Cabin	1	0.01		
Land	0	0		
Trailer	67	8.62		
Camper	56	7.24		
Camp equipment	10	1.23		
Boats and equipment	40	5.16		
Firearms or archery equip.	128	16.42		
Ammunition and related equip.	30	3.83		
Horses or dogs	4	0.48		
Miscellaneous	<u>6</u>	<u>0.75</u>		
	\$780	100.00		

Source: Colorado Sportsman Survey (a sample of 203 resident small game hunters).

TABLE IV-9

1981 Per Hunter Variable Costs of Bear Hunting  
in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Transportation	\$ 3	3.09	N.A.	N.A.
Communication	1	1.20		
Auto dealers	0	0		
Gas stations	49	45.59		
Eating places	13	11.80		
Hotel-motel	0	0		
Campgrounds	1	0.34		
Retail stores	8	16.54		
Entertainment	4	3.43		
Health services	0	0		
Other services	0	0		
Local government	1	0.34		
State government	10	9.26		
Federal government	0	0		
Individuals	7	6.86		
All other	<u>2</u>	<u>1.54</u>		
	\$109	99.99		

Source: Colorado Sportsman Survey (a sample of 27 resident bear hunters).

TABLE IV-10

## 1981 Per Hunter Fixed Costs of Bear Hunting in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Family vehicle	\$ 39	18.46	N.A.	N.A.
Recreational vehicle	17	7.93		
Cabin	0	0		
Land	12	5.64		
Trailer	0	0		
Camper	0	0		
Camp equipment	9	4.16		
Boats and equipment	9	4.40		
Firearms or archery equip.	93	44.03		
Ammunition and related equip.	11	5.25		
Horses or dogs	13	6.06		
Miscellaneous	<u>9</u>	<u>4.05</u>		
	\$212	99.98		

Source: Colorado Sportsman Survey (a sample of 27 resident bear hunters).

TABLE IV-11

1981 Per Fisher Variable Costs of Fishing  
in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Transportation	\$ 40	13.48	\$ 34	6.96
Communication	1	0.45	2	0.50
Auto dealers	26	8.75	7	1.34
Gas stations	109	36.47	75	15.65
Eating places	33	11.01	53	10.98
Hotel-motel	9	2.90	55	11.32
Campgrounds	9	3.13	14	2.98
Retail stores	39	12.91	50	10.40
Entertainment	6	2.03	155	32.15
Health services	1	0.20	1	0.28
Other services	2	0.77	2	0.42
Local government	11	3.54	1	0.24
State government	8	2.51	25	5.19
Federal government	1	0.30	1	0.11
Individuals	3	0.99	1	0.16
All other	<u>2</u>	<u>0.56</u>	<u>6</u>	<u>1.33</u>
	\$300	100.00	\$482	100.00

Source: Colorado Sportsman Survey (a sample of 877 resident and 407 non-resident fishers).



TABLE IV-12  
1981 Per Fisher Fixed Costs of Fishing in Colorado

	Resident		Non-Resident	
	Average	Percent	Average	Percent
Family vehicle	\$218	26.56	\$259	34.80
Recreational vehicle	185	22.59	67	8.96
Cabin	74	9.09	31	4.13
Land	27	3.34	44	5.95
Trailer	82	9.99	74	9.99
Camper	45	5.43	39	5.19
Camp equipment	96	11.73	123	16.52
Boats and equipment	51	6.23	71	9.56
Firearms or archery equip.	28	3.42	21	2.87
Ammunition and related equip.	4	0.51	2	0.23
Horses or dogs	0	0	0	0
Miscellaneous	<u>9</u>	<u>1.10</u>	<u>13</u>	<u>1.79</u>
	\$819	99.99	\$744	99.99

Source: Colorado Sportsman Survey (a sample of 877 resident and 407 non-resident fishers).

COLORADO WATER RESOURCES RESEARCH INSTITUTE

LIST OF PUBLICATIONS AVAILABLE

A. MANAGEMENT OF HYDROLOGIC EXTREMES

		<u>Date</u>	<u>Price</u>
CR 16	Experimental Investigation of Small Watershed Floods	6/68	\$ 2.00
CR 18	Experimental Investigation of Small Watershed Floods	6/70	5.00
CR 29	Identification of Urban Watershed Units Using Remote Multispectral Sensing	6/71	5.00
CR 40	Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes	12/72	3.00
CR 42	Theory and Experiments in the Prediction of Small Watershed Response	12/72	5.00
CR 43	Experiments in Small Watershed Response	12/72	5.00
CR 56	Evaluation and Implementation of Urban Drainage and Flood Control Projects	6/74	8.00
CR 65	Urban Drainage and Flood Control Projects: Economic, Legal and Financial Aspects	7/75	10.00
CR 83	Modelling the Dynamic Response of Floodplains to Urbanization in Eastern New England	1/78	6.50
CR 95	Drought-Induced Problems and Responses of Small Towns and Rural Water Entities in Colorado: The 1976-1978 Drought	6/80	4.00

S-GS856 Research Data Assembly for Small Watershed Floods, Part II 1967 .50

IS 13	Flood Plain Management of the Cache La Poudre River near Fort Collins	8/74	2.75
IS 17	Cache La Poudre River near Fort Collins, Colorado - Flood Management Alternatives - Relocations and Levies	8/74	5.00
IS 22	Implementation of the National Flood Insurance Program in Larimer County, Colorado	9/76	4.00
IS 24	Factors Affecting Public Acceptance of Flood Insurance in Larimer and Weld Counties, Colorado	9/77	3.00
IS 27	Proceedings, Colorado Drought Workshops	11/77	Free
IS 44	The National Flood Insurance Program in the Larimer County, Colorado area	8/80	3.00

B. WATER SUPPLY AUGMENTATION AND CONSERVATION

CR 3	Snow Accumulation in Relation to Forest Canopy	6/69	1.50
CR 4	Runoff from Forest and Agricultural Watersheds	6/69	3.00
CR 8	Improving Efficiency in Agricultural Water Use	6/69	1.00
CR 9	Controlled Accumulation of Blowing Snow	6/69	2.50
CR 15	Hydraulic Operating Characteristics of Low Gradient Border Checks in the Management of Irrigation Water	6/68	3.00
CR 16	Experimental Investigation of Small Watershed Floods	6/68	2.00
CR 18	Experimental Investigation of Small Watershed Floods	6/70	5.00
CR 19	Hydraulics of Low Gradient Border Irrigation Systems	6/70	3.00
CR 20	Improving Efficiency in Agricultural Water Use	7/70	3.00
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CR 24	Studies of the Atmospheric Water Balance	8/71	5.00
CR 25	Evaporation of Water as Related to Wind Barriers	6/71	5.00
CR 30	Geohydraulics at the Unconformity between Bedrock and Alluvial Aquifers	6/72	5.00
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CR 42	Theory and Experiments in the Prediction of Small Watershed Response	12/72	5.00
CR 43	Experiments in Small Watershed Response	12/72	5.00
CR 49	Improvements in Moving Sprinkler Irrigation Systems for Conservation of Water	6/73	7.50
CR 50	Systematic Treatment of Infiltration with Applications	6/73	5.00
CR 51	An Experimental Study of Soil Water Flow Systems Involving Hysteresis	8/73	7.00

		<u>Date</u>	<u>Price</u>
CR 52	Consolidation of Irrigation Systems: Phase I - Engineering, Legal and Sociological Constraints and/or Facilitators	6/73	25.00
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CR 57	Snow-Air Interactions and Management of Mountain Watershed Snowpack	6/74	3.00
CR 63	Analysis of Colorado Precipitation	6/75	2.00
CR 64	Computer Estimates of Natural Recharge from Soil Moisture Data - High Plains of Colo.	1/76	4.00
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CR112	Daily Operational Tool for Maximum Beneficial Use Management of Surface and Ground Waters in a Basin	3/82	3.00
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CR115	Planning Water Reuse: Development of Reuse Theory and the Input-Output Model, V. II, Application	9/80	5.00
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		<u>Date</u>	<u>Price</u>
S-TB128	Evaluating Water Distributions of Sprinkler Irrigation Systems	1976	.85
S-TB 76	Introduction of Supplemental Irrigation Water	1965	.50

C. IDENTIFICATION AND CONTROL OF ENTERING POLLUTANTS

CR 14	Hydrogeology and Water Quality Studies in the Cache La Poudre River Basin, Colorado	6/69	5.00
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CR 59	A System for Geologic Evaluation of Pollution at Mountain Dwelling Sites	1/75	3.50
CR 60	Research Needs as Related to the Development of Sediment Standards in Rivers	3/75	3.00
CR 67	Toxic Heavy Metals in Groundwater of a Portion of the Front Range Mineral Belt	6/75	3.00
CR 71	Salt Transport in Soil Profiles with Application to Irrigation Return Flow - The Dissolution and Transport of Gypsum in Soils	1/76	5.00
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D. EFFECTS OF POLLUTANTS

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S-GS870	Chemical Quality of Groundwater in the Prospect Valley Area, Colorado	1968	.25

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CR 32	Bacterial Movement Through Fractured Bedrock	7/72	5.00
CR 33	The Mechanism of Waste Treatment at Low Temperature, Part A: Microbiology	8/72	5.00
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CR 50	Systematic Treatment of Infiltration with Applications	6/73	5.00
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CR 102	Measuring Benefits and the Economic Value of Water in Recreation on High Country Reservoirs	9/80	3.00
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IS 2	Economics of Water Quality--Salinity Pollution - Abridged Bibliography	6/71	11.00
IS 35	Federal Water Storage Projects: Pluses and Minuses	6/79	Free
SR 3	Irrigation Development Potential in Colorado		4.00

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TR 19	An Economic Evaluation of the General Management for Yosemite National Park	3/80	4.00
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TR 39	Sportsmen Expenditures for Hunting and Fishing in Colorado - 1981	1/83	4.00
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TR 41	The Economy of Albany, Carbon and Fremont Counties, Wyoming, Rawlins BLM District	5/83	4.00
TR 42	The Economy of Big Horn, Hot Springs, Park, and Washakie Counties, Wyoming, Worland BLM District	5/83	4.00
TR 43	The Economy of Eastern Wyoming, Casper BLM District	5/83	4.00
S-GS953	Economic Analysis of Water Use in Boulder, Larimer and Weld Counties, with Projections to 1980	1976	1.00
S-543S	Pump Irrigation on the Colorado High Plains	1970	.65
S-545S	Secondary Economic Effects of Irrigation on the Colorado High Plains	1971	.80
G. ECOSYSTEM EFFECTS			
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IS 28	Proceedings of a Workshop on Revegetation of High-Altitude Disturbed Lands, No. 3	6/68	4.00
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IS 48	Proceedings: High-Altitude Revegetation Workshop No. 5	12/82	6.00
IS 50	Possible Capture of the Mississippi by the Atchafalaya River	8/83	4.00
SR 2	Environment and Colorado - A Handbook	1973	4.00
SR 4	Piceance Basin Inventory	12/71	10.00

		<u>Date</u>	<u>Price</u>
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TR 4	Vegetative Stabilization of Spent Oil Shale	12/74	3.00
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H. PUBLIC WELFARE (SOCIAL GOALS) EFFECTS

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CR 38	Water Quality Management Decisions in Colorado	6/72	5.00
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CR 81	Achieving Urban Water Conservation: Testing Community Acceptance	9/77	5.00
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CR 95	Drought-Induced Problems and Responses of Small Towns and Rural Water Entities in Colorado: The 1976-1978 Drought	6/80	4.00
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CR 44	Economic, Political and Legal Aspects of Colorado Water Law	2/73	5.00
CR 48	Institutional Requirements for Optimal Water Quality Management in Arid Urban Areas	6/73	3.00
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CR 88	Institutional Arrangements for Effective Water Management in Colorado	11/78	4.00
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TR 34	Energy and Water Scarcity and the Irrigated Agricultural Economy of the Colorado High Plains: Direct Economic-Hydrologic Impact Forecasts (1979-2020)	2/82	7.00
X-740A	Ground Water Management District Director's Handbook	1970	.25
SR 5	A Guide to Colorado Water Law	9/78	2.50



J. PLANNING AND ANALYSIS METHODOLOGY

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CR 86	Development of a Drainage and Flood Control Management Program for Urbanizing Communities - Part II	9/78	7.00
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IS 41	Exploring Ways of Increasing the Use of South Platte Water		Free
IS 43	An Evaluation of the Cache la Poudre Wild and Scenic River Draft Environmental Impact Statement and Study Report	8/80	5.00
SR 1	Design of Water and Wastewater Systems for Rapid Growth Areas (Boom Towns - Mountain Resorts)	7/76	4.00
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S-TB127	A Simulation Model for Analyzing Timber-Water Joint Production in the Colorado Rockies	1975	1.25
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K. WATER CONVEYANCE AND CONTROL WORKS			
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S-TB76	Parshall Measuring Flumes of Small Sizes	1957	.25
S-TB120	Selection and Installation of Cutthroat Flumes for Measuring Irrigation and Drainage Water	1976	1.25
S-TB126	A Shunt-Line Metering System for Irrigation Wells	1977	.75
X-426A	Parshall Flumes of Large Size	1961	.50

L. OTHER

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IS	3	Inventory of Environmental Resources Research in Progress - Colorado State University	7/72 Free
IS	5	Directory of Environmental Research Faculty - Colorado State University	12/72 Free
IS	8	Inventory of Current Water Resources Research at Colorado State University	7/73 Free
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IS	30	The Larimer-Weld Council of Governments 208 Water Quality Plan: An Assessment and Suggestions for Future Directions	8/78 2.00
TR	2	Estimated Average Annual Water Balance for Piceance and Yellow Creek Watersheds	8/74 Free
S-5045		Colorado's Ground Water Problems	1967 .35
S-5125		Ground Water in the Bijou Valley	1961 .25
S-GS757		Public Water Supplies of Colorado 1959-1960	1961 1.25