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An Analysis of the Economy of the Upper Main Stem Sub-basin of the Colorado River Drainage Basin in 1960 with Emphasis on Heavy Water-using Industries

Jay Andersen
University of Colorado

Gilbert W. Bonem
University of Colorado

John H. Chapman Jr.
University of Colorado

William H. Miernyk
University of Colorado

Hollis Price
University of Colorado

See next page for additional authors

AN ANALYSIS OF THE ECONOMY OF THE UPPER MAIN STEM SUB-BASIN OF THE COLORADO RIVER DRAINAGE BASIN IN 1960 WITH EMPHASIS ON HEAVY WATER-USING INDUSTRIES

Edited by

Bernard Udis
Associate Professor of Economics
University of Colorado
Boulder, Colorado

Principal Authors:

Jay Andersen
Gilbert W. Bonem
John H. Chapman, Jr.
William H. Miernyk
Hollis Price
Bernard Udis

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Input-Output Analysis

A Brief Description of the Model

The essence of input-output or interindustry analysis is the explicit recognition that each sector of the economy is dependent upon every other sector, and an effort to determine the degree of quantitative interdependence.[1] The literature on input-output is replete with references to "structure," "interdependence" or "interrelationship." These terms emphasize that the primary focus of this analysis is not on the particular level of economic activity as measured by Gross National Product, Employment, or Personal Income, but rather on how the typical or representative firm in each industry depends on all other industries, both as suppliers of inputs and customers for output. A substantial and unique advantage of this means of analysis over alternative techniques is that of its capacity to ferret out both direct and indirect effects of a change in the level of output of a particular industry on all other industries.

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[1] For a simple introduction to input-output analysis, the reader is referred to William H. Miernyk, The Elements of Input-Output Analysis (New York: Random House, 1965). A more sophisticated treatment may be found in Hollis B. Chenery and Paul G. Clark, Interindustry Economics (New York: John Wiley & Sons, Inc., 1959). Detailed and advanced critiques of the method are available in Conference on Research in Income and Wealth, Studies in Income and Wealth, Vol. 18, National Bureau of Economic Research, Input-Output Analysis: An Appraisal (Princeton: Princeton University Press, 1955); and Oskar Morgenstern (ed.), Economic Activity Analysis (New York: John Wiley & Sons, Inc., 1954). The basic references to input-output analysis are those of its modern father, Wassily W. Leontief, The Structure of American Economy, 1919-1939 (New York: Oxford University Press, Second Edition, 1951); and Leontief, et. al., Studies in the Structure of the American Economy (New York: Oxford University Press, 1953). A convenient collection of Leontief's articles has been published as Input-Output Economics (New York: Oxford University Press, 1966). It includes a number of interesting examples of the application of I-O analysis.

Thus a knowledge of the structure of the economy provides the means to trace the implications, industry by industry, and in the aggregate, of a change in the level of economic activity of a particular sector.

The workings of such a table will be illustrated shortly. It should be pointed out here, however, that in a study of this sort where the primary interest is quite particular--what will be the water requirements (both quantitative and qualitative), necessary to support alternative levels of economic activity and population in the future--overall estimates of economic aggregates such as GNP or population are inadequate. The regulatory agency must be concerned with the economic base and how its parts fit together. Officials of the Federal Water Pollution Control Administration, however alert to sharp changes in the level of activity of traditional heavy water users, may be quite unprepared for changes arising elsewhere in the economy, however induced, which may have significant secondary or tertiary effects on the heavy water users. It is our conviction that a knowledge of the structural interrelationships within an economy is a prerequisite to rational and effective measures in the realm of public policy.

The raw material for the analysis is found in the grid or matrix of interindustry transactions. Such a matrix for the Upper Main Stem Sub-Basin is found in Table UMS-S on page 58 of this report. This table shows the detailed disposition of the output of each industry along the horizontal lines or rows. Thus in 1960, the range livestock industry in the Upper Main Stem Sub-Basin kept $2,780,000 of its own production for further use while selling $2.8 million to feeder livestock, and smaller amounts to other industries. The vertical columns of the table are used to indicate each industry's sources of supply. Again referring to Table UMS-S we see that range livestock was its own most important supplier. This, of course, is simply the other side of the transaction noted above. However, as we read down the column, we can quickly spot $87,000 of purchases by range livestock from the dairy industry and other purchases from various suppliers of the industry. We can also identify $2,573,000 of imports from outside the Colorado Basin, payments of $10.3 million in profits and related payments and $3.3 million in wages and salaries.

While a useful method of interindustry accounting, the transactions table will not yield the desired answer to the basic question: How will a change in the output output of one industry affect all other industries? For this, additional steps are necessary which involve mathematical manipulations of the figures in the transactions table. The details are cumbersome, but in essence, the task is to solve as many simultaneous linear equations as the number of industrial categories in the so-called processing sector[2] of the matrix. Linear or matrix algebra is the technique and a high-speed electronic computer the instrument for this operation. Briefly put, the procedure is to adjust the column totals, labeled Total Gross Outlays, by subtracting the row entry identified as inventory change (depletion), and then expressing each remaining number in the column as a percent of the now-adjusted total. To repeat, this is done only for the industries in the processing sector. The resulting table is known as the "A" matrix, or table of direct coefficients. It yields the direct requirements of the regional economy from industries named in row headings at the left per dollar of output sold outside the processing sector by the industry named at the column head. However, this is only a way-station because it fails to take account of secondary, tertiary and other indirect effects. To complete the story, the "A" matrix must be subtracted from an identity matrix, (a series of 1's along the diagonal and zeros in all other cells), and then inverted. The resulting inverse matrix shows the direct and indirect effects on all industries of a change in the output level of any one of them. It enables one to specify the level of production required of each industry to sustain any particular level of final demand.[3]

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[2]The economy is assumed to consist of two classes of sectors, an autonomous sector which responds largely to forces external to this regional economy, and a non-autonomous sector which is responsive to changes originating within the regional economy. To unearth structural interrelationships within the non-autonomous sectors is the goal of the analysis. These non-autonomous categories are classified as constituting the "processing" sector. The autonomous categories are labeled the "Payments" sector along the rows and the "final demand" sector along the columns. For a detailed discussion of this point together with a diagrammatic and symbolic exposition, see Miernyk, op. cit., Chapter 2.

[3]Ibid.

The inverse matrix for the Upper Main Stem is shown in Table UMS-U on page 60 of this report. Each entry shows the total dollar production directly and indirectly required from the industry at the top of the table per dollar of deliveries to final demand by the industry at the left. Again using range livestock as an example, it may be determined that for each dollar of its sales to final demand, this industry must produce $1.11 of output. Other significant effects are felt in rentals and finance (4.8 cents), agricultural services (2.8 cents), other retail (2.4 cents), and other manufacturing (2.1 cents). In the aggregate, it requires $1.30 of production from the processing sector to support each dollar of range livestock sales to the final demand sector. The magnitude of these direct and indirect effects gives range livestock a rank order of fourteen within the processing sector of the Upper Main Stem. (See Table UMS-Z)

Returning for a moment to Table UMS-S showing interindustry transactions, it is assumed that the actual entries will change from year to year but that the relative proportions between industries remain essentially constant over periods of short to intermediate length. This is to say that industrial technology and household consumption patterns change only slowly.[4]

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[4]This assumption of fixed coefficients appears to fly in the face of popular conceptions of an ever-changing technology and fluid tastes. There is also controversy on the professional level concerning the constancy of coefficients assumption. The resolution of this issue, however, will be found in empirical evidence rather than in theorizing, and on this count, there is evidence which supports the assumption of relative constancy over short periods. In his input-output study of four Southwestern Wyoming counties, Richard Lund found very little change in coefficients between 1953 and 1959, despite drastic changes in the economy of the region during the period. It should be noted that the four counties he studies are all in the Green River Sub-Basin of the Colorado River Basin. See Richard E. Lund, A Study of the Resources, People and Economy of Southwestern Wyoming. (Cheyenne: Wyoming Natural Resource Board, 1962), p. 77. Chenery and Clark have commented that "the results of input-output analyses are not sensitive to changes in the great many of the coefficients," and "....the research task of examining the important coefficients for possible modifications of the assumption of constancy is a manageable one." See their Interindustry Economics, op. cit., p. 161. In Chapter 6 of the same volume, there is a discussion of various studies which have been conducted to test the validity of the assumptions underlying input-output analysis. Finally, input-output analysis, unlike other methods of analysis, provides an advantage in that it "readily permits introduction of revised coefficients". See Philip M. Ritz, "Comment", in Input-Output Analysis: An Appraisal, op. cit., pp. 181-182.

It cannot be denied, however, that despite some reasonably stable components, the American economy is a dynamic one where change is not a stranger. Nevertheless, the essential point is that the validity of the input-output technique is independent of the degree of constancy of coefficients. As Evans, Hoffenberg have noted, interindustry analysis is basically cross-sectional and "The structural interconnections revealed by it should not be considered as immutable or unchanging, but rather as the starting point approximate to the period to which an analysis of input structures is to refer.[5] Thus, the 1960 tables contained in this report give valuable insights into the structure of the economy of the Upper Main Stem that will probably remain valid for perhaps a decade. However, projections of the structural relationships which will prevail in this region more than ten years hence must be interpreted with an awareness of their highly tentative nature. Such projections of technical coefficients have been made however, and appear in the last chapter of this report where the topic of projections is treated in detail.

Implementing the Model in the Upper Main Stem Sub-Basin of Colorado River Basin[6]

The model described briefly above is deceptively simple. The direct coefficients can be computed easily on a desk calculator even for a fairly large table. And programs for the inversion of matrices are readily available. The major work involved is in constructing the basic transactions table. Before this can be done the sectors to be included in the table must be defined. An effort must be made to limit each sector to one with relatively homogeneous inputs and outputs. Care must be exercised to avoid the problem of substitutability. After preliminary

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[5] W. Duane Evans and Marvin Hoffenberg, "The Interindustry Relations Study for 1947", Review of Economics and Statistics (May, 1952), pp. 97-142. See especially p. 126.

[6] This section borrows heavily from Miernyk's excellent paper, "Small-Area Interindustry Analysis", Bureau of Economic Research, University of Colorado, (Mimeographed, 1963), pp. 8-17.

investigation has shown what sectors are to be used the transactions table is constructed in two steps:

(1) The first step is to establish "control totals." For the processing sectors these are usually total sales figures, except for the trade sector where gross margins (operating costs plus net revenues) represent output.[7] In the final demand and payments sectors it is possible to estimate other control totals, such as payments to government and personal consumption expenditures.

(2) Once the control totals have been established, the row and column distributions are worked out. In this study the distributions were based on survey data obtained from a sample of all establishments represented in the processing sectors. The procedure is to fill out each row and the corresponding column separately, then to reconcile differences at the intersections. The entire process is iterative. There is no single method for arriving at the final distribution. Frequently, judgment must be used in making intersection reconciliations.

In constructing the transactions table either producer's or purchaser's prices may be used. The standard practice in the United States, however, has been to use producer's prices, and this was the procedure followed in this study. When this method of valuation is employed, marketing costs are excluded from the output control totals. They are added to the costs of the comsuming sector. Trade margins are registered as purchases by the consumers of specific commodities. Both outputs and inputs are stated in f.o.b. prices. The buyer pays transportation costs, and where a firm uses its own transportation facilities, transportation costs must be imputed to the transportation sector.[8]

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[7]The problem of treating the trade sectors so that they reflect only the distribution of the gross margin is complex, but quite important. An illustrative example appears in the appendix to this chapter.

[8]For a discussion of the problems involved in obtaining data, and the reaons for preferring producer's to purchaser's prices, see Chenery and Clark, op. cit., pp. 141-142; and Evans and Hoffenberg, pp. 103-104.

For data collection purposes, the processing sector of the transactions table for the Upper Main Stem was divided into thirty-one industries. The number of processing sector industries simply reflects the types of economic activity found in the regions. Heavy water using industries were singled out for separate treatment in the processing sector of the transactions table. Also, a number of sub-divisions of the trade and service sectors were closely examined in view of their importance to water-related recreation activities.

It is essential to provide for unallocated inputs and outputs during the data gathering phase. Chenery and Clark have argued that it is better to eliminate unallocated figures even if this must be done solely on the basis of judgment.[9]

In this study unallocated inputs and outputs were not a particularly serious problem. Reasonably comprehensive surveys of most processing sectors permitted fairly reliable distributions of purchases and sales.[10] The survey data were also helpful in distributing purchases and sales within the payment and final demand sectors. This is perhaps an advantage which small area input-output analysis has over the construction of national tables. Those involved in the construction of national tables have available a wealth of statistical information which cannot be obtained on a small-area basis, and thus can estimate more reliable control totals. On the other hand, it would be inordinately costly to conduct nation-wide surveys for all sectors to allocate interindustry flows. In a relatively small and sparsely-populated area, however, such surveys yield a high rate of return.[11]

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[9] Chenery and Clark, op. cit., p. 142.

[10] The extent of coverage varied from sector to sector. It is important to emphasize, however, that sample data were not used to estimate control totals. These were derived from secondary sources.

[11] In some small-area input-output studies interindustry flows have been estimated by applying national coefficients to regional control totals. As Isard has pointed out, however, such estimates are affected by interregional differences in factor proportions and product mix. The use of survey data to distribute purchases and sales should result in far more accurate technical coefficients. See Walter Isard, "Regional Commodity Balances and Interregional Commodity Flows", American Economic Review (May, 1953), pp. 170-171.

The construction of the transactions table would be greatly simplified if there were no interest in imports and exports, i.e., if one were dealing with a closed model. But it is completely unrealistic to treat a small area as a closed economy. In small-area analysis the import and export flows are among the most important to be considered. More will be said about this presently.

In wholesale and retail trade it is possible to obtain good data on purchases both on an interindustry and geographical basis. On the other hand, however cooperative they might be, retailers are rarely in a position to give an interviewer much information about the final destination of their sales. To a lesser extent this difficulty is also encountered in the wholesale trade sector.

Many services are entirely of a local nature, and these present no serious problems. Some services are highly seasonal, however, such as those provided by firms which cater to the tourist trade. In such cases it is difficult to make an accurate breakdown between services provided to residents of the area and those provided to transients. In lodging facilities, for example, such data could no doubt be obtained by a careful search of records. Indeed, some respondents in our survey provided accurate figures, but others were unwilling to do more than make rough estimates. The transportation sector poses similar problems. There are no major difficulties in measuring intra-area shipments. But there are serious difficulties when shipments to and from other areas are involved. In construction, the major problem is simply one of obtaining accurate information from builders. Even at the national level there are serious data deficiencies in the construction sectors, and in some ways these difficulties are compounded in a small-area study.[12] Utilities provide another example of measurement difficulties. Utilities do not keep books on a basis which would permit accurate estimates of sales by county. Power and telephone companies typically distinguish among sales to households, and to commercial and industrial users. But they are quite indifferent to county lines, and usually are equally indifferent to

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[12] See Evans and Hoffenberg, op. cit., pp. 117-118.

state lines. Hence in estimating the sales of utilities on a small-area basis it is necessary to rely on various ratios (to population, employment, etc.) in allocating these sales on a county and eventually a regional basis.

One other classification within the processing sector calls for some comment. This is the exclusion of professional services from the service row and column. These were included in households, a decision dictated entirely by data considerations.

All data were expressed in 1960 prices with no attempt to adjust for price changes during the year. The latter adjustment would have been desirable. But there would have been no way of estimating the percentage of transactions at each of a succession of prices without examining all records on a day-to-day basis, something which could not be attempted because of time and money considerations. Thus, we assumed that the volume of transactions in the base year was not affected by price changes.[13]

The Final Demand and Payments Sectors

The autonomous sector represents the "open" part of the input-output system. For each component of the processing sector, the sum of the row must equal the sum of the column. That is, total gross output must equal total gross outlays (by definition). This is not so for the final demand and payments sectors, however. In this case, the only constraint is that the sum of all rows in the payments sector must equal the sum of all columns in the final demand sector. Thus when the input-output system is used to analyze changes in final demand the sub-sectors comprising final demand can be collapsed into a single column vector. It is important, however, to examine each of the final demand (and payments) sub-sectors since variations in any one will have an effect on levels of production in the processing sectors.

Final Demand sub-sectors---In this model, there are seven final demand sub-sectors. These are: (1) additions to inventory (no matter

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[13] Additions to inventory were no doubt affected to some extent by price changes, although there would be some offset from inventory depletions. Price changes in 1960 were not large, however. Consumer prices rose about 1.6 percent and, wholesale prices were virtually stable. See Economic Report of the President (January, 1963), pp. 220-224. Cf. Evans and Hoffenberg, op. cit., p. 119.

where held) during the base year, (2) gross investments, (3) households, (4) state and federal government, (5) local government, and (6) exports. Exports are divided into two classes: (a) exports outside the Sub-Basin but within the Colorado River Basin, and (b) exports to the rest of the world.

The Payments sub-sectors---These consist of: (1) inventory depletion during the year, (2) depreciation allowances, (3) households, (4) state and federal government, (5) local government, and (6) imports. As with exports, imports are subdivided into two groups: (a) imports from the rest of the Colorado River Basin, and (b) imports from the rest of the world.

It is probably fair to say that the most difficult data problems in the construction of a transactions table occur in the final demand and payments sectors.

Inventories---Both the inventory column and row measure gross changes. Thus the column vector minus the row vector yields net inventory changes. As Evans and Hoffenberg point out, it is difficult to handle inventories within the input-output framework since "they introduce a dynamic element into what is essentially a series of static flows."[14] To establish inventory totals in each cell properly it is necessary to obtain data on the amounts sold from stock during the base year (entered in the inventory row), and also to obtain data on the amounts added to stock during the base year (entered in the inventory column). Thus we are concerned only with the flows into and out of inventory, and not the size of the stock itself. Excellent data on inventory changes were obtained from some firms in the survey, but in other cases only rough estimates could be made.[15]

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[14] Op. cit., p. 118.

[15] The inventory problem in some small-area input-output studies has been handled by reporting only net inventory changes. See for example, the transactions table in "The Eighth District Balance of Trade", Monthly Review, Federal Reserve Bank of St. Louis (June, 1952). In others it has been avoided by leaving inventories out of the calculations entirely. See, for example Frederick T. Moore and James W. Peterson, "Regional Analysis: An Interindustry Model of Utah," Review of Economics and Statistics (November, 1955), pp. 368-383, table following page 372; and Richard E. Lund, A Study of the Resources, People and Economy of Southwestern Wyoming Laramie, Wyoming; Division of Business and Economic Research, University of Wyoming (June, 1962), table following page 74.

Household & Government---Control totals for these sectors were built up from published sources of data on income, tax payments, and government purchases. The county data were somewhat uneven from state to state, but there probably are no significant errors in the control totals. Payroll data, obtained from state Divisions of Employment Security, sales tax data, and survey data obtained from business establishments were used to work out the inter-industry flows and some of the allocations within the payments and final demand sectors.

Investment and depreciation---As Chenery and Clark have noted, one of the major gaps in national statistics is the lack of investments by industry cross-classified with investment by type of capital equipment.[16] Even if good data were available, however, there are some conceptual problems involved in handling capital outlays within the input-output system. The basic transactions table is supposed to show the flow of all goods and services from industry of origin to industry of destination. It might be argued that if all flows are to be recorded, they should include sales on current account for intermediate and final use plus sales of capital equipment. But Evans and Hoffenberg have pointed out that input ratios computed from a generalized flow matrix of this kind would not be stable (since purchases of capital equipment by individual establishments tend to be "lumpy" rather than continuous), and these ratios would not be limited to transactions on current account which are the central focus of input-output analysis.[17] Thus industry outputs to gross private domestic investment are listed in a separate column, and depreciation allowances in a separate row. In the tables in this study, the first approximations were based on survey data. These were adjusted following successive iterations of the various rows and columns.

Exports---Many activities covered by a small-area input-output table will be purely local in character, and these pose no particular problem. At the other extreme, some industries in a small area

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[16] Op. cit., p. 273.

[17] Op. cit., pp. 104-105.

might produce entirely for export which greatly simplify the allocation of their production. For those that fall in between some estimation is required. In our tables the distinction between local and export sales for such industries was based largely on survey data. Local sales were subtracted from total sales and the difference allocated to the export column for each sector.

Imports---It is customary in constructing national transactions tables to distinguish between competitive and non-competitive imports. It has also been the practice in constructing national tables to add competitive imports to domestic production in the appropriate sector. Only the non-competitive imports, therefore, are entered in the import row.[18] In our tables this distinction was not made. With the possible exception of some agricultural products, there are few examples of commodities produced in this area which are also imported for local consumption. This simplified the problem, and the assumption was made that all imports were non-competitive.

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[18] See Chenery and Clark, p. 142, and Evans and Hoffenberg, p, 109.

Appendix: Illustrative Example of the Process of Margnning the Trade Sectors

Assumptions

(1) A simple economy with a single processing industry (perhaps mining) with no consumer goods manufacturing in the economy, a single trade sector, a household sector and a link with the outside world through exports and imports-- such as Appendix Table M-1.

(2) All numbers in Appendix Table M-1 represent total dollar sales.

(3) No wholesale sector exists.

(4) The retail trade sector is supplied through imports.

(5) The retail trade margin is twenty percent.

The twenty percent margin is applied to all entries in the trade row which reduces each original entry by eighty percent. The amount by which the trade row is reduced is then added to the import intersection with each of the affected columns as shown in Appendix Table M-2. If we stopped at this point, the import row would be grossly overstated since the processing industry, the household, and exports are all now viewed as importing goods which still appear as trade sector imports. The totals would also be out of balance with the retail trade row total equal to 26 while its column total comes to 130. Further, the sum of the final demand columns (households plus exports) equal 185 while their row totals come to 289. Hence, it becomes necessary to reduce trade imports by the sum of the additions to the imports of the other three columns---104. All row and column totals are now brought back into balance within the processing sector as is the aggregate of the autonomous payments sector and final demand. See Appendix Table M-3.

APPENDIX TABLE M-1

TRANSACTIONS TABLE FOR A HYPOTHETICAL ECONOMY

(Stage 1)

	MINING	RETAIL TRADE	HOUSEHOLDS	EXPORTS	TOTAL GROSS OUTPUT
MINING	0	5	55	0	60
RETAIL TRADE	10	0	90	30	130
HOUSEHOLDS	40	20	0	0	60
IMPORTS	10	105	10	0	125
TOTAL GROSS OUTLAY	60	130	155	30	375

APPENDIX TABLE M-2

TRANSACTIONS TABLE FOR A HYPOTHETICAL ECONOMY

(Stage 2)

	MINING	RETAIL TRADE	HOUSEHOLDS	EXPORTS	TOTAL GROSS OUTPUT
MINING	0	5	55	0	60
RETAIL TRADE	2	0	18	6	26
HOUSEHOLDS	40	20	0	0	60
IMPORTS	18	105	82	24	229
TOTAL GROSS OUTLAY	60	130	155	30	375

APPENDIX TABLE M-3

TRANSACTIONS TABLE FOR A HYPOTHETICAL ECONOMY

(Stage 3)

	MINING	RETAIL TRADE	HOUSEHOLDS	EXPORTS	TOTAL GROSS OUTPUT
MINING	0	5	55	0	60
RETAIL TRADE	2	0	18	6	26
HOUSEHOLDS	40	20	0	0	60
IMPORTS	18	1	82	24	125
TOTAL GROSS OUTLAY	60	26	155	30	271

Just why is all of this manipulation necessary? For one thing the trade sectors differ from other processing sector industries in that their major task is to see that commodities and services are available when and where the consumer requires them. Thus they provide time and place utility but do not alter the physical form of the good. In this analysis an attempt is made to get at "value added" by entering only the gross margins of the trade sectors (the sum of operating expenses plus profit) in the transactions table.

To refer back to the example for a moment, if the trade sector supplies other industries with only twenty percent of the total value of their purchases, who supplies the remaining eighty percent? This example assumes that the missing eighty percent comes in the form of imports from outside the region. It is far from unrealisitc in this part of the country although there are clearly some local producers servicing the domestic market. Thus, instead of assigning the full amount of the difference between total trade sales and the trade margin to imports, some should go to local producers whose product is channeled to local consumers through the trade sector. The simplest case was chosen for the example to make the illustration of the general principle as clear as possible.

Perhaps the rationale for margining the trade sector is best presented by Evans and Hoffenberg when they write:

> If output of the trade sectors were defined to cover total sales, it would mean that a great variety of commodities would flow into trade as inputs and then be charged out in some averaged aggregate form to consuming sectors. This procedure would eliminate the direct link between producers and users which is a a main purpose of the tabulations and would substitute instead a heterogeneous trading structure.[19]

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[19] Evans and Hoffenberg, op. cit., p. 104.

The Economy of the Upper Main Stem Sub-Basin of the Colorado River Basin: An Overview

Introduction

The Upper Main Stem Sub-basin is the smallest of any of the six sub-basins of the drainage area of the Colorado River Basin. Its 26,097 square miles comprise almost 11% of the overall area of the Colorado Basin. Almost 85% of its area lies within Colorado with the remaining 15% in Utah.[1] For purposes of this analysis, the Upper Main Stem Sub-basin has been defined to include 13 counties in Colorado and one in Utah. The Colorado counties include the following: Delta, Dolores, Eagle, Garfield, Grand, Gunnison, Hinsdale, Mesa, Montrose, Ouray, Pitkin, San Miguel, and Summit. Grand County in Utah completes the list of representative counties of the Upper Main Stem. Figures UMS-A and UMS-B show the precise location of the Upper Main Stem, while Table UMS-A lists the representative counties[2] of each sub-basin of the Colorado River Basin.

The Upper Main Stem Sub-basin covers most of west central Colorado and Grand County's location in east central Utah. The largest city in the sub-basin is Grand Junction, Colorado located in Mesa County. Other communities in the sub-basin include the ski resort of Aspen, and the towns of Glenwood

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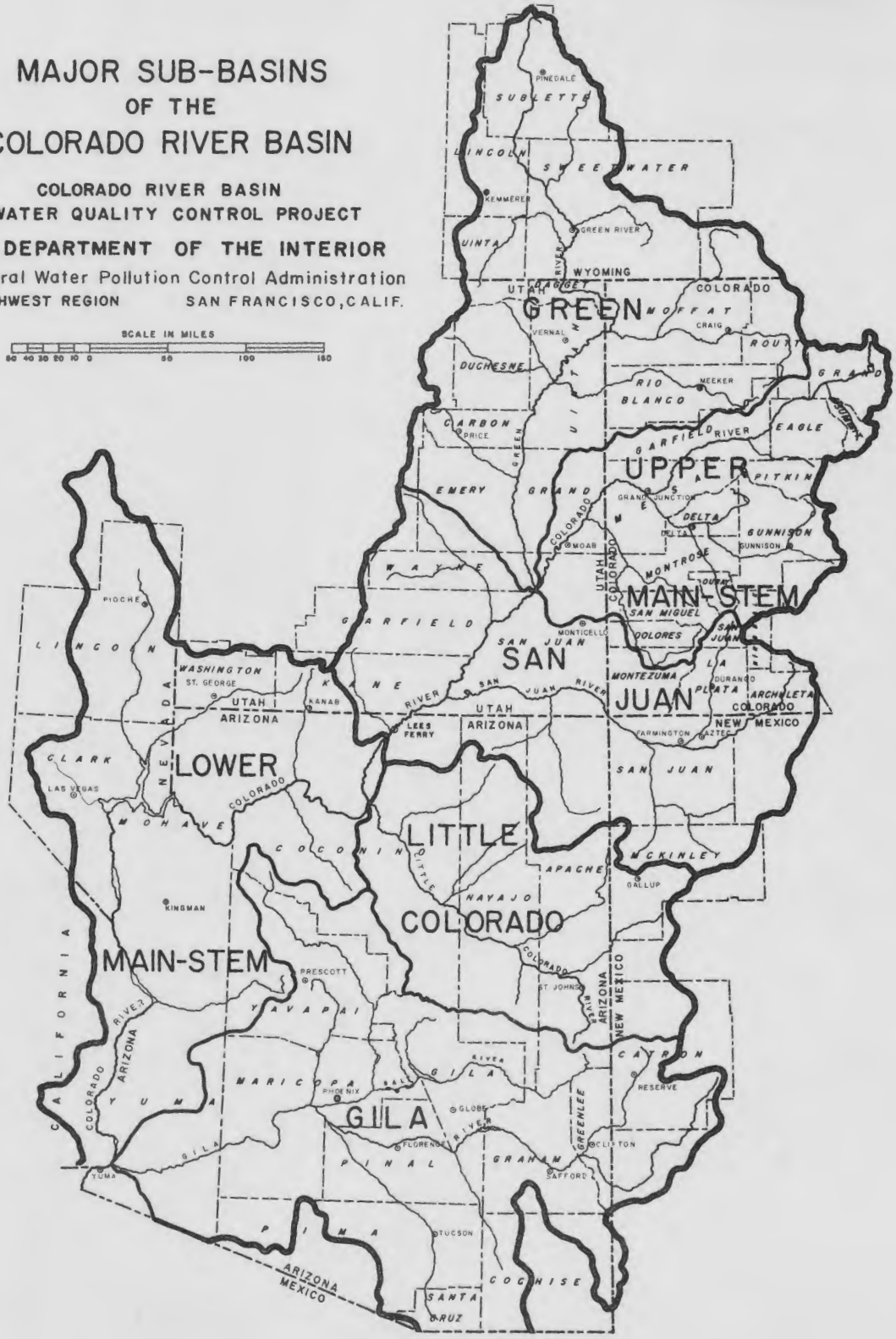
[1] See U.S. Department of Health, Education, and Welfare, Public Health Service, Bureau of State Services, Division of Water Supply and Pollution Control, Region VIII, Colorado River Basin Water Quality Control Project, State and County Area Tabulations for the Colorado River Basin: (Denver: Colorado River Basin Water Quality Control Project, January, 1962), p. 7.

[2] The Public Health Service has designated as "representative" certain counties of the Colorado Basin in which most of the economic activity occurs. This was necessary because the boundaries of the Colorado River Basin and its sub-basins follow natural drainage divisions and rarely conform to county borders while most statistical data are available only for entire counties. Ibid., p. 12.

MAJOR SUB-BASINS OF THE COLORADO RIVER BASIN

COLORADO RIVER BASIN
WATER QUALITY CONTROL PROJECT

U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
SOUTHWEST REGION SAN FRANCISCO, CALIF.



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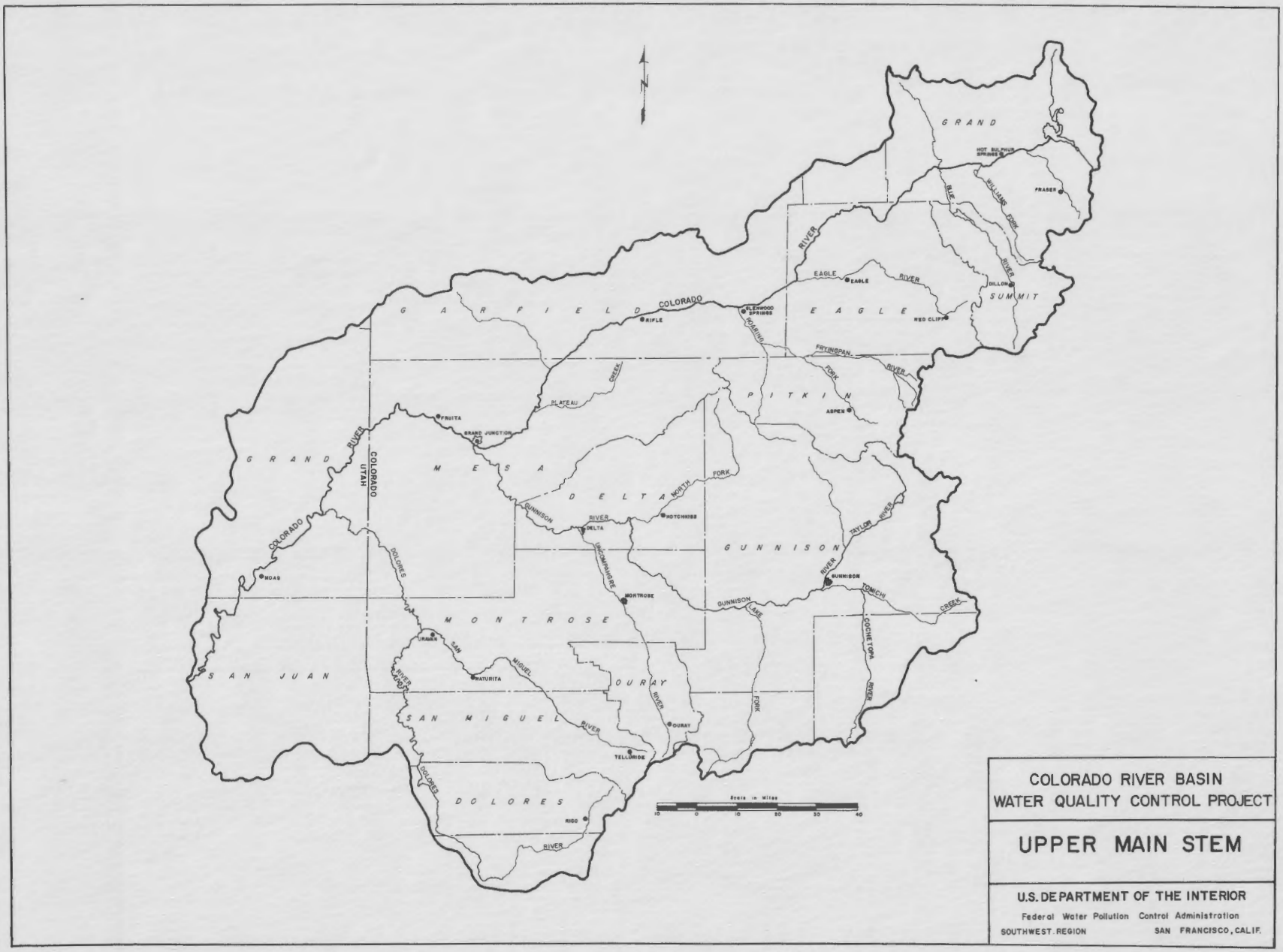
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GRAND
HOT SULPHUR SPRINGS
FRASER
WILLIAMS FORK
BLUE
RIVER
EAGLE
EAGLE
RIVER
DILLON
SUMMIT
G A R F I E L D
COLORADO
GLENWOOD SPRINGS
RIFLE
E A G L E
RED CLIFF
ROARING
FORK
RIVER
FRYINGPAN
CREEK
PLATEAU
P I T K I N
ASPEN
FRUITA
GRAND JUNCTION
GRAND
RIVER
COLORADO
UTAH
M E S A
D E L T A
NORTH
FORK
GUNNISON
RIVER
DELTA
HOTCHKISS
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RIVER
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TOMICHI
CREEK
MONTROSE
GUNNISON
LAKE
COCHETOPA
RIVER
M O N T R O S E
SAN
MIGUEL
RIVER
OURAY
FORK
S A N J U A N
RIVER
NATURITA
OURAY
SAN M I G U E L
RIVER
TELLURIDE
DOLORES
D O L O R E S
RICO
RIVER
Scale in Miles
10 0 10 20 30 40
COLORADO RIVER BASIN
WATER QUALITY CONTROL PROJECT
UPPER MAIN STEM
U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
SOUTHWEST REGION
SAN FRANCISCO, CALIF.

TABLE UMS-A

A LIST OF REPRESENTATIVE COUNTIES IN THE COLORADO RIVER BASIN

Sub-Basin	State and County
I. Upper Main-Stem	Colorado 1. Delta 2. Dolores 3. Eagle 4. Garfield 5. Grand 6. Gunnison 7. Hinsdale 8. Mesa 9. Montrose 10. Ouray 11. Pitkin 12. San Miguel 13. Summit Utah 1. Grand
II. Green	Colorado 1. Moffat 2. Rio Blanco 3. Routt Utah 1. Carbon 2. Daggett 3. Duchesne 4. Emery 5. Uintah Wyoming 1. Lincoln 2. Sublette 3. Sweetwater 4. Uinta
III. San Juan	Colorado 1. Archuleta 2. La Plata 3. Montezuma 4. San Juan New Mexico 1. San Juan
III. San Juan (cont'd)	Utah 1. Garfield 2. Kane 3. San Juan 4. Wayne
IV. Little Colorado	Arizona 1. Apache 2. Navajo New Mexico 1. McKinley
V. Gila	Arizona 1. Cochise 2. Gila 3. Graham 4. Greenlee 5. Maricopa 6. Pima 7. Pinal 8. Santa Cruz 9. Yavapai New Mexico 1. Catron 2. Grant
VI. Lower Main-Stem	Arizona 1. Coconino 2. Mohave 3. Yuma Nevada 1. Clark 2. Lincoln Utah 1. Washington

Springs, Hot Sulphur Springs, Fraser, Dillon, Red Cliff, Eagle, Rifle, Delta, and Montrose in the State of Colorado, and Moab in Grand County Utah. The sub-basin has long been a center of mining activity, and in recent years uranium has been of particular importance. Garfield County figures prominently in much of the current speculative talk concerning the development of an oil shale industry in Colorado, and pilot plants already exist in the Rifle area. With its excellent ski facilities, outdoor recreation during the winter season also has become important in the economic life of the sub-basin.

Range livestock is by far the most important agricultural industry in the Upper Main Stem Sub-basin, and grazing on federally owned land has always been a key part of this industry. Despite increases in the average size of farm and decreases in the number of farms in this sub-basin in recent years, most of the agricultural establishments are small. Thus, it has been estimated that only about 25% of the farms in the Upper Main Stem could be considered as commercial farms with sales over $10,000.00 per year.[3] Irrigation has always played a significant role in the agricultural life of the sub-basin and some of the earliest projects of the U.S. Bureau of Reclamation are located in the area.

Population

The Upper Main Stem Sub-basin is the third most populous sub-basin of the Colorado River with a 1960 population of 128,079. Table UMS-B presents a summary of the age and sex distribution of 1960 sub-basin population. In that year the age profile of population in the sub-basin showed a somewhat larger percentage of the population under age 20 and over age 64 and a corresponding

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[3]See Jay Andersen, "Agricultural and Forestry Aspects of an Interindustry Analysis of the Upper Main Stem Sub-basin of the Colorado River," Economic Research Service, U.S. Department of Agriculture, Logan, Utah, August, 1967, p. attached.

TABLE UMS-B

Population by Age and Sex - 1960

Upper Main-Stem Sub-Basin

Age Group	Male	Female
0 - 19	26,258	25,438
20 - 39	14,784	15,392
40 - 64	17,395	16,349
65+	6,245	6,218
TOTAL	64,682	63,397
BOTH SEXES - TOTAL	128,079	

Source: U. S. Census of Population, 1960.

smaller proportion between the ages of 20 and 64 than was the case a decade earlier.

The population of the Upper Main Stem has been growing since at least 1930 although the rate of growth slowed appreciably in the decade to 1950 when a growth of only 3.8% was recorded. However, in the 1950 - 1960 period, the population grew 17.4%. In the same decade nine of the fourteen counties which comprise the Upper Main Stem grew in population ranging from an increase of 233% in Grand County, Utah to a gain of 3.4% in Garfield County, Colorado.. Five counties of the Sub-basin lost population in the decade to 1960. These were Ouray (-23.9%), Hinsdale (-20.9%), Grand, Colorado (-10.3%), Delta (-10.2%), and Gunnison (-4.2%).

Census data permit an analysis of population change in terms of the components of such change. For example, it enables one to determine how much of the difference of population between 1950 and 1960 was due to factors other than the excess of births over deaths (the natural increase). The results of such an analysis in the Upper Main Stem are instructive. During the decade to 1960 the excess of births over deaths in this sub-basin amounted to 18,301. The reported excess of total 1960 population over 1950 was 19,019. Thus, net in-migration is said to have taken place, and the 718 in-migrants constitute 0.66% of the 1950 population taken as a base. Thus a net migration rate of +0.66% is assigned the Upper Main Stem Sub-basin. Similarly calculated rates for the component counties show positive net rates for five counties (Grand Utah, Summit, Pitkin, Mesa, and Montrose, Colorado) and negative rates for nine counties (Ouray, Grand, Hinsdale, Dolores, Gunnison, Eagle, Delta, San Miguel, and Garfield).

In the aggregate, the Upper Main Stem ranked third in population in 1960 among the six sub-basins of the Colorado. Its approximate 7% of total Colorado River Basin population in that year lagged far behind the Lower Main Stem's 12.8% and the Gila's 63.1%. In relative terms it was only marginally ahead of the San Juan's 5.8%, the Little Colorado's 5.7%, and the Green's 5.6%. In terms of rank, however, the Upper Main Stem had moved up one knotch from its fourth-ranked position in 1950, although its relative share of total Colorado Basin population has continued to decline from 12.4% in 1940 and 915% in 1950.

Population Density

The 128,079 residents of the Upper Main Stem in 1960 were distributed over a land area of 25,680 square miles in the representative counties, with a resulting population density of just about 5 persons per square mile. This figure compares with national density of population of 59 persons per square mile in that year. While sparsity of population relative to land characterizes all the sub-basins of the Colorado, the sub-basin of the Upper Main Stem ranks second among the six, trailing the Gila's "crowded" figure of 18.8 persons per square mile. While population density in the United States in the decade to 1960 increased by 18.4%, that of the Upper Main Stem grew by 17.4%.

Within the sub-basin, 1960 population density ranged from a low of 1.7 persons per square mile in Gunnison County to a high of 15.3 persons per square mile in Mesa County. In ten of the 14 component counties, however, population density did not exceed 4 persons per square mile.

By census definition, 65.3% of the population of the Upper Main Stem was classed as rural in 1960. Of this group, 15.6% were classed as rural farm and

49.8% as rural nonfarm. The changes were from 30.3% and 45.6% respectively of the population of the Upper Main Stem in the year 1950. Thus, it may be noted that the rural farm segment of the population had declined by almost half in relative importance during the decade to 1960. It is interesting to note, however, that during this period of relative decline of the rural population, the rural nonfarm population actually increased its importance by a few percentage points reflecting the growing concentration of population in this sub-basin in an essentially small town environment rather than on farms. Nevertheless, the sub-basin of the Upper Main Stem can hardly be considered urban. The 34.6% of its 1960 population considered urban was the second lowest of all six sub-basins with only the Little Colorado Sub-basin showing a smaller urban percentage --28.4% of the population.

It might also be noted that among the component counties of the Upper Main Stem, five are considered 100% rural nonfarm--Dolores, Hinsdale, Ouray, Pitkin, and Summit. Grand County Utah's 74.6% urban population qualified it as the most urban of all of the counties of the Upper Main Stem.

Educational Level of the Population (Table C)

The educational attainment of the population 25 years of age and older in the Upper Main Stem Sub-basin was higher among both men and women in 1960 than in the nation at large. The median number of school years completed for these groups was 10.8 and 11.7 respectively in the sub-basin and 10.5 and 11.0 for the U. S. Among sub-basin males in 1960, schooling completed ranged from a low of 9.3 years in Delta County to a high of 12.5 years in Pitkin. Unfortunately, no 1960 data were available for the educational attainment of males in Hinsdale

Table UMS-C

Median School Years Completed (Persons 25 & Over)

UPPER MAIN STEM SUB-BASIN	Male			Female		
Representative Counties	1950	1960	%Change	1950	1960	%Change
COLORADO						
1. Delta	8.9	9.3	4.5	10.7	11.2	4.7%
2. Dolores	*	9.8	*	*	10.7	*
3. Eagle	9.0	9.8	8.9	11.7	11.5	-1.7
4. Garfield	9.1	10.5	15.4	11.5	12.0	4.3
5. Grand	10.4	11.0	5.8	12.2	12.2	-
6. Gunnison	10.0	12.0	20.0	12.0	12.4	3.3
7. Hinsdale	*	*	*	*	*	*
8. Mesa	9.2	11.4	23.9	11.5	12.1	5.2
9. Montrose	8.8	9.9	12.5	10.2	11.3	10.8
10. Ouray	8.9	10.3	15.7	*	12.2	*
11. Pitkin	*	12.5	*	*	12.7	*
12. San Miguel	8.9	10.5	18.0	10.1	10.8	6.9
13.. Summit	*	11.2	*	*	11.4	*
UTAH						
1. Grand	*	11.9	*	*	12.1	*
UPPER MAIN STEM	9.2	10.8	17.4	11.2	11.7	4.5
UNITED STATES	9.0	10.5	17.0	9.6	11.0	15.0

* Not Reported.

Source: U.S. Census of Population, 1950 and 1960.

County. Among women in the sub-basin in the same year, the range of educational attainment extended from a low of 10.7 in Dolores to a high of 12.7 years in Pitkin County. Once again no data were available for Hinsdale County. Women in the Upper Main Stem Sub-basin in the year 1960 had the distinction of showing the highest median number of years of schooling completed in any sub-basin in the Colorado River area.

Income

The Upper Main Stem Sub-basin had the third highest per capita personal income of any sub-basin of the entire Colorado River Basin in 1960 (See Table UMS-D). Our estimate of $1,695.00 for the Upper Main Stem trailed the richest sub-basin (Lower Main Stem) by $417.00 and trailed the U. S. national average by $246.00. By our estimates personal income per capita in the Upper Main Stem was approximately 87% of the national average.[4] As shown in Table UMS-E, per capita personal income varied widely in the sub-basin ranging from a low of $1,316.00 in Delta County Colorado to a high of $2,635.00 in Pitkin County.

Labor Force Participation

Labor force participation may be taken to show what proportion of the adult population is employed or considers itself available for work. More

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[4] In Table UMS-D the term "location quotient" appears for the first time in this report. This refers to a convenient device which aids in the study of regions by permitting a simple comparison per head of population between the region and the entire country for whatever particular economic characteristic is under study. A location quotient with a value of 1.0 would indicate equality between region and nation. A value greater than 1.0 indicates the relative excess of the region over the nation, while a quotient less than 1.0 shows the relative magnitude by which the region trails the nation.

Table UMS-D

Personal Income Per Capita

U.S., Colorado River Basin, and Six Sub-Basins, 1960

	Per Capita Personal Income (1960 Estimates)	Location Quotient (Sub-Basin Per Capita Personal Income) / (U.S. Per Capita Personal Income)
United States	1,941	-- --
San Juan Sub-Basin	1,554	0.801
Upper Main Stem Sub-Basin	1,695	0.873
Green Sub-Basin	1,656	0.853
Gila Sub-Basin	1,912	0.985
Lower Main Stem Sub-Basin	2,112	1.088
Little Colorado Sub-Basin	1,022	0.527
Colorado River Basin	1,836	0.946

Source: Our estimates of per capita personal income were derived in the following manner. Personal income for each county was determined by multiplying the mean income from all sources received by income recipients in 1959 by the number of income recipients as reported in Table 86 of various state reports of the 1960 Census of Population, General Social and Economic Characteristics. The personal income from all sources thus derived for 1959 was adjusted to 1960 by the national growth rate in Personal Income between 1959 and 1960 (4.9%). The resulting total was then divided by 1960 population to arrive at the 1960 per capita personal income figures.

Table UMS-E

Per Capita Personal Income by Representative Counties, Upper Main Stem Sub-Basin (1960)

County	Personal Income
Pitkin, Colorado	$2,635
Summit, Colorado	2,142
Grand, Utah	2,081
San Miguel, Colorado	1,834
Mesa, Colorado	1,806
Gunnison, Colorado	1,775
Garfield, Colorado	1,771
Grand, Colorado	1,766
Ouray, Colorado	1,657
Dolores, Colorado	1,624
Montrose, Colorado	1,377
Eagle, Colorado	1,333
Delta, Colorado	1,316
Hinsdale, Colorado	(Not Reported)

Source: Our estimates of percapital personal income were derived in the following manner. Personal income for each county was determined by multiplying the mean income from all sources received by income recipients in 1959 by the number of income recipients as reported in Table 86 of various state reports of the 1960 Census of Population, General Social and Economic Characteristics. The Personal income from all sources thus derived for 1959 was adjusted to 1960 by the national growth rate in Personal Incoem between 1959 and 1960 (4.9%). The resulting total was then divided by 1960 population to arrive at the 1960 per capital personal income figures.

precisely, the labor force is comprised of those who are employed or who are actively seeking work. This number, when expressed as a percentage of the noninstitutionalized population age 14 or older, yields the labor force participation rate. This concept is a useful indicator of the level of economic development in a region and is particularly valuable when broken down into age and sex categories. For this report, this aggregation into age classes was not possible, but Table UMS-F does provide labor force participation rates by sex for the continental United States, the entire Colorado River Basin, and for each of its six sub-basins. The participation rate for each region has been divided by the corresponding national figure to obtain a location quotient.

Table UMS-F indicates that in 1960, the share of the adult population employed or seeking work in the Upper Main Stem ranked third among the sub-basins of the Colorado. Approximately 78.3% of the men and 31.4% of the women in the normal work phase of their lives were in the labor force. Sub-basin location quotients of 0.994 and 0.901 for males and females, respectively, indicate a relatively narrow gap between labor force participation rates in the Upper Main Stem and in the United States. The labor force participation patterns of both men and women in the Upper Main Stem moved closer to the national norm between 1950 and 1960.

The wide variation in labor force participation rates within the sub-basin is shown in Table UMS-G. The range of participation rates among men varied from a low of 71.2% in Delta to a high of 90.0% in Grant, Utah. The range among women in 1960 stretched from Hinsdale's low of 20.8 to a high in Pitkin County of 45.6. Interestingly, while labor force participation rates increased for males in seven counties of the region's fourteen between 1950 and 1960, the rate among females increased in every county except Hinsdale.

Table UMS-F

Labor Force Participation Rates

	1950 Male			1960 Male			1950 Female			1960 Female		
	Rate	Location Quotient	Rank	Rate	Location Quotient	Rank	Rate	Location Quotient	Rank	Rate	Location Quotient	Rank
United States	81.02	1.000		78.75	1.000		29.28	1.000		34.88	1.000	
Colorado River Basin	77.56	0.957		77.88	0.989		25.47	0.870		32.33	0.927	
Lower Main Stem Sub-Basin	82.93	1.024	1	82.84	1.052	1	29.03	0.991		38.01	1.090	1
Gila Sub-Basin	75.78	0.935	5	77.62	0.986	4	25.93	0.886	3	32.63	0.935	2
Little Colorado Sub-Basin	75.72	0.934	6	62.92	0.799	6	28.59	0.976	2	25.22	0.723	6
Upper Main Stem Sub-Basin	78.20	0.965	3	78.31	0.994	3	23.46	0.801	4	31.44	0.901	3
San Juan Sub-Basin	77.77	0.960	4	77.00	0.978	5	21.19	0.724	5	26.36	0.756	5
Green Sub-Basin	82.11	1.013	2	79.75	1.013	2	20.67	0.706	6	28.52	0.818	6

Source: Computed from data in the U.S. Census of Population, 1950 and 1960.

Table UMS-G

Labor Force Participation Rates
Upper Main Stem Sub-Basin

County	Male		Female	
	1950	1960	1950	1960
Delta, Colorado	77.86	71.24	21.33	26.60
Dolores, Colorado	83.29	78.99	19.07	31.89
Eagle, Colorado	83.43	82.43	20.44	24.96
Garfield, Colorado	80.02	80.22	25.75	33.83
Grand, Colorado	83.96	82.65	28.89	41.24
Gunnison, Colorado	71.88	71.25	23.28	38.23
Hinsdale, Colorado	80.00	89.02	26.88	20.83
Mesa, Colorado	77.29	77.74	24.25	32.88
Montrose, Colorado	79.31	79.39	22.42	27.93
Ouray, Colorado	79.73	75.73	17.42	24.46
Pitkin, Colorado	77.98	83.98	27.18	45.63
San Migue, Colorado	84.66	80.75	20.58	23.79
Summit, Colorado	82.71	88.25	27.50	34.15
Grand, Utah	75.70	90.04	24.92	29.50
Sub-Basin Total	78.58	78.35	23.46	31.45

Source: Computed from data in U.S. Census of Population, 1950 and 1960.

Employment

Table UMS-H presents the Census version[5] of industrial distribution of sub-basin employment for 1940, 1950, and 1960. Total adjusted employment of 45,618 in 1960 represented a 17.7% increase during the most recent decade almost matching the sub-basin's employment growth of 19.9% in the 1940-50 period. Growth in sub-basin employment in the decade to 1960 compares favorably to national growth in the same period of 15.5%. (See Table UMS-K).

The most significant changes in the pattern of employment since 1950 in the Upper Main Stem have been the following:

1. A sharp decline in agricultural employment--of 37%.
2. An impressive 84.2% gain in mining employment reversing the mild decline of about 4% in the 1940-50 decade.
3. Impressive increases in manufacturing and service employment --gains of 53.7% and 53.8% respectively.

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[5]The two major sources of data on the industrial distribution of employment by county are the Employment Security Commission (ESC's of the various states which gather statistics on covered employment, i.e., employment in industries not exempted from the law, and in establishments large enough to qualify for coverage under the law; and the U.S. Bureau of the Census. The Census enumeration of county employment by industry usually produces larger figures than those reported by the ESC's. This is partly due to the much more inclusive definition used by Census which includes agricultural employment, for example, but also reflects various other methodological differences. Thus, the two sets of data are not strictly comparable. A major virtue of the Census data (available in this detail only for the years of the decennial censuses) is that they do provide a detailed historical record of employment for a group of industries which are defined in a generally consistent manner. For this reason in this general historical review of the economy of the Upper Main Stem, and in the same section of the reports on the other sub-basins of the Colorado River Basin, Census data have been selected for analysis. However, in the detailed study of particular industries for 1960 which follows, ESC data have been utilized.

Table UMS-H
Upper Main Stem Employment by Industry

INDUSTRY	1940 Reported Employment	1940 Adjusted Employment*	1950 Reported Employment	1950 Adjusted Employment*	1960 Reported Employment	1960 Adjusted Employment*
Agriculture	12,276	12,465	11,304	11,561	7,072	7,290
Mining	2,956	2,993	2,843	2,878	5,138	5,300
Contract Construction	2,061	2,092	3,178	3,236	3,345	3,445
Manufacturing (Total)	1,054	1,065	1,680	1,710	2,541	2,628
Food and kindred products mfg.	352	358	458	466	716	735
Textile mill products mfg.	4	4	6	6	0	0
Apparel mfg.	7	7	4	4	12	12
Lumber, wood products, furniture mfg.	294	296	435	443	477	496
Printing and publishing mfg.	220	222	296	302	446	458
Chemicals and allied products mfg.	26	26	52	53	162	180
Electric and other machinery mfg.	34	34	90	91	163	166
Motor vehicles and equipment mfg.	1	1	6	6	13	13
Other transportation equipment mfg.	2	2	4	4	7	7
**Primary metals	5	5	41	42	43	44
**Fabricated metals	8	8	34	34	89	91
Other and miscellaneous mfg.	101	102	254	259	413	426
Transportation	1,844	1,870	2,118	2,159	2,004	2,064
Communication, utilities	615	623	1,252	1,273	1,496	1,539
Wholesale trade	654	664	951	968	1,387	1,427
Eating and drinking places	629	637	1,145	1,162	1,433	1,477
Other retail trade	3,102	3,150	4,354	4,432	5,860	6,038
Finance, insurance, real estate	444	450	718	730	1,338	1,376
Services (Total)	5,106	5,181	6,824	6,943	10,364	10,681
Hotels and other personal services	1,163	1,182	1,398	1,421	1,855	1,914
Private households	884	896	650	659	1,066	1,118
Business and repair services	726	736	1,149	1,170	1,017	1,047
Entertainment, recreation services	256	257	355	361	377	391
Medical, other professional services	2,077	2,110	3,272	3,332	6,029	6,211
Government	1,102	1,119	1,672	1,702	2,282	2,353
Total	31,843		38,119		44,260	
Industry Not Reported	466		635		1,358	
Adjusted Total		32,309		38,754		45,618

Table UMS-H (Cont'd)
Upper Main Stem Employment by Industry

INDUSTRY	Industry as percentage of adjusted Sub-Basin employment			Per cent change Based on adjusted employment		
	1940	1950	1960	1940 1950	1940 1960	1950 1960
Agriculture	38.58%	29.83%	15.98%	-7.30%	-48.48%	-37.00%
Mining	9.26	7.43	11.62	-3.85	77.07	84.15
Contract construction	6.47	8.35	7.55	54.68	64.67	6.45
Manufacturing (total)	3.30	4.41	5.76	60.56	146.76	53.68
Food and kindred products mfg.	1.11	1.20	1.61	30.16	105.30	57.72
Textile mill products mfg.	0.01	0.01	0	50.00		
Apparel mfg.	0.02	0.01	0.03	-42.86	71.42	200.00
Lumber, wood products, furniture mfg.	0.92	1.14	1.09	49.66	67.56	11.96
Printing and publishing mfg.	0.69	0.78	1.00	36.03	106.30	51.65
Chemicals and allied products mfg.	0.08	0.14	0.39	103.84	592.30	239.62
Electrical and other machinery mfg.	0.10	0.23	0.36	167.64	388.23	82.41
Motor vehicles and equipment mfg.	0	0.01	0.03	500.00	1200.00	116.66
Other transportation equipment mfg.	0.01	0.01	0.01	100.00	250.00	75.00
Primary metals	0.01	0.10	0.09	720.00	780.00	10.00
Fabricated metals	0.02	0.08	0.19	325.00	1037.50	167.64
Other and miscellaneous mfg.	0.31	0.67	0.93	154.90	317.64	63.84
Transportation	5.79	5.57	4.52	15.45	10.37	-4.41
Communication, utilities	1.93	3.28	3.37	104.33	147.03	20.89
Wholesale trade	2.05	2.50	3.13	45.78	114.90	47.41
Eating and drinking places	1.97	3.00	3.24	82.41	131.86	27.10
Other retail trade	9.75	11.44	13.24	40.69	91.68	36.23
Finance, Insurance, real estate	1.39	1.88	3.02	62.22	205.77	88.49
Services (total)	16.03	17.94	23.41	34.00	106.10	53.80
Hotels and other personal services	3.66	3.67	4.19	20.21	61.92	34.69
Private households	2.77	1.70	2.45	-26.46	24.77	69.65
Business and repair services	2.28	3.02	2.29	58.96	42.25	-10.52
Entertainment, recreation services	0.79	0.93	0.86	40.46	52.14	8.31
Medical, other professional services	6.53	8.60	13.61	57.91	194.36	86.40
Government	3.46	4.39	5.16	52.10	110.27	38.24
Total	100.00	100.00	100.00	19.90	41.19	17.70

Table UMS-H (Cont'd)

Upper Main Stem Employment by Industry

* The inclusion of an "industry not reported" sector would grossly complicate the projection procedure and hence it was decided to allocate employees so classified among the identified sectors. This was done by a percentage distribution which would leave the original relationships unchanged.

Source: U. S. Department of Commerce, Office of Business Economics, Growth Patterns in Employment by County, 1940 - 1950 and 1950 - 1960 (Washington, D. C.: U. S. Government Printing Office, 1965).

** U. S. Department of Commerce, Bureau of the Census, U. S. Census of Population, 1960 (Washington, D. C.: U. S. Government Printing Office, 1965).

Table UMS-H_1

Adjusted Employment by Industry in Counties of the Upper Main Stem Sub-Basin - 1960

Industry	Delta	Dolores	Eagle	Garfield	Grand	Gunnison	Hinsdale	Mesa	Montrose	Ouray	Pitkin	San Miguel	Summit	Grand Utah
Agriculture	1,539	102	265	805	176	292	30	2,098	1,518	144	99	91	42	89
Mining	189	128	468	547	4	222	17	1,022	991	124	12	467	11	997
Contract Construction	367	53	97	391	129	86	8	1,396	381	25	89	40	29	85
Manufacturing	336	150	71	131	136	93	0	1,242	314	35	25	21	8	66
Food & Kindred Prods.	203	0	4	44	8	0	0	354	106	0	0	0	0	12
Textile Mill Prods.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apparel Mfg.	0	0	0	0	0	0	0	8	4	0	0	0	0	0
Lumber & Wood Prods.	72	5	46	16	119	51	0	37	112	18	4	16	0	0
Printing & Publishing	25	4	8	37	9	21	0	263	44	17	4	0	0	26
Chemicals, Etc.	0	126	0	0	0	0	0	42	4	0	0	0	0	8
Electrical, Etc.	20	0	0	4	0	4	0	123	7	0	0	0	0	8
Motor Vehicles, Etc.	0	0	0	0	0	0	0	13	0	0	0	0	0	0
Other Transportation	0	0	0	0	0	0	0	7	0	0	0	0	0	0
Primary Metals	9	4	0	5	0	5	0	17	0	0	0	0	0	4
Fabricated Metals	3	5	0	0	0	8	0	71	4	0	0	0	0	0
Other Miscellaneous Mfg.	4	6	13	25	0	4	0	307	33	0	17	5	4	8
Transportation	118	20	126	145	77	82	0	1,140	128	4	33	19	10	162
Communications & Utilities	148	24	36	128	93	47	0	650	238	8	11	29	5	77
Wholesale Trade	131	16	19	120	25	24	0	853	186	4	9	7	0	33
Eating & Drinking Places	152	15	50	192	88	65	8	515	143	29	87	37	5	45
Other Retail Trade	811	62	191	647	161	282	0	2,580	765	54	105	82	46	252
Finance, Insurance, Etc.	144	9	22	121	45	36	4	660	171	20	56	31	4	53
Services	1,046	124	259	1,045	448	773	12	4,624	1,098	93	470	152	142	395
Hotels, Etc.	123	0	83	259	147	137	3	594	205	25	187	18	5	82
Private Households	130	25	8	92	42	33	0	548	127	17	48	11	1	24
Business & Repair	112	14	10	92	27	38	0	521	113	0	37	29	0	54
Entertainment	48	13	0	38	62	14	4	114	33	0	25	0	5	35
Medical & Other	633	72	158	564	170	551	5	2,847	620	51	173	94	73	200
Government	200	50	65	237	101	124	9	1,074	263	36	44	35	60	55
Total	5,181	753	1,669	4,509	1,483	2,126	88	17,854	6,196	576	1,040	1,011	823	2,309

Source: Same as Table H

Table UMS-H_2

Adjusted Employment by Industry in Counties of the Upper Main Stem Sub-Basin - 1950

Industry	Delta	Dolores	Eagle	Garfield	Grand	Gunnison	Hinsdale	Mesa	Montrose	Ouray	Pitkin	San Miguel	Summi	Grand Utah
Agriculture	2,618	282	464	1,349	330	437	43	3,017	2,241	182	183	205	54	156
Mining	237	85	371	236	4	349	7	281	473	256	23	405	70	81
Contract Construction	488	38	80	403	245	111	20	1,261	334	37	56	61	49	53
Manufacturing	237	8	72	263	176	97	2	651	116	9	19	19	35	6
Food & Kindred Prods.	134	0	1	18	11	8	0	244	44	2	4	0	0	0
Textile Mill Prods.	2	0	0	1	0	0	0	3	0	0	0	0	0	0
Apparel Mfg.	0	0	1	2	0	0	0	0	0	0	0	0	1	0
Lumber & Wood Prods.	20	3	47	23	150	62	2	61	20	1	8	14	31	1
Printing & Publishing	48	4	5	30	6	19	0	147	25	4	3	3	3	5
Chemicals, Etc.	7	0	1	8	2	1	0	28	6	0	0	0	0	0
Electrical, Etc.	8	1	0	2	0	5	0	62	11	0	0	2	0	0
Motor Vehicles, Etc.	0	0	0	1	1	0	0	4	0	0	0	0	0	0
Other Transportation	0	0	0	0	1	0	0	3	0	0	0	0	0	0
Primary Metals	0	0	16	1	1	1	0	21	1	1	0	0	0	0
Fabricated Metals	2	0	0	7	1	0	0	23	1	0	0	0	0	0
Other Miscellaneous Mfg.	16	0	1	170	3	1	0	55	8	1	4	0	0	0
Transportation	119	21	174	160	87	74	2	1,289	130	27	13	7	9	47
Communications & Utilities	160	5	19	136	100	37	1	460	195	21	16	43	55	25
Wholesale Trade	97	5	10	84	25	18	1	603	113	1	2	3	0	6
Eating & Drinking Places	122	17	50	170	98	62	3	374	127	20	25	37	24	33
Other retail Trade	681	98	142	527	171	190	6	1,779	571	46	62	67	30	62
Finance, Insurance, Etc.	96	7	12	65	16	27	0	378	92	9	8	10	2	8
Services	868	65	206	814	322	536	11	2,699	793	102	199	130	80	118
Hotels, Etc.	142	14	44	189	125	96	4	486	129	24	90	25	29	24
Private Households	116	9	27	77	11	27	2	263	86	1	10	9	5	16
Business & Repair	157	9	26	168	53	59	0	440	160	15	13	34	13	23
Entertainment	57	2	10	43	39	16	0	99	35	7	27	12	8	6
Medical & Other	396	31	99	337	94	338	5	1,411	383	55	59	50	25	49
Government	176	34	79	187	76	91	12	652	209	24	35	49	31	47
Total	5,099	665	1,670	4,394	1,650	2,022	103	13,444	5,394	734	641	1,036	439	642

Source: Same as Table H.

Table UMS-H_3

Adjusted Employment by Industry in Counties of the Upper Main Stem Sub-Basin - 1940

Industry	Delta	Dolores	Eagle	Garfield	Grand	Gunnison	Hinsdale	Mesa	Montrose	Ouray	Pitkin	San Miguel	Summit	Grand Utah
Agriculture	2,470	299	591	1,547	411	501	53	3,388	2,236	234	267	237	89	142
Mining	162	115	495	82	7	559	4	194	448	123	71	556	103	74
Contract Construction	196	18	75	210	150	76	3	606	258	32	17	117	274	60
Manufacturing	205	25	59	84	66	80	1	337	141	11	18	23	10	5
Food & Kindred Prods.	117	2	2	29	1	8	0	147	51	0	0	0	0	1
Textile Mill Prods.	1	0	0	0	0	1	0	0	2	0	0	0	0	0
Apparel Mfg.	1	1	0	1	0	0	0	4	0	0	0	0	0	0
Lumber & Wood Prods.	33	19	50	19	59	22	0	28	22	6	13	19	5	1
Printing & Publishing	32	3	7	23	5	13	0	88	35	4	2	4	3	3
Chemicals, Etc.	3	0	0	0	0	0	0	7	16	0	0	0	0	0
Electrical, Etc.	3	0	0	3	1	1	0	17	7	1	0	0	1	0
Motor Vehicles, Etc.	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Other Transportation	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Primary Metals	1	0	0	0	0	0	0	1	2	0	0	0	1	0
Fabricated Metals	1	0	0	4	0	0	0	3	0	0	0	0	0	0
Other Miscellaneous Mfg.	12	0	0	5	0	35	1	40	6	0	3	0	0	0
Transportation	107	12	157	123	78	84	1	971	125	49	6	28	6	123
Communication & Utilities	77	1	18	76	22	29	3	230	72	14	16	33	16	16
Wholesale Trade	101	2	7	51	10	10	0	391	83	2	1	5	1	0
Eating & Drinking Places	65	4	41	85	44	38	0	211	71	10	6	34	8	20
Other Retail Trade	462	27	112	328	101	163	5	1,265	451	55	40	71	34	36
Finance, Insurance, Etc.	54	0	9	43	6	23	2	226	63	3	7	7	2	5
Services	686	47	242	589	208	337	21	1,818	694	110	84	169	79	97
Hotels, Etc.	126	8	55	141	72	73	11	413	144	25	23	46	28	17
Private Households	122	8	49	92	26	55	2	324	138	13	21	29	6	11
Business & Repair	119	10	30	79	32	29	1	255	114	20	7	17	5	18
Entertainment	24	0	11	40	16	17	1	87	27	9	1	12	6	6
Medical & Other	295	21	97	237	62	163	6	739	271	43	32	65	34	45
Government	122	14	62	133	47	75	8	373	128	30	19	42	25	41
Total	4,707	564	1,868	3,351	1,150	1,975	101	10,010	4,770	673	552	1,322	647	619

Source: Same as Table H

Table UMS-K
United States Employment by Industry

INDUSTRY	Reported Employment 1940	Adjusted Employment* 1940	Reported Employment 1950	Adjusted Employment* 1950	Reported Employment 1960	Adjusted Employment* 1960
Agriculture	8,538,419	3,670,494	7,042,750	7,147,643	4,349,884	4,527,986
Mining	918,253	932,427	930,657	944,496	654,006	680,643
Contract Construction	2,068,474	2,100,419	3,457,236	3,508,712	3,815,937	3,972,103
Manufacturing	10,591,468	10,754,920	14,600,903	14,818,148	17,513,086	18,228,893
Food and kindred products mfg.	1,105,875	1,122,954	1,414,009	1,435,022	1,822,477	1,896,904
Textile mill products mfg.	1,151,805	1,169,574	1,240,283	1,258,764	954,036	992,947
Apparel mfg.	799,288	811,595	1,063,921	1,079,701	1,159,163	1,206,430
Lumber, wood products, furniture mfg.	939,444	953,964	1,190,176	1,207,898	1,067,252	1,110,864
Printing and publishing mfg.	632,298	642,046	855,254	867,996	1,141,192	1,187,676
Chemicals and allied products mfg.	440,142	446,917	659,327	669,116	864,542	899,797
Electrical and other machinery mfg.	1,072,424	1,088,949	2,084,337	2,115,392	3,055,447	3,180,537
Motor vehicles and equipment mfg.	574,960	583,808	869,388	882,300	841,861	876,333
Other transportation	807,133	811,833	482,799	489,972	976,837	1,016,793
**Primary Metals	878,648	892,230	1,184,975	1,202,612	1,224,922	1,275,062
**Fabricated metals	628,464	638,181	847,209	859,783	1,291,709	1,344,461
Other and miscellaneous mfg.	2,060,992	2,092,869	2,709,255	2,749,592	3,113,648	3,241,089
Transportation	2,185,775	2,219,508	2,954,230	2,998,195	2,739,913	2,851,946
Communication, utilities	938,615	953,135	1,495,077	1,517,271	1,718,234	1,788,482
Wholesale trade	1,209,449	1,228,118	1,981,827	2,011,278	2,212,984	2,303,603
Eating and drinking places	1,120,571	1,137,857	1,692,805	1,717,952	1,801,667	1,875,311
Other retail trade	5,233,332	5,314,305	6,910,018	7,012,632	7,777,984	8,096,324
Finance, insurance and real estate	1,469,881	1,492,560	1,920,691	1,949,298	2,694,630	2,804,834
Services	8,620,952	8,754,248	10,106,309	10,256,685	13,549,947	14,104,103
Hotels and other personal services	1,689,514	1,715,652	1,861,588	1,889,267	1,941,530	2,020,919
Private Households	2,336,497	2,372,642	1,639,551	1,663,939	1,916,964	1,995,308
Business and repair services	867,413	880,826	1,313,235	1,332,728	1,610,728	1,676,538
Entertainment, recreation services	396,966	403,050	494,720	502,062	502,879	523,249
Medical, other professional services	3,330,562	3,382,078	4,797,215	4,868,689	7,577,846	7,888,089
Government	1,790,086	1,817,744	3,539,859	3,592,602	4,936,292	5,138,421
Total	44,685,275		56,632,392		63,764,564	
Industry Not Reported	690,540		842,520		2,608,085	
Adjusted total		45,375,815		57,474,912		66,372,649

Table UMS-K (Cont'd)
United States Employment by Industry

INDUSTRY	Industry as a percentage of U. S. Employment			Percentage Change		
	1940	1950	1960	1940 1950	1940 1960	1950 1960
Agriculture	19.12%	12.44%	6.82%	-17.57%	-47.78%	-36.66%
Mining	2.06	1.64	1.03	1.29	-27.01	-27.94
Contract Construction	4.63	6.11	5.98	67.04	89.11	13.20
Manufacturing	23.65	25.78	27.46	37.78	69.49	23.01
Food and kindred products mfg.	2.47	2.50	2.86	27.78	68.92	32.18
Textile mill products mfg.	2.57	2.19	1.50	7.62	15.11	-21.12
Apparel mfg.	1.78	1.88	1.82	33.03	48.64	11.73
Lumber, wood products, furniture mfg.	2.11	2.10	1.67	7.75	16.44	-8.04
Printing and publishing mfg.	1.41	1.51	1.79	35.19	84.98	36.82
Chemicals and allied products mfg.	.98	1.16	1.36	49.71	101.33	34.47
Electrical and other machinery mfg.	2.39	3.68	4.79	94.25	192.07	50.35
Motor vehicles and equipment mfg.	1.28	1.54	1.32	51.12	50.10	-0.68
Other transportation	.68	.85	1.53	57.12	226.06	107.52
Primary metals	1.96	2.09	1.92	34.78	42.90	6.02
Fabricated metals	1.41	1.50	2.03	34.72	110.67	110.67
Other and miscellaneous mfg.	4.61	4.78	4.88	31.37	54.86	17.87
Transportation	4.90	5.22	4.30	35.08	28.48	-4.88
Communication, utilities	2.11	2.64	2.69	59.18	87.64	17.87
Wholesale trade	2.71	3.50	3.47	63.76	87.57	14.53
Eating and drinking places	2.51	2.99	2.83	50.98	64.81	9.15
Other retail trade	11.72	12.20	12.21	31.95	52.34	15.45
Finance, insurance and real estate	3.29	3.39	4.23	30.60	87.92	43.88
Services	19.30	17.84	21.24	17.16	61.07	37.51
Hotels and other personal services	3.78	3.29	3.04	10.11	17.79	6.96
Private households	5.22	2.90	3.01	-29.87	-15.91	19.91
Business and repair services	1.94	2.32	2.53	51.30	90.33	25.79
Entertainment, recreation services	.88	.87	.79	24.56	29.82	4.21
Medical, other professional services	7.45	8.47	11.88	43.95	133.23	62.01
Government	4.01	6.25	7.74	97.64	182.68	43.02
Total	100.00	100.00	100.00	26.66	46.27	15.48

Table UMS-K (Cont'd.)

Upper Main Stem Employment by Industry

* The inclusion of an "industry not reported" sector would grossly complicate the projection procedure and hence it was decided to allocate employees so classified among the identified sectors. This was done by a percentage distribution which would leave the original relationships unchanged.

Source: U. S. Department of Commerce, Office of Business Economics, Growth Patterns in Employment by County, 1940 - 1950 and 1950 - 1960 (Washington, D.C.: U. S. Government Printing Office, 1965.)

** U. S. Department of Commerce, Bureau of the Census, U. S. Census of Population, 1960 (Washington, D.C.: U. S. Government Printing Office, 1965).

4. An increase of almost 40% in government employment.

5. A decline in the concentration of total employment found among the leading employing industries.

The details may be found in Tables UMS-H and UMS-J. In 1940 agriculture was the leading employer in the Upper Main Stem, accounting for almost 39% of all jobs. Employment in service industries ranked second with 16% and together with agriculture provided 55% of all sub-basin jobs. By 1960 services employment ranked first and provided 23.4% of total sub-basin employment. Agriculture had dropped to second place accounting for just under 16% of all jobs. Thus, the two top ranking industries together accounted in 1960 for only 39% of total sub-basin employment compared to their combined 55% twenty years earlier. While employment in mining remained the fourth most important employing industry, its percentage of total employment had increased from 9.3% in 1940 to 11.6% in 1960 after declining to 7.4% in 1950.

Table UMS-I shows the details of manufacturing employment in 1950 and 1960. During the past decade impressive increases in employment took place in food manufacturing, printing, publishing, chemicals, fabricated metals, and in miscellaneous manufacturing industries. During this same decade the relative importance of manufacturing as a provider of jobs inched up from 4.4% of sub-basin employment to 5.8%.

There were some significant divergences in employment developments between the Upper Main Stem and the nation during the decade to 1960. A comparison of Tables UMS-J and UMS-L indicates that the concentration of employment in the sub-basin in 1960 was less than in the United States at large, reflecting a shift from prior trends observed in the decennial Census years of 1940 and 1950. Table UMS-M shows the relative change in employment in 12 major industry groups for the

Table UMS-I

Manufacturing Employment

	Upper Main Stem 1950	1960
Food and Kindred Products	466	735
Textile Mill Products Mfg.	6	0
Apparel Mfg.	4	12
Lumber, Wood Products	443	496
Printing and Publishing	302	458
Chemicals and Allied Products	53	180
Electrical and Other Machinery	91	166
Primary Metals	42	44
Fabricated Metals	34	91
Motor Vehicles and Equipment	6	13
Other Transportation	4	7
Other Miscellaneous Mfg.	259	426
Total	1,710	2,628

Source: Table UMS-H

Table UMS-J

Percentage Distribution of Employment by Industry
in the Upper Main Stem Sub-Basin

Sector	% of Total Employment	Cumulative Percent
	1940	
Agriculture	38.58%	38.58%
Services	16.03	54.61
Other Retail	9.75	64.36
Mining	9.26	73.62
Construction	6.47	80.09
Transportation	5.79	85.88
Government	3.46	89.34
Manufacturing	3.30	92.64
Wholesale Trade	2.05	94.69
Eating and Drinking	1.97	96.66
Communications and Utilities	1.93	98.59
Finance, Insurance, Etc.	1.39	99.98
	1950	
Agriculture	29.83%	29.83%
Services	17.94	47.77
Other Retail	11.44	59.21
Construction	8.35	67.56
Mining	7.43	74.99
Transportation	5.57	80.56
Manufacturing	4.41	84.97
Government	4.39	89.36
Communications, Etc.	3.28	92.64
Eating and Drinking	3.00	95.64
Wholesale Trade	2.50	98.14
Finance, Insurance, Etc.	1.88	100.02
	1960	
Services	23.41%	23.41%
Agriculture	15.98	39.39
Other Retail	13.24	52.63
Mining	11.62	64.25
Construction	7.55	71.80
Manufacturing	5.76	77.56
Government	5.16	82.72
Transportation	4.52	87.24
Communications, Etc.	3.37	90.61
Eating and Drinking	3.24	93.85
Wholesale Trade	3.13	96.98
Finance, Insurance, Etc.	3.02	100.00

Source: Computed from data in Table UMS-H 1960

Table UMS-L

Percentage Distribution of Employment by Industry - United States, 1940, 1950, 1960

INDUSTRY	% 1940	Cumulative Total	INDUSTRY	% 1950	Cumulative Total	INDUSTRY	% 1960	Cumulative Total
Manufacturing	23.65%	23.65%	Manufacturing	25.78%	25.78%	Manufacturing	27.46%	27.46%
Services	19.30	42.95	Services	17.84	43.62	Services	21.24	48.70
Agriculture	19.12	62.07	Agriculture	12.44	56.06	Other Retail Trade	12.21	60.91
Other Retail Trade	11.72	73.79	Other Retail Trade	12.20	68.26	Government	7.74	68.65
Transportation	4.90	78.69	Government	6.25	74.51	Agriculture	6.82	75.47
Contract Construction	4.63	83.32	Contract Construction	6.11	80.62	Contract Construction	5.98	81.45
Government	4.01	87.33	Transportation	5.22	85.84	Transportation	4.30	85.75
Finance, Insurance, Etc.	3.29	90.62	Wholesale Trade	3.50	89.34	Finance, Insurance Etc.	4.23	89.98
Wholesale Trade	2.71	93.33	Finance, Insurance, Etc.	3.39	92.73	Wholesale Trade	3.47	93.45
Eating & Drinking Places	2.51	95.84	Eating & Drinking Places	2.99	95.72	Eating & Drinking Places	2.83	96.28
Communications & Utilities	2.10	97.94	Communications & Utilities	2.64	98.36	Communications & Utilities	2.69	98.97
Mining	2.06	100.00	Mining	1.64	100.00	Mining	1.03	100.00

Source: Computed from data in Table UMS-K.

Table UMS-M

Comparison of Percentage Change in Employment by Industry
Between 1950 and 1960 - United States and Upper Main Stem

Industry	United States	Upper Main Stem
Agriculture	- 36.66%	- 37.00%
Mining	- 27.94	84.15
Contract Construction	13.20	6.45
Manufacturing:	23.01	53.68
Food & Kindred Products	32.18	57.72
Textile Mill Products	- 21.12	---
Apparel Mfg.	11.73	200.00
Lumber & Wood Products, Etc.	- 8.04	11.96
Printing and Publishing	36.82	51.65
Chemicals & Allied Products	34.47	239.62
Electrical & Other Machinery	50.35	82.41
Motor Vehicles	- 0.68	116.66
Other Transportation Equipment Mfg.	107.52	75.00
Primary Metals	6.02	10.00
Fabricated Metals	110.67	167.64
Other Miscellaneous Mfg.	17.87	63.84
Transportation	- 4.88	- 4.41
Communications & Utilities	17.87	20.89
Wholesale Trade	14.53	47.41
Eating & Drinking Places	9.15	27.10
Other Retail Trade	15.45	36.23
Finance, Insurance & Real Estate	43.88	88.49
Services:	37.51	53.80
Hotels & Other Personal Services	6.96	34.69
Private Households	19.91	69.65
Business & Repair Services	25.79	- 10.52
Entertainment	4.21	8.31
Medical & Other Professional Services	62.01	86.40
Government	43.02	38.24
Total	15.48	17.70

Source: Table UMS-K and Table UMS-H

two areas. While agricultural employment in the Upper Main Stem declined by 37% -- almost exactly the relative decline experienced in the U. S. -- mining employment grew appreciably. It's 84.2% increase compares to a national decline of mining employment of 27.9%. Employment growth rates appreciably in excess of those experienced nationally were also observed in sub-basin employment in mnaufacturing, wholesale trade, eating and drinking places, finance, insurance and real estate, and in the service trades.

A more detailed analysis of industry in industry employment changes over time in the sub-basin relative to the nation is made possible by the findings in Table UMS-N. Here 27 industries have been ranked in terms of their location quotients. These were calculated by dividing sub-basin employment per capita by the corresponding national figure. Industries with a location quotient greater than 1.0 may be viewed roughly as the sub-basin's "specialty" industries which export a portion of their output to other regions while those whose quotients fall below 1.0 may be considered regional industries whose output is probably supplemented by goods imported from other areas.

The number of "specialty" industries has increased steadily between 1940 and 1960 as has the degree of regional specialization. For example, the simple mean value for all regional industries with location quotients greater than 1.0 increased from 1.832 in 1940 to 1.863 in 1950 and to 2.213 in 1960. In the most recent decade the figure has been swamped by the renewed influence of mining in the economy of the Upper Main Stem reflecting the uranium boom of the 1950's. The recent growth of the Upper Main Stem as a resort area is reflected in the growing importance of employment relative to the nation in hotels, eating and drinking places and entertainment.

Table UMS-N
Employment by Industry
Location Quotients for Upper Main Stem Sub-Basin**

Rank	1960 Industry	Location Quotient*	Rank	1950 Industry	Location Quotient*	Rank	1940 Industry	Location Quotient*
1	Mining	10.868	1	Mining	4.242	1	Mining	4.000
2	Agriculture	2.249	2	Agriculture	2.246	2	Agriculture	1.808
3	Hotels, Etc.	1.319	3	Contract Construction	1.276	3	Contract Construction	1.253
4	Contract Construction	1.207	4	Business, Etc.	1.216	4	Transportation	1.054
5	Communications & Utilities	1.200	5	Communications & Utilities	1.160	5	Business, Etc.	1.045
6	Medical, Etc.	1.100	6	Hotels, Etc.	1.040	6	Hotels, Etc.	.862
7	Eating & Drinking	1.095	7	Entertainment, Etc.	1.000	7	Communications & Utilities	.819
8	Other Retail Trade	1.044	8	Transportation	.995	8	Entertainment, Etc.	.800
9	Entertainment, Etc.	1.034	9	Medical, Etc.	.947	9	Medical, Etc.	.781
10	Transportation	1.013	10	Eating & Drinking	.930	10	Government	.768
11	Business, Etc.	.871	11	Other Retail Trade	.877	11	Other Retail Trade	.744
12	Wholesale Trade	.867	12	Wholesale Trade	.662	12	Eating & Drinking	.698
13	Households	.784	13	Government	.658	13	Wholesale Trade	.677
14	Finance, Insurance, Etc.	.686	14	Households	.545	14	Households	.472
15	Government	.638	15	Finance, Insurance, Etc.	.512	15	Printing & Publishing	.429
16	Lumber & Wood Products	.613	16	Lumber & Wood Products	.500	16	Food & Kindred Products	.400
17	Food & Kindred Products	.538	17	Printing & Publishing	.474	17	Lumber & Wood Products	.389
18	Printing & Publishing	.530	18	Food & Kindred Products	.442	18	Finance, Insurance, Etc.	.104
19	Chemicals, Etc.	.280	19	Other Miscellaneous Mfg.	.126	19	Chemicals, Etc.	.059
20	Other Miscellaneous Mfg.	.182	20	Chemicals, Etc.	.091	20	Other Miscellaneous Mfg.	.057
21	Other Transportation	.100	21	Electrical Energy, Etc.	.057	21	Electrical Energy, Etc.	.037
22	Fabricated Metals	.093	22	Fabricated Metals	.053	22	Fabricated Metals	.021
23	Electrical Energy, Etc.	.068	23	Primary Metals	.038	23	Primary Metals	.015
24	Primary Metals	.042	24	Other Transportation	.013	24	Apparel Mfg.	.011
25	Motor Vehicles, Etc.	.020	25	Motor Vehicles, Etc.	.009	25	Other Transportation	.008
26	Apparel Mfg.	.013	26	Textile Mill Products Mfg.	.007	26	Textile Mill Products Mfg.	.005
27	Textile Mill Products Mfg.	---	27	Apparel Mfg.	.006	27	Motor Vehicles, Etc.	.002
	ALL INDUSTRIES	.962		ALL INDUSTRIES	.936		ALL INDUSTRIES	.895

* Sub-Basin employment in each industry per capita of sub-basin population divided by national employment in each industry per capita of U. S. population

** Quotients are based on adjusted sub-basin, and adjusted U. S. employment figures. See Tables UMS-H and UMS-K.

Employment Changes by County

Thus far, our discussion of employment trends has been limited to the Upper Main Stem Sub-basin in the aggregate and to the nation. It is interesting, however, to note developments within the component counties of the sub-basin over the past few decades. These are illustrated in Table UMS-O_1, O_2, O_3. Even a quick inspection of the tables demonstrates the overwhelming importance of Mesa County as a provider of jobs in almost all industries. It is only on infrequent occasions when in a particular industry or year the top four employing industries are found other than in Mesa, Montrose, Garfield, or Delta Counties. Among the twelve major employing industries, with the exception of mining, Mesa County's employment has lead in the sub-basin with the other three counties competing for second, third, and fourth positions. With its small population and land area, Hinsdale almost invariably shows at the bottom of the list of employing industries Ouray and Dolores Counties also appear frequently near the bottom of the list.

Occupational Distribution of the Labor Force

The occupational make-up of the labor force tells how people earn their living and is another useful guide to the economy of a region. Table UMS-P presents occupational data on the labor force, by sex, in the Upper Main Stem in the years 1950 and 1960. A comparison of the relative magnitude of each occupation for those years both in the Upper Main Stem and the nation appears in Tables UMS-Q_1 and UMS-Q_2. While in each year the Upper Main Stem showed a larger proportion of its labor force among white collar jobs and a smaller proportion among blue collar jobs than in the nation at large, the gap had narrowed over the decade between 1950 and 1960.

At the specific occupation level, the proportionate share of total employment represented by six groups -- professional and technical workers, farmers

Table UMS-D1

Percent Distribution of Employment by Industry
In Counties of the Upper Main Stem Sub-Basin - 1960

	Delta	Dolores	Eagle	Garfield	Grand	Gunnison	Hinsdale	Mesa	Montrose	Ouray	Pitkin	San Miguel	Summit	Grand Utah
Agriculture	21.11%	1.39%	3.63%	11.04%	2.41%	4.00%	0.41%	28.77%	20.32%	1.97%	1.35%	1.24%	0.57%	1.22%
Mining	3.56	2.41	8.83	10.32	0.07	4.18	0.32	19.28	18.69	2.33	0.22	8.81	2.11	18.81
Contract Construction	10.65	1.53	2.81	11.34	3.74	2.49	0.23	40.52	11.05	0.72	2.58	1.16	8.65	2.46
Manufacturing	12.78	5.71	2.70	4.98	5.18	3.54	--	47.26	11.95	1.33	0.95	0.80	0.30	2.51
Food & Kindred Prods.	27.61	--	0.54	5.98	1.08	--	--	48.16	14.42	--	--	--	0.54	1.63
Textile Mill Prods.	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Apparel Mfg.	--	--	--	--	--	--	--	66.66	33.33	--	--	--	--	--
Lumber & Wood Prods.	14.51	1.00	9.27	3.22	23.99	10.28	--	7.45	22.58	3.62	4.96	3.22	--	--
Printing & Publishing	5.45	0.87	1.74	8.07	1.96	4.58	--	57.42	9.60	3.71	0.87	--	--	5.67
Chemicals, Etc.	--	70.00	--	--	--	--	--	23.33	2.22	--	--	--	--	4.44
Electric Energy	12.04	--	--	2.40	--	2.40	--	74.09	4.21	--	--	--	--	4.81
Motor Vehicles, Etc.	--	--	--	--	--	--	--	100.00	--	--	--	--	--	--
Other Transportation	--	--	--	--	--	--	--	100.00	--	--	--	--	--	--
Primary Metals	20.45	9.09	--	11.36	--	11.36	--	38.63	--	--	--	--	--	9.09
Fabricated Metals	3.29	5.49	--	--	--	8.79	--	78.02	4.39	--	--	--	--	--
Other Miscellaneous Mfg.	0.93	1.40	3.05	5.86	--	0.93	--	72.06	7.74	--	3.99	1.17	0.93	1.87
Transportation	5.71	0.96	6.10	7.02	3.73	3.97	--	55.23	6.20	0.19	1.59	0.92	0.48	7.84
Communications & Utilities	9.61	1.55	2.33	8.31	6.04	3.05	--	42.23	15.46	0.51	0.71	1.88	3.24	5.00
Wholesale Trade	9.18	1.12	1.33	8.40	1.75	1.68	--	59.77	13.03	0.28	0.63	0.49	--	2.31
Eating & Drinking Places	10.29	1.01	3.38	12.99	5.95	4.40	0.54	14.77	9.68	1.96	5.89	2.50	3.45	3.04
Other Retail Trade	13.43	1.02	3.16	10.71	2.66	4.67	--	42.72	12.66	0.89	1.73	1.35	0.76	4.17
Finance, Insurance, Etc.	10.46	0.65	1.59	8.79	3.27	2.61	0.29	47.96	12.42	1.45	4.06	2.25	0.29	3.85
Services	9.79	1.16	2.42	9.78	4.19	7.24	0.11	43.29	10.28	0.87	4.40	1.42	1.33	3.70
Hotels, Etc.	6.42	--	4.33	13.53	7.68	7.15	0.15	31.03	10.71	1.30	9.77	0.94	2.66	4.28
Private Households	11.62	2.23	0.71	8.22	3.75	2.95	--	49.01	11.35	1.52	4.29	0.98	1.16	2.14
Business & Repair	10.69	1.33	0.95	8.78	2.57	3.62	--	49.76	10.79	--	3.53	2.76	--	5.15
Entertainment	12.27	3.32	--	9.71	15.85	3.58	1.02	29.15	8.43	--	6.39	--	1.27	8.95
Medical & Other	10.19	1.15	2.54	9.08	2.73	8.87	0.08	45.83	9.98	0.82	2.78	1.51	1.17	3.22
Government	8.49	2.12	2.76	10.07	4.29	5.26	0.38	45.64	11.17	1.52	1.86	1.48	2.54	2.33
Total	11.4	1.7	3.7	9.9	3.3	4.7	.2	39.1	13.6	1.3	2.3	2.2	1.8	5.1

Source: Computed from Table UMS-H.

Table UMS-0_2

Percent Distribution of Employment by Industry
In Counties of the Upper Main Stem Sub-Basin - 1950

	Delta	Dolores	Eagle	Garfield	Grand	Gunnison	Hinsdale	Mesa	Montrose	Ouray	Pitkin	San Miguel	Summit	Grand Utah
Agriculture	22.64%	2.43%	4.01%	11.86%	2.85%	3.77%	0.37%	26.09%	19.38%	1.57%	1.58%	1.77%	0.46%	1.34%
Mining	8.23	2.95	12.89	8.20	0.13	12.12	0.24	9.76	16.43	8.89	0.79	14.07	2.43	2.81
Contract Construction	15.08	1.17	2.47	12.45	7.57	3.43	0.61	38.96	10.32	1.14	1.73	1.88	1.51	1.63
Manufacturing	13.86	0.47	4.21	15.38	10.29	5.67	0.12	38.07	6.78	0.53	1.11	1.11	2.05	0.35
Food & Kindred Prods.	28.75	--	0.21	3.86	2.36	1.71	--	52.36	9.44	0.42	0.85	--	--	--
Textile Mill Prods.	33.33	--	--	16.66	--	--	--	50.00	--	--	--	--	--	--
Apparel Mfg.	--	--	25.00	50.00	--	--	--	--	--	--	--	--	25.00	--
Lumber & Wood Prods.	4.51	0.67	10.60	5.19	33.86	13.99	0.45	13.76	4.51	0.22	1.80	3.16	6.99	0.22
Printing & Publishing	15.89	1.32	1.65	9.93	1.98	6.29	--	40.67	8.27	1.32	0.99	0.99	0.99	1.65
Chemicals, Etc.	13.20	--	1.88	15.09	3.77	1.88	--	52.83	11.32	--	--	--	--	--
Electric Energy	8.79	1.09	--	2.19	--	5.49	--	68.13	12.08	--	--	2.19	--	--
Motor Vehicles, Etc.	--	--	--	16.66	16.66	--	--	66.66	--	--	--	--	--	--
Other Transportation	--	--	--	--	25.00	--	--	75.00	--	--	--	--	--	--
Primary Metals	--	--	38.09	2.38	2.38	2.38	--	50.00	2.38	2.38	--	--	--	--
Fabricated Metals	5.88	--	--	20.58	2.94	--	--	67.64	2.94	--	--	--	--	--
Other Miscellaneous Mfg.	6.17	--	0.38	65.63	1.15	0.38	--	21.23	3.08	0.38	--	1.54	--	--
Transportation	3.51	0.97	8.05	7.41	4.02	3.42	0.09	59.70	6.02	1.25	0.60	0.32	0.41	2.17
Communication & Utilities	12.56	0.39	1.49	10.68	7.85	2.90	0.07	36.13	15.31	1.64	1.25	3.37	4.32	1.96
Wholesale Trade	10.02	0.51	1.03	8.67	2.58	1.85	0.10	62.29	11.67	0.10	0.20	0.30	--	0.61
Eating & Drinking Places	10.49	1.46	4.30	14.62	8.43	5.33	0.25	32.18	10.92	1.72	2.15	3.18	2.06	2.83
Other Retail Trade	15.36	2.21	3.20	11.89	3.85	4.28	0.13	40.13	12.88	1.03	1.39	1.51	0.67	1.39
Finance, Insurance, Etc.	13.15	0.95	1.64	8.90	2.19	3.69	--	51.78	12.60	1.23	1.09	1.36	0.27	1.09
Services	12.50	0.94	2.97	11.72	4.64	7.72	0.16	38.87	11.42	1.47	2.87	1.87	1.15	1.70
Hotels, Etc.	9.09	0.88	3.03	13.30	8.73	6.75	0.20	34.20	9.07	1.68	6.33	1.75	2.34	1.68
Private Households	17.60	1.36	4.00	11.68	1.66	4.00	0.80	38.00	13.05	0.15	1.51	1.36	0.75	2.42
Business & Repair	13.41	0.76	2.22	14.35	4.52	5.04	--	37.60	13.67	1.28	1.11	2.90	1.11	1.96
Entertainment	15.73	0.55	2.77	11.91	10.80	4.43	--	27.42	9.69	1.08	7.47	3.32	2.21	1.66
Medical & Other	11.88	0.88	2.07	10.11	2.82	10.14	0.15	42.34	11.49	1.65	1.77	1.50	0.75	1.47
Government	10.84	1.09	4.64	10.08	4.46	5.34	0.70	38.30	12.27	1.41	2.05	2.87	1.82	2.76
Total	15.2	1.7	4.3	11.3	4.2	5.2	.3	34.7	13.0	1.9	1.7	2.7	1.1	1.7

Source: Computed from Table UMS-H

Table UMS-O_3

	Delta	Dolores	Eagle	Garfield	Grand	Gunnison	Hinsdale	Mesa	Montrose	Ouray	Pitkin	San Miguel	Summit	Grand Utah
Agriculture	19.81%	2.39%	4.74%	12.41%	3.29%	4.01%	0.42%	27.18%	17.93%	1.87%	2.14%	1.90%	0.71%	1.13%
Mining	5.41	3.84	16.53	2.73	0.23	18.67	0.13	6.48	14.96	4.10	2.37	18.57	3.44	2.47
Contract Construction	9.36	0.86	3.58	10.03	7.17	3.63	0.14	28.96	12.33	1.52	0.81	5.59	13.09	2.86
Manufacturing	19.41	2.37	5.59	7.89	7.10	7.58	0.09	31.91	13.35	1.04	1.70	2.18	0.95	0.47
Food and Kindred Prods.	32.68	0.55	0.55	8.10	0.27	2.23	--	41.06	14.24	--	--	--	--	0.27
Textile Mill Prods.	25.00	--	--	--	--	25.00	--	--	50.00	--	--	--	--	--
Apparel Mfg.	14.28	14.28	--	14.28	--	--	--	57.14	--	--	--	--	--	--
Lumber & Wood Prods.	11.14	6.41	16.89	6.41	19.93	7.43	--	9.45	7.43	2.02	4.39	6.41	1.68	0.33
Printing & Publishing	14.47	1.35	3.15	10.36	2.25	5.85	--	39.63	15.76	1.80	0.90	1.80	1.35	1.35
Chemicals, Etc.	11.53	--	--	--	--	--	--	26.92	61.53	--	--	--	--	--
Electric Energy	8.82	--	--	8.82	2.94	2.94	--	50.00	20.58	2.94	--	--	2.94	--
Motor Vehicles, Etc.	--	--	--	--	--	--	--	100.00	--	--	--	--	--	--
Other Transportation	50.00	--	--	--	--	--	--	50.00	--	--	--	--	--	--
Primary Metals	20.00	--	--	--	--	--	--	20.00	40.00	--	--	--	20.00	--
Fabricated Metals	12.50	--	--	50.00	--	--	--	37.50	--	--	--	--	--	--
Other Misc. Mfg.	11.76	--	--	4.90	--	34.31	0.98	39.21	5.88	--	2.94	--	--	--
Transportation	5.72	0.64	8.39	6.57	4.17	4.49	0.05	51.92	6.68	2.62	0.32	1.49	0.32	6.57
Communication & Utilities	12.35	0.16	2.88	12.19	3.53	4.65	0.48	36.91	11.55	2.24	2.56	5.29	2.56	2.56
Wholesale Trade	15.21	0.30	1.05	7.68	1.50	1.50	--	58.88	12.50	0.30	0.15	0.75	0.15	--
Eating & Drinking Places	10.20	0.62	6.43	13.34	6.90	5.96	--	33.12	11.14	1.56	0.94	5.33	1.25	3.13
Other Retail Trade	14.66	0.85	3.55	10.41	3.20	5.17	0.15	40.15	14.31	1.74	1.26	2.25	1.07	1.14
Finance, Insurance, Etc.	12.00	--	2.00	9.55	1.33	5.11	0.44	50.22	14.00	0.66	1.55	1.55	0.44	1.11
Services	13.77	0.94	4.36	11.82	4.18	6.77	0.42	35.09	13.93	2.21	1.69	3.39	1.59	1.95
Hotels, Etc.	10.65	0.67	4.65	11.92	6.09	6.17	0.93	34.94	12.18	2.11	1.94	3.89	2.36	1.43
Private Households	13.61	0.89	5.46	10.26	2.90	6.13	0.22	36.16	15.40	1.45	2.34	3.23	0.66	1.22
Business & Repair	16.16	1.35	4.07	10.73	4.34	3.94	0.13	34.64	15.48	2.71	0.95	2.30	0.67	2.44
Entertainment	9.33	--	4.28	15.56	6.22	6.61	0.38	33.85	10.50	3.50	0.38	4.66	2.33	2.33
Medical & Other	13.98	0.99	4.59	11.23	2.93	7.72	0.28	35.02	12.84	2.03	1.51	3.08	1.61	2.13
Government	10.90	1.25	5.54	11.88	4.20	6.70	0.71	33.33	11.43	2.68	1.69	3.75	2.23	3.66
Total	14.6	1.7	5.8	10.4	3.6	6.1	.3	31.0	14.8	2.1	1.7	4.1	2.0	1.9

Source: Computed from Table UMS-H.

Table UMS-P

Employment by Occupational Groups

	Male		Female		Total	
	1950	1960	1950	1960	1950	1960
Total	30,221	32,780	8,495	12,805	38,716	45,585
1. Professions, Technical & Kindred	1,906	3,198	1,373	2,272	3,279	5,470
2. Farmers & Farm Managers	6,729	4,137	155	164	6,884	4,301
3. Managers, Officials & Proprietors	3,081	3,933	615	961	3,696	4,894
4. Clerical	997	1,177	1,969	3,243	2,966	4,420
5. Sales Workers	1,293	1,519	883	1,098	2,176	2,617
6. Craftsmen & Foremen	4,285	5,330	71	87	4,356	5,417
7. Operatives	4,827	6,728	383	564	5,210	7,292
8. Private Household Workers	30	20	518	945	548	969
9. Service Workers (Excepting Household)	1,118	1,524	1,509	2,625	2,627	4,149
10. Farm Laborers & Foremen	3,479	2,119	749	162	4,228	2,281
11. Laborers (Excepting Farm & Mine)	2,160	2,141	37	46	2,197	2,187
12. Not Reported	316	954	233	634	549	1,588

Source: U.S. Census of Population, 1950 and 1960.

Table UMS-C$_1$

Percent Distribution - Occupation Groups for 1960

	Male & Female		Male Only		Female Only	
	U.S.	UMS	U.S.	UMS	U.S.	UMS
All Groups	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Predominantly White Collar	45.02	47.60	40.23	42.60	54.80	60.42
Professional, Technical	11.19	12.00	10.30	9.76	13.00	17.74
Farmers & Farm Managers	8.37	9.43	10.65	12.62	3.68	1.28
Managers, Officials, Proprietors	3.88	10.73	5.49	12.00	0.56	7.51
Clerical	14.40	9.70	6.94	3.59	29.71	25.32
Sales Workers	7.18	5.74	6.85	4.63	7.85	8.57
Predominantly Blue Collar	50.07	48.91	55.20	54.49	39.54	34.63
Craftsmen & Foremen	13.52	11.89	19.53	16.26	1.19	0.68
Operatives	18.41	16.00	19.88	20.52	15.38	4.41
Private Household Workers	8.42	2.12	5.98	0.07	13.44	7.41
Service Workers	4.81	9.10	6.90	4.65	0.52	20.50
Farm Laborers & Foremen	2.24	5.00	2.77	6.46	1.15	1.27
Laborers (Except farm & mine)	2.67	4.80	0.14	6.53	7.86	0.36
Occupation Not Reported	4.91	3.49	4.57	2.91	5.66	4.95

Source: Figures have been calculated from Table UMS-G and Table UMS-P.

Table UMS-Q_2

Percent Distribution - Occupation Groups for 1950

	Male & Female		Male Only		Female Only	
	U.S.	UMS	U.S.	UMS	U.S.	UMS
All Groups	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Predominantly White Collar	44.53	49.00	41.17	46.35	53.20	59.79
Professional, Technical	8.72	8.47	7.30	6.31	12.37	16.16
Farmers & Farm Managers	8.93	17.78	10.72	22.27	4.31	1.82
Managers, Officials, Proprietors	7.64	9.55	10.31	10.19	0.74	7.24
Clerical	12.32	7.66	6.51	3.30	27.32	23.18
Sales Workers	6.92	5.62	6.33	4.28	8.46	10.39
Predominantly Blue Collar	54.15	49.50	57.70	52.60	45.01	38.47
Craftsmen & Foremen	13.36	11.25	18.65	14.17	1.50	0.84
Operatives	19.81	13.46	20.05	15.97	19.19	4.51
Private Household Workers	7.61	1.42	5.85	0.10	12.17	6.10
Service Workers	6.09	6.78	8.14	3.70	9.81	17.76
Farm Laborers & Foremen	4.28	10.92	4.83	11.51	2.86	8.82
Laborers (Except Farm & Mine)	2.50	5.67	0.18	7.15	3.48	0.44
Occupation Not Reported	1.32	1.42	1.13	1.05	1.79	2.74

Source: Figures have been calculated from Tables UMS-G and UMS-P

and farm managers, managers, officials and proprietors, service workers, farm laborers and foremen, and laborers (except farm and mine), was larger in the sub-basin in 1960 than in the United States. One of the most impressive differences is found among managers, officials and proprietors with a much heavier representation in the sub-basin than in the nation. On the other kand, employment among clerical workers, sales workers, craftsmen, foremen, and operatives, and private household workers was relatively less important in the sub-basin than in the country as a whole. Clerical workers and private household workers were appreciably less important in the sub-basin.

There were some sharp changes over time, however, in the relative importance of particular occupations in the sub-basin. Of particular significance is the sharp decline in farm-related employment. Farmers and farm managers declined from a first ranked 17.8% of sub-basin employment in 1950 to sixth rank 9.4% in 1960. Similarly, farm laborers and foremen dropped from a fourth ranking 10.9% of sub-basin employment in 1950 to a ninth rank of 5% in 1960. Employment of professional and technical workers in the sub-basin increased from a sixth ranking 8.5% of total employment in 1950 to a second ranking 12% in 1960.

The location quotients in Table UMS-R facilitate a comparison of per capita employment in the region with the nation in 1950 and 1960. While confirming the decline in the importance of agriculture, they indicate that relative to population, agriculture still must be considered one of the specialty industries of the Upper Main Stem.

Interesting contrasts are seen when the data are disaggregated by sex, as in Table UMS-Q_1 and UMS-Q_2. Employment of women in the Upper Main Stem in white collar jobs is somewhat more concentrated than in the nation at large, and this white collar margin among women has increased slightly between 1950 and 1960.

Table UMS-R

Location Quotients (Based on Population)
Employment By Occupation Groups 1950 & 1960
In the Upper Main Stem Sub-Basin

1950

Farm Laborers	2.423
Farmers, Etc.	2.230
Managers, Etc.	1.044
Professionals, Etc.	0.938
Laborers (except farm and mine)	0.904
Service Workers	0.853
Craftsmen, Etc.	0.785
Sales	0.775
Operatives, Etc.	0.652
Clerical	0.600
Household Workers	0.531

1960

Farmers, Etc.	2.392
Farm Laborers	2.199
Managers, Etc.	1.261
Service Workers	1.062
Professionals, Etc.	1.054
Laborers (except farm and mine)	0.981
Craftsmen, Etc.	0.863
Operatives, Etc.	0.854
Sales	0.786
Household Workers	0.783
Clerical	0.662

Source: Computed from data in the U. S. Census of Population: 1950 and 1960.

Female employment in the sub-basin in occupations described as professional and technical, and managers, officials and proprietors, were appreciably more important than in the nation at large. While female employment in blue collar occupations remains relatively less important than among women nationally, the magnitude of the gap has declined somewhat in the decade to 1960. Many more women in the Upper Main Stem are employed as service workers than in the nation. On the other hand, a much smaller proportion of women were employed in the sub-basin as operatives and as private household workers.

The profile of male employment in the sub-basin was somewhat closer to the national norms, with the gap between predominatly while collar jobs in the region narrowing appreciably in the 1950-60 period. Relatively speaking, employment among men as managers, officials and proprietors was somewhat more important in the region than in the United States while male employment in clerical occupations and private households jobs was less significant in the region. A larger share of men in the sub-basin were employed as laborers.

Interindustry Analysis of the Economy of the Upper Main Stem Sub-Basin of the Colorado River Basin -- 1960

The interindustry or input-output method of economic analysis was explained in general terms early in this report. In this and the following sections the actual analysis will be applied to major industrial sectors of the Upper Main Stem Sub-basin in 1960 with the objective of uncovering the patterns of structural interdependence which characterize the sub-basin's economy.

The basic documents for the analysis which follows are the interindustry transactions table for the Upper Main Stem (Table UMS-S), and its derivatives -- the table of direct input requirement coefficients (Table UMS-T), and the table of direct and indirect input requirement coefficients (Table UMS-U). It may be recalled that the table of direct input requirements contains the coefficients indicating the direct additions to output by each industry required to sustain a one-dollar increase in sales to the final demand sector by the particular industry under study. Each entry in Table UMS-U yields the total dollar production which the sub-basin economy requires from the industry at the top of the table per dollar of deliveries to final demand by the industry at the left, after all rounds of needs (direct and indirect) in the economy had been met.[1]

Each of the processing sector industries will be discussed separately, but certain summary tables have been prepared to highlight particularly important aspects of these industries in the Upper Main Stem. Tables UMS-V, W, X, Y and

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[1] As explained in the first chapter, this method of reading Table UMS-U results from the fact that the table has been transposed for ease of reading. In the agriculture sector of this report, however, the table of direct and indirect requirements has not been transposed and hence is read in the opposite manner. The reader will be cautioned again of this complication at the appropriate point in the agricultural section.

Industry Producing \ Industry Purchasing		1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food & Field Crops	5 Truck crops	6 Fruit	7 Forestry	8 All Other Agri-culture	9 Coal	10 Oil & gas	11 Uranium	12 Zinc	13 All Other Mining	14 Food & Kindred Products	15 Lumber & Wood Products	16 Printing & Publishing	17 Fabri-cated Metals	18 Stone, Glay & Glass	19 All Other Manu-facturing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating & Drinking Places	24 Agricul-tural Services	25 Lodging	26 All Other Services	27 Trans-portation	28 Electric energy	29 Other Utilities	30 Contract Construct-ion	31 Rentals & Finance	32 State & Federal	33 Local	34 Wages	35 Profit & Other Income	36 Inventory Change (depletion)	37 Depreciation Allowances	38 Imports From CRB	39 Imports from out-side CRB	40 Total Gross Output	
Processing Sector	1. Range livestock	2,780	2,758	64	0	0	0	0	350	0	0	0	0	0	3,076	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	1,152	0	712		0	93	0	17,259	28,284	1
	2. Feeder livestock	0	0	0	0	0	0	0	0	0	0	0	0	0	383	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	3,627	4,010	2
Agriculture	3. Dairy	87	73	0	0	0	0	0	285	0	0	0	0	0	2,005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54		0	0	0	616	3,155	3
	4. Food & field crops	0	43	0	0	0	0	0	0	0	0	0	0	0	1,619	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	48		0	0	186	3,159	5,793	4
	5. Truck crops	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	738	0	0		0	0	0	0	738	5
	6. Fruit	79	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	129		0	0	35	652	862	6
	7. Forestry	4	0	0	0	0	0	0	0	0	0	0	0	0	859	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	508		0	0	897	3,830	6,243	7
	8. All other agriculture	5	0	1	2	0	0	0	1	0	0	0	0	0	0	1,884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3		0	0	16	45	1,952	8
	9. Coal	0	0	0	0	0	0	0	0	6	0	0	0	0	743	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	634		0	0	132	1,142	2,660	9
	10. Oil & gas	0	0	0	0	0	0	0	0	0	28	0	0	0	2	0	0	0	0	0	3	1	3	17	2	0	7	7	0	902	3	0	14	34	85	709	371	0	0	3,431	5,620	10
Mining	11. Uranium	0	0	0	0	0	0	0	0	0	0	16,854	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,671	0	269	1,968	11
	12. Zinc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,537	7,004	92,422	12
	13. All other mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	67,027	0	0	447	0	0	0	11,117	11,564	13
	14. Food & Kindred products	0	648	136	0	0	0	0	0	0	0	0	1,122	0	0	0	0	0	0	0	0	0	0	374	0	0	0	0	0	1	0	1,316	0	182	80	0	322	507	0	2,809	6,713	14
	15. Lumber & wood products	17	0	0	0	0	0	0	265	0	0	0	0	0	98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,294	17	220	48	0	48	103	10,185	1,045	0	168	4,868	19,143	15
Manufacturing	16. Printing & publishing	5	0	1	2	0	0	4	0	0	0	0	195	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	0	0	15	219		109	42	0	4,379	5,033	16
	17. Fabricated metals	0	0	0	0	0	0	0	0	0	0	0	422	186	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	10	26	21	0	13	23	3,049	17
	18. Stone, clay & glass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	158	118	0	509	1,663	18
	19. All other manufacturing	457	6	69	422	27	86	40	63	97	26	292	67	32	200	42	9	94	75	86	20	4	91	8	132	12	19	5,656	40	78	848	75	606	542	1,620		924	16	710	4,338	17,929	19
Trade (Retail)	20. Wholesale trade	267	3	34	74	8	46	13	17	48	27	341	63	97	129	10	6	2	4	45	40	6	109	507	48	48	192	576	14	48	324	44	260	313	5,571		4,283	1,042	3,369	2,317	20,345	20
	21. Service stations	264	4	30	128	3	32	23	28	0	12	78	1	8	116	20	3	1	8	8	18	1	8	50	5	36	4	7	978	14	13	235	44	26	21	1,106		214	0	205	686	4,530	21
	22. All other retail	582	8	76	95	27	121	14	14	0	0	22	109	2	27	26	10	14	3	1	39	46	14	151	189	18	93	102	148	19	34	181	103	79	98	27,761		6,524	854	1,874	2,910	42,388	22
	23. Eating & drinking places	24	1	2	0	0	0	0	0	0	0	2	5	0	0	25	0	2	0	0	53	20	3	32	2	0	4	10	23	8	13	50	48	52	7	5,228		415	0	132	6,817	12,978	23
Services	24. Agricultural services	648	66	330	422	370	2,855	0	63	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	4,754	24
	25. Lodging	9	0	0	0	0	0	0	0	0	0	2	1	0	0	15	0	0	0	36	11	1	14	2	0	10	4	9	2	6	33	12	48	3	364		350	0	581	6,133	7,646	25
	26. All other services (except professional)	75	8	3	61	1	25	4	17	6	81	193	31	26	117	27	18	14	8	52	205	67	910	116	39	296	459	1,755	76	238	674	424	2,541	657	4,930		2,324	6	313	1,807	18,604	26
	27. Transportation	325	104	177	95	1	5	0	57	0	46	8,642	0	1	36	564	14	17	34	232	1,743	175	2,035	107	15	38	78	1,843	35	13	1,225	30	213	1,967	8,547		0	76	2,287	20,170	50,947	27
Utilities	28. Electric energy	103	5	42	19	3	21	0	19	144	18	386	374	130	147	105	33	7	21	177	96	123	553	220	116	249	434	55	990	45	120	255	189	412	2,964		19	0	16	850	9,460	28
	29. Other utilities	69	1	7	11	1	7	0	13	53	3	298	40	61	109	29	44	5	15	59	137	49	622	325	24	360	376	138	89	114	218	374	424	261	7,083		6,345	30	1,242	0	19,036	29
	30. Contract construction	0	0	0	0	0	0	0	0	0	30	33	13	0	17	0	5	0	0	128	115	27	304	241	0	154	76	211	7	355	23,757	102	3,255	2,063	7,726		12,408	35,539	7,064	0	93,630	30
	31. Rentals & finance	1,076	68	74	39	12	29	41	37	97	159	48	1	49	58	83	36	1	21	53	880	143	2,676	278	74	237	371	620	138	164	847	857	2,132	3,227	15,949		0	673	144	5,153	36,545	31
	32. State & Federal	683	1	15	29	2	15	519	24	185	44	366	293	241	1,797	108	96	43	23	816	967	86	991	175	33	55	110	1,760	124	695	238	2,432	9,491	323	42,435		0	0	194	3,067	68,476	32
Government	33. Local	1,721	15	296	272	16	271	51	53	92	92	537	65	201	254	95	152	62	94	216	323	112	983	225	92	243	215	776	1,274	590	130	313	16,707	879	10,360		0	0	207	959	38,943	33
	34. Wages	3,310	11	123	225	111	42	589	213	2,360	235	19,476	4,087	2,344	3,118	1,195	1,014	350	328	2,731	4,845	1,369	13,577	3,043	1,103	1,685	5,245	14,484	2,141	4,382	15,688	8,918	35,093	15,894	636		0	1,326	6,087	1,902	179,280	34
Households	35. Profits & other income	10,253	77	844	2,780	172	1,964	464	534	628	27	3,614	636	1,451	1,425	163	183	107	26	642	2,062	1,479	7,308	641	792	1,256	1,381	4,782	472	1,984	6,176	17,872	327	1,218	7,942		0	0	756	49	82,487	35
	36. Inventory change (depletions)	413	0	0	0	0	0	0	0	359	0	0	810	422	772	76	43	152	16	521	2,519	322	6,411	394	0	298	4,565	0	17	6,345	12,411	0	0	0	0		0	0	0	0	36,866	36
	37. Depreciation allowances	2,416	47	457	336	25	214	60	101	337	42	8,261	528	700	480	220	118	14	90	837	748	196	1,452	553	422	791	625	4,653	1,010	1,782	1,231	1,151	0	0	0		0	0	0	0	29,897	37
Imports	38. Imports from other Colorado River Sub-Basins	39	0	4	95	0	38	21	122	0	12	8,831	0	127	0	47	2	60	126	1,683	93	767	30,057	38
	39. Imports from outside Colorado River Basin	2,573	63	317	686	83	464	113	384	1,204	1,059	22,302	4,367	675	1,457	353	1,208	728	242	2,883	5,472	347	2,046	4,399	1,647	1,575	3,637	9,564	1,747	1,439	24,265	3,322	8,765	6,528	72,316		28,958	31,790	23,926	16,024	288,928	39
	40. Total Gross Outlays	28,284	4,010	3,155	5,793	862	6,243	1,952	2,660	5,620	1,968	92,422	11,564	6,713	19,143	5,033	3,049	1,663	1,460	17,929	20,345	4,530	42,388	12,978	4,754	7,646	18,604	50,947	9,460	19,036	93,630	36,545	149,957	35,502	237,657		65,480	75,466	52,184	138,688	1,295,320	40

Final payments

Profits and other income included in column 34

Note: Each row shows sales by the industry at the left to all industries listed at the top of the table. Each column shows purchases by the industry listed at the top of the table from each industry listed down the left margin.

INTERINDUSTRY TRANSACTIONS (IN THOUSANDS OF DOLLARS)

Industry Producing \ Industry Purchasing		1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food & Field Crops	5 Truck Crops	6 Fruit	7 Forestry	8 All Other Agriculture	9 Coal	10 Oil & Gas	11 Uranium	12 Zinc	13 All Other Mining	14 Food & Kindred Products	15 Lumber & Wood Products	16 Printing & Publishing	17 Fabricated Metals	18 Stone, Clay & Glass	19 All Other Manufacturing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating & Drinking Places	24 Agricultural Services	25 Lodging	26 All Other Services	27 Transportation	28 Electric Energy	29 Other Utilities	30 Contract Construction	31 Rentals & Finance	
Agriculture	1. Range Livestock	.099745	.687781	.020285	0	0	0	0	.131579	0	0	0	0	0	.167438	0	0	0	0	0	0	0	0	.008414	0	0	0	0	0	0	0	0	1
	2. Feeder Livestock	0	0	0	0	0	0	0	0	0	0	0	0	0	.020848	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	3. Dairy	.003122	.018204	0	0	0	0	0	.107143	0	0	0	0	0	.109139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	4. Food and Field Crops	0	.010723	0	0	0	0	0	0	0	0	0	0	0	.088128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
	5. Truck Crops	0	0	0	0	0	0	0	0	0	0	0	0	0	.001361	0	0	0	0	0	0	0	0	.001510	0	0	0	0	0	0	0	0	0	5
	6. Fruit	.002834	0	.016799	0	0	0	0	0	0	0	0	0	0	.046758	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
	7. Forestry	.000144	0	0	0	0	0	0	0	0	0	0	0	0	0	.380069	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
	8. All Other Agriculture	.000179	0	.000317	.000345	0	0	0	.000376	0	0	0	0	0	.040444	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Mining	9. Coal	0	0	0	0	0	0	0	0	.001140	0	0	0	0	.000109	0	.000998	.000662	.004155	.000287	.000673	.000713	.000473	.000159	0	.000953	.000499	0	.095520	.000236	0	.000383	0	9
	10. Oil and Gas	0	0	0	0	0	0	0	0	0	.014228	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
	11. Uranium	0	0	0	0	0	0	0	0	0	0	.182359	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
	12. Zinc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
	13. All Other Mining	0	0	0	0	0	0	0	0	0	0	.012140	0	0	0	0	0	0	.259003	0	0	0	0	0	0	0	0	0	.000106	0	.016203	0	0	13
Manufacturing	14. Food and Kindred Products	0	.161596	.043106	0	0	0	0	.093624	0	0	0	0	0	.005334	0	0	0	0	0	0	0	0	.102829	.003576	.029940	.003419	0	0	0	0	0	14
	15. Lumber and Wood Products	.000610	0	0	0	0	.000641	0	0	0	0	.002110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.000653	0	.000653	0	15
	16. Printing and Publishing	.000179	0	.000317	.000345	0	.000641	0	0	.000760	.000508	.000173	0	.007312	.001905	.000403	.015303	.001324	.004155	.002700	0	.000713	.057036	.007470	.005048	.301497	.005841	.000746	.001165	.005358	.000505	.004241	16
	17. Fabricated Metals	0	0	0	0	0	0	0	0	0	0	.004566	.017296	.011922	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.000529	0	.001859	0	17
	18. Stone, Clay and Glass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.014048	0	0	18
	19. All Other Manufacturing	.016397	.001496	.021870	.072847	.031323	.013775	.020402	.023684	.018438	.013211	.003159	.006230	.005087	.010887	.008473	.002994	.062210	.051939	.004940	.001122	.000951	.002529	.000636	.027766	.001633	.001353	.111017	.004236	.006146	.010441	.002052	19
	20. Wholesale Trade	.009580	.000748	.010777	.012774	.009281	.007368	.006660	.006391	.009124	.013720	.003690	.005858	.015419	.007022	.002017	.001996	.001324	.002770	.002585	.002244	.001426	.003030	.040289	.010097	.006532	.013676	.011306	.001483	.003782	.003989	.001204	20
Trade	21. Service Stations	.009472	.000998	.009509	.022096	.003480	.006126	.011783	.010526	0	.006098	.000844	.000093	.001272	.006314	.004035	.000998	.000662	.005540	.000460	.001010	.000238	.001390	.000397	.007573	.000544	.000499	.019196	.001483	.001024	.002893	.001204	21
Retail	22. All Other Retail	.020882	.001995	.024089	.016399	.031323	.013382	.007172	.005263	0	.011179	.001179	.000186	.004292	.001415	.002017	.004657	.001985	.000693	.002240	.002581	.003327	.004197	.015019	.003786	.012657	.007265	.002905	.002012	.002679	.002229	.002819	22
	23. Eating and Drinking Places	.000861	.000249	.000634	0	0	0	0	0	0	.001016	.000054	0	0	.001361	0	.000665	0	0	.003045	.001122	.000713	.000989	.000159	0	.000544	.000712	.000451	.000847	.001024	.000616	.001313	23
Services	24. Agricultural Services	.023250	.016459	.104596	.072847	.429234	.457312	0	.023684	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
	25. Lodging	.000323	0	0	0	0	0	0	0	0	.001016	.000011	0	0	.000817	0	0	0	0	.002068	.000617	.000238	.000389	.000159	0	.001361	.000285	.000177	.000212	.000473	.000406	.000329	25
	26. All Other Services	.002691	.001995	.000951	.010530	.001160	.004004	.002049	.006391	.001140	.041159	.002088	.002883	.004133	.006369	.005447	.005988	.009265	.005540	.002987	.011500	.015922	.025294	.009218	.008204	.040293	.032695	.034448	.008043	.018753	.008269	.011602	26
	27. Transportation	.011661	.025935	.056101	.016399	.001160	.000801	0	.021429	0	.023374	.093506	0	.000159	.001960	.113778	.004657	.011251	.023546	.013327	.097779	.041587	.056564	.008503	.003155	.005171	.005556	.036175	.003706	.001024	.015083	.000821	27
Utilities	28. Electric Energy	.003696	.001247	.013312	.003280	.003480	.003364	0	.007143	.027371	.009146	.004176	.034778	.020664	.008002	.021182	.010978	.004633	.014543	.010168	.005385	.029230	.015371	.017483	.024401	.033887	.030914	.001080	.104840	.003546	.001477	.006978	28
	29. Other Utilities	.002476	.000249	.002219	.001999	.001160	.001121	0	.004887	.010074	.001524	.003224	.003720	.009696	.005933	.005850	.014637	.003309	.010388	.003389	.007685	.011644	.17259	.025826	.005048	.048993	.026783	.002709	.009425	.008993	.002664	.010234	29
	30. Contract Construction	0	0	0	0	0	0	0	0	0	.015244	.000357	.001209	0	.000925	0	.001663	0	0	.007353	.006451	.006416	.008450	.019151	0	.020958	.005413	.004142	.000741	.027973	.292505	.002791	30
	31. Rentals and Finance	.038606	.016958	.023455	.006732	.013921	.004645	.021004	.013910	.018438	.080793	.000519	.000093	.007789	.003157	.016744	.011976	.000662	.014543	.003045	.049366	.033983	.074391	.022092	.015566	.032254	.026426	.012170	.014614	.012923	.010429	.023451	31

Note: Each entry shows the input directly required from the industry at the left of the table to produce one dollar's worth of output by the industry at the top of the table.

DIRECT PURCHASES PER DOLLAR OF OUTPUT
UPPER MAIN STEM SUB-BASIN 1960
Table UMS-1960-b

Industry Purchasing \ Industry Producing		1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food & Field Crops	5 Truck Crops	6 Fruit	7 Forestry	8 All Other Agriculture	9 Coal	10 Oil & Gas	11 Uranium	12 Zinc	13 All Other Mining	14 Food & Kindred Products	15 Lumber & Wood Products	16 Printing & Publishing	17 Fabricated Metals	18 Stone, Clay & Glass	19 All Other Manufacturing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating & Drinking Places	24 Agricultural Services	25 Lodging	26 All Other Services	27 Transportation	28 Electric Energy	29 Other Utilities	30 Contract Construction	31 Rentals Finance	
Agriculture	1. Range Livestock	1.111254	.000009	.003539	.000038	.000002	.003229	.000418	.000218	.000750	0	0	0	.000026	.000429	.000691	.002102	.000007	.000013	.021456	.011593	.011273	.023971	.001186	.027693	.000448	.005765	.017347	.007996	.004513	.001288	.048005	1
	2. Feeder Livestock	.799789	1.003456	.039595	.025371	.000228	.010684	.000303	.006873	.001069	0	0	0	.000037	.165791	.000496	.002427	.000009	.000025	.026056	.011910	.012040	.021387	.001427	.046247	.000501	.009647	.043671	.010314	.005527	.001798	.055492	2
	3. Dairy	.033015	.000927	1.005201	.003929	.000062	.019059	.000017	.002125	.002052	0	0	0	.000038	.044403	.000034	.002949	.000015	.000025	.034409	.014020	.012611	.026532	.000982	.115002	.000172	.006642	.063733	.020772	.005052	.001786	.032341	3
	4. Food and Field Crops	.000815	.000008	.000084	1.000035	.000001	.000022	.000001	.000361	.000873	0	0	0	.000037	.000392	.000002	.002146	.000008	.000026	.077959	.014359	.023211	.017307	.000336	.072695	.000199	.013575	.020000	.008376	.003951	.001827	.012983	4
	5. Truck Crops	.004355	.000034	.000198	.000143	1.000003	.000091	.000002	.000066	.001748	0	0	0	.000032	.001620	.000004	.004489	.000012	.000021	.044712	.014231	.007086	.033576	.000259	.429412	.000137	.007029	.007905	.017625	.005057	.001499	.025674	5
	6. Fruit	.004639	.000036	.000211	.000152	.000003	1.000097	.000246	.000071	.001765	0	0	0	.000025	.001722	.000644	.004518	.000012	.000016	.027691	.012533	.008893	.021650	.000185	.457501	.000094	.009659	.005976	.017938	.004872	.001145	.015715	6
	7. Forestry	.000005	.000001	.000003	.000002	0	.000001	1.000000	.000061	.001139	0	0	0	.000013	.000025	0	.000621	.000002	.000009	.020927	.006876	.011985	.007412	.000122	.000001	.000063	.003039	.001992	.001103	.000749	.000640	.023056	7
	8. All Other Agriculture	.171465	.002219	.119647	.009406	.000146	.007477	.000867	1.004755	.001476	0	0	0	.000035	.106458	.000110	.001659	.000011	.000024	.036822	.011303	.015405	.012942	.000601	.044522	.000261	.011216	.035297	.014730	.008074	.001690	.028550	8
Mining	9. Coal	.000005	0	.000003	.000002	0	.000001	0	.000001	1.004153	0	0	0	.000020	.000024	.000001	.001041	.000019	.000012	.019036	.009403	.001133	.000247	.000137	.000001	.000065	.002147	.001420	.001283	.010945	.000866	.020234	9
	10. Oil and Gas	.000070	.000007	.000038	.000029	.000002	.000016	.000006	.000014	.001393	1.0144333	0	0	.000463	.000334	.000015	.002037	.000057	.000331	.017319	.015395	.007002	.012303	.001512	.000017	.001147	.046396	.028231	.013632	.004616	.023827	.088193	10
	11. Uranium	.000011	.000001	.000006	.000004	0	.000002	.000961	.000002	.000695	0	1.223031	0	.014886	.000851	.002592	.000695	.005763	.000027	.017216	.006355	.003435	.002060	.000209	.000003	.000085	.007526	.120304	.007023	.005013	.001903	.003417	11
	12. Zinc	.000005	0	.000003	.000002	0	.000001	.000001	.000001	.003786	0	0	1.000000	.000046	.000022	.000001	.000172	.017321	.000030	.007742	.006106	.002211	.000389	.000075	.000001	.000033	.003754	.001176	.039364	.004439	.002113	.001341	12
	13. All Other Mining	.000006	.000001	.000003	.000003	0	.000001	0	.000001	.002328	0	0	0	1.000019	.000030	.000001	.007393	.011936	.000012	.036443	.015738	.001426	.004587	.000098	.000002	.000041	.005416	.002517	.023924	.010697	.000844	.010030	13
	14. Food and Kindred Products	.214761	.021233	.116635	.038931	.001399	.050139	.000094	.041312	.001672	0	0	0	.000056	1.018440	.000165	.003412	.000014	.000039	.022269	.013498	.014119	.011179	.001845	.043623	.001001	.011421	.017991	.015773	.009047	.002759	.020426	14
Manufacturing	15. Lumber and Wood Products	.000015	.000001	.000009	.000006	0	.000003	.380069	.000003	.002474	0	0	0	.000036	.000071	1.000001	.001181	.000017	.000025	.000081	.006340	.010943	.005491	.000423	.000004	.000115	.011945	.120140	.025412	.007532	.001731	.028992	15
	16. Printing and Publishing	.000022	.000002	.000012	.000009	.000001	.000005	.000001	.000004	.002294	0	0	0	.000067	.000105	.000002	1.016059	.000014	.000047	.003939	.002366	.001203	.004970	.000752	.000006	.000031	.007305	.005734	.013169	.015676	.003321	.013765	16
	17. Fabricated Metals	.000014	.000001	.000007	.000006	0	.000003	0	.000003	.001412	0	0	0	.000022	.000065	.000001	.001772	1.000006	.000015	.004099	.001852	.000974	.002307	.000228	.000003	.000145	.010525	.013046	.006471	.004081	.001066	.001848	17
	18. Stone, Clay and Glass	.000014	.000001	.000007	.000006	.000001	.000003	0	.000003	.006510	0	0	0	.259038	.000065	.000001	.006715	.003104	1.000023	.057122	.007590	.006514	.002316	.000274	.000003	.000182	.009032	.026724	.024037	.014328	.001671	.013287	18
	19. All Other Manufacturing	.000085	.000009	.000046	.000036	.000005	.000020	.000003	.000016	.001451	0	0	0	.000219	.000405	.000007	.003036	.000029	.000164	1.006889	.003003	.000825	.002516	.003113	.000021	.002103	.004220	.014735	.011993	.004116	.010996	.004381	19
Trade	20. Wholesale Trade	.000046	.000005	.000025	.000019	.000002	.000011	.000003	.000009	.001448	0	0	0	.000214	.000218	.000007	.000713	.000027	.000161	.012939	1.003925	.003127	.003315	.001324	.000011	.000701	.016802	.102732	.007637	.009412	.010736	.053337	20
Retail	21. Service Stations	.000035	.000003	.000019	.000015	.000002	.000003	.000003	.000007	.004011	0	0	0	.000209	.000168	.000007	.001408	.000040	.000146	.006441	.002496	1.001252	.003396	.000873	.000009	.000298	.019325	.044245	.034109	.013359	.010371	.037297	21
	22. All Other Retail	.000052	.000005	.000028	.000022	.000002	.000012	.000004	.000010	.002528	0	0	0	.000282	.000244	.000009	.058992	.000040	.000198	.010141	.004651	.002838	1.005318	.001174	.000012	.000432	.030634	.060607	.020214	.020652	.014109	.080072	22
	23. Eating and Drinking Places	.022109	.002185	.012004	.009261	.001653	.005165	.000017	.004252	.002427	0	0	0	.000586	.104615	.000036	.009265	.000074	.000413	.006187	.042533	.002301	.016950	1.000542	.005653	.000345	.013536	.016580	.022795	.028739	.029407	.029769	23
	24. Agricultural Services	.010130	.000977	.000453	.000327	.000055	.000209	.000004	.000152	.002794	0	0	0	.000023	.003701	.000007	.005696	.000017	.000014	.029134	.010699	.007938	.004413	.000194	1.000410	.000096	.009351	.005769	.029768	.006373	.001016	.018615	24
Services	25. Lodging	.006489	.000642	.003524	.002719	.000043	.001516	.000011	.001248	.004455	0	0	0	.000653	.030773	.000026	.003218	.000090	.000459	.004585	.009247	.001408	.013909	.000899	.001470	1.001434	.044931	.008649	.041072	.052322	.032696	.038291	25
	26. All Other Services	.000782	.000077	.000425	.000328	.000006	.000183	.000003	.000151	.004074	0	0	0	.000195	.003711	.000007	.006984	.000040	.000135	.003099	.014710	.000911	.007987	.000894	.000178	.000355	1.035941	.008476	.036747	.029205	.009617	.039832	26
	27. Transportation	.000052	.000005	.000028	.000022	.000002	.000012	.000002	.000010	.000552	0	0	0	.000164	.000245	.000005	.001690	.000020	.000110	.116549	.012811	.020160	.003803	.000993	.000012	.000463	.038498	1.041952	.004964	.003010	.008261	.016332	27
	28. Electric Energy	.000032	.000003	.000017	.000013	.000002	.000008	.000001	.000006	.107248	0	0	0	.000159	.000152	.000001	.001807	.000599	.000022	.007544	.003007	.001823	.002512	.001031	.000008	.000274	.010329	.005098	1.121236	.012443	.002047	.019803	28
Utilities	29. Other Utilities	.000044	.000004	.000024	.000018	.000002	.000010	.000010	.000008	.000776	0	0	0	.000802	.000206	.000026	.005933	.000087	.000566	.007140	.004444	.001266	.003109	.001135	.000011	.000527	.020511	.002707	.005271	1.010237	.340404	.015143	29
	30. Contract Construction	.000036	.000004	.000020	.000015	.000002	.000009	.000253	.000007	.000554	0	0	0	.028864	.000173	.000923	.001510	.002967	.019870	.619081	.006759	.004750	.003665	.000956	.000009	.000640	.013978	.024281	.004569	.005321	1.414368	.017393	30
	31. Rentals Finance	.000043	.000004	.000023	.000018	.000002	.000010	.000031	.000009	.001251	0	0	0	.000095	.000202	.000008	.004770	.000015	.000067	.002522	.001608	.001325	.003124	.001395	.000011	.000356	.012877	.001548	.008770	.011267	.004787	1.028217	31

Note: Each entry shows the total dollar production directly and indirectly required from the industry at the top of the table per dollar of deliveries to final demand by the industry at the left.

DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR OF FINAL DEMAND
UPPER MAIN STEM SUB-BASIN 1960
Table UMS-1960-c

Z rank processing sector industries according to the magnitude of their total gross output, sales to final demand, and percent of their total gross output which goes to final demand sectors (providing an index of dependence of the particular sector upon customers other than domestic industries), the magnitude of their payments to sub-basin households, and the size of the direct and indirect requirements per dollar of sales to final demand by each processing sector industry. Table UMS-AA shows the number of industries responding directly and indirectly in amounts of $0.01 or more to an increase in sales of $1.00 by each processing sector industry. This provides an indicator of degree of interdependence existing among sub-basin industries.

A glance at these tables reveals that the same five industries lead, although the rankings shift, in total gross output, sales to final demand, and payments to households. These prominent sectors are contract construction, uranium, transportation, other retail trade, and rentals and finance. Quite a different picture emerges when sectors are ranked in terms of the relative share of their total output which goes to final demand sectors. Here, the zinc industry leads with 100% of its output directed to final demand, the bulk of which is represented by exports. Final demand sales absorb 98.6% of the total gross output of the oil and gas industry with most of these sales representing sales to gross private capital formation. In this case, this represents drilling and exploration activities conducted in the sub-basin. Lodging follows in third place with 97.8% of its total gross output going to final demand with the largest part of its services provided in the form of export sales to visitors from outside the sub-basin. Eating and drinking places and truck crops follow in fourth and fifth place in terms of the importance of final demand sales relative to total output with 97.5% and 94.9% respectively.

Table UMS-V

Total Gross Output of Processing
Sector Industries in the Upper Main Stem Sub-Basin

Rank	Industry	Total Gross Output
1	Contract Construction	$93,630,000
2	Uranium	92,422,000
3	Transportation	50,947,000
4	Other Retail	42,388,000
5	Rentals and Finance	36,545,000
6	Range Livestock	28,284,000
7	Wholesale Trade	20,345,000
8	Food and Kindred Products	19,143,000
9	Other Utilities	19,036,000
10	Other Services	18,604,000
11	Other Manufacturing	17,929,000
12	Eating and Drinking Places	12,978,000
13	Zinc	11,564,000
14	Electric Energy	9,460,000
15	Lodging	7,646,000
16	Other Mining	6,713,000
17	Fruit	6,243,000
18	Food and Field Crops	5,793,000
19	Coal	5,620,000
20	Lumber and Wood Products	5,033,000
21	Agricultural Services	4,754,000
22	Service Stations	4,530,000
23	Feeder Livestock	4,010,000
24	Dairy	3,155,000
25	Printing and Publishing	3,049,000
26	Other Agriculture	2,660,000
27	Oil and Gas	1,963,000
28	Forestry	1,952,000
29	Fabricated Metals	1,663,000
30	Stone, Clay and Glass	1,460,000
31	Truck crops	862,000

Source: Interindustry Transactions Table UMS-S

Table UMS-W

Processing Sector Industry Sales to Final Demand in the Upper Main-Stem Sub-Basin

Rank	Industry	Sales to Final Demand
1	Uranium	75,568,000
2	Contract Construction	68,055,000
3	Other Retail	40,100,000
4	Transportation	33,260,000
5	Rentals and Finance	27,278,000
6	Range Livestock	19,216,000
7	Wholesale Trade	17,155,000
8	Food and Kindred Products	16,417,000
9	Other Utilities	15,340,000
10	Eating and Drinking Places	12,651,000
11	Other Services	12,578,000
12	Zinc	11,564,000
13	Other Manufacturing	8,756,000
14	Lodging	7,479,000
15	Fruit	5,252,000
16	Lumber and Wood Products	4,764,000
17	Coal	4,630,000
18	Electric Energy	4,450,000
19	Food and Field Crops	4,131,000
20	Other Mining	3,900,000
21	Feeder Livestock	3,627,000
22	Service Stations	2,358,000
23	Oil and Gas	1,940,000
24	Other Agriculture	1,900,000
25	Fabricated Metals	824,000
26	Truck Crops	818,000
27	Dairy	705,000
28	Stone, Clay and Glass Products	319,000
29	Printing and Publishing	253,000
30	Forestry	64,000
31	Agricultural Services	0

Source: Interindustry Transactions Table, UMS-S

Table UMS-X

Sales to Final Demand of Processing Sectors Listed Below as a Percentage of Total Gross Output in the Upper Main Stem Sub-Basin

Rank	Industry	Sales to Final Demand ÷ Total Gross Output %
1	Zinc	100.00
2	Oil and Gas	98.58
3	Lodging	97.82
4	Eating and Drinking Places	97.48
5	Truck Crops	94.90
6	Lumber and Wood Products	94.66
7	Other Retail	94.60
8	Feeder Livestock	90.45
9	Food and Kindred Products	85.76
10	Wholesale Trade	84.32
11	Fruit	84.13
12	Coal	82.38
13	Uranium	81.76
14	Other Utilities	80.58
15	Rentals and Finance	74.64
16	Contract Construction	72.68
17	Other Agriculture	71.73
18	Food and Field Crops	71.31
19	Range Livestock	67.70
20	Other Services	67.61
21	Transportation	65.28
22	Other Mining	58.10
23	Service Stations	52.05
24	Fabricated Metals	49.55
25	Other Manufacturing	48.84
26	Electric Energy	47.04
27	Dairy	22.34
28	Stone, Clay and Glass Products	21.85
29	Printing and Publishing	8.30
30	Forestry	3.28
31	Agricultural Services	0.00

Source: Tables UMS-V and UMS-W

Table UMS-Y

Magnitude of Processing Sector Industry
Payments to Upper Main Stem Sub-Basin Households

Rank	Industry	Wages & Salaries	Profits	Total Payments
1	Rentals and Finance	$ 8,918,000	17,872,000	26,790,00
2	Uranium	19,476,000	3,614,000	23,090,00
3	Contract Construction	15,688,000	6,176,000	21,864,00
4	Other Retail Trade	13,577,000	7,308,000	20,885,00
5	Transportation	14,484,000	4,782,000	19,266,00
6	Range Livestock	3,310,000	10,253,000	13,563,00
7	Wholesale Trade	4,845,000	2,062,000	6,907,00
8	Other Services	5,245,000	1,381,000	6,626,00
9	Other Utilities	4,382,000	1,984,000	6,366,00
10	Zinc	4,087,000	636,000	4,723,00
11	Food & Kindred Products	3,118,000	1,425,000	4,543,00
12	Other Mining	2,344,000	1,451,000	3,795,00
13	Eating & Drinking Places	3,043,000	641,000	3,684,00
14	Other Manufacturing	2,731,000	642,000	3,373,00
15	Food & Field Crops	225,000	2,780,000	3,005,00
16	Coal	2,360,000	628,000	2,988,00
17	Lodging	1,685,000	1,256,000	2,941,00
18	Service Stations	1,369,000	1,479,000	2,848,00
19	Electric Energy	2,141,000	472,000	2,613,00
20	Fruit	42,000	1,964,000	2,006,00
21	Agriculture Services	1,103,000	792,000	1,895,00
22	Lumber & Wood Products	1,195,000	163,000	1,358,00
23	Printing & Publishing	1,014,000	183,000	1,197,00
24	Forestry	589,000	464,000	1,053,00
25	Dairy	123,000	844,000	967,00
26	Other Agriculture	213,000	534,000	747,00
27	Fabricated Metals	350,000	107,000	457,00
28	Stone, Clay & Glass Products	328,000	26,000	354,00
29	Truck Crops	111,000	172,000	283,00
30	Oil & Gas	235,000	27,000	262,00
31	Feeder Livestock	11,000	77,000	88,00

Source: Interindustry Transactions Table UMS-S, 1960.

Table UMS-Z

Processing Sector Industries of the Upper Main Stem Sub-Basin Ranked by the Magnitude of the Total Dollar Production Directly and Indirectly Required by the Sub-Basin Economy to sustain a $1.00 Increase in Deliveries to Final Demand by the Industries Named

Rank	Industry	Direct and Indirect Requirements Per Dollar of Sales
1	Feeder Livestock	2.302180
2	Food and Kindred Products	1.756332
3	Other Agriculture	1.646068
4	Lumber and Wood Products	1.632865
5	Truck Crops	1.606320
6	Fruit	1.598043
7	Contract Construction	1.570377
8	Dairy	1.447976
9	Stone, Clay and Glass Products	1.444531
10	Uranium	1.423997
11	Eating and Drinking Places	1.309597
12	Other Retail	1.313331
13	Lodging	1.306249
14	Range Livestock	1.304454
15	Electric Energy	1.297252
16	Oil and Gas	1.278260
17	Food and Field Crops	1.273203
18	Transportation	1.272663
19	Wholesale Trade	1.220951
20	Other Services	1.196043
21	Service Stations	1.180045
22	Agriculture Services	1.146885
23	Other Utilities	1.120425
24	Fabricated Metals	1.109868
25	Other Mining	1.103997
26	Coal	1.101203
27	Printing and Publishing	1.099975
28	Rentals and Finance	1.089291
29	Zinc	1.088175
30	Forestry	1.078687
31	Other Manufacturing	1.074521

Source: Table of Direct and Indirect Input Requirement Coefficients, UMS-U, 1960.

Table UMS - AA

Number of Processing Sector Industries Responding in Amounts of at least $0.01 per Dollar of Sales to Final Demand by the Industries Listed Below

Industry	Intersections $\geq$ $0.01
Food and kindred	15
Feeder livestock	13
All other agriculture	12
Dairy	11
Eating and drinking	11
Food and field crops	8
Oil and Gas	8
All other retail	8
Range livestock	7
Lumber and wood	7
Lodging	7
Truck crops	6
Fruit	6
Stone, clay and glass	6
Service stations	6
Contract construction	6
Transportation	5
All other mining	5
Wholesale trade	5
Agricultural services	5
Coal	4
All other services	4
Electric energy	4
Printing and publishing	3
Forestry	3
Uranium	3
Fabricated metals	3
All other manufacturing	3
Other utilities	3
Zinc	2
Rentals and finance	2

Source: Table of Direct and Indirect Input Requirement Coefficients, UMS-U, 1960

As generators of additional economic activity in the sub-basin, three new industries appear as highly important -- feeder livestock, food and kindred products manufacturing, and other agriculture. These three sectors are important both when measured in terms of the magnitude of the direct and indirect economic activity resulting from their sales to final demand and also in terms of the number of processing sector industries reacting directly and indirectly in amounts larger than one penny per dollar of sales to final demand. When measured against the first of these two criteria of interdependence, lumber and wood products manufacture and truck crops occupy fourth and fifth place. By the second measure, dairy farming and eating and drinking places occupy fourth and fifth place.

It is interesting to note that two of the three industries which consistently lead in measures of interindustry interdependence (Tables UMS-Z and UMS-AA) -- the feeder livestock and other agriculture industries -- are consistently found near the bottom of all the other tables which measure industry importance. This illustrates dramatically the unique capacity of input-output analysis to ferret out structural interrelationships not otherwise evident.

We now turn to an industry-by-industry review based upon the findings of the input-output analysis.

AGRICULTURAL AND FORESTRY ASPECTS OF AN INTERINDUSTRY ANALYSIS OF THE UPPER MAIN STEM SUB-BASIN OF THE COLORADO RIVER

by

Jay Andersen

Natural Resources Economics Division

Economic Research Service
United States Department of Agriculture
Logan, Utah

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SETTLEMENT AND DEVEL MENT

Settlement in the Up r Main Stem area began wit discovery of gol in what is now Sumal Coun in 1859. During the next few years y mining claims were registered. Agricultural deve nt was y slo u til the Compromise Agreement of 188l when the Ute Indians agreed to leave th area and locate in the Uintah reservation in Utah.

Development of the Agricultural Economy

Despite the early flurry of mining in western Colorado, the area r ther quickly became primarily agricultural. Cattlemen were attracted to the re by the expansive grazing lands. Many pioneer settler came seeking gold, but realizing that easy riches would not come their y, stayed to raise livestock or to farm.

Settlement and development has been limited by a continual search for irrigation water. Early settlers established far long the river course where diversions were comparatively simple. Growth was slower as development became more difficult.

Population growth

Growth of tion in the area ha not been stea . Urban and rural populations for the sen tative counties for the Upper Main Ste are shown in ble 1. This table shows that the population is primari'y rural, but is becoming less so.

Farms and size of farms

Apparently, the rural nonfarm as well s the nonrural portion of th population is incre sing In spite of n increase in rural popu tion, numbers of farms have d creased steadily si ce 1930 (see table 2).

Table 1.--Total and Rural Population, Upper Main Stem Subbasin, Colorado River Basin, Census Years 1900-1960

Year	Population		Proportion of population which is rural
	Total	Rural	
	Number	Number	Percent
1900	57,050	NA	NA
1910	64,590	NA	NA
1920	84,660	69,791	82.4
1930	83,787	67,036	80.0
1940	105,099	84,139	80.1
1950	109,060	82,725	75.9
1960	128,079	83,757	65.4

Source: U.S. Census.

Table 2.--Total Number of Farms, Total Land in Farms, and Average Farm Size, Upper Main Stem Subbasin, Colorado River Basin Census Years 1939-1959

Year	Total farms	Land in farms	Products sold per farm	Average farm size
	Number	Acres	Dollars	Acres
1890	2,419	431,124	NA	178.2
1900	4,074	637,732	NA	156.5
1910	7,809	1,112,006	NA	142.4
1920	8,259	1,542,236	NA	186.7
1930	8,792	2,101,564	NA	239.0
1939	8,685	2,757,328	1,718	317.4
1944	8,261	3,382,491	3,911	409.5
1949	7,753	3,422,006	5,374	441.4
1954	6,932	3,538,002	5,855	498.8
1959	5,731	3,926,113	8,574	686.3

Source: U.S. Census.

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In addition to this declining number of farms, more farm operators have been working off their farms. In 1939 and 1949 slightly less than one-third of the farm operators had worked off their farms, but in the post World War II era and up to the present, approximately half the farm operators reported off-farm work despite the decrease in farm numbers and increases in farm size. In fact, of those reporting off-farm work, an ever-increasing proportion show more than 100 days work off-farm. In 1949 and 1954, approximately one-third of the farmers reported other income exceeding farm sales, but in 1959 this proportion was up to 42 percent.

Despite decreases in farm employment, value of farm products sold continues to rise. From 1939 to 1959, total value of products sold increased from $15 million to $49 million. Products sold per farm increased from $1700 to $8600 in the same period. In constant dollars, total value of products from all farms increased about one-third from 1939 to 1959, and sales per farm slightly more than doubled.

Thus, in summary, fewer and fewer farmers working less and less on their farms are producing greater amounts of products. But, nonfarm industries are increasing in output at a faster rate and increasing employment as well.

Land development

As shown in table 2, land in farms has increased steadily over the past 70 years. From 1939 to 1959 the increase amounted to nearly 30 percent. Total cropland harvested has not kept pace, however. The amount of cropland harvested increased in the 1940's but dropped to and below the level of 1939 in the 1950's. (See table 3).

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Table 3.--Cropland Harvested and Land Irrigated, Upper Main Stem Subbasin, Colorado River Basin, Census Years 1939-1959

Year	Cropland harvested	Land irrigated
	Acres	Acres
1890	NA	139,408
1900	NA	227,281
1910	NA	437,292
1920	NA	548,546
1930	436,594	569,966
1939	429,244	483,933
1944	479,068	NA
1949	477,188	558,404
1954	428,357	513,509
1959	413,467	518,534

Source: U.S. Census.

Since acreage of land irrigated has not followed the pattern of acreage of cropland harvested exactly, then slightly increasing amounts of land must be under irrigation where no crops were harvested in recent years. This is likely pasture land. It is significant to notice that either cropland harvested or land irrigated is a small proportion (about 11 to 18 percent) of total land in farms.

Water development

Scanty rainfall makes irrigation necessary in the Upper Main Stem area. Agricultural and irrigation development proceeded quite rapidly in the 1880's and 1890's. By 1900 most of the easily developed irrigation diversions had been accomplished by private individuals and small irrigation companies. Federal irrigation development in Colorado began shortly after the Bureau of Reclamation was established in 1902. One of the Bureau's first projects was the Uncompahgre project in the Delta and Montrose area.

The Grand Valley project was begun in 1912. These two projects have been major developments in the basin. As indicated in table 3, irrigation was at a peak in about 1930. There are problems in defining irrigated acreage due to shortages of water which takes some land out of irrigation in some years, flooding in river bottom lands which may or may not be called irrigation, and sub-irrigation and seepage in some areas.

It became evident quite early that water was to be a limiting factor in the Southwest. This realization and several developments led to the Colorado River Compact of 1922 which is the basis for allocation of water between the Upper and Lower Colorado River Basin. The dividing line between the Upper and Lower Basins is at Lee Ferry, Arizona. The Upper Colorado Basin Compact which allocated water to states in the Upper Basin was signed in 1948. Congress provided for development of regulating reservoirs and development of additional irrigation projects in the Upper Basin in Public Law 485, the Upper Colorado River Storage Project Act of 1956.

In Colorado and other arid states of the West, the doctrine of prior appropriation has governed water rights. This doctrine is distinctive to the region and permits diversion of water and endows the first user of the water with a permanent right to that water as long as he needs it and continues to use it. This doctrine is very different from English Common Law which has been adopted by the more humid sections of the United States (doctrine of riparian rights). Congress in 1866 established the doctrine of appropriation legally. It said that "whenever by priority of possession, rights to the use of water for mining, agriculture, manufacturing, or other purposes, have vested and accrued, and the same is recognized and acknowledged

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by the local custom, laws, and the decision of the courts, the possessors and owners of such vested rights shall be maintained and protected in the same."[1/] The courts of the states and the United States have consistently upheld this doctrine in the semi-arid states.

Construction of Hoover Dam and other large developments on the Lower Colorado River would undoubtedly have been delayed had the waters of the river not been allocated between the Upper and Lower Basins by the Compact of 1922. Likewise, the planning and construction of the Colorado River Storage Project in the Upper Basin had to await the 1948 compact which allocated the Upper Basin's share of water among Upper Basin States.

There are some conflicting ideas and figures, but apparently acreage irrigated has decreased somewhat in recent years. As shown in table 4, the 1959 census of irrigation for the Colorado portion of the subbasin reported 38,000 acres less of irrigated land than was reported for 1939. The water supply which was short in the late fifties was apparently not used, or was not available for short-season areas or poor cropping areas.

Conveyance losses are substantial in the Upper Main Stem Subbasin. The amount shown in table 4 is nearly one-half million acre-feet for 1959. Not all of the water lost from conveyance systems is net loss since much of it returns to the river as part of the return flow. Proportions of total water diverted lost in conveyance vary from about one-fifth to one-tenth, according to the Census of Irrigation. Higher proportions lost tend to be in the lower valleys and the smallest proportions lost in the mountain valleys. Evaporation as well as length of conveyance systems and nature of farming, crops and soils account for the difference.

1/ Frits, P.S. "Colorado--the Centennial State." Prentice-Hall, Inc., New York, 1941.

Quantity of water delivered per acre irrigated is higher a the higher elevations. Possibly priority of water rights, over-flooding of mountain meadows, and topography are the important factors in this relationship.

Not all of the water delivered or irrigation is used up in the process. As shown in table 4, deliveries of irrigation water to the Colorado drainage basins of the Upper Main Stem, plus an allowance for deliveries in Grand County, Utah, amount to about 1,900,000 acre-feet of water. Estimates of consumptive use by crops and other uses incidental to irrigation (table 5), and checking inflow-outflow statistics reveal that only about 50 percent of deliveries can be attributed to use in irrigation.

The proporti of water used in seeped lands, phreatophytes and other incidental areas compared to water used by crops is much higher in the lower valley areas than in high mountain areas. No doubt this is due to the higher proportion of conveyance losses in the lower valleys and to the broader flat areas of land that have gone into disuse as a result of irrigation in the lower valleys.

Economic class of farms

Despite the increases in farm size and decreases in number of farms shown in a previous table, only 10.6 percent of the farms in the 14 county area were listed as Class I or class II commercial farms in 1959.[2/] This indicates that for 1959 gross sales were less than $20,000 on nearly 90 percent of the farms. Furthermore, only an additional 15 percent of farms were commercial farms with sales between $10,000 and $20,000 in 1959. Thus, only about 25 percent of the farms were commercial farms with sales over $10,000. (See table 6.)

2/ According to the Census, a commercial farm is one with sales amounting to $2,500 or more, or one on which (1) the operator is under 65 years of age and does not work off the farm more than 100 days per year, and (2) income received by the operator and his family from off-farm sources does not exceed the value of all farm products sold

Table 4.--Acreage Irrigaged and Water Diversion and Use by Drainage Basin, Upper Main Stem Drainage Area, Colorado River Basin, 1959 1/

Drainage Basin	Land irrigated 1959	Land irrigated 1949	Water conveyed by irrigation organizations, 1959				
			Conveyance loss in basin	Conveyed to another drainage basin	Delivered to farm irrigation water users	Delivered for other uses	Average delivery of irrig. water per acre irrigated
	Acres	Acres	Ac.ft.	Ac.ft.	Ac.ft.	Ac.ft.	Ac.ft.
Colo. River Direct.	145,000	156,351	218,839	287,181	538,955	113,012	3.5
Dolores River	29,000	36,145	12,200	9,000	66,093	1,200	2.8
Plateau Creek	25,000	29,125	8,912	1,292	56,931	4,143	2.6
Roaring Fork	38,000	31,369	26,037	45,528	159,220	7,494	5.2
Eagle River	14,000	15,415	3,379	--	38,189	23	5.3
Blue River & Muddy Creek	22,000	21,090	3,421	--	17,069	--	6.4
Frazer River	10,000	10,172	2,547	--	21,363	--	4.1
Gunnison River	248,000	269,397	194,536	--	945,046	7,720	4.0
Total	531,000	569,064	469,871	343,001	1,842,866	133,592	--

Source: U.S. Bureau of the Census - Irrigation of Agricultural Lands, Vol. 3, 1959.

Note: 1/ In addition, 2,390 acres were irrigated in Grand County, Utah, in 1959. The acreages and water uses in this table are for drainage areas rather than for representative counties as is the case for most data presented in this report.

Table 5.--Water Use Due to Irrigation by Major Drainages, Upper Main Stem Subbasin, Colorado River Basin, 1949-1960 Average

Drainage area	Average amount of water used in net crop consumptive use	Estimated consumption on seeped lands, non-beneficial phreatophytic plants, and other areas incidental to irrigation	Total use attributable to irrigation
	Acre feet	Acre feet	Acre feet
Colo. River Main Stem..	368,550	59,277	427,827
Gunnison River.....	312,151	77,183	389,334
Other areas (Dolores, Little Dolores, and Grand County, Utah)..	43,897	5,935	49,832
Total.....	724,598	142,395	866,993

Sources: Upper Colorado River Basin Compact Commission, "Record-Negotiation of Upper Colorado River Basin Compact, Vol. III, Final Draft of Engineering Advisory Committee Report and Inflow-Outflow Manual." Denver, Colorado, November 1948.

U.S. Dept. of Agriculture, "Water and Related Land Resources--Colorado River Basin in Colorado." Denver, Colo., May 1965.

U.S. Dept. of Agriculture, "Water and Related Land Resources--Gunnison River Basin, Colorado." Denver, Colorado, November 1962.

Personal communication with members of U.S. Dept. of Agriculture Field Party River Basin Surveys, Denver, Colorado.

Table 6.--All Farms by Economic Class, Upper Main Stem Subbasin, Colorado River Basin, 1959

Economic class of farm	All farms	Proportion of total farms
	Number	Percent
All farms	5,721	100.0
All commercial farms	3,750	65.5
Class I - $40,000 and above	196	3.4
Class II- $20,000 to $39,999	409	7.2
Class III-$10,000-$19,999	843	14.7
Class IV - $5,000-$9,999	971	17.0
Class V - $2,500 - $4,999	905	15.8
Class VI- $50 - $2,499	426	7.4
Other farms 1/	1,981	34.6

Note: 1/ Includes part-time, part-retirement, and abnormal

Source: U.S. Census.

Farms in this area do tend to be smaller than in many places. For instance, in the Lower Main Stem Subbasin of the Colorado River Basin approximately 12 percent of all farms were in the class I group with sales over $40,000. Small farms which provide only part-time employment and subsistence units where a living can barely be eked out are very common in this area of west central Colorado.

Farm tenure

Most farmers in the Upper Main Stem area are part owners or owner-operators on their farms. Only about 10 percent of the farms were operated by full tenants in 1959. Table 7 shows number of farms, farm acreage, and cropland acreage by tenure group.

Table 7.--Number of Farms, Acreag in F rms, and Crop nd Acreage by Tenure Groups, Upper Main Stem Subbasin, Colorado River Basin, 1959

Tenure group	Farms	Acreage in	Cropland acreage
	Number	Acres	Acres
All farms	5,721	3,926,113	413,467
Owners	3,856	1,254,569	186,544
Part owners	1,283	2,120,344	171,740
Managers	64	343,047	11,446
Full tenants	518	208,153	43,737

Note: 1/ Four large farms with almost no cropland which are located in Grand County, Utah, account for about two-thirds of this acreage.

Source: U.S. Census.

Part owners have the largest farms, both in terms of cropland and total acreage except for the few farms with absentee owners and a farm manager. Part ownership arrangements often apply to the ranches where a headquarters and hay land and some pasture is owned, but grazing is often leased.

Fertilizer use

Use of commercial fertilizer has been increasing steadily for many years. Census data on fertilizer use were taken only in 1959 and 1954. During this period, substantial increases were evident in the Upper Main Stem area (table 8).

In the Upper Main Stem area in 1959, the acreage fertilized was 23 percent of acreage of cropland harvested. Some fertilizer was used on 41 percent of the farms. Since fertilizer has the potential of being a pollutant in the river, some attention is being paid to the possible effects on downstream water quality as increasing quantities of fertilizer are applied.

Table 8. -- Use of Commercial Fertilizer, Upper Main Stem Sub-Basin, Colorado River Basin, 1954 and 1959

Year	Total farms	Farms using commercial fertilizer	Total area fertilized	Quantity of fertilizer applied
	Number	Number	Acres	Acres
1954	7,093	2,434	65,487	7,994
1959	5,721	2,365	96,556	11,573

SOURCE: Census of Agriculture

For 1959, data have been assembled for application of fertilizer to various crops in each of the agricultural subregions in the United States. Subregion 90 in Colorado includes approximately the western half of the state. These data then include some acreage for northwestern and southern and southwestern Colorado which is not in the Upper Main Stem area. Nevertheless, some major crop areas are in the Upper Main Stem.

According to the subregion data (western half of Colorado) fertilizer was applied on 39 percent of row crops, only about 4 or 5 percent of small grains, less than 1 percent of wild hay, and about 6 percent of tame hay and cropland pasture (see Table 9). The amount of improved permanent pasture fertilized was about 1 percent of irrigated acreage of this crop. None of the non-irrigated pasture was fertilized. As would be expected, the major part of the fertilizer is used on high-valued crops.

No data on use of commercial fertilizer are available for the area in years since 1959. But, for the State of Colorado, expenditures on fertilizer and lime are estimated to have increased from 6.8 to 10.0 million dollars in the period 1959 to 1963. This is a rate of increase of over 10 percent per year.

Table 9 --Fertilizer Use on Crops and Pasture, Agricultural Subregion 90 in Western Colorado, 1959

Crop	Acreage harvested	Acreage irrigated	Acreage fertilized with available N	Acreage fertilized with available P_2O_5	Acreage fertilized with available K_2O	Quantity per acr fertilized with available N	Quantity per acr fertilized with available P_2O_5	Quantity per acr fertilized with available K_2O
	Acres	Acres	Acres	Acres	Acres	Lbs.	Lbs.	Lbs.
Corn	36,417	35,134	22,173	--	--	93	--	--
Dry beans	101,323	10,854	--	5,686	--	--	22	--
Sugar beets	5,990	5,990	5,439	5,439	--	99	127	--
Vegetables	12,525	10,761	10,760	10,760	10,398	166	141	45
Potatoes	34,859	34,415	23,951	23 951	23,951	43	85	18
Tree fruits	16,828	16,244	11,751	51	51	18	78	118
Miscellaneous	13,511	NA	--	--	--	--	--	--
Intertilled crops	221,453	113,403	74,074	45,887	34,440	76	95	26
Wheat	118,520	18,828	2,326	1,177	--	44	46	--
Rye	1,646	NA	--	--	--	--	--	--
Oats	50,651	NA	--	--	--	--	--	--
Barley	76,151	52,973	15,002	9,000	--	55	16	--
Proso	34	NA	--	--	--	--	--	--
Wild hay	213,788	202,570	1,369	1,369	--	25	12	--
Close-growing crops	460,800	274,371	18,697	11,546	--	51	19	--
Tame hay and cropland pasture	1,041,116	443,884	55,716	61,992	--	19	63	--
Improved perm. pasture	7,671,052	326,986	3,873	3,873	373	34	27	5
Hay and pasture	8,712,168	770,870	59,589	65,865	373	20	61	5
Total	9,394,421	1,158,644	152,360	123,298	34,773	51	70	26

Source: D. B. Ibach, J. R. Adams and Esther I Fox, "Commercial Fertilizer Used on Crops and Pasture in the United States - 1959 Estimates." Statistical Bulletin No. 348, U.S. Dept. of Agr., U.S.Govt. Printing Office, Washington, D.C. 1964.

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Investment in agriculture

The value of land and buildings on farms has been increasing rapidly in recent years (table 10).

Table 10.--Value of Land and Buildings on Farms, Upper Main Stem Subbasin, Colorado River Basin, Census Years 1939-1959

Year	Total value of land and buildings	Value of land and buildings per farm	Value of land and buildings per acre
	1,000 dollars	Dollars	Dollars
1939	52,444	6,039	19
1944	73,976	8,955	22
1949	140,622	18,137	41
1954	172 204	24,841	49
1959	230,614	40,240	59

Source: U. S. Census.

A big share of the increase in value has been due to inflation of values. For the same period, the index number of farm real estate value per acre has increased from 37 to 138 (1947-49 = 100) for the state of Colorado. This 3.7 times increase is likely mostly due to inflation but also to some extent due to increased value of improvements. In the Upper Main Stem area, values of real estate have increased (table 10), but value per acre has not increased as rapidly as for the state of Colorado. The reason for this relationship is apparently found in the increase in land in farms from 2.8 million acres in 1939 to 3.9 million acres in 1959, but at the same time a decrease in cropland harvested from 429,000 acres to 413,000 acres. Thus, more land of lower value is pulling down the average value per acre.

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Investment per farm has increased over six times in the 20-year period. This reflects a tripling in value per acre and a doubling of farm size.

In 1959, farm investment in equipment was substantial. For instance, 16 percent of the farms had combines, even though small grain crops are not too widely grown. Hay crops are prevalent enough so that in 1959, 26 percent of the farms had pick-up balers. Eighty-one percent of the farms had trucks and 40 percent of the farms had more than one tractor.

Livestock trends

Investment in livestock has been increasing, too. Total number of cows in the Upper Main Stem area has increased by about 21 percent from 1940 to 1959 (see Table 11). This overall change represents a fairly large increase in beef cows (about 39 percent) but a decrease in number of milk cows from about 24,000 to about 14,000. Changes in enumeration dates and cattle cycles make analysis of trends difficult, however. Some of the changes in cattle and sheep numbers may be due only to change in dates of inventory. The October and November dates of enumeration for the last two census years would likely cause more livestock on feed to be reported than might otherwise be the case. Too, the April 1 date used in 1950 could have been at a time when a year's calves had not been born yet and last year's crop already sold. Other possibilities of actual trends being obscured by changes in reporting are also evident.

Annual series of data are available for all cattle and calves and for milk cows by county. These data are available only for the 13 counties in Colorado, since these annual statistics are not available for Utah counties. Thus, Grand County, Utah, is not included in the following data.

Table 11.--Livestock Numbers in the Upper Main Stem Subbasin, Colora River Basin, Census Years 1940-1959

Type of livestock	Year				
	1940 (Apr. 1)	1945 (Jan.1)	1950 (Apr.1)	1954 (Fall)	1959 (Fall)
	Number				
Cows, incl. heifers that have calved	108,573	128,827	120,220	138,338	131,399
Milk cows	23,969	23,475	21,983	19,291	14,096
Beef cows 1/	84,604	105,352	98,237	119,047	117,303
Steers & bulls incl. steer & bull calves	NA	NA	46,059	81,902	79,866
Cattle & calves(over 3 mos.)	206,150	241,417	245,710	300,699	290,572
Horses and mules	38,556	35,938	27,064	16,663	14,142
Hogs and pigs	30,622	34,456	36,958	23,008	35,508
Sheep and lambs	420,366	490,857	435,987	462,904	522,708
Chickens 7 mo. old and older	304,420	366,852	282,066	287,486	218,350
Turkeys & turkey fryers raised	44,616	42,046	40,781	35,640	22,299

Note: 1/ Computed by subtraction of milk cows from all cows.

Source: Census of Agriculture.

Percent of Average 1945 - 1964

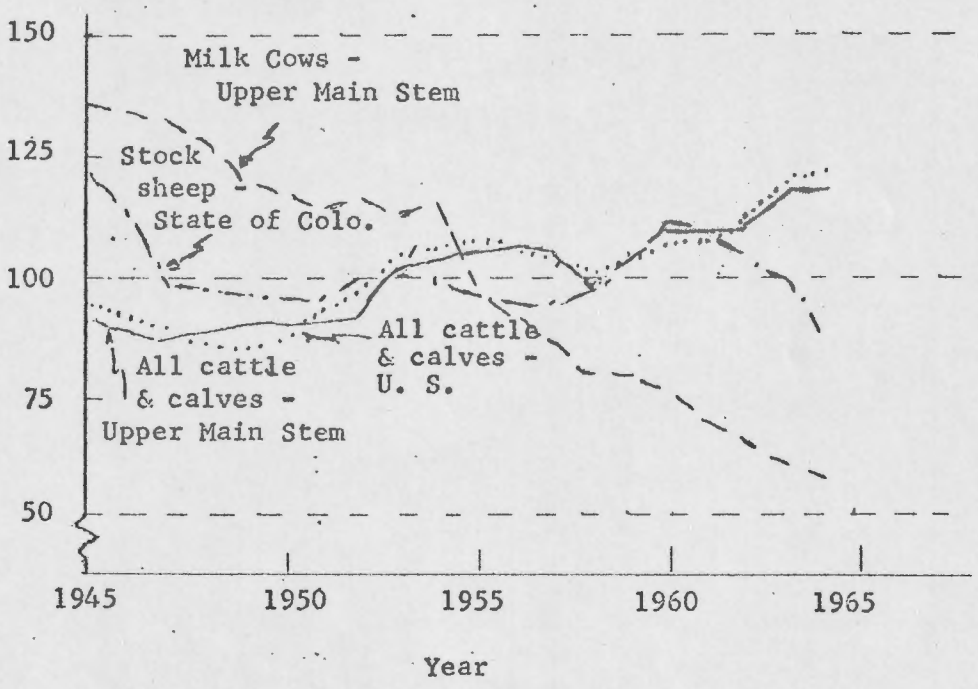

Figure 1. Inventories of Livestock as of January 1 for Upper Main Stem Sub-Basin and Other Areas, 1945-64.

As shown in Figure 1, the tendency has been for numbers of cattle and calves in west central Colorado to follow the national pattern for cattle and calves very closely. In general, the trend has been upward. As shown in the preceding paragraphs pertaining to census data, the trend upward is even more marked if the effect of the sharply decreasing numbers of dairy cows is removed from the all-cattle and calves trend.

Cropping trends

There have been some significant changes in the cropping pattern in the Upper Main Stem area in the past 20 years (see Table 12). There have been small increases in a few crops despite a decrease in cropland harvested. Among the crops with an apparent increase in acreage is corn, particularly in the amount cut for silage. Clover, timothy and grass mixtures cut for hay have also increased in acreage with an associated drop in acreage of wild hay and other hay cut. This change is apparently the result of improving mountain meadow haylands. Average yields per acre on the clover, timothy and clover and grass mixtures are about 1½ tons per acre, while wild hay and other hay are barely better than a ton per acre. In addition, nutritive value is certainly better for the improved varieties. Hay crops account for about 58 percent of cropland harvested in 1959, and a similar proportion in earlier years.

Winter wheat acreage increased sharply up to the 1950's but the government programs then brought about a reduction. Dry beans increased in acreage until the 1954-1959 period when acreage was sharply reduced. Fruit acreage increased then decreased -- due, at least partially, to severe freezing winterkill in the late 1950's.

Among the crops for which decreases in acreage were evident was

Table 12. -- Harvested Crop Acreages in the Upper Main Stem Sub-Basin, Colorado River Basin, Census Years 1939-1959

Crop	1939	1944	1949	1954	1959
			Acres		
All corn	27,081	23,482	25,802	27,678	31,427
Irrigated	NA	NA	24,068	26,924	30,782
All sorghum	1,376	972	326	NA	1,381
Irrigated	NA	NA	293	275	1,187
Small grains:					
Winter wheat	6,718	21,278	35,515	30,884	26,553
Irrigated	NA	NA	6,189	3,212	3,198
Spring wheat	16,529	14,643	15,236	7,945	6,633
Irrigated	NA	NA	12,985	6,835	5,452
Oats	17,235	26,374	24,856	16,630	17,062
Irrigated	NA	NA	23,144	15,086	15,991
Barley	12,237	20,204	21,656	14,206	18,421
Irrigated	NA	NA	18,664	12,199	16,234
Rye	601	595	621	465	347
Irrigated	NA	NA	NA	NA	244
Dry beans	39,789	42,163	56,759	60,162	46,029
Irrigated	NA	NA	14,501	15,134	9,984
Hay crops:					
Alfalfa & alfalfa mixtures	135,886	138,863	188,412	127,150	122,614
Irrigated	NA	NA	115,532	120,519	115,705
Clover, timothy & mixtures	54,290	47,588	77,096	87,519	89,788
Irrigated	NA	NA	72,686	81,559	88,370
Small grains cut for hay	7,338	3,368	5,467	6,649	4,110
Irrigated	NA	NA	4,347	5,504	3,745
Wild hay cut	32,502	74,539	47,054	18,037	18,305
Irrigated	NA	NA	44,617	17,161	16,352
Other hay cut	33,498	10,106	7,206	1,766	4,292
Irrigated	NA	NA	6,409	1,662	3,975
Field crops:					
Potatoes	9,977	9,528	4,672	2,079	1,498
Irrigated	NA	NA	4,333	2,013	1,469
Sugar beets	6,170	5,007	3,405	6,090	5,611
Irrigated	NA	NA	3,357	6,076	5,611
Vegetables	NA	6,969	3,294	2,095	2,102
Irrigated	NA	NA	NA	2,062	2,102
Fruit orchards & vineyards	15,532	16,059	19,380	18,426	15,726
Irrigated	NA	NA	18,733	15,819	15,098
Oats cut for feeding unthreshed	2,163	5,509	2,010	NA	NA
Irrigated	NA	NA	1,862	NA	NA

spring wheat, potatoes and vegetables, in addition to the unimproved hay crops mentioned earlier. Finding of better crops and varieties, labor problems, and increased competition from other areas are mainly responsible for the acreage decreases.

Grazing on Federal Lands

Grazing on federally owned lands is an important part of the economy of the sub-basin. Range livestock is the foremost agricultural enterprise and grazing on federally owned lands has always been a key part of the industry. As an indication of the importance of public grazing, notice that in the period of 1950 to 1959, the number of beef cows is estimated to have fluctuated from 100,000 to about 120,000 (Table 11). In Tables 13 and 14, approximately 100,000 head of cattle and horses are shown to have used BLM[3] lands for grazing. Most of these animals listed as cattle and horses would be beef cows. Very few horses and some yearling cattle would comprise the remainder of the number permitted.

The data of Table 13 show a tendency for more BLM grazing capacity to be used by big game animals and less by domestic animals; also there is the tendency for permits to be held by a smaller number of operators.

Data of Table 15 show a downward tendency in use of BLM lands in the Utah portion of the sub-basin. These data for Grand County, Utah, reflect an increase in cattle numbers using BLM lands, but a more than compensating decrease in sheep use of this range.

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[3] Bureau of Land Management is abbreviated by the letters "BLM"

Table 13. -- Use of BLM Grazing District Lands in Colorado Portion of Upper Main Stem Sub-Basin, 1955 and 1960

Year	Total authorized use: Cattle & horses: Number	Total authorized use: Cattle & horses: AUM[1/]	Total authorized use: Sheep & goats: Number	Total authorized use: Sheep & goats: AUM	Estimated capacity: Livestock: AUM	Estimated capacity: Big game: AUM	Operators: Cattle: Number	Operators: Sheep: Number
1955	95,550	208,515	257,708	125,657	271,900	105,600	843	232
1960	98,932	182,579	253,071	116,553	257,200	121,200	738	223

SOURCE: Unpublished data in BLM State Office, Denver, Colorado

Note: 1/ "AUM" indicates animal unit months.

Table 14. -- Use of BLM Section 15 (leased) Lands in Colorado Portion of Upper Main Stem Sub-Basin, 1960

Acres of land	Annual rental: Dollars	Operators: Number	Cattle & horses: Number	Sheep & goats: Number	Estimated use: AUM	Estimated capacity: AUM
73,628	2,453	127	2,871	2,600	13,009	14,200

SOURCE: Unpublished data in BLM State Office, Denver, Colorado

Table 15. -- Number of Operators and Livestock Use of BLM Lands in Utah Portion of the Upper Main Stem Sub-Basin, 1950, 1955, and 1960

District and year	Cattle and horses: Number	Cattle and horses: AUM	Sheep and goats: Number	Sheep and goats: AUM	Number of operators: Cattle	Number of operators: Sheep	Number of operators: Total
District No. 9 and total for Utah portion of sub-basin:							
1950	7,243	44,568	109,147	120,183	57	35	92
1955	7,175	45,841	95,204	99,265	46	36	82
1960	8,166	55,298	90,670	95,503	30	42	72

SOURCE: Unpublished data in BLM State Office, Salt Lake City, Utah

Forest Service Grazing

Numbers of livestock permits for grazing on portions of national forests lying in the sub-basin have been estimated for the past 20 years (Table 16). The estimate is based on all permitted grazing on all national forests that have any acreage within the 14 county area and on the proportion of acreage (and assumed grazing) that is within the 14 counties.

Table 16. -- Estimated Permitted Livestock Grazing on National Forests, Upper Main Stem Sub-Basin, Colorado River Basin, 1945-1964

	Total cattle permitted	Total sheep permitted	Sheep ÷ 5	Animal units of cattle & sheep
	Number	Number	A.U.	A.U.
1945	92,600	415,100	83,000	175,600
1946	90,700	408,700	81,700	172,400
1947	95,300	410,700	82,100	177,400
1948	95,600	404,000	80,800	176,400
1949	92,000	385,300	77,100	169,100
1950	88,300	379,700	75,900	164,200
1951	85,900	380,000	76,000	161,900
1952	84,300	371,900	74,400	158,700
1953	85,100	373,400	74,700	159,800
1954	85,600	367,200	73,400	159,000
1955	86,100	355,100	71,000	157,100
1956	85,300	344,700	68,900	154,200
1957	82,700	322,400	64,500	147,200
1958	81,900	332,200	66,400	148,300
1959	81,400	333,400	66,700	148,100
1960	82,300	325,800	65,200	147,500
1961	81,700	323,800	64,800	146,500
1962	83,200	315,100	63,000	146,200
1963	83,900	298,400	59,700	143,600
1964	84,500	290,500	58,300	142,800

Table 16 shows only the number of livestock permitted. There may have been adjustments in length of time allowed on the forest in addition to the adjustments in permitted livestock. It is apparent that sheep permits have decreased more sharply in the past 20 years (about 30 percent) than has been the case for cattle. Cattle permits have decreased about 10-12 percent for a total estimated decrease in animal units of about 18 to 20 percent as shown in the last column of table 16.

Data for 1960 indicate that cattle used an estimated 301,600 animal months of grazing while sheep used approximately 148,800 animal months on the national forests.[4/] Thus, for 1960 cattle averaged nearly 4 months on the forest and sheep a little less than 3 months on the forest summer range.

Trends in income and expenses in agriculture

Sales of products in the Upper Main Stem Subbasin have been increasing (see table 17). Value of total products sold grew from about $15 million to about $49 million from 1939 to 1959. Crops sold and livestock and livestock products sold both increased but a slightly larger increment was attained in value of livestock and livestock products sold. Particularly, value of cattle and calves sold nearly doubled from 1954 to 1959. Value of crops sold fell sharply from 1954 to 1959. Much of the decrease was due to a disastrous freeze in the fruit growing industry which cut production for several years, and in fact is still very much a factor. Poultry and poultry products sales have fallen since World War II due to specialization

4/ Personal communication with John Douglas, Region 2 Office, U.S. Forest Service, Denver, Colorado, and Forest Supervisor, Manti-Lasal National Forest Office.

and consolidation of the poultry industry.

Data on farm expenses from census tabulations are not very helpful in establishing trends in levels of expenditure. Some of the items have had changes in definition and other items have been omitted in certain census years. Data for a few items of expense are shown in table 18. No really clear trends are evident except the apparent increase in expenditures for gasoline and petroleum products. This tendency is consistent with other indications of increasing mechanization on farms. It is also consistent with the steady (or slightly downward) tendency for expenditures on labor- or machine-hiring.

Table 17. -- Products Sold From Farms, Upper Main Stem Sub-Basin, Colorado River Basin, Census Years 1939-1959

Item Sold	Apr. 1 1939	Jan. 1 1944	Apr. 1 1949	1954	1959
	- - - - - - Thousands of dollars - - - -
Field crops other than vegetables & fruits & nuts sold	NA	NA	NA	7,777	7,516
Vegetables sold	NA	NA	NA	503	530
Fruit & nuts sold	NA	NA	NA	9,068	6,679
Forest products & horticultural specialty products sold	NA	NA	NA	347	366
Total crops sold[1/]	5,364	13,856	12,775	17,697	15,094
Cattle & calves sold alive	NA	NA	NA	11,810	22,224
Hogs & pigs sold alive	NA	NA	1,962	837	1,221
Sheep & lambs sold alive	NA	NA	6,917	5,326	5,787
Poultry & poultry products sold	361	935	881	876	584
Milk or cream sold	890	1,666	1,941	2,209	2,351
Value of sales or livestock and/or livestock products[1/]	9,552	18,457	28,890	22,888	34,041
Total products sold[1/]	14,920	32,212	41,668	40,585	49,137

Source: U. S. Census

1/ Totals do not necessarily equal parts due to lack of itemizing minor items and rounding individual crop and livestock items.

Table 18. -- Selected Expense Items, Upper Main Stem Sub-Basin, Colorado River Basin, Census Years 1949-1959

Expense item	1949	1954	1959
	- - - - Thousand of dollars - - - -		
Machine hire	1,082	1,154	1,017
Hired labor	5,891	5,380	5,593
Gasoline & petroleum products	1,851	2,227	2,659
Feed for livestock & poultry	3,848	3,382	4,060

Source: U. S. Census

Forestry trends

In recent years it is evident that timber cut on national forests and output of forest products has been declining for the Upper Main Stem area (Table 19).

Table 19. -- Roundwood Products Output, National Forests within the Upper Main Stem Sub-Basin, Colorado River Basin, Fiscal Years 1957-62
(Thousand board feet)

Year	Total	Saw logs	Other roundwood
1957	124,352	112,621	11,731
1958	NA	NA	NA
1959	108,002	99,237	8,765
1960	103,099	96,271	6,828
1961	77,057	73,925	3,132
1962	68,873	65,300	3,573

Note: Compiled by Alvin K. Wilson, Intermountain Forest & Range Experiment Station, U.S. Forest Service, Ogden, Utah, from Forest Service Region 2 timber cut and sold reports.

Surprisingly enough, the data for the Upper Main Stem area do not follow the trends for the states of Colorado and Utah. If any trend is discernible from table 20, it is a possible slight upward trend in lumber production. Of course, it should be recognized that the available data are for a very short period of time. Figure 2 shows lumber production for the state of Colorado for a longer period of time and is probably more indicative of real trends.

A recent report[5] of a new large stud mill at Montrose which began operation in November 1963, gives some indication that the downward trend in forest-harvesting activity in the Upper Main Stem area may be reversed.

Table 20.--Lumber production, in Colorado and Utah, 1957-1963

Year	Lumber production 1/	
	Colorado	Utah
	Million board feet	
1957	188	NA
1958	209	NA
1959	227	NA
1960	181	69
1961	197	66
1962	208	67
1963	239	82

Note: Compiled by Alvin K. Wilson, Intermountain Forest and Range Experiment Station, U.S. Forest Service, Ogden, Utah, from U.S. Census Bureau sources.

[5] Forest Industry 91(10) Sept. 1964, pp. 92-93.

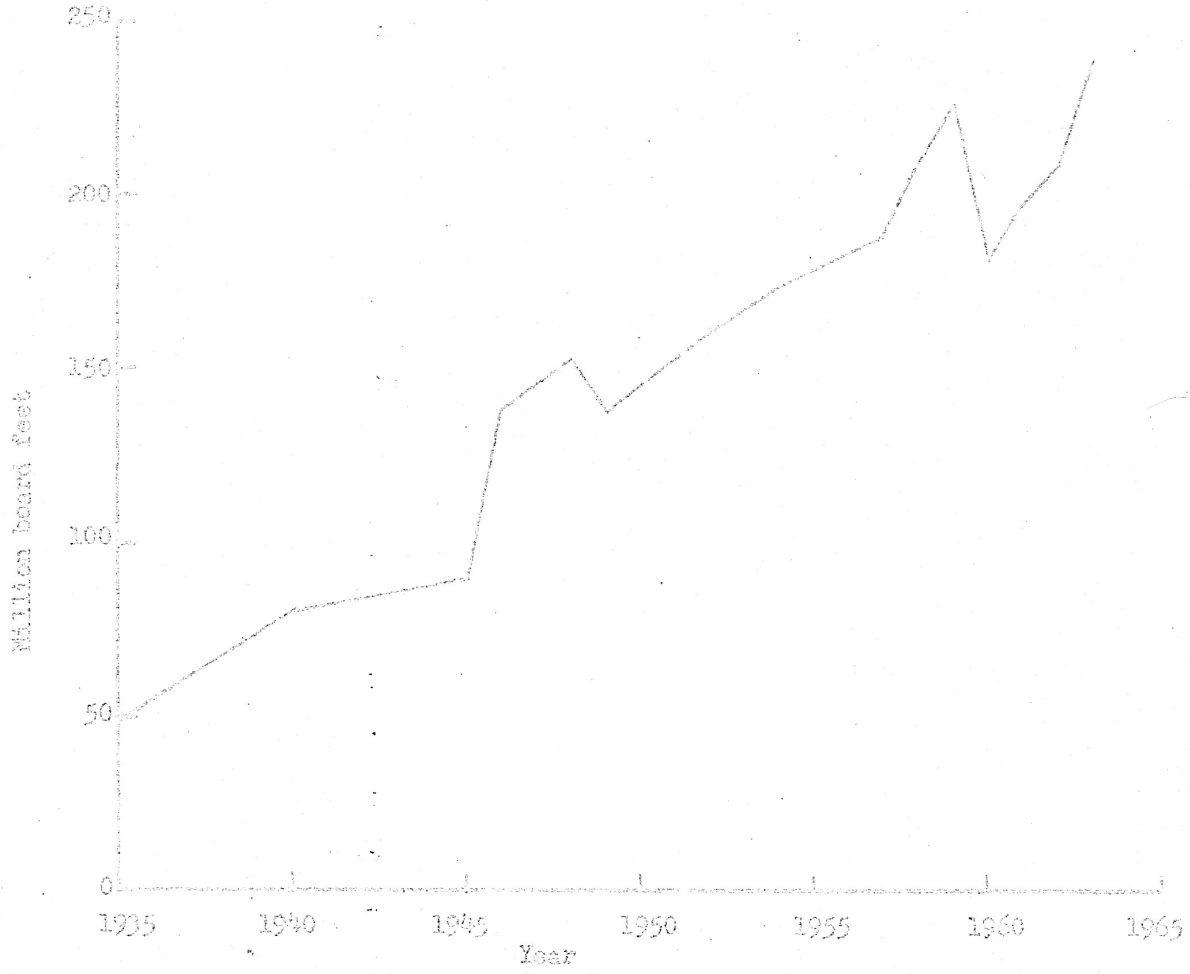

Figure 2. Lumber Production in Million Board Feet, State of Colorado, 1935-1965

Source: Robert L. Miller and Alvin K. Wilson, "Saw Log Production in Colorado and Wyoming, 1957." Forest Survey Release No.3, Rocky Mountain Forest and Range Expt. Sta. Forest Service, U.S. Dept. of Agr., Ft. Collins, Colorado. April 1960 and Table 20, this report.

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In attempting to determine the reason for the 1957-62 decrease in roundwood products output in the Upper Main Stem, data by counties for saw logs and for other roundwood products have been compiled for 1957 and for 1962 (table 21). It can be seen that there were major decreases in saw log output in Montrose and San Miguel counties which were offset by significant increases in saw log output in Grand and Gunnison counties. Thus, saw log output remained approximately constant. Major cutbacks in other roundwood products output occurred in Ouray, Grand, and Pitkin counties to account for almost all of the decrease shown in the county tabulations of table 21.

Table 21.--Estimated distribution of saw log and other roundwood products by county, Upper Main Stem Subbasin, Colorado River Basin, 1957 and 1962 1/

County	1957			1962		
	Total	Saw logs	Other roundwood	Total	Saw logs	Other roundwood
	Thousand cubic feet					
COLORADO						
Delta	24	24	0	135	126	9
Delores	601	448	153	643	600	43
Eagle	4,301	1,170	3,211	2,089	1,196	893
Garfield	228	69	159	289	221	168
Grand	4,947	3,992	955	5,790	5,234	556
Gunnison	2,472	1,342	131	3,245	3,030	215
Mesa	148	138	6	34	32	2
Montrose	2,575	2,478	97	821	757	64
Ouray	0	0	0	172	158	14
Pitkin	1,197	310	887	1,021	569	452
San Miguel	2,431	2,340	21	592	537	55
Summit	106	138	29	0	0	0
Total	19,140	13,659	5,681	14,851	12,490	21,352

UTAH	1960		1962			
Grand	178	154	29	84	76	8

Note: 1/ Grand County, Utah, data are for 1960 and 1962.
Source: Compiled by Alvin R. Wilson, Intermountain Forest and Range Experiment Station, U.S. Forest Service, Ogden, Utah

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FORESTRY AND AGRICULTURE IN 1960

One of the main purposes of this study was the development of a transactions table for Agricultural and Forestry sectors for the base year, 1960.

Agricultural sectors have been defined for Range Livestock, Feeder Livestock, Dairy, Food and Field Crops, Truck Crops, Fruit, and All Other Agriculture. Since an Agricultural Services sector is so closely related to Agriculture, this sector was also given to Economic Research Service for detailed study.

The Transactions Table

In the transactions table which follows (table 22), the magnitude of the inputs and outputs for each of the agriculture and forestry sectors are specified. Sources of input are shown in columns and disposition of products is given in rows. These data have have now been reconciled with data from non-agricultural sectors, and integrated to make a complete table for the subbasin. Reconciliation is necessary because of the practice of accounting for both purchases and sales. For instance, those dealing with government sectors had indications of the receipts and disbursements from and to agricultural sectors. At the same time, the work in agriculture developed quantities for the same transactions. Since sampling variations and other factors enter, the differences had to be resolved. Reasons

Table 22

--Interindustry transactions of the agriculture and forestry sectors, Upper Main Stem Subbasin, Colorado River Basin, 1960 1/ 2/

Industry purchasing → / Industry producing ↓	Processing sectors									Finald demand								
	1	2	3	4	5	6	7	8	24	14	15	23	32	34-35	37	38	39	
	Range livestock	Feeder livestock	Dairy	Food & field crops	Truck crops	Fruit	Forestry	Other agriculture	Agricultural services 3/	Food and kindred	Lumber & wood prod.	Eating and drinking	State & Federal government	Households	Gross private capital formation	Exports: Other subbasins	Exports: Outside Colo. River Basin	Total output
	1,000 dollars																	
1 Range livestock	2,780	2,758	64	---	---	---	---	350	40	3,076	---	---	1,152	712	93	---	17,259	28,284
2 Feeder livestock	---	---	---	---	---	---	---	---	---	383	---	---	---	---	---	---	3,627	4,010
3 Dairy	87	73	---	---	---	---	---	285	---	2,005	---	---	35	54	---	---	679	3,155
4 Food & field crops	---	43	---	---	---	---	---		---	1,619	---	19	738	48	---	186	3,159	5,793
5 Truck crops	---	---	---	---	---	---	---	---	---	25	---	---	2	129	---	35	652	862
6 Fruit	79	---	53	---	---	---	---	---	---	859	---	---	17	508	---	897	3,830	6,243
7 Forestry	4	---	---	---	---	---	---	---	---	---	1,884	---	---	3	---	16	45	1,952
8 Other agriculture	5	---	1	2				1		743				634	---	132	1,142	2,660
24 Agr. services 3/	648	66	330	422	370	2,855	---	63	---	---	---	---	---	---	---	---	---	4,754
9 Coal	---	---	---	---	---	---	---	---	---									
10 Oil and gas	---	---	---	---	---	---	---	---	---									
11 Uranium	---	---	---	---	---	---	---	---	---									
12 Zinc	---	---	---	---	---	---	---	---	---									
13 All other mining	---	---	---	---	---	---	---	---	---									
14 Food and kindred	---	648	136	---	---	---	---	265	17									
15 Lumber & wood products	17	---	---	---	---	4	---	---	---									
16 Printing & Publishing	5	---	1	2	---	4	---	---	24									
17 Fabricated metals	---	---	---	---	---	---	---	---	---									
18 Stone, clay & glass	---	---	---	---	---	---	---	---	---									
19 All other mfg.	457	6	69	422	27	86	40	63	132									
20 Wholesale trade	267	3	34	74	8	46	13	17	48									
21 Service stations	264	4	30	128	3	32	23	28	36									
22 All other retail	582	8	76	95	27	121	14	14	18									
23 Eating & drinking	24	1	2	---	---	---	---	---	---									
25 Lodging	9	---	---	---	---	---	---	---	---									
26 All other services (except professional)	75	8	3	61	1	25	4	17	---									
27 Transportation	325	104	177	95	1	5	---	57	15									
28 Electric energy	103	5	42	19	3	21	---	19	116									
29 Other utilities	69	1	7	11	1	7	---	13	24									
30 Contract construction	---	---	---	---	---	---	---	---	---									
31 Rentals & finance	1,076	68	74	39	12	29	41	37	74									
32 State & Fed. Gov't.	683	1	15	29	2	15	519	24	33									
33 Local govt.	1,721	15	296	272	16	271	51	53	92									
34 Household-wages	3,310	11	123	225	111	42	589	213	1,103									
35 Profit & other income	10,253	77	844	2,780	172	1,964	464	534	792									
36 Inventory depletions	413	---	---	---	---	---	---	---	---									
37 Depreciation	2,416	47	457	336	25	214	60	101	422									
38 Imports-Other subbasins	39	---	4	95	---	38	21	122	82									
39 Imports-Outside CRB	2,573	63	317	686	83	464	113	384	1,647									
Total payments	28,284	4,010	3,155	5,793	862	6,243	1,952	2,660	4,754									

1/ All transactions among nonagricultural sectors are not shown in this table.
2/ Columns have been deleted where there were no purchases from agriculture and forestry sectors.
3/ Sector 24 is listed out of numerical order so that it is adjacent to other agriculture and forestry sectors.

for the discrepancies could usually be discovered so that a satisfactory reason and settlement was usually easy to produce.

The rows and columns of table 22 do not change when non-agricultural rows and columns are added. One omission in this table is the items in th Gross Private Capital Formation column. In a complete transactions table the Gross Private Capital Formation column shows source of purchase of all capital items bought by all private sectors. In table 22, the capital formation column includes only those capital items bought by the Agricultural and Forestry sectors from Agriculture and Forestry sectors. The remainder of agriculture's capital purchases are not available in a form which is comparable to other data of table 22, due to the margining process explained below.

Trade sectors in the transactions table have been margined. Th s means that only the gross margin or increase in value due to change in time, form, or place of the item provided by the Retail and Wholesale Trade sectors is included as output. In effect, purchases made through retail outlets are distributed according to increase in value among the Retail, Wholesale, Transportation, Manufacturing, Import, and other sectors. This procedure is used to show the direct linkage among the "providing" and "using" sectors.

Agriculture and Forestry Sectors

The remainder of this section of the report is devoted to a more detailed examination of the sectors within Agriculture and Forestry. Sectors have not been defined for Agriculture on a strict commodity basis. Farms in the area tend to be heterogeneous and diversified with the exception of some livestock-producing firms. Many farms, for instance,

produce milk and perhaps sugar beets, fruit or vegetables, in addition to feed crops. Other farms might produce onions, potatoes, even malting barley and beef, hogs or sheep in addition to feed crops. In order to facilitate information-gathering and using processes, most sectors are developed on the basis of farm and ranch types where type is determined by main enterprises. Thus, all activities connected with a dairy farm, where feed is produced in addition to milk, are reported in the Dairy sector, even though there are sales of feed or other items included in the farm transactions. The description of each sector following includes details of the enterprises encompassed by the sector.

Range livestock

All activities except livestock feeding that produce beef cattle or sheep for sale are included in this sector. Four types of farms are included: (1) mountain meadow cattle ranches, (2) specialized sheep farms with migratory grazing, (3) farm based beef production where crops are raised in irrigated valleys, and (4) farm-flock sheep farms. As shown in the transactions table (table 22) range livestock is by far the largest sector in agriculture in the Upper Main Stem. Major expenditures by this sector are to other Range Livestock firms for feed and livestock, to Trade, Manufacturing, Service Stations and others for supplies and materials, to Agricultural Services for sheep shearing, yardage, and selling services, crop spraying, etc., to Transportation for livestock hauling, to Rentals and Finance for interest and rentals in the local area. In the final payments sectors, major payments are to State and Federal Government, mostly for grazing fees, to Local Government for property tax and water costs, to Households for hired labor, to Profit

and Other Income as return to operator and family labor and owned capital. Depreciation is important also, as are Imports from Outside the Colorado River Basin.

Sales of the output of the Range livestock sector are concentrated more. Of course, the purchase of range livestock products by Range Livestock is also a sale. About one-tenth of the total product of the sector is sold to the Feeder Livestock sector in the Upper Main Stem Subbasin. Other sales of small amounts go to Dairy and All Other Agriculture as feed sales. Sales to the Food and Kindred sector are over 10 percent of output which is mostly cull breeding stock. Sales of a small amount of feed and other minor items are also listed to the Agricultural Services sector which in turn sells services to Agriculture.

Final demand items include: (1) state and federal government payments for lamb and wool subsidies and agricultural conservation practice payments, (2) receipts from households which represent home consumption and a few direct sales, (3) capital formation which is a sale of breeding stock, and (4) a large item (61 percent of output) exports to points outside the Colorado River Basin.

Feeder livestock

Cattle and lambs are fed in limited numbers in the Upper Main Stem area. Though statistics are meager, apparently about 12,000 head of cattle are fed annually and the remainder of the $4 million output of this sector is comprised of lambs. Lamb-feeding on irrigated crop aftermath is practiced on a limited basis in the Grand Junction - Delta - Montrose area.

By far the largest expenditure of the Feeder Livestock sector is to

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the Range Livestock sector. About 69 percent of the total product goes for purchase of livestock within the subbasin and for a limited amount of feed. An additional 16 percent of the total for the sector is paid to the Food and Kindred sector for prepared feeds. Other expenditures are widely distributed.

Sales of the sector are almost entirely in exports. Very little (about 10 percent) of the fed beef and lamb is slaughtered locally. The rest of the sales are exported primarily to Denver, Ogden, and California.

Dairy

Both grade A dairy and cream-producing dairy farms are included in this sector, along with associated other enterprises on predominantly dairy farms. Dairy products sold in 1959 according to the census were valued at $2,351,000. Therefore, most of the total output from the sector ($3,155,000) was from milk or cream. About one-third of the fluid milk sold is exported, primarily to the Denver-Colorado Springs area. Cull livestock and feeder livestock along with sales of a little feed and some government payments for agricultural conservation (payments) practices make up the remainder of the value of sales. Purchases of this sector are widely distributed with fairly large amounts to local governments for taxes and water charges, to households for hired and family labor, and for owned capital. Depreciation and imports were also important sectors in the cost structure.

Feed and field crops

Sugar beets, malting barley, dry beans, potatoes, and wheat make up a separate sector since they are somewhat different from many livestock-oriented feed crops and because many of these crops are produced as specialties

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by farms in parts of the area. Value of these crops which were sold is listed in table 23.

Table 23.--Value of Sales of Food and Field Crop Sector, Upper Main Stem Sub-Basin, Colorado River Basin, 1960

Product	Value of Product
	Thousands of Dollars
Sugar beets	1,497
Malting barley	467
Dry beans (irrigated and dry land)	2,014
Potatoes	541
Wheat	1,274
Total	5,793

Beets are all processed within the sub-basin and some of the potatoes are processed into chips at a small plant in Montrose. Dry beans are cleaned in the area and prepared for shipment. They are not actually sold by the grower until after they have been cleaned, processed, and bagged--almost entirely for export. Malting barley is shipped out of the sub-basin to the Coors plant on the eastern slope. About 20 percent of sales of this sector goes to Food and Kindred products and 55 percent to Exports Outside the Colorado River Basin. Other receipts are mainly from the federal government for agricultural programs, especially for sugar beet payments and the wheat program and also payments for the Conservation Reserve Program which was widely used in the dryland wheat and bean areas of Western Colorado in 1960.

Fertilizer costs are important in this sector and are reflected mainly

in All Other Manufacturing or Imports rows which represent the immediate or ultimate source of the fertilizer. Payments to Households are important also, since these crops have high labor and capital requirements.

Truck crops

Onions, lettuce and tomatoes are the crops used to represent this sector. There are minor acreages of numerous other crops, but all were similar to one of the above. Onions are by far the most important of the group. Total acreage for all crops in this sector was estimated to be 1550 acres. In addition to the crops mentioned, there were minor acreages of beans, cabbage, cantaloup, carrots, celery, sweet corn, peas, and spinach. With the exception of onions which are shipped out of the area, most of these crops are grown to partially supply local consumption. Onions would have less than 5 percent use in the sub-basin and about 5 percent more in other parts of the Colorado River Basin. Major markets for the onions are in the eastern and southern parts of the United States. Storage, sorting and packing costs for onions are a major expense at $1.00 or more per cwt. Labor, fertilizer, and other supplies are also major items of cost. Over three-fourths of the output of this sector goes to export.

Fruit

Fruit production is a major enterprise in the lower parts of the sub-basin. Mild climate and other factors make this a favorable location for orchard crops. In the past 15 years about 85 percent of Colorado's commercial peaches have been produced in Mesa County. Just prior to the 1960 and 1963 seasons two disastrous freezes had a serious effect on the fruit crops, particularly peaches. Permanent damage was done to a substantial proportion of the trees. In 1960, 1963, and 1964 the crop was

particularly light due to winter freezing. During these three years, fresh shipments of peaches amounted to 411,799 bushels, 197,513 bushels, and 471,325 bushels, respectively. A "normal" fresh shipment is just over 1 million bushels. A crop of about two-thirds or three-fourths normal is expected in 1965. Crops for 1961 and 1962 were near normal.

For the Fruit sector, the quantities produced were "normalized" for the input-output analysis, since use of the 1960 actual production would show an abnormal situation, including negative returns to Households for operator's labor and capital earnings.

For the Fruit sector major sales are to exports as shown in Table 22. Local use by Households and processors are also fairly important. By far the largest expenditure is to Agricultural Services sector for processing and marketing as well as for some migrant labor and spraying and dusting.

Since much of the labor is done by operator and family, a large portion of the inputs are allocated to Profit and Other Income of Households. Average size of the orchards is only about 10 acres, making it almost the only commercial fruit-growing area with such small enterprises. Over 90 percent of the producers are believed to have other employment outside agriculture.

Forestry

Volume of timber cut was shown in the previous section on forestry trends. Cost allocations in the Forestry sector are difficult to estimate. Data on five broad-cost areas are available from the Forest Service. Costs in these categories are estimated as follows in Table 24.

Table 24.--Costs for the Forestry Sector, Upper Main Stem Sub-Basin, Colorado River Basin 1960

Item	Cost
	Dollars
Stumpage fees	519,000
Felling and bucking	369,000
Skidding and loading	606,000
Logging administration	204,000
Profit and other income	254,000
Total	1,952,000

Transportation costs for bringing logs from the loaded trucks in the forest to the sawmills are allocated to the Lumber and Wood Products sector. Allocation was made to the various sectors for sales and costs as shown in Table 22.

All other agriculture

Miscellaneous agricultural products were included in this sector. Those included were: seed products, horses and mules sold, hogs, poultry, and nursery and greenhouse products. Half of the total sales for this sector are hogs. Sales for the sector are relatively greater to Households than for most other sectors. Local sales of horses, hogs, and nursery and greenhouse products make up the major portion. Major purchases are from ranches and farms for feed and from households for labor as shown in Table 22.

Agricultural services

Entries for this sector are shown as column 24 and row 24 in Table 22. The Agricultural Services sector serves each of the agricultural sectors in some way. Receipts from the Range Livestock sector are for sheep shearing, livestock handling and selling, and crop spraying. Receipts from the Feeder Livestock sales are for a variety of things including some work on the crops and livestock handling and selling. Food and Field Crops pay Agricultural Services for processing beans and other crops for sale as well as some field work. Fruit and Truck Crops pay a very large portion of total receipts to the Agricultural Services for storage, sorting, packing, and so forth. Other Agriculture buys services for handling hogs and also storage, cleaning, and so forth for other items. Allocation of costs are widely dispersed for this sector, but labor costs from Households and various sources (mainly imports) for the supplies for packing produce are major items

Direct Coefficients

The direct coefficients or technical coefficients are defined as the amount of output of sector i required to produce a unit of output of sector j. Or, it may be defined as the required amount of output of the sectors listed as rows per unit of output by the sectors listed in columns. In the context of input-output analysis, the technical coefficient represents the flow of goods from one local industry to produce a unit of output of another local industry. Thus, the technical coefficients do not represent total input requirements. Imports and other inputs from the final payments sector may be more or less important, depending on the size of area for which the table is made and other factors. National economies may be nearly self-sufficient, but some regional economies may receive the major portion

of their input requirements from sources other than the local industries.

Table 25 is a matrix of part of the direct coefficients for the Upper Main Stem. Only the agricultural sectors and the sectors which buy from Agriculture are listed as columns (purchasers) in Table 25. The direct coefficients may be interpreted as the percentage of inputs from a given source. The coefficients in Table 25 range from zero (blanks) to .69 for purchases by the Feeder Livestock sector from the Range Livestock sector. Totals for the columns reflect total local purchases other than operator's labor and capital and hired labor.

Range Livestock obtains 25 percent of inputs from local sectors, Feeder Lovestock obtains 95 percent, and so forth. The Forestry sector in obtaining only 7 percent from local processing sectors is lowest of the group.

Of those sectors purchasing from Agriculture and Forestry, Food and Kindred obtains 47 percent of its inputs from agricultural sectors, Lumber and Wood Products receives 38 percent of its inputs from Forestry and Agricultural Services receives about 1 percent from the Range Livestock sector.

One other interpretation of the direct coefficients is the direct impact upon each sector of the economy resulting from an addition to output of any of the sectors listed as a column in Table 25. By the same token, increases in sectors not listed as a column in Table 25 are implied to have no direct effect on the Agriculture and Forestry sectors. As will be shown in the next section, however, indirect effects are important and widespread throughout the economy.

Table 25.--Direct Purchases per Dollar of Output for Sectors Relating to Agriculture and Forestry, Upper Main Stem Sub-Basin Colorado River Basin, 1960

Sector Producing \ Sector Purchasing	1 Range livestock	2 Feeder livestock	3 Dairy	4 Food & field crops	5 Truck crops
	Dollars				
1. Range Livestock	.100	.608	.020	---	---
2. Feeder livestock	---	---	---	---	---
3. Dairy	.003	.018	---	---	---
4. Food & field crops	---	.011	---	---	---
5. Truck crops	---	---	---	---	---
6. Fruit	.003	---	.017	---	---
7. Forestry	1/	---	---	---	---
8. All other agriculture	1/	---	1/	1/	---
9. Coal	---	---	---	---	---
10. Oil and gas	---	---	---	---	---
11. Uranium	---	---	---	---	---
12. Zinc	---	---	---	---	---
13. All other mining	---	---	---	---	---
14. Food & kindred products	---	.162	.043	---	---
15. Lumber and wood	.001	---	---	---	---
16. Printing & publishing	1/	---	1/	1/	---
17. Fabricated metals	---	---	---	---	---
18. Stone, clay & glass	---	---	---	---	---
19. All other manufacturing	.016	.001	.022	.073	.031
20. Wholesale trade	.010	.001	.011	.013	.009
21. Service stations	.009	.001	.010	.022	.003
22. All other retail	.021	.002	.024	.016	.031
23. Eating & drinking	.001	1/	.001	---	---
24. Agricultural services	.023	.016	.105	.073	.429
25. Lodging	1/	---	---	---	---
26. All other services	.003	.002	.001	.011	.001
27. Transportation	.012	.026	.056	.016	.001
28. Electric energy	.004	.001	.013	.003	.003
29. Other utilities	.003	1/	.002	.002	.001
30. Contract construction	---	---	---	---	---
31. Rentals and finance	.039	.017	.023	.007	.014
Total 2/	.247	.947	.348	.236	.526

NOTE: 1/ Less than .0005
2/ Totals are based on unrounded data.

Table 25 (continued)

Sector producing \ Sector purchasing	Fruit 6	Forestry 7	All other agriculture 8	Food & kindred products 14	Lumber and wood 15	Eating and drinking 23	Agric. services 24
	Dollars						
1. Range livestock	---	---	.132	.167	---	---	.008
2. Feeder livestock	---	---	---	.021	---	---	---
3. Dairy	---	---	.107	.109	---	---	---
4. Food & field crops	---	---	---	.088	---	---	---
5. Truck crops	---	---	---	.001	---	.002	---
6. Fruit	---	---	---	.047	---	---	---
7. Forestry	---	---	---	---	.380	---	---
8. All other agric.	---	---	1/	.040	---	---	---
9. Coal	---	---	---	1/	---	1/	---
10. Oil and gas	---	---	---	1/	---	1/	---
11. Uranium	---	---	---	---	---	---	---
12. Zinc	---	---	---	---	---	---	---
13. All other mining	---	---	---	---	---	---	---
14. Food & kindred prod.	---	---	.100	.005	---	.103	.004
15. Lumber and wood	.001	---	---	---	---	---	---
16. Printing & publ.	.001	---	---	.002	1/	.007	.005
17. Fabricated metals	---	---	---	---	---	---	---
18. Stone,clay & glass	---	---	---	---	---	---	---
19. All other mfg.	.014	.020	.024	.011	.008	.001	.028
20. Wholesale trade	.007	.007	.006	.007	.002	.040	.010
21. Service stations	.005	.012	.011	.006	.004	1/	.008
22. All other retail	.019	.007	.005	.001	.002	.015	.004
23. Eating & drinking	---	---	---	.001	---	1/	---
24. Agric. services	.457	---	.024	---	---	---	---
25. Lodging	---	---	---	.001	---	1/	---
26. All other services	.004	.002	.006	.006	.005	.009	.008
27. Transportation	.001	---	.021	.002	.114	.009	.003
28. Electric energy	.003	---	.007	.008	.021	.017	.024
29. Other utilities	.001	---	.005	.006	.006	.026	.005
30. Contract construc.	---	---	---	.001	---	.019	---
31. Rentals & finance	.005	.021	.014	.003	.017	.022	.016
Total 2/	.518	.069	.462	.536	.554	.271	.123

NOTE: 1/ Less than .0005
2/ Totals are based on unrounded data.

Direct and Indirect Coefficients

One of the main purposes of the interindustry analysis method is for "structural analysis." Some interesting structural insights can be obtained by examining the transactions table and the table of direct coefficients, but the real structural analysis can only be based on the inverse matrix. The inverse matrix gives the direct and indirect demands on industry *i* generated by a unit of final demand for industry *j*. The ultimate impact of demand for a commodity on all industries can be obtained by reading all the way down a column.

Table 26 shows the direct and indirect requirements per dollar of delivery to final demand by each of the 31 processing sectors. Here, each column shows the direct and indirect requirements from the sectors at left to support a delivery of a dollar of output to final demand by the sector listed at the top.[6] In Table 26 the "chain reaction" of successive rounds of purchases are reflected.

It should be pointed out that the direct requirements coefficients in Table 25 relate to a change in total output, whether it goes to processing or final demand sectors. The direct and indirect or interdependence coefficients of Table 26 relate solely to a dollar change in final demand for the products of the endogenous sector.

The total of direct and indirect effects for each sector at the top of Table 26 are shown as the total at the bottom of the table. This total shows that for each dollar increase in final demand for a sector, total sales by processing sectors go up by varying amounts greater than a dollar. For instance, for Range Livestock, an increase of $1.00 in sales to final

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[6] Editors Note: In this chapter, Dr. Andersen has used the untransposed form of the table of Direct and Indirect Coefficients. Throughout the remainder of this sub-basin report, however, the transposed form of the table is used. Per the chapter describing the input-output mode, a transposed table is read in reverse: the columns in Dr. Andersen's table become rows.

Table 26. -- Direct and Indirect Requirements Per Dollar of Delivery to Final Demand, Agriculture, Forestry, and Closely Related Sectors Upper Main Stem Sub-Basin, Colorado River Basin, 1969 1/

Sector producing \ Sector purchasing	Range livestock 1	Feeder livestock 2	Dairy 3	Food & field crops 4	Truck crops 5	Fruit 6	Forestry 7
	- - - - - - - - - - - -			Dollars	- - - - - - - - - - - -		
1. Range livestock	1.111	.800	.033	.001	.004	.005	2/
2. Feeder livestock	2/	1.003	.001	2/	2/	2/	2/
3. Dairy	.004	.040	1.005	2/	2/	2/	2/
4. Food & field crops	2/	.025	.004	1.000	2/	2/	2/
5. Truck crops	2/	2/	2/	2/	1.000	2/	- -
6. Fruit	.003	.011	.019	2/	2/	1.000	2/
7. Forestry	2/	2/	2/	2/	2/	2/	1.000
8. All other agric.	2/	.007	.002	2/	2/	2/	2/
9. Coal	.001	.001	.002	.001	.002	.002	2/
10. Oil & gas	- -	- -	- -	- -	- -	- -	- -
11. Uranium	- -	- -	- -	- -	- -	- -	- -
12. Zinc	- -	- -	- -	- -	- -	- -	- -
13. All other mining	2/	2/	2/	2/	2/	2/	2/
14. Food & kindred products	2/	.166	.044	2/	.002	.002	2/
15. Lumber & wood	.001	2/	2/	2/	2/	.001	- -
16. Printing & publ.	.002	.002	.003	.002	.004	.005	.001
17. Fabricated metals	2/	2/	2/	2/	2/	2/	2/
18. Stone, clay & glass	2/	2/	2/	2/	2/	2/	2/
19. All other mfg.	.021	.026	.034	.078	.045	.028	.021
20. Wholesale trade	.012	.012	.014	.014	.014	.013	.007
21. Service stations	.011	.012	.013	.023	.007	.009	.012
22. All other retail	.024	.021	.027	.017	.034	.022	.007
23. Eating & drinking	.001	.001	.001	2/	2/	2/	2/
24. Agric. services	.028	.046	.115	.073	.429	.458	2/
25. Lodging	2/	.001	2/	2/	2/	2/	2/
26. All other services	.006	.010	.007	.014	.007	.010	.003
27. Transportation	.017	.044	.064	.022	.007	.006	.002
28. Electric energy	.007	.010	.021	.008	.018	.018	.001
29. Other utilities	.005	.006	.005	.004	.005	.005	.001
30. Contract constr.	.001	.002	.002	.002	.001	.001	.001
31. Rentals & finance	.048	.055	.032	.012	.026	.016	.023
Total 3/	1.304	2.364	1.448	1.273	1.606	1.598	1.079

Note: 1/This table is from an untransposed inverse of an identity matrix minus the table of direct coefficients. Each column shows the direct and indirect requirements from sectors at the left to support a delivery of one dollar to final demand by the sector at the top.

2/Less than .0005.

3/Output multipliers. These multipliers are calculated as the sum of the interdependence coefficients for sectors.

Table 2b. (continued)

Sector producing \ Sector purchasing	All other agriculture 8	Food & kindred products 14	Lumber & wood products 15	Agricultural services 24
	Dollars			
1. Range livestock	.171	.215	2/	.010
2. Feeder livestock	.002	.021	2/	2/
3. Dairy	.120	.117	2/	2/
4. Food & field crops	.009	.090	2/	2/
5. Truck crops	2/	.001	---	2/
6. Fruit	.007	.050	2/	2/
7. Forestry	2/	2/	.380	2/
8. All other agriculture	1.005	.041	2/	2/
9. Coal	.001	.002	.002	.003
10. Oil and gas	---	---	---	---
11. Uranium	---	---	---	---
12. Zinc	---	---	---	---
13. All other mining	2/	2/	2/	2/
14. Food & kindred products	.106	1.018	2/	.004
15. Lumber and wood	2/	2/	1.000	2/
16. Printing and publishing	.002	.003	.001	.006
17. Fabricated metals	2/	2/	2/	2/
18. Stone, clay & glass	2/	2/	2/	2/
19. All other manufacturing	.037	.029	.030	.029
20. Wholesale trade	.012	.013	.006	.011
21. Service stations	.015	.013	.011	.003
22. All other retail	.013	.012	.005	.004
23. Eating and drinking	.001	.002	2/	2/
24. Agricultural services	.045	.049	2/	1.000
25. Lodging	2/	.001	2/	2/
26. All other services	.011	.011	.012	.010
27. Transportation	.035	.018	.120	.006
28. Electric energy	.015	.016	.025	.029
29. Other utilities	.008	.009	.008	.006
30. Contract construction	.002	.003	.002	.001
31. Rentals and finance	.029	.030	.029	.019
Total	1.647	1.756	1.633	1.147

demand would generate a total of $1.30 output in the processing sectors. The biggest share of the increased output would be in the Range Livestock sector itself, but some increase would also be noticed in All Other Manufacturing (fertilizer, etc.), trade sectors, Agricultural Services, and in Rentals and Finance.

The Feeder Livestock sector has the largest total of the direct and indirect coefficients for any of the 31 sectors (Table 26). This total of $2.30 means that from a delivery of $1.00 to final demand in the Feeder Livestock sector, $2.30 is the total impact in terms of output for the sub-basin area. The largest interdependence coefficient except for the sector itself is for the Range Livestock sector which shows $0.80 required from that sector. Caution should be used in use of this coefficient in a regional development plan.

If livestock feeding were expanded sharply, alternative sources of supply of feeder cattle would certainly replace the very high proportion purchased from local ranchers. Eastern Colorado cattle feeders in a rather large feeding area obtain many of their cattle from sources far from Colorado. Therefore, the interdependence of Range Livestock on Feeder Livestock would likely not be so high if livestock feeding were to be increased several times. On the other side of the picture, an increase in final demand for the Feeder Livestock sector has an impact of about $0.17 on the Food and Kindred Products sector output. At present, very little slaughter of fed cattle is done in the Basin (notice sales of the Feeder Livestock sector to Food and Kindred in Table 22). But it seems apparent that external economies would become important so that local slaughter would be expanded more rapidly than livestock feeding. Therefore, under an expansion program for livestock

feeding, the interdependence coefficient for Food and Kindred on Feeder Livestock would almost certainly become higher.

A $1.00 increase in final demand for dairy output would ultimately result in $1.45 in total output for all sectors. Food and Kindred, All Other Manufacturing, Trade, Agricultural Services, Transportation, Electric Energy, and Rental and Finance sectors would be affected most.

The Food and Field Crops sector has the lowest total of direct and indirect coefficients of any of the agriculture sectors. Most of the effects of an increase in final demand would be evident in the sector itself, All Other Manufacturing (fertilizer), Trade, Agricultural Services, Transportation, and Rental and Finance.

Truck Crops and Fruit sectors both have output multipliers (Table 26) of about 1.60. Almost all of the impact from an increase in final demands for these sectors would be on the sectors themselves and on the Agricultural Services sector. This relationship is due to the very high requirements for packing and processing the products of these sectors.

Forestry would develop only $1.08 activity per dollar increase in final demand. However, the associated Lumber and Wood Products sector from which eventual consumers would ordinarily buy, has a fairly high total (sector 15 in Table 26). An increase in this sector's final demand would increase total activity by 1.63 times. Particularly strong impacts would be evident in the Forestry and Transportation sectors.

All Other Agriculture has a high degree of interdependence with other sectors. Total requirements would be felt through the economy, but particularly in the Range Livestock sector (for feed, etc.), the Dairy sector (for

skim milk and other feed), and the Food and Kindred Products sector (for feed).

The Food and Kindred Products sector is not an agriculture sector, but is included because of the impacts on agricultural sectors related to changes in final demand for products of this sector. The total of the interdependence coefficients for the sector is $1.76 which is one of the highest for any sector, and far above average. This indicates agricultural processing industries would be excellent prospects for an economic development program. Strongest impacts of increased final demand for this sector are in the agricultural sectors, particularly Range Livestock and Dairy.

Impacts from the Agricultural Services sector are rather low. As would be expected, major impacts are on the All Other Manufacturing, Electric Energy, and Rental and Finance sectors which are major suppliers to the Agricultural Services sector. Impacts on agriculture are a minimum because title to the goods processed does not pass to the Agricultural Services sector when the products are processed. This is in contrast to the Food and Kindred Products sector which performs somewhat similar functions, but which does take title to the goods.

It is interesting to note that there are far fewer zero entries in table 26 than in the previous table of direct coefficients (table 25). This indicates the widespread indirect effects of any transaction in the economy. In table 26 only three sectors are unaffected by changes in final demand for agriculture. These are the Oil and Gas, Uranium, and Zinc sectors. But, even in these sectors, there would be some interaction due to competition for inputs if one or another is expanded or contracted.

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THE MINING, MANUFACTURING AND ENERGY SECTORS OF THE UPPER MAIN STEM SUB-BASIN

BY

John H. Chapman, Jr.

and

Hollis Price

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MINING

Introduction

Mining has been a source of income and employment in the Upper Main Stem Sub-Basin since the earliest recorded settlement of the area. Sixteenth century Spaniards extracted gold and silver ores. The first American settlers continued to mine these metals and mined lead and zinc in addition. While the significance of gold and silver mining has diminished in recent times, lead and zinc mining have retained their importance and additional minerals have broadened the economic base. Starting in the early 1900's coal mining became an important activity which grew until about 1953 when the major western railroads began their massive switch from coal to diesel oil as a fuel. About the same time, however, large uranium deposits were located in the sub-basin, and the locus of heavy mining activity changed from coal to the new mineral. The emphasis on uranium extraction has grown steadily, so that by 1960, according to the Mineral Yearbook, the uranium sector accounted for almost one-half the total value of output for all sub-basin extractive activities.

The value of all mining production in the Upper Main Stem from 1930 through 1960 is shown in Table UMS-I. Uranium, coal, lead and zinc together made up almost 92 percent of the 1960 value of mineral production. The range in value of mineral output extends from a low in 1932 of $1.1 millions to a high in 1960 of approximately $38.3 millions. (Table UMS-I). The most significant increases were recorded between the years 1955 and 1956, for it was in the latter year when the value of uranium production was first reported by the United States Bureau of Mines. Prior to the mid-fifties, the growth in tonnage and value of mineral output had been fairly steady except for 1932 and 1933 when production fell precipitously. Over the 30-year period reported in Table UMS-I, however, there has been a ninefold increase in the value of production.

Table UMS-II shows total household payments by all mining sectors in the sub-basin. These payments consist of wages and salaries and profits and other income (professional services, etc.) as reported in the 1960 Upper Main Stem Transactions Table, Table UMS-S. Mining wage and salary

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Table UMS-I

Value of Upper Main Stem Sub-Basin Mineral Production, 1930-1960
(in Current Dollars)

Year	Total	Colorado Counties	Utah County	Year	Total	Colorado Counties	Utah County
1960	$38,283,720	$37,072,031	$1,211,689	1944	---	---	---
1959	37,136,851	35,900,351	1,236,500	1943	$10,781,115	$10,781,115	---
1958	36,973,837	35,644,326	1,329,511	1942	8,548,958	8,432,165	$116,793b
1957	38,137,375	37,300,391	836,984	1941	10,599,139	10,426,729	172,410c
1956	37,829,478	37,121,321	708,157	1940	11,945,380	11,820,001	125,379b
1955	22,601,036	22,570,505	30,531	1939	10,358,142	10,355,679	2,463a
1954	20,135,742	20,112,703	23,039	1938	8,543,865	8,542,977	888a
1953	20,153,003	20,122,861	30,142	1937	7,835,729	7,835,029	700a
1952	26,947,872	26,909,227	38,645	1936	6,639,987	6,638,034	1,953a
1951	29,160,884	29,132,132	28,752	1935	5,411,193	5,283,289	127,904b
1950	19,404,268	19,360,579	43,689a	1934	3,539,820	3,537,138	2,682c
1949	18,122,858	18,064,468	58,390b	1933	1,694,627	1,693,938	689c
1948	19,555,276	19,468,297	86,979b	1932	1,123,193	1,123,193	---
1947	13,559,931	13,451,397	108,534b	1931	3,029,700	2,757,618	272,082b
1946	10,595,641	10,595,641	---	1930	4,244,002	4,212,702	313,000a
1945	---	---	---				

a Figure represents only value of coal production.
b Figure represents only value of gold, silver, copper, lead and zinc production.
c Figure represents only the value of coal, gold, silver, copper, lead and zinc production.

Sources: Minerals Yearbook Annuals, 1930-1961, U.S. Department of the Interior, Bureau of Mines (Washington, D.C.: U.S. Government Printing Office), and

Colorado Bureau of Mines' Annual Statistics, 1930-1950 (Denver, Colorado).

Table UMS-II

RANK ORDER DISTRIBUTION OF MINING SECTOR PAYMENTS TO HOUSEHOLDS
IN THE UPPER MAIN STEM SUB-BASIN
(In Thousands of Dollars)

RANK	SECTOR	WAGES & SALARIES	PROFITS & OTHER INCOME	TOTAL PAYMENTS
1.	Uranium	$19,476	$3,614	$23,090
2.	Zinc	4,087	636	4,723
3.	All Other Mining	2,344	1,451	3,795
4.	Coal	2,360	628	2,988
5.	Oil & Gas	235	27	262
	Totals	$28,502	$6,356	$34,858

Source: Table UMS-Y, n

payments of $28.5 million represent approximately 16 percent of total sub-basin wage and salary payments for 1960.[1] Employment in the extractive industries was 4,593--almost twenty-three percent of total employment within the sub-basin. Average annual earnings per mining employee come to $6,206. Table UMS-III shows partial mining wage and employment data by county. These data are incomplete because of disclosure and classification problems.

Interindustry Relations

Coal---The total gross output of the coal sector was $5,620,000 in 1960 which represents production slightly in excess of one million short tons. Historical tonnage and value data on sub-basin coal production from 1945 through 1960 are presented in Table UMS-IV. The most significant fact about this series is that, as of 1960 production had not yet recovered to the 1945 level of slightly more than 1.3 million tons. The national decline in coal production in the post World War II period, coupled with the decline of the regional railroad market starting in 1953, caused coal production by 1954 to slip to only slightly more than one-fourth of the 1945 level. Because of a rise in the price of coal, the value of 1954 production was almost 60 percent of the 1945 figure.

Coal sales to final demand amounted to 82 percent of 1960 total gross output. This gave coal the 12th highest rank among the 31 processing sectors in terms of this measure. Among extractive activities, only zinc and oil and gas ranked higher. Exports outside the Colorado Basin of approximately $3.4 million accounted for nearly three-fourths of total final demand sales. Of the sales to other sub-basin processing sector industries 91 percent ($902,000) were to electric energy producers.

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[1] This compares with $20,006,907 reported by the Colorado and Utah State Departments of Employment. The Colorado agency is restricted in its collection of data to establishments employing more than three persons, not including active proprietors and their relatives, so that there is large underreporting in the mining sector as well as in manufacturing, trade, and services. Also, sector classifications do not exactly correspond to those listed in the 1957 Standard Industrial Classification Manual. For these reasons it was decided to utilize wage and salary totals derived from the sample data collected specifically for this study.

Table UMS-III

Mining Wages and Employment, by County and Sector, 1960
Upper Main Stem Sub-Basin

County		Wages	Employment
Delta			
Coal		$150,022	36
Oil & Gas		17,423	4
All Other Mining		a	a
	Total	$167,445	40[b]
Dolores			
Lead & Zinc		c	c
All Other Mining		a	a
Eagle			
Lead & Zinc		c	c
All Other Mining		a	a
Garfield			
Coal		14,000	4
Oil & Gas		a	a
All Other Mining		a	a
	Total	14,000	4[b]
Grand		a	a
Gunnison			
Coal		944,540	189
Lead & Zinc		c	c
Uranium		c	c
All Other Mining		a	a
	Total	944,540	189[b]
Hinsdale		a	a
Mesa			
Coal		330,999	55
Oil & Gas		663,396	125
Uranium		c	c
All Other Mining		429,350	52
	Total	1,423,745	232[b]

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Table UMS-III Cont'd.

County		Wages	Employment
Montrose			
Coal		a	a
Oil & Gas		$330,224	55
Uranium		c	c
All Other Mining		a	a
	Total	330,224	55[b]
Ouray			
Lead & Zinc		c	c
All Other Mining		a	a
Pitkin			
Coal		817,841	130
Uranium		c	c
Lead & Zinc		c	c
All Other Mining		a	a
	Total	817,841	130[b]
San Miguel			
Oil & Gas		29,315	6
Uranium		c	c
Lead & Zinc		c	c
All Other Mining		a	a
	Total	29,315	6[b]
Summit		a	a
Grand			
Oil & Gas		3,441,283	1,673
Uranium		c	c
All Other Mining		a	a
	Total	3,441,283	1,673

[a]Withheld to avoid disclosing figures for individual firms.

[b]Total exclusive of data witheld for disclosure reasons or because of classification problems.

[c]Because all wage and employment information for metal mining in the subject county was grouped into one general classification, it is not possible to report the wage and employment data by particular type of metal mining.

Source: Colorado State Department of Employment.

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Table UMS-IV

Annual Tonnage and Value of Upper Main Stem Sub-Basin Coal Production, 1945-1960
(Current Dollars)

Year	Sub-Basin Totals		Colorado Counties		Utah County	
	Tons	Dollar Value	Tons	Dollar Value	Tons	Dollar Value
1960	1,000,870	5,619,908	1,000,870	5,619,908		
1959	437,923	2,498,272	437,923	2,498,270[a]		
1958	439,727	2,559,511	439,727	2,559,511[a]		
1957	469,664	2,815,240	469,664	2,815,240[a]		
1956	612,176	3,643,508	612,176	3,643,508		
1955	555,703	3,150,084	555,703	3,150,084		
1954	375,961	2,056,796	375,961	2,056,793		
1953	512,908	2,737,365	510,925	2,727,450	1,983	9,915
1952	561,268	2,995,891	555,295	2,989,900	5,991	28,936
1951	559,784	2,939,242	554,201	2,900,490	5,583	28,752
1950	746,616	3,784,701	737,913	3,741,012	8,703	43,689
1949	855,751	4,084,042	843,866	4,025,687	11,885	58,355
1948	912,254	4,013,597	890,220	3,927,003	22,034	86,594
1947	881,087	3,166,811	850,749	3,058,326	30,338	108,485
1946	1,101,438	3,772,381	1,101,438	3,772,381		
1945	1,309,147	3,579,200	1,271,826	3,541,879	37,321	120,174

[a]Coal production for Montrose and Pitkin counties was combined with production from Moffat and El Paso counties to avoid disclosure, and, for this reason coal production for the former two counties could not be reported.

Source: Minerals Yearbook Annuals, 1945-1960, U. S. Department of the Interior, Bureau of Mines (Washington, D. C.: U. S. Government Printing Office)

Most of the inputs to coal mining--92 percent of total gross outlays--came from outside the processing sector, with wage and salary payments, and imports from outside the Colorado River Basin, accounting for 46% and 23% respectively. Purchases of electric energy ($144,000) constituted the only important processing sector input.

Table UMS-Z (p. 65) shows the sum of the direct and indirect output requirements from all processing sector industries called forth by the sales to final demand of one dollar by each of the industries at the left of the table. The coal mining sector had a very low degree of interdependence with other processing sector industries as shown in this table. The sum of the direct and indirect effects for the coal industry is only $1.10. This is the second smallest expansionary effect of all the mining sectors and ranks 26th among all processing sector industries. The largest sectional direct and indirect effect was in electric energy--a three cent output increase for every dollar of coal sold to final demand. (Table UMS-U, p. 60).

Oil and Gas---Annual petroleum production for the years 1955 through 1960 is shown in Table UMS-V. The 1960 production was 14 thousand barrels at an average price of $2.80 per well-head barrel--a total value of $39,200. In addition, almost 1.9 million mcf's (thousands of cubic feet) of natural gas were produced at an average price per mcf of twelve cents --a total value of $228,000. Thus the total value of production of petroleum and natural gas combined was $267,200.

The total gross output for the oil and gas sector of the transactions table was $1,968,000--much larger than the value of production of petroleum and natural gas combined, computed above. The reason for this wide disparity is that in the transactions table we included, in addition to petroleum and gas production, oil field service activities which accounted for nearly $1.7 million of the total. Even with the inclusion of oil field service activities, the oil and gas sector has the lowest total gross output of any of the mining sectors. As shown in Table UMS-X (p. 63) oil and gas sales to final demand (99 percent of total gross output) is the second highest of all deliveries to final demand ranking

Table UMS-V

Annual Petroleum Production of Upper Main Stem Sub-Basin 1955-1960
(Number of 42 Gallon Barrels)

Year	Total	Utah County
1960	14,000	14,000
1959	9,000	9,000
1958	11,000	11,000
1957	18,000	18,000
1956	2,000	2,000
1955	6,000	6,000

Source: Minerals Yearbook, Annuals, 1953-1960, Vol. II, Area Statistics, U. S. Department of the Interior, Bureau of Mines (Washington, D. C.: U. S. Government Printing Office)

Table UMS-VI

Value and Tonnage of Upper Main Stem Sub-Basin
Uranium Production, 1956-1960

Year	Upper Main Stem Sub-Basin Total		Colorado Sub-Basin Counties		Utah Sub-Basin Counties	
	Short Tons	Value (dollars)	Short Tons	Value (dollars)	Short Tons	Value (dollars)
1960	856,467	18,389,852	812,715	17,455,775	43,752	934,077
1959	797,580	17,836,811	756,383	16,923,109	41,197	913,702
1958	749,411	17,190,602	714,773	16,281,281	35,138	909,321
1957	667,973	14,520,965	635,872	13,870,868	32,101	650,097
1956	475,444	11,740,115	449,170	11,153,777	26,274	586,338

Source: Minerals Yearbook, Annuals, 1956-1960, Vol. III., Area Statistics, U. S. Department of Interior, Bureau of Mines (Washington, D. C.: U. S. Government Printing Office)

immediately behind zinc. Most of these sales (86%) were to capital account --gross private capital formation--representing drilling and exploration activities conducted in the sub-basin in 1960. Intraindustry transactions of $28,000 were the only processing sectors sales.

Approximately seventy-seven percent of the oil and gas industries' total gross outlays were made in the payments sector with imports from outside the Colorado River Basin, and wage and salary payments accounting for 70% and 16%, respectively, of imports. Of the inputs from processing sector industries the largest purchase (35%) was from rentals and finance- $159,000 - with the bulk of these payments representing lease and royalty payments to local land owners of producing properties.

Table UMS-Z (p. 65) shows that the sum of direct and indirect effects of the oil and gas sector on processing sector industries is $1.28 which is the median of the rank order distribution of all processing sector industries. The only mining sector which ranks above oil and gas in the sum of its direct and indirect effects is uranium. The largest sectoral output increase was the nine cents called forth from rentals and finance. In addition, the "all other services" sector experienced output increases of approximately five cents for every dollar of sales to final demand by the oil and gas sector. (Table UMS-U, p. 60).

Uranium---Table UMS-VI shows the current dollar value and tonnage of sub-basin uranium production in 1960 and prior years through 1956-- when uranium production data were first published. The $18.4 millions of raw uranium ore mined in 1960 is a very much lower value than the $92.4 million total gross output reported for the uranium sector in the transactions table. Because of the heavy concentration of uranium mining in the Upper Main Stem and contiguous sub-basins, a large uranium ore processing industry has grown up in the area to separate the U_3O_8 (yellowcake) from the raw ore. It consists primarily of milling and flotation operations that are properly classified as "mining" activities in the Standard Industrial Classification Manual.[2]

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[2] U. S. Bureau of the Budget, Standard Industrial Classification Manual - 1957, U. S. Government Printing Office, Washington, D. C. (1957).

To preserve this classification, all local mining and processing were included in the single uranium row and column of the transactions table. Thus, the uranium sector is a vertically structured industry with locally mined raw ore showing as a uranium row to uranium column sale (intraindustry) which is then further processed in the same column. Not only does this procedure cause double-counting of the value of ore mined locally (and not all of it was since over $1.5 million went to the San Juan Sub-Basin) but it also causes inclusion of both mining and further processing expenses in one table column. For this reason the uranium sector's total gross output is slightly more than five-times the value of the locally mined ores. The vertical combination of separate input structures is an accepted procedure where the output of one activity is consumed as an input to another in the same geographical area (i.e., sub-basin).[3]

Almost 82 percent of the uranium sector's total gross output was sold to final demand, the largest portion of which ($67 million) represented "yellow-cake" sales to the federal government. Uranium's total final demand sales twice tied with coal; for third place among the five mining sectors and for twelfth place among all processing sector industries. (Table UMS-X, p. 63). Intraindustry sales of almost $16.9 million represented the only processing sector transaction, and the entire amount consisted of sales of unprocessed uranium ores to concentrating mills.

Almost seventy percent of uranium's inputs came from the payments sector with imports from outside the Colorado River Basin and wages and salaries accounting for over two-thirds of the total. Intraindustry transactions and purchases from transportation and all other mining accounted for ninety-two percent of uranium processing sector purchases, with 58%, 30% and 4%, respectively, of imports to the processing sectors.

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[3] W. Duane Evans and Marvin Hoffenberg, "The Nature and Uses of Interindustry Relations Data and Methods," Input-Output Analysis: An Appraisal (Princeton, New Jersey: Princeton University Press, 1955), p. 75.

Table UMS-Z, (p. 65) shows uranium to have the largest sum of direct and indirect effects ($1.42) of all sub-basin mining activities. This sector stands tenth highest among all processing sector industries. Most of these effects are accounted for by intraindustry transactions and transportation.

Lead and Zinc---The total value of sub-basin lead and zinc production in 1960 came to $11.1 million, and this production was restricted to Colorado counties. Table UMS VII shows the annual dollar value of lead and zinc production from 1945 through 1960. The largest production year was 1951 ($22 million) almost twice the value of 1960 production. Lead and zinc sales were entirely to final demand, and 96% of these were exports to destinations outside the Colorado River Basin. Over ninety-three percent of lead and zinc's total gross outlays went to the payments sector with imports from outside the Colorado River Basin and wage and salary payments accounting for the greatest share, 40% and 38%, respectively. Inputs from two processing sector industries--electric energy and fabricated metals--accounted for almost three-fourths the total gross outlays of the processing sector.

Lead and zinc had the lowest expansionary effect of all mining sectors. For every additional dollar of sales to final demand barely $1.09 in additional outputs by all processing sector industries was generated. Only three processing sector industries had lower values for the sum of the direct and indirect effects in the sub-basin economy than zinc and lead as shown in Table UMS-Z.

All Other Mining---The total gross output of the "all other" mining sector ($6.7 million) includes the production value of gold, silver, copper, stone, sand and gravel and other mining activities which individually account for a very small proportion of total sub-basin extractive activities. Annual production data of gold, silver, and copper from 1952 through 1960 are shown in Table UMS-VIII. Approximately 58 percent of this sector's output was delivered to final demand in 1960--the lowest percentage of all mining sectors and 22nd among all sub-basin processing

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Table UMS-VII

Annual Dollar Value of Sub-Basin Lead and Zinc Production by State, 1945-1960

Year	Upper Main Stem Sub-Basin Total	Colorado Sub-Basin Counties		Utah Sub-Basin Counties	
		Lead	Zinc	Lead	Zinc
1945	7,091,799	1,294,304	5,797,495	-	-
1946	8,159,842	1,666,880	6,492,962	-	-
1947	10,402,609	2,859,130	7,543,479	-	-
1948	15,398,664	5,579,072	9,819,574	18	-
1949	14,372,142	4,954,430	9,417,712	-	-
1950	14,092,722	3,991,410	10,101,312	-	-
1951	22,012,370	6,070,262	15,942,108	-	-
1952	19,539,212	5,753,818	13,785,394	-	-
1953	10,708,362	3,897,250	6,811,112	-	-
1954	10,386,012	3,608,580	6,777,432	-	-
1955	11,715,630	3,677,916	8,037,714	-	-
1956	14,808,062	4,806,649	10,001,397	16	-
1957	12,795,279	3,925,908	8,869,371	-	-
1958	9,852,845	2,588,894	7,263,951	-	-
1959	10,198,580	2,382,973	7,815,607	-	-
1960	11,106,716	3,548,399	7,558,317	-	-

Source: Minerals Yearbook, Annuals, 1945-1960, U. S. Department of the Interior, Bureau of Mines (Washington D. C., U. S. Government Printing Office).

Table UMS-VIII

Annual Dollar Value of Upper Main Stem Sub-Basin Gold, Silver, and Copper Production, 1952-1960

Year	$ Value
1952	4,220,898
1953	5,222,463
1954	6,516,151
1955	6,039,742
1956	6,206,726
1957	5,514,135
1958	4,844,756
1959	3,575,641
1960	3,918,741

Source: Minerals Yearbook, Annuals, 1952-1960, Vol. III, Area Statistics, U. S. Department of the Interior, Bureau of Mines (Washington, D. C.: U. S. Government Printing Office).

sector industries. The largest final demand sales were exports outside the Colorado River Basin. Within the processing sector, "other mining", sales were highly concentrated and limited to three industries - construction (47%), uranium (40%), and stone, clay and glass (13%). The first two of these accounted for 87 percent of all sales to processing sector purchasers.

As with all previous mining sectors, inputs from the payments sectors accounted for the largest proportion (92%) of total gross outlays. Wage and salary payments (38%), and profits and other income (24%), were the largest payments and together accounted for three-fifths of inputs from the payments sector. The only processing sector purchase in excess of $100,000 was from electric energy.

Although output increases of one cent or greater were generated in five processing sector industries, "all other mining" had a very low degree of structural interdependence in the sub-basin economy. For every additional dollar of sales to final demand, production increases of only $1.10 were generated. This tied with coal as the lowest of the mining sectors, and only five other industries in the sub-basin processing sector ranked lower, as shown in Table UMS-Z.

MANUFACTURING

Introduction

Manufacturing has not yet become a major economic activity in the counties of the Upper Main Stem Sub-Basin. The economy has always been classified as an agricultural and extractive one, and the only manufacturing which has taken place has been in those activities oriented towards the basic resources of the area such as lumber and wood products, stone, clay and glass products, and those activities oriented towards small local markets such as dairies, bakeries, and printing and publishing establishments.

Table UMS-IX shows some selected characteristics of sub-basin manufacturing, by county, for the United States census years 1939, 1947, 1954 and 1958. Over this time the number of establishments has more than doubled, while the number of production employees has increased by 136 percent. The value added by manufacture however, has increased from about $1.5 million in 1939 to almost $13.5 million in 1958.

By 1960 the number of firms, as reported by the University of Colorade Bureau of Business Research and the U. S. Public Health Service, had increased to 314. (Table UMS-X). This might be misleading since many of the manufacturing establishments listed by these two reporting agencies were not included in the 1958 United States Census of Manufacturers - even though these establishments were operating in 1958. Much of the difficulty occurs in the lumber and wood products sector where many of the firms are small contract loggers who cut and deliver logs to the sawmills. While the Standard Industrial Classification Manual considers logging camps and logging contractors as manufacturers--under Code 2411--many of these logging operations are conducted on a seasonal basis by men who practice other occupations, such as farming, for the remainder of the calendar year. Because of casual and seasonal nature of these firms, many of them are not picked up in the Federal census statistics. The

Table UMS-IX

Selected Statistics on Manufacturing by County
In the Upper Main Stem Sub-Basin
(Average Annual Employment)

Year		Number of Establishments	Total Employees	Production Employees	Value Added
1939	Delta, Colorado	16	*	181	388,000
	Dolores, Colorado	3	*	**	**
	Eagle, Colorado	6	*	27	101,000
	Garfield, Colorado	8	*	35	88,000
	Grand, Colorado	9	*	53	103,000
	Gunnison, Colorado	3	*	5	25,000
	Hinsdale, Colorado	---	---	---	---
	Mesa, Colorado	27	*	246	639,000
	Montrose, Colorado	15	*	67	198,000
	Ouray, Colorado	2	*	**	**
	Pitkin, Colorado	1	*	**	**
	San Miguel, Colorado	1	*	**	**
	Summit, Colorado	---	---	---	---
	Grand, Utah	1	*	**	**
	Sub-Basin Totals	92	*	614	1,542,000a
1947	Delta, Colorado	23	345	292	1,679,000
	Dolores, Colorado	4	**	**	**
	Eagle, Colorado	6	53	46	139,000
	Garfield, Colorado	15	84	76	272,000
	Grand, Colorado	13	152	146	507,000
	Gunnison, Colorado	9	65	59	161,000
	Hinsdale, Colorado	1	**	**	**
	Mesa, Colorado	39	679	577	2,541,000
	Montrose, Colorado	12	85	66	438,000
	Ouray, Colorado	2	**	**	**
	Pitkin, Colorado	2	**	**	**
	San Miguel, Colorado	5	14	14	55,000
	Summit, Colorado	4	29	27	108,000
	Grand, Utah	1	**	**	**
	Sub-Basin Totals	136	1,506	1,303	5,900,000a

Table UMS-IX (Cont'd)

Year		Number of Establishments	Total Employees	Production Employees	Value Added
1954	Delta, Colorado	20	372	321	1,452,000
	Dolores, Colorado	5	14	12	204,000
	Eagle, Colorado	16	94	81	437,000
	Garfield, Colorado	11	52	32	291,000
	Grand, Colorado	20	166	158	864,000
	Gunnison, Colorado	12	60	51	215,000
	Hinsdale, Colorado	---	---	---	---
	Mesa, Colorado	51	658	434	4,138,000
	Montrose, Colorado	18	116	87	507,000
	Ouray, Colorado	1	**	**	**
	Pitkin, Colorado	4	92	70	**
	San Miguel, Colorado	11	54	49	209,000
	Summit, Colorado	4	12	11	73,000
	Grand, Utah	2	**	**	**
	Sub-Basin Totals	175	1,690	1,306	8,390,000a
1958	Delta, Colorado	22	311	251	1,768,000
	Dolores, Colorado	3	28	25	**
	Eagle, Colorado	10	59	49	444,000
	Garfield, Colorado	13	66	57	262,000
	Grand, Colorado	19	165	160	1,118,000
	Gunnison, Colorado	12	52	42	194,000
	Hinsdale, Colorado	---	---	---	---
	Mesa, Colorado	59	933	555	8,187,000
	Montrose, Colorado	29	273	216	1,219,000
	Ouray, Colorado	3	5	4	86,000
	Pitkin, Colorado	5	32	26	124,000
	San Miguel, Colorado	8	49	44	**
	Summit, Colorado	1	**	**	**
	Grand, Utah	6	20	17	95,000
	Sub-Basin Totals	190	1,993	1,446	13,492,000a

* Not available.
** Withheld to avoid disclosing figures for individual companies.

a Total less value added for counties where data not released because of disclosure, for subject year.

Source: U. S. Bureau of the Census, U.S. Census of Manufactures: 1958, 1954, 1947 and 1939, Volume III, Area Statistics (Washington, D.C.: U.S. Government Printing Office, Appropriate states' data).

Table UMS-X

Number of Manufacturing Firms by Sector and County
In the Upper Main Stem Sub-Basin, 1960

County		
Delta		
Food & Kindred Products		22
Lumber & Wood Products		15
Printing & Publishing		4
Leather & Leather Goods		2
Fabricated Metals		3
Stone, Clay & Glass Products		1
Other Manufacturing		3
	Total	50
Dolores		
Food & Kindred Products		4
Lumber & Wood Products		2
Printing & Publishing		1
Other Manufacturing		3
	Total	10
Eagle		
Food & Kindred Products		2
Lumber & Wood Products		9
Primary Metals		1
Printing & Publishing		0
Stone, Clay & Glass Products		2
Other Manufacturing		2
	Total	14
Garfield		
Food & Kindred Products		6
Lumber & Wood Products		14
Oil & Gas		1
Printing & Publishing		5
Stone, Clay & Glass Products		4
Fabricated Metals		2
Other Manufacturing		7
	Total	39
Grand		
Lumber & Wood Products		28
Printing & Publishing		2
	Total	30

Table UMS-X (Cont'd)

Gunnison		
Food & Kindred Products		1
Lumber & Wood Products		29
Primary Metals		1
Printing & Publishing		3
Stone, Clay & Glass Products		1
Other Manufacturing		3
	Total	38
Hinsdale		
Lumber & Wood Products		2
Mesa		
Food & Kindred Products		21
Lumber & Wood Products		17
Chemicals		2
Oil & Gas		1
Primary Metals		5
Printing & Publishing		13
Fabricated Metals		12
Textile Mill Products		2
Other Manufacturing		26
	Total	99
Montrose		
Food & Kindred Products		10
Lumber & Wood Products		23
Printing & Publishing		4
Primary Metals		1
Stone, Clay & Glass Products		1
Leather & Leather Goods		1
Other Manufacturing		3
	Total	43
Ouray		
Food & Kindred Products		1
Lumber & Wood Products		4
Primary Metals		1
Printing & Publishing		1
	Total	7
Pitkin		
Lumber & Wood Products		3
Printing & Publishing		1
Stone, Clay & Glass Products		2
Other Manufacturing		5
	Total	11
San Miguel		
Food & Kindred Products		1
Lumber & Wood Products		14
Primary Metals		1
Stone, Clay & Glass Products		1
Other Manufacturing		3
	Total	20

Table UMS-X (Cont'd)

Summit		
Lumber & Wood Products		7
Primary Metals		1
Printing & Publishing		1
	Total	9
Grand (Utah)		
Food & Kindred Products		1
Lumber & Wood Products		2
Printing & Publishing		1
	Total	4

Sources: 1960 Directory of Colorado Manufactures., Bureau of Business Research, University of Colorado, Boulder, Colorado.

1960 Directory of Manufactures for the Colorado River Basin, U. S. Department of Health, Education And Welfare, Public Health Service, Bureau of State Services, Division of Water Supply and Pollution Control, Region VIII, Denver, Colorado.

seasonal nature of lumber and wood products creates an additional problem in connection with calculating average annual wage payments to employees. Since many of the employees are on the payroll for only a portion of the year, their average wage payments calculated on a full year basis are quite low. The only way to correct this is to utilize "man-years" when discussing employment in heavily seasonal industries.

The total gross output of all sub-basin manufacturing sectors came to $48.3 million in 1960, which represents only four percent of the total gross output of all processing sector industries. The largest manufacturing sectors were food and kindred products and "all other" manufacturing. Wage and salary payments for all manufacturing came to $8,736,000 in 1960, roughly five percent of total sub-basin wage and salary payments.[4] Sectoral wages and salary, and other household payments, are shown in Table UMS-XI. The largest payments were made by the food and kindred products and "all other" manufacturing sectors.

County employment and wages by industrial classification are shown in Table UMS-XII. The total manufacturing employment in 1960 was 2,009, and the average annual wage was $4,289.[5]

Food and Kindred Products---The major kinds of food and kindred products establishments in 1960 were fruit and vegetable canners, dairies, beet sugar manufacturers, meat packing plants and establishments engaged in manufacturing animal feeds. Table UMS-X shows food and kindred products final demand deliveries of 86 percent of gross output to be ninth highest of all sub-basin processing sector industries - exceeded only by one manufacturing sector--lumber and wood products. The largest final demand deliveries were to sub-basin residents, and of the $2.7 million sold to processing sector industries, eating and drinking places took almost half. Only 49 percent of food and kindred products inputs came

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[4]The wage figure compares with $8,617,504 reported by the Colorado and Utah State Departments of Employment. (Table UMS-XII)

[5]Source: Colorado State Department of Employment.

Table UMS-XI

RANK ORDER DISTRIBUTION OF MANUFACTURING SECTOR PAYMENTS TO HOUSEHOLDS IN THE UPPER MAIN STEM SUB-BASIN
(In Thousands of Dollars)

Rank	Sector	Wages & Salaries	Profits	Total Payments
1.	Food & Kindred Products	$3,118	$1,425	$4,543
2.	All Other Manufacturing	2,731	642	3,373
3.	Lumber & Wood Products	1,195	163	1,358
4.	Printing & Publishing	1,014	183	1,197
5.	Fabricated Metals	350	107	457
6.	Stone, Clay & Glass	328	26	354
	Totals	$8,736	$2,546	$11,282

Source: Table UMS-Y.

Table UMS-XII

Manufacturing Wages and Employment, by Sector and County,
1960 - Upper Main Stem Sub-Basin

County	Wages	Employment
Delta		
Food & Kindred Products	$1,206,526	326
Lumber & Wood Products	97,243	32
Printing & Publishing	58,375	18
Fabricated Metals	a	a
Stone, Clay & Glass	a	a
All Other Manufacturing	16,743	5
Total	1,378,887	381[b]
Dolores	a	a
Eagle		
Food & Kindred Products	7,565	3
Lumber & Wood Products	151,347	53
Stone, Clay & Glass	3,018	1
All Other Manufacturing	a	a
Total	161,930	57[b]
Garfield		
Food & Kindred Products	54,847	13
Lumber & Wood Products	53,132	13
Printing & Publishing	19,804	6
Stone, Clay & Glass	119,820	30
All Other Manufacturing	53,481	12
Total	301,084	74
Grand		
Lumber & Wood Products	420,882	116
Printing & Publishing	a	a
Total	420,882	116[b]
Gunnison		
Food & Kindred Products	1,243	1
Lumber & Wood Products	35,187	11
Printing & Publishing	53,196	16
Stone, Clay & Glass	27,873	6
Total	117,499	34
Hinsdale	a	a

Table UMS-XII (Cont'd)

County	Wages	Employment
Mesa		
Food & Kindred Products	$1,570,886	413
Lumber & Wood Products	102,998	30
Printing & Publishing	674,762	154
Fabricated Metals	328,865	63
Stone, Clay & Glass	163,010	33
All Other Manufacturing	1,580,620	223
Total	4,421,141	916
Montrose		
Food & Kindred Products	83,139	32
Lumber & Wood Products	223,953	81
Printing & Publishing	103,536	37
Stone, Clay & Glass	a	a
All Other Manufacturing	132,637	32
Total	543,265	182[b]
Ouray		
Food & Kindred Products	35,247	9
Lumber & Wood Products	3,477	1
Printing & Publishing	a	a
Total	38,724	10[b]
Pitkin		
Lumber & Wood Products	68,946	16
Printing & Publishing	34,858	10
Stone, Clay & Glass	a	a
All Other Manufacturing	46,168	11
Total	149,972	37[b]
San Miguel		
Food & Kindred Products	a	a
Lumber & Wood Products	33,526	9
Stone, Clay & Glass	a	a
All Other Manufacturing	1,046,371	190
Total	1,079,897	199
Summit		
Lumber & Wood Products	4,223	3
Printing & Publishing	a	a
Total	4,223	3[b]
Grand	a	a
Grand Totals	8,617,504	2,009

[a]Witheld to avoid disclosing figures for individual companies.

[b]Total less wage and employment data not released because of disclosure for subject year.

Source: Colorado State Department of Employment.

from the payments sector, the largest of which was for wages and salaries. About $9.8 million of purchases were made from processing sector industries, and 89 percent of these purchases came from the agricultural sectors.

The sum of the direct and indirect effects of the food and kindred product industries was $1.76, second only to feeder livestock as shown in Table UMS-Z. It had the largest intraindustry expansion effect of any of the manufacturing sectors ($1.02). The largest individual production increases were range livestock and dairy farming, with 21¢ and 11¢ increases respecively.

Lumber and Wood Products---The major producers for this sector included logging camps, sawmills and planing mills. The 1960 total gross output was $5 million, of which 95 percent represented deliveries to final demand as shown in Table UMS-X. This table shows that no other manufacturing sector had final demand deliveries of this relative magnitude and that only five other processing sector industries exceeded this percentage. Almost 90% of lumber and wood products deliveries consisted of exports outside the Colorado River Basin. The only significant delivery to other processing sector industries was the $195,000 sale of mine shaft timbers to the uranium sector.

Inputs from the payment sector accounted for only 45 percent of the total gross outlays of this sector--the smallest percentage of any subbasin manufacturing sector. The major portion of this ($1.2 million) or 53% was for wages and salaries. Most of the processing sector purchases were for rough timber supplied by the forestry sector.

Table UMS-Z shows that lumber and wood products created $1.63 of additional output for every additional dollar of deliveries to final demand. It ranked fourth among all processing sector industries and was the second largest of the manufacturing sectors--exceeded only by food and kindred products. The largest of the seven individual production increases generated by additional final demand deliveries come from the forestry and transportation sectors with 38¢ and 12¢ increases, respectively.

Printing and Publishing---Most of the activity in this sector in 1960 consisted of publishing local and county newspapers. The final demand deliveries for this sector were a smaller percentage of total gross output than any of the other sub-basin manufacturing industries and third lowest of all processing sector industries (Table UMS-X). Only eight percent of the total gross output of $3,049,000 found its way to final demand and 49% of these sales were accounted for by the households sector. Sales were made to 25 of the 31 processing sector industries, but the largest part of these--73 percent--were to the "other retail" sector.

The greatest share of input purchases (92 percent) came from the final payments sector, primarily for imports from outside the Colorado River Basin and wage and salary payments. The largest processing sector purchase came from intraindustry transactions - 20% of the total, while other utilities and rentals and finance followed with 18% and 15% respectively.

For every dollar of additional sales to final demand printing and publishing generated only $1.09 in additional output from all processing industries. Only one manufacturing industry - the conglomerate "other" manufacturing - had a lower sum of direct and indirect effects.

Fabricated Metals---Structural steel fabricators and boiler shops were the major types of producers in this sector. The sector's total gross output was the second smallest for all the manufacturing sectors amounting to only $1,633,000. Fifty percent of this amount went to final demand, the third lowest for all sub-basin manufacturing sectors and the 24th in rank among all processing sector industries. Exports outside the Colorado River Basin accounted for the major final demand deliveries - 62%. The largest processing sectors sales were to the mining sectors, the bulk of which was the $422,000 of sales to uranium.

Payment sector inputs of $1.5 million accounted for approximately 91 percent of this industry's total gross outlays and the largest (48%) were for imports from outside the Colorado River Basin and wages and salaries (23%). The only significant processing sector purchase was from "all other" manufacturing.

The sum of the direct and indirect effects is shown in Table UMS-Z. The $1.11 of output so generated was the fourth largest of all manufacturing sectors but eighth lowest for all processing industries. The largest single output increase was experienced in "all other" manufacturing with a 6¢ increase.

Stone, Clay and Glass Products--The major activity of this sector was the manufacture of ready-mix concrete. Total gross output came to $1,460,000 for 1960--the smallest of any manufacturing sector. The 22 percent of output to final demand ranked fourth lowest of all processing sector industries while among manufacturing industries, only printing and publishing had smaller relative final demand deliveries. Slightly less than half the final demand deliveries went to governmental units, and 45% went to households in the form of wages.

Input purchases from the payment sector came to 61 percent of total gross outlays, and the largest expenditures were for wage and salary payments, and imports from outside the Colorado River Basin. Of the remaining purchases from the processing sectors 66 percent ($374,000) were supplied by the "all other" mining sector.

This sector had a reasonably high degree of interdependence with all other processing sector industries. Total production in the processing sector was increased by $1.44 for every dollar of this sector's sales to final demand. This represents the third largest sum of the direct and indirect effects of the manufacturing sectors and ranks 9th among all processing sector industries. The largest individual output increases were experienced in the "all other" mining and "all other" manufacturing sectors.

"All Other" Manufacturing--The establishments comprising this sector are a very heterogeneous group and are included together under one heading to eliminate the possibility of disclosure where there are fewer than three firms of a given type operating in the sub-basin. Included in this classification are rolling mills, furniture manufacture, leather products

manufacturers, one large petroleum refinery operated by the American Gilsonite Company at Fruita and several other small and varied establishments.

"All other" manufacturing total gross output in 1960 came to $17.9 million of which 49 percent was sold to final demand. This was the third smallest percentage for all manufacturing sectors and seventh lowest for all sub-basin processing sector industries. The largest component of final demand sales was exports which accounted for 58% of sales to final demand. Eighty-six percent of these went outside the Colorado River Basin. Since the petroleum refinery was included in this sector, "all other" manufacturing sold its output to all of the 31 processing industries. In most cases these are gasoline sales which pass through the margined service station sector. The largest of these sales (62%)--almost $5.7 million--went to the transportation sector.

Almost all inputs for this sector came from the final payment sector of the transactions table--94%. Of these purchases imports from other sub-basins and from outside the Colorado River Basin represented the largest shares constituting 49 and 17 percent respectively. The large inflow from other sub-basins of the overall Colorado River Basin is due to the importation of almost $8.3 million of gilsonite from the Green Sub-Basin. Wages and salaries paid to sub-basin households also represented an important outlay accounting for 16 percent of purchases from the final payments sector.

Because of the almost total dependence on payment sector inputs, Table UMS-Z shows that the "all other" manufacturing sector had the lowest sum of direct and indirect requirements ($1.07) of all processing sector industries.

ELECTRIC ENERGY

Introduction

The Upper Main Stem electric energy sector contained 15 operating establishments in 1960. The largest, Public Service Company of Colorado, served users over a wide area but had fairly concentrated operations in Mesa County. At the time of the study Public Service was constructing the Cameo producing plant which was operating in 1965 and exporting energy out of the sub-basin.

Eleven power establishments were borrowers from the Rural Electrification Association, and each served only relatively small areas except for the Colorado-Ute Power Association, which is a producing cooperative with most of the Western slope R. E. A.'s as members. Some of the single R. E. A.'s overlap into other sub-basins as, for example, the Yampa Valley and White River Associations which extend into the Green and the Western Colorado Power Company whose service area includes portions of the San Juan.

The operating statistics for the sub-basin R. E. A.'s are presented in Table UMS XIII. The establishment with the largest sub-basin sales was the San Miguel Power Association which had large energy sales to the uranium mill at Nucla. Unfortunately the time series data for the Public Service Company are for its entire state-wide operations, not just those in the sub-basin. The 1960 sub-basin energy sales of Public Service Company were larger than any of the other local producers, however. Another private energy company, the Utah Power and Light Company, operated in Grand County, Utah, but its sales there were not as large as those of some of the local R. E. A.'s. Finally, two small municipalities--the cities of Aspen and Glenwood Springs--purchased power for local distribution.

Interindustry Transactions---The total gross output for the electric energy sector was $9,460,000 in 1960. Forty-seven percent of this amount was sold to final demand, placing electric energy sixth from the bottom

of the list among sub-basin processing sector industries. Sixty-seven percent of these sales were to resident households. Sales were made to thirty of the thirty-one processing sector industries. The largest delivery to processing sector industries was the $1,052,000 sold to all the mining sectors combined. Intraindustry transactions of $990,000 constituted the largest delivery to any single processing sector.

Seventy-five percent ($7,109,000) of the electric energy industry's total gross outlays were allocated to the payments sector with wage and salary payments and imports from outside the Colorado River Basin comprising the largest share--55% combined. Intraindustry transactions and coal constituted the only significant processing sector purchases accounting for 42% and 38%, respectively, of the total.

Each dollar of electric energy sales to final demand generated $1.30 of additional output within the processing sector. Fourteen other processing sector industries had an equal or larger expansionary effect. (See Table UMS-Z). Intraindustry transactions totaled $1.12 ranking 3rd among all processing sector industries. Coal mining increased its output by $0.11 for every dollar of electricity sales to final demand - placing it in second place.

Table UMS-XV

Selected Operating Statistics of Sub-Basin
Electric Energy Producing Firms, 1941-1960
Upper Main Stem Sub-Basin

Year	Sangre De Cristo Electric Assn.			Grand Valley Rural Power Assn.			Colorado-Ute Electric Assn.		
	Miles Energized	Consumers Served	Operating Revenue	Miles Energized	Consumers Served	Operating Revenue	Miles Energized	Consumers Served	Operating Revenue
1960	507	1,463	$ 221,065	753	3,424	$ 473,024	190	12,309	$1,1[illegible],826
1959	498	1,415	209,238	747	3,310	472,066	126	9,831	1[illegible]4,211
1958	491	1,380	196,819	737	3,287	407,008	-	-	-
1957	480	1,322	181,973	731	3,339	363,624	-	-	-
1956	469	1,184	162,392	724	3,649	341,738	-	-	-
1955	458	1,053	142,537	716	3,526	304,416	-	-	-
1954	455	1,163	129,640	695	3,085	258,471	-	-	-
1953	455	1,121	118,803	692	3,002	238,244	-	-	-
1952	441	998	96,473	680	2,902	217,475	-	-	-
1951	441	a	88,775	625	a	197,824	-	-	-
1950	364	a	83,585	534	a	172,847	-	-	-
1949	a	a	a	a	a	a	-	-	-
1948	232	a	62,692	378	a	128,098	-	-	-
1947	226	a	70,169	376	a	108,657	-	-	-
1946	130	a	63,718	367	a	91,694	-	-	-
1945	122	a	48,673	366	a	68,586	-	-	-
1944	17	a	30,974	326	a	57,343	-	-	-
1943	16	a	33,370	321	a	49,243	-	-	-
1942	-	a	-	a	a	a	-	-	-
1941	-	-	-	320	a	41,841	-	-	-

[a]Data not available for these years.

Table UMS-XV (Cont'd.)

Year	San Miguel Power Assn.			Utah Power and Light Co.			Delta-Montrose Rural Power Assn.		
	Miles Energized	Consumers Served	Operating Revenue	Miles Energized	Consumers Served	Operating Revenue	Miles Energized	Consumers Served	Operating Revenue
1960	713	2,208	$ 929,340	3,363	212,011	$48,899,340	844	2,393	$ 304,012
1959	654	2,070	884,294	3,112	205,857	45,190,189	781	2,344	280,64[illegible]
1958	639	2,073	812,013	3,092	199,943	41,371,365	789	2,32[illegible]	257,29[illegible]
1957	583	2,047	751,719	2,988	194,835	40,261,913	788	2,228	237,46[illegible]
1956	544	1,870	597,101	a	189,128	38,386,602	775	2,21[illegible]	223,10[illegible]
1955	513	1,727	493,193	3,616	182,277	34,831,016	769	2,188	209,16[illegible]
1954	334	1,432	394,568	3,382	176,213	29,689,512	757	2,049	194,41[illegible]
1953	326	1,287	312,485	3,353	171,932	27,716,213	754	2,010	185,09[illegible]
1952	310	1,210	245,489	3,275	167,483	24,050,758	750	2,001	174,875
1951	292	a	179,792	3,191	162,948	21,789,466	733	a	166,997
1950	218	a	82,357	2,648	156,639	19,367,939	690	a	136,263
1949	a	a	a	2,802	151,137	18,373,103	a	a	a
1948	211	a	75,590	2,848	145,210	17,035,763	641	a	102,653
1947	205	a	57,622	2,635	138,318	15,543,060	565	a	80,598
1946	140	a	36,443	2,541	131,690	13,745,575	530	a	66,209
1945	133	a	31,451	2,470	126,738	13,074,842	530	a	57,554
1944	127	a	31,764	2,508	131,841	13,120,741	530	a	52,587
1943	120	a	27,662	2,445	130,837	15,586,262	530	a	45,330
1942	a	a	a	2,411	126,604	14,319,283	a	a	a
1941	113	a	18,386	2,460	112,944	13,095,909	503	a	31,724

[a]Data not available for these years.

Table UMS-XV (Cont'd.)

Year	Western Colorado Power Co.			Holy Cross Electric Assn.			Public Service Co. of Colorado		
	Miles Energized	Consumers Served	Operating Revenue	Miles Energized	Consumers Served	Operating Revenue	Miles Energized	Consumers Served	Operating Revenue
1960	197	12,198	$2,506,395	643	2,032	$ 296,683	908	318,721	$61,614,755
1959	196	12,095	3,359,032	625	1,905	267,039	908	308,898	53,8[illegible],690
1958	196	11,847	3,125,529	608	1,834	239,652	887	298,475	49,063,437
1957	195	11,627	2,807,720	599	1,696	224,088	801	290,772	45,907,762
1956	195	11,383	2,665,604	554	1,610	229,518	784	281,132	42,50[illegible],407
1955	195	11,106	2,423,052	538	2,034	261,499	680	266,492	38,880,794
1954	195	10,802	2,200,041	533	1,947	240,457	667	248,940	32,789,429
1953	192	10,562	2,111,922	529	1,845	163,742	644	233,317	29,451,027
1952	192	10,496	1,863,510	450	1,255	126,495	602	222,533	26,633,771
1951	191	10,533	1,670,628	450	a	116,269	589	210,905	25,011,904
1950	191	10,438	1,514,188	327	a	97,125	589	198,951	22,399,032
1949	191	10,093	1,385,178	a	a	a	518	187,483	20,119,473
1948	191	9,741	1,264,487	259	a	67,695	497	177,071	18,744,844
1947	191	9,242	1,122,078	152	a	51,681	473	166,924	16,851,936
1946	191	8,630	938,819	152	a	43,986	470	157,869	16,009,464
1945	168	8,051	818,931	137	a	35,631	470	151,685	14,718,775
1944	160	7,707	779,379	137	a	32,385	469	149,842	14,206,417
1943	141	7,502	742,676	112	a	11,906	469	147,485	14,038,534
1942	141	7,714	719,568	a	a	a	440	146,662	12,965,493
1941	141	7,386	743,987	112	a	10,647	441	144,061	12,165,166

[a]Data not available for these years.

Table UMS-XV (Cont'd.)

Year	Mountain Parks Electric Inc.			White River Electric Assn.			Yampa Valley Electric Assn.		
	Miles Energized	Consumers Served	Operating Revenue	Miles Energized	Consumers Served	Operating Revenue	Miles Energized	Consumers Served	Operating Revenue
1960	885	3,497	$ 521,314	528	1,130	$ 332,159	1,453	4,746	$ 959,501
1959	771	3,298	431,702	488	1,124	287,552	1,429	4,610	364,821
1958	762	2,753	456,273	475	1,107	209,192	1,435	4,550	793,126
1957	719	2,655	434,736	458	1,047	171,450	1,395	4,386	675,119
1956	703	2,506	393,787	372	989	144,870	1,356	4,264	611,027
1955	650	2,154	364,629	348	931	128,760	1,299	4,026	544,414
1954	600	1,828	309,627	200	877	109,366	1,109	4,072	487,569
1953	560	1,531	181,584	198	869	97,423	1,031	3,796	446,794
1952	310	537	72,415	192	802	89,688	756	3,581	429,334
1951	69	a	37,401	187	a	82,715	558	a	415,904
1950	24	a	9,354	187	a	74,303	532	a	99,258
1949	-	-	-	a	a	a	a	a	a
1948	-	-	-	23	a	47,616	267	a	37,066
1947	-	-	-	19	a	39,408	201	a	23,730
1946	-	-	-	10	a	17,584	196	a	21,505
1945	-	-	-	-	-	-	194	a	17,439
1944	-	-	-	-	-	-	182	a	15,224
1943	-	-	-	-	-	-	180	a	13,586
1942	-	-	-	-	-	-	-	-	-
1941	-	-	-	-	-	-	-	-	-

[a]Data not available for these years.

Table UMS-XV (Cont'd.)

Year	Gunnison Electric Assn.		
	Miles Energized	Consumers Served	Operating Revenue
1960	400	939	$ 132,990
1959	411	910	126,515
1958	400	828	112,151
1957	396	672	105,038
1956	291	651	105,585
1955	277	584	82,266
1954	270	407	63,177
1953	220	405	51,828
1952	220	402	51,724
1951	209	a	50,336
1950	209	a	46,509
1949	a	a	a
1948	123	a	33,553
1947	123	a	23,676
1946	123	a	20,821
1945	123	a	17,040
1944	123	a	17,058
1943	123	a	16,152
1942	-	a	-
1941	-	-	-

[a]Data not available for these years.

Sources: Annual Statistical Report, 1941-1960, Rural Electrification Administration (Washington, D. C.: U. S. Government Printing Office).

Statistics of Electric Utilities in the United States, Publicly Owned, 1945-1960, Federal Power Commission (Washington, D. C.: U. S. Government Printing Office).

Statistics of Electric Utilities in the United States, Privately Owned, 1941-1960, Federal Power Commission (Washington, D. C.: U. S. Government Printing Office).

INTERINDUSTRY ANALYSIS

TERTIARY INDUSTRIES AND CONSTRUCTION

UPPER MAIN STEM SUB-BASIN

BY

BERNARD UDIS

August, 1967

The tertiary industries are usually viewed as consisting of the trade and service sectors, transportation, utilities, government and finance. Since government is not considered a processing sector in this report it is excluded from the following analysis.

Generally, trade sectors primarily depend upon local income and population. They also reflect the particular trade channels which have evolved in the region for the distribution of goods and services. Typically they cater to the needs of the local population,[1] and mirror changes in the economy which have originated elsewhere in the "basic" industries whose level of operations are determined outside the region. These basic industries are usually the "specialty" industries of the region which export a significant portion of their output to the rest of the country or to customers located abroad.

As noted earlier, the trade categories are treated differently from other industries in input-output analysis. Since they are conceived of as providing essentially place utility without changing the basic physical form of the goods, an attempt is made to get at "value added" by entering only their gross margins into the transactions table. Gross margins are defined to be the sum of operating expenses plus profit. On the basis of intensive study the following margins were used in the Upper Main Stem Sub-Basin: 22.1% for wholesale trade, 24.4% for gas service stations, and 32.5% for other retail trade.

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[1] In those sections of the country which draw visitors from outside their own regions, the trade and service sectors clearly do not depend primarily on local population. This complicates any attempt at projecting future levels of output for these industries. For a further discussion of this see the final chapter of this report dealing with projections and also the section entitled "Outdoor Recreation" by Professor Paul T. Therkildsen which will appear as a part of the final report of this study.

Wholesale Trade[2]

Interindustry Relations---Total gross output of the wholesale sector amounted to $20,345,000.00 in 1960, the seventh largest of the thirty-one processing sector industries in the Upper Main Stem. Although sales of the wholesale industry were made to every other processing sector industry the overwhelming share of its output--84.3%--was destined for the final demand sectors. Among processing sector industries, transportation, and eating and drinking places absorbed the largest outputs from wholesaling. Among final demand sector transactions, wages of slightly more than $5.5 million and combined exports of $5.7 million accounted for the major activities. Something over a fifth of wholesaling's TGO--$4.3 million --was accounted for by inventory accumulation.

Inputs of the Wholesale Sector---Eighty-four percent of the total outlays of this industry went to the autonomous or payments sector with the largest outlay--$5.5 million--representing imports from outside the sub-basin, the bulk of these from outside the Colorado River Basin. These imports constituted one-third of total purchases from the payments sector and about 27% of total gross outlays. Wage payments of $4.8 million ranked next in magnitude, accounting for 28% of wholesalers' purchases from the payments sector.

Within the processing sector, only two industries--transportation and rentals and finance--were significant suppliers to the wholesaling industry, and together accounted for only 13% of wholesalers total outlays.

Direct and Indirect Effects of the Wholesale Trade Sector on the Sub-Basin Economy---Total sales of $1.23 are generated in the regional economy for each sale of $1.00 to final demand sectors by wholesalers. Thus, this industry ranked 19th among the 31 processing sector industries in

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[2]According to the Census of Business for 1958 there were 3,325 wholesaling establishments in the counties comprising the Upper Main Stem of which the largest number (99) were found in Mesa County. 1963 figures of total number of wholesaling establishments were 3,720 while Mesa County increased to 118.

the Upper Main Stem in terms of its influence on the output of other industries. Intraindustry transactions ($1.004) ranked sixteenth among processing sector industries. Only five other processing sector industries responded in amounts of at least $0.01 for each wholesaling dollar of sales to final demand. Transportation with $0.10 and rentals and finance with $0.05, led the list. "All other"services ($0.02),and contract construction and"all other"manufacturing with $0.01 each completed the list.

Service Stations[3]

Interindustry Relations---Among the thirty-one processing sector industries in the Upper Main Stem, gas service stations with a total gross output of $4.5 million had a rank of twenty-two. Just over half of these gross sales went to the final demand sector--$2.4 million. Among sales to final demand sectors, purchases by households of $1.1 million and export sales of $891,000 were the most significant. Of total export sales it was estimated that approximately 77% went outside the Colorado River Basin.

Of service station sales to the processing sectors, the transportation industry and contract construction were the most important customers, together absorbing 56% of total service station sales to other processing sector industries.

Inputs to the Gas Service Station Sector---Of the $4.5 million of total gross outlays of this industry, 86% of $3.9 million represented purchases from the autonomous or payments sector. Payments to sub-basin households, both in the form of profit and wages and salaries, together accounted for 62% of total outlays of the industry. Inputs from outside the Colorado River Basin of $347,000 was the next most significant purchase to the industry--but in magnitude appreciably less than the income payments noted above.

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[3]The 1958 Census of Business shows 204 service stations in the Upper Main Stem with the largest number (63) located in Mesa County. The 1963 Census shows a total of 255 service stations in the sub-basin with the largest number (95) still located in Mesa County.

The most significant processing sector "customers" of the service station industry in this sub-basin were the transportation industry, rentals and finance, electric energy, and contract construction. No other industries purchased as much as $1,000 from service stations.

Direct and Indirect Effects of the Gas Service Station Sector on the Sub-Basin Economy---Service stations ranked twenty-first in importance as a generator of economic activity in the Upper Main Stem with each dollar of their sales to final demand giving rise to total sales of $1.18 in the sub-basin economy. Only six processing sector industries responded by at least $0.01 of sales, and these were lead by the transportation industries ($0.04). In order the remaining five were electric energy ($0.03), rentals and finance ($0.03), other services ($0.02), and contract construction and other utilities with $0.01 each. Intraindustry transactions were just $1.00 or 19th in magnitude among processing sector industries.

"All Other" Retail Trade[4]

Interindustry Relations---The "all other retail" group is a residual category within which new and used car dealers occupy an important position. It's 1960 total gross output of $42.4 million placed this industry in fourth rank in the sub-basin. Almost 95% of its gross output was destined for the final demand sector. Of its $40.1 million of sales to final demand, households took 69%. Combined, inventory accumulation and exports accounted for an additional 28% of sales to final demand.

The major processing sector outlets for the sales of "all other" retail trade are range livestock which purchased one-fourth of all processing sector sales by this industry. Eating and drinking places and contract construction ranked second and third but with appreciably smaller absolute amounts.

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[4] In 1958, the Census of Business classified 258 establishments in the Upper Main Stem as "other retail" trade. The largest number of these (91) were found in Mesa County. In 1963, "other retail" trade establishments numbered 265; Mesa County accounted for 84.

Inputs of the "All Other"Retail Group---The payments sector accounted for 77% of this industry's gross outlays or $32.8 million. Households alone provided $10.9 million combined, both in the form of labor services renumerated by wages, salaries and profits. This represented 63% of total outlays to the autonomous payments sector. Inventory depletion of $6.4 million and imports--almost entirely from outside the Colorado River Basin--of $2.0 million were also significant. Within the processing sectors, rentals and finance, transportation, and printing and publishing each accounted for approximately 6% of gross outlays of the "other retail"trade industry.

Direct and Indirect Effects of "Other Retail"Trade Industry on the Sub-Basin Economy---Processing sector industries of the Upper Main Stem responded with $1.31 of output for each $1.00 of final demand sales by the "other retail" group. This reaction ranked twelfth in the sub-basin.

Eight industries responded in amounts of at least $0.01 for each dollar of final demand sales by the "other retail" group. The most pronounced reaction was rentals and finance ($0.08). Both transportation, and printing and publishing followed with $0.06 each. Other utilities and electric energy showed responses of $0.02 each, all other services $0.03, and contract construction and all other manufacturing $0.01 each.

Eating and Drinking Places[5]

Introduction

A few words are in order concerning this industry before we examine the findings of the input-output analysis. While classified as a retail trade sector in the Census of Business, for purposes of interindustry analysis, eating and drinking places are not treated in the same fashion as other trade sectors. The margining of sales found in the trade sectors

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[5]By Census enumeration in 1958, there were 286 eating and drinking establishments in the Upper Main Stem. Mesa's 68 again led the list. In 1963, 283 eating and drinking establishments were counted; Mesa county accounted for 60.

reflects the fact that there is no physical transformation of the commodity in this phase of its movement to the consumer. This, of course, is not true of restaurants where, for better or worse, the food is cooked, baked, broiled, fried, or what have you. Thus, no margining is applied to the transactions of this industry.

Interindustry Relations---The almost $13 million of gross output of the eating and drinking group earned twelfth rank for the industry among the processing sector industries of the Upper Main Stem. It's $12.7 million of sales to final demand represented 97.5% of its gross output, giving it a fourth ranking position in the sub-basin in terms of its share of output going to other than domestic processing industries. Sales to exports and to sub-basin households constituted 96% of its total final demand output. Exports outside the Colorado River Basin were a full 98% of total export sales.

The remaining 2.5% of its gross output was directed to the processing sector. All other manufacturing, contract construction, and rentals and finance each accounted for approximately $50,000 of sales. Most of its other row intersections were quite insignificant.

Inputs of Eating and Drinking Places---These establishments spent $9.6 million, or approximately 73% of their total outlays, on the output of the payments sector. Almost four-fifths of these purchases came in the form of imports from outside the Colorado River Basin, and labor services provided by sub-basin households.

Almost 63% of this industries purchases from other processing sector industries came from the food and kindred products group, wholesale trade, and other utilities. As is quite natural with this industry, with the exception of its logical tie to the food and products industries manufacturing group, most of its other suppliers are found in the tertiary group of industries.

Direct and Indirect Effects of the Eating and Drinking Industry on the Sub-Basin Economy---The regional economy responded in the amount of $1.39 for each dollar of final demand sales by the eating and drinking group.

This ranked eleventh among the processing sector's thirty-one industries. A total of eleven other industries responded in amounts of at least $0.01 each time eating and drinking places experienced a $1.00 increase in its sales to final demand. With the exception of the food and kindred industries $0.10 reaction, the other responding industries showed relatively small amounts, none exceeding wholesale trade ($0.04).

Lodging

Interindustry Relations---Lodging held fifteenth place among the Upper Main Stems' thirty-one processing sector industries when ranked by magnitude of gross output. Almost 98% of its total gross output ($7.6 million) was accounted for in sales to final demand, and of this 88% represented exports, most of which to tourists from outside the Colorado River Basin. All other manufacturings ($36,000) and contract constructions ($33,000) accounted for the largest shares of lodgings' modest sales to processing sector industries.

Inputs of the Lodging Industry---Slightly over three-fourths of lodging outlays--$5.9 million--went to the payments sector. A full half of these inputs came from sub-basin households with $1.7 million representing wage and salary payments, and $1.3 million--profits and other income. Imports from outside the Colorado River Basin of $1.6 million accounted for 27% of inputs from the payments sector. Among suppliers to the lodging industry in the sub-basin, five industries were moderately significant. These were "other utilities" ($360,000 or 21% of processing sector inputs), "all other" services ($296,000 or 17% of processing sector inputs), electric energy ($249,000), rentals and finance ($237,000), and food and kindred products manufacturing ($220,000). These last three supplying industries each accounted for approximately 14% of processing sector inputs to the lodging industry.

Direct and Indirect Effects of the Lodging Industry on the Sub-Basin Economy---The direct and indirect effect in the sub-basin economy of $1.31 per dollar of lodging sales to final demand ranked thirteenth in

the Upper Main Stem. In terms of self-stimulation, lodgings' intraindustry coefficient of $1.00 was quite low, and ranked nineteenth among the thirty-one processing sector industries in the sub-basin.

Each dollar of lodging sales to the final demand sector did evoke a response of at least $0.01 in seven other sub-basin processing industries. The largest of these reactions was other utilities ($0.05), followed by $0.04 each in"all other"services, electric energy, and rentals and finance. Contract construction, and food and kindred industries showed a response of $0.03, followed by"all other"retail trade ($0.01).

"All Other"Services

This sector includes all services not shown separately on the tables with the exception of professional services which have been included in the "profits and other income" row.

Interindustry Relations---The "other services" group produced a total gross output of $18.6 million in 1960 to earn 10th place among the thirty-one processing sector industries in the Upper Main Stem. Of this amount, $12.6 million or 68% was accounted for as sales to final demand. The major final demand customers of "other services" were households ($4.9 million or almost 40% of final demand sales), state and federal government ($2.5 million or one-fifth of final demand sales), inventory accumulation ($2.1 million or 17% of final demand sales). More than four-fifths of the export sales were destined for outside the Colorado River Basin.

Of $6 million worth of sales to the processing sector by other services, the most important single buying industries were transportation,"all other" retail trade, contract construction, rentals and finance, and lodging. Together these five industries accounted for 67% of sales to the processing sector by the other services industry.

Inputs of the "All Other"Services Industry---Purchases from the autonomous payments sector ($16.3 million) accounted for almost 90% of gross outlays of the"all other"services industry. A full 60% of these

purchases were made from sub-basin households, with $5.2 million in the form of wages and salaries, and $4.6 million in the form of profit and income. Of total imports of $4.2 million, 87% represented imports from outside the Colorado River Basin.

Within the processing sector, intraindustry purchases of $459,000 were the largest single item and represented one-fifth of inputs from processing sectors. Electric energy, other utilities, and rentals and finance followed close behind. These four industries together accounted for 72% of total inputs from processing sector industries to the "all other"services industry.

Direct and Indirect Effects of the "Other Services" Group on the Sub-Basin Economy---The sub-basin economy experienced an addition of $1.19 to its output for each dollar of sales to final demand by the "other services" group. This was a modest reaction and ranked twentieth among all thirty-one sub-basin processing sector industries. Only four other processing sector industries evoked a response of at least $0.01 for each dollar of final demand sales by the "other services" group. The responding industries were electric energy ($0.04), rentals and finance and "other utilities" (each showing a $0.03 reaction), and wholesale trade (a $0.01 reaction). The intraindustry coefficient ($1.03) ranked sixth among all processing sector industries.

Transportation

Interindustry Relations---Transportations' $50.9 million of total gross output ranked third in the sub-basin economy. More than was the case with the other tertiary sector industries discussed in this section, transportation output was directed toward serving the processing sector industries of the Upper Main Stem. Sixty-five percent of its gross output ($33.3 million) represented sales to final demand. Two final demand sectors: exports, and wage payments to sub-basin households, together accounted for 94% of transportation sales to final demand sectors and a full 61% of transportation total gross output. Ninety percent of transportation exports represented those to destinations outside the Colorado River Basin.

Five processing sector industries accounted for 88% of transportation sales to the processing sector in general. These were, in order of their importance, uranium ($8.6 million or 49% of processing sector sales), "other retail" trade ($2.0 million or 12% of sales to processing sector), wholesale trade ($1.7 million or 10% of processing sector sales), transportation ($1.8 million or 10% of sales to processing sectors), and contract construction ($1.2 million or 7% of processing sector sales).

Inputs of the Transportation Industry--- Seventy-six percent of gross outlays of the transportation group ($38.9 million) went for purchases from the payments sector. Wages of $14.5 million (37% of purchases from the autonomous sectors) and imports of $12.4 million (32% of autonomous sector purchases) led the list of significant supplying industries to transportation.

Within the processing sector group, no industry approached the "all other" manufacturing group in importance as a supplier to transportation with its $5.7 million (47% of gross outlays) of transportation. Other services and intraindustry purchases each represented approximately 15% of processing sector inputs.

Direct and Indirect Effects of Transportation Industry on the Sub-Basin Economy---Transportation sales to final demand of $1.00 gave rise to an accumulative effect of $1.27 from the processing sector of the sub-basin. This ranked eighteenth out of the thirty-one industries in the Upper Main Stem.

Nine of these industries responded by at least $0.01 for every such dollar of final demand sales by the transportation group. The largest response was found in"all other" manufacturing which reported $0.12. This was followed by $0.04 in "all other" services, $0.02 each in rentals and finance, and service stations, and $0.01 in wholesaling. The intra-industry coefficient of $1.04 ranked fifth among all industries in the sub-basin.

"All Other"Utilities

Interindustry Relations---The utilities group, excluding electric power, ranked ninth in the sub-basin with total gross output of $19 million. Eighty-one percent of this amount ($15.3 million) represented sales to final demand. Sub-basin households were the major customer in the final demand sector, and their purchases of $7.1 million accounted for 37% of the gross output of the industry, and 46% of its sales to the final demand group. Inventory accumulation and exports to other Colorado River Sub-Basins were also significant as final demand sources for the output of the other utilities group.

Within the processing sector industries, at least 10% of such processing sector sales were accounted for all other retail trade, rentals and finance, all other services, and lodging. Eating and drinking places and uranium were close behind, each approaching 10% of other utility sales to processing sector industries.

Inputs of "All Other"Utilities ---This industry's purchases from the payments sector of $17.9 million represented 94% of its gross outlays. Inventory depletion, payments to sub-basin households both in the form of wages and profits and other income, and imports in the aggregate accounted for 84% of the"other utilities"group purchases from the payments sector.

Contract construction,"all other"services, and rentals and finance were the three most important supplying industries to the"other utilities" group within the processing sector.

Direct and Indirect Effects of the "All Other"Utilities Group on the Sub-Basin Economy---This industry was a rather weak generator of economic activity in the Upper Main Stem, giving rise to a total reaction of $1.12 for each dollar of its sales to the final demand sector among the regions' processing industries. This figure ranked twenty-third out of the Upper Main Stem's thirty-one processing sector industries. Only three industries--contract construction, rentals and finance and"all other"services responded

in amounts of at least $0.01 per dollar of the"other utilities"group final demand sales. The responses were respectively, $0.04, $0.02 and $0.02.

Contract Construction

Interindustry Relations---Contract constructions' gross output of $93.6 million led all thirty-one industries in the processing sector of the Upper Main Stem Sub-Basin in 1960. Seventy-two percent of this total ($68.1 million) represented sales to final demand. Almost 91% of construction sales to final demand were accounted for by four groups: gross private capital formation, inventory accumulation, exports to other sub-basins in the Colorado River Basin, and payments to sub-basin households in the form of wages and salaries. Intraindustry sales of $23.8 million was by far the most significant single processing sector transaction, and represented 25% of the construction industry's total gross output.

Inputs of Contract Construction---Construction's $62.4 million purchases from the payments sector accounted for 67% of its gross outlays. Fully 88% of inputs from the autonomous sector were accounted for by imports (most of these from outside the Colorado River Basin), wage payments, and inventory depletion. The largest single source of supply from the processing sector was accounted for in the form of intraindustry transactions of $23.8 million. The next three ranking industries, "all other"mining; stone, clay and glass; and transportation did not singly amount to $1.5 million. In aggregate these three industries accounted only for 12% of inputs from processing sectors to contract construction.

Direct and Indirect Effects of the Contract Construction Industry on the Sub-Basin Economy---Construction ranks seventh among the Upper Main Stem's thirty-one processing sector industries, generating $1.57 accumulative effects in the sub-basin economy for every dollar of its sales to final demand. Six industries responded in amounts of at least $0.01. The largest was the $0.03 reaction of"all other"mining. Stone, clay and glass,

"all other" manufacturing, transportation, and rentals and finance each reacted in the amount of $0.02, and "all other" services reacted with $0.01. Intraindustry effects already noted as being rather significant were particularly noticable in terms of direct and indirect effects. Here, the construction industry ($1.41) ranked first in intraindustry reaction in the sub-basin.

Rentals and Finance

Interindustry Relations---Rentals and finance ranked fifth in the sub-basin economy with total gross output of $36.5 million. It's sales to final demand ($27.3 million) accounted for 75% of its gross output. The overwhelming share of these sales--97%--were due to sales to three sectors, sub-basin households ($15.9 million), exports of $5.3 million (97% went to destinations outside the Colorado River Basin), and sales to local, state, and federal government which in aggregate total $5.4 million.

Of the $9.3 million of sales of the rentals and finance sector to processing sector industries, only two sectors accounted for at least $1 million of sales: "all other" retail trade ($2.7 million), and range livestock ($1.1 million). Sales to wholesale trade, intraindustry transactions, and contract construction each absorbed between $847,000 and $888,000 or approximately 9% of processing sector sales by rentals and finance.

Inputs of Rentals and Finance---Ninety-three percent of finance industry outlays represented purchases from the payments sector. Of this substantial figure, $34 million, the largest share (53% or $17.9 million) represented payments to households as profits and related income. This large entry reflects the convention of channeling property and related income through the rentals and finance sector. Payments to sub-basin households for labor services amounted to $8.9 million (26% of inputs from the autonomous or payments sector). The combined payments by the rentals and finance industry to households ($26.8 million) ranked first among all thirty-one processing sectors in the sub-basin. Imports and purchases from the state and local governments--largely in the form of tax payments--were also significant inputs to rentals and finance.

Intraindustry transactions were the most significant among processing sector inputs of rentals and finance. "All other"services and"other utilities"were also moderately important as supplying industries.

Direct and Indirect Effects of the Rentals and Finance Industry on the Sub-Basin Economy---The rentals and finance sector was not a powerful generator of additional economic activity in the region. Its $1.08 of direct and indirect effect accompanying each dollar of final demand sales ranked twenty-eighth among thirty-one processing sector industries in the Upper Main Stem. Only two other industries responded by at least $0.01 to each dollar increase in finance sales to final demand. These were other utilities and all other services. The intraindustry coefficient of $1.02 ranked seventh among sub-basin processing industries.

PROJECTED INTERINDUSTRY RELATIONS

UPPER MAIN STEM SUB-BASIN: 1980 AND 2010

August, 1967

Principal Authors

Jay Andersen
Gilbert W. Bonem
John H. Chapman, Jr.
William H. Mierzyk
Bernard Udis

PROJECTIONS

We are striving for long-range consistent projections for the Colorado River Basin in addition to a model of the region's structural interdependence in the base year -- 1960. It is true, of course, that the quality of any attempt to forecast the future structure of a region's economy through the input-output technique will be no better than the independently determined estimates of final demand used and the validity of the input coefficients. Nevertheless, we believe that the automatic internal consistency feature of input-output analysis will impose useful limits on the range of our forecasts of final demand, assuming that we have knowledge of factor productivity and of resource constraints within the region. As Evans & Hoffenberg have noted,

> . . . a reasonable structural relationship that accounts directly and positively for demand should give sensible results regardless of the values of the independent variables in the estimating equation. A regression relationship based on historical data, on the contrary, may in some instances yield estimates that contradict physical possibilities. The degree to which past variation is "explained" by the equation as judged by the coefficient of correlation, is not evidence in determining whether a representation of the underlying structural situation has been obtained.[1]

This advantage of input-output technique is especially valuable in our study since one of our major tasks will be to determine the feasibility of alternative growth patterns in the Colorado Basin in terms of anticipated resource availability -- particularly water. Thus, once the water requirements, both quantitative and qualitative, which match alternative demand structures have been ascertained, we should be able to render a judgment on the ability of the region to sustain a particular development path.

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[1] W. Duane Evans and Marvin Hoffenberg, "The Nature and Uses of Interindustry-Relations Data and Methods," in Conference on Research Income and Wealth, Input-Output Analysis: An Appraisal (Princeton: Princeton University Press, 1955), pp. 53-123, especially p. 112.

The Stability of Technical Coefficients

There is evidence that for relatively short periods input coefficients are quite stable. Also, given the relatively weak interdependence among many sectors of the sub-basin economies, some of the direct input coefficients are quite small. Even fairly large changes in these coefficients would not have a serious impact upon the interindustry projections. One can be equally sure, however, that for long-term projections regional input-output coefficients will not be stable. These coefficients can be affected by: (a) changes in relative prices with possible substitution among factors of production, (b) technological change, and (c) changes in interregional trade patterns. Each of these might have an important effect upon the regional coefficients and hence upon the accuracy (or even the "reasonableness") of the projected transactions tables.

It should also be mentioned that the projections of gross output, and hence the new transactions tables, can also be affected by errors in projection of final demand. There is no fixed formula for projecting final demand. Different methods have been employed in making the projections for agriculture; for the mining, manufacturing and energy sectors; and for the trade, service and construction sectors. The assumptions on which the final demand projections are based, and the projection methods used, are discussed in a later section of this chapter

Long-Run Change in Input-Output Coefficients

The static, open input-output model used in the Colorado River Basin Economic Study is based upon three fundamental assumptions. These are that:

(1) Each group of commodities is supplied by a single producing sector.

(2) The inputs to each sector are a unique function of the level of output of that sector.

(3) There are no external economies or diseconomies.[2]

It is assumed that the demand for part of the output of one nonautonomous sector (x_i) by another nonautonomous sector (x_j) is a direct

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[2] Chenery and Clark, op. cit., pp. 33-34.

function of the level of production in x_j. This is expressed symbolically in equation (1):

$$(1) \qquad x_{ij} = a_{ij}X_j$$

The transactions table may then be described by equation (2):

$$(2) \qquad X_i = \sum_{j=1}^{n} a_{ij}\,(x_j) + x_{ia} \qquad (i = 1. \ . \ .n)$$

where x_j is the amount demanded by the j-th sector from the i-th sector, and x_{ia} is the end product demand of the autonomous sector.

The direct input coefficients in equation (1) may be rewritten as

$$(3) \qquad a_{ij} = \frac{x_{ij}}{X_j},$$

and it is the stability (or lack of stability) of these input coefficients that we wish to examine.

The Effects of Changes in Prices and Technology on the Direct Input Coefficients

The trend of some prices can be projected with reasonable accuracy. The "price" of labor (wages plus fringe benefits) has been steadily rising, and it is relatively safe to assume that this rise will continue. It is less easy to forecast future changes in the prices of some of the other factors of production. In making consistent projections, however, it is not absolute price changes but relative price changes that matter since it is the latter which are likely to induce substitution among the factors of production. This raises some questions: What will be the direction and rate of changes in prices for the various factors of production? And how are these relative changes likely to affect the demand for different factors of production?

These are not simple questions to answer, but it might not be necessary to answer them directly since the effects of relative price changes are

not completely independent of technological change. This can be illustrated by a simple example. If labor costs rise more rapidly than the cost of capital, management will have an inducement to substitute machinery for labor. This substitution is not a continuous process since it is partly dependent upon discovery and innovation. It also depends upon the extent to which existing machinery has been depreciated, the state of the market, and a number of other variables. But in many industries there has been a long-run substitution of capital for labor, and it is reasonable to suppose that this is at least partly a function of relative changes in labor and capital costs.[3] Thus, if it is possible to adjust the a_{ij}'s for long-run technological change, some of the effects of relative price changes will be included. If these changes can be projected, the resulting coefficients will have been "adjusted" to some extent at least for anticipated changes in relative prices and technology.

In an effort to adjust for such changes a simple "dynamic" model has been constructed.[4] The input coefficients in the 1960 tables represent averages based on the sample establishments included in the various subbasin surveys. Within each industry and sector, however, there are variations around these averages, and to a large extent the different input patterns are the result of variations in productivity among the establishments in each industry and sector. These variations in productivity in turn are primarily a function of the combinations of capital and labor in the sample establishments.[5]

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[3] See, for example, U.S. Department of Labor, Bureau of Labor Statistics, Technological Trends in Thirty-Six Major American Industries (Washington, D.C.: Office of Productivity and Technological Developments, 1964).

[4] The general outline of this technique for adjusting input coefficients was suggested by Professor Wassily Leontief of Harvard University. The procedure is a simplified version of methods used by others for projecting technical coefficients for specific industries. See, for example, Anne P. Carter, "Incremental Flow Coefficients for a Dynamic Input-Output Model with Changing Technology," in Tibor Barna (ed.), Structural Interdependence and Economic Development (New York: St. Martin's Press, 1963), pp. 277-302; and Per Sevaldson, "Changes in Input-Output Coefficients," idem., pp. 303-328.

[5] It is important to stress that not all variations in productivity are the result of different capital/output ratios. An example of another influence, which complicates the statistical analysis, is given in a later section.

The measurement of productivity is not a simple process. The following formulas were used to estimate productivity in the sample establishments in the lower sub-basins:

$$(4) \qquad P = \frac{O}{(L)} \quad ,$$

and

$$(5) \qquad P' = \frac{O}{(C)+(L)}$$

where P and P' equal "productivity," O is the gross output of the establishment measured in dollars, C represents capital inputs, and L represents labor inputs. Ideally, the labor inputs would be measured in terms of man-hours or man-years. Data were not available on this basis, however, and in our computations L measures the annual average number of production workers in each establishment. Also, ideally C should measure the stock of capital in the establishment in 1960. Since this figure could not be obtained for each establishment, that year's depreciation allowance was used as a substitute. In effect, the depreciation allowance was used to weight the labor input to give an approximation of output per unit of capital plus labor inputs. This is admittedly a rough measure, but it would have been useless to employ a more refined formula given the data limitations.

The use of two formulas to estimate "productivity" requires an explanation. It has long been customary to measure productivity in terms of labor inputs, and this practice has been followed in the present study by using formula (4) above. It is possible, however, for two establishments in the same industry to produce the same number of units of output in a given time period, and yet have widely different labor inputs. If this occurs, examination will generally reveal that the establishment with smaller labor inputs has correspondingly higher capital inputs. For this reason, a second measure of productivity -- the one represented by formula (5) -- was also computed for each industry and sector.[6] The two productivity

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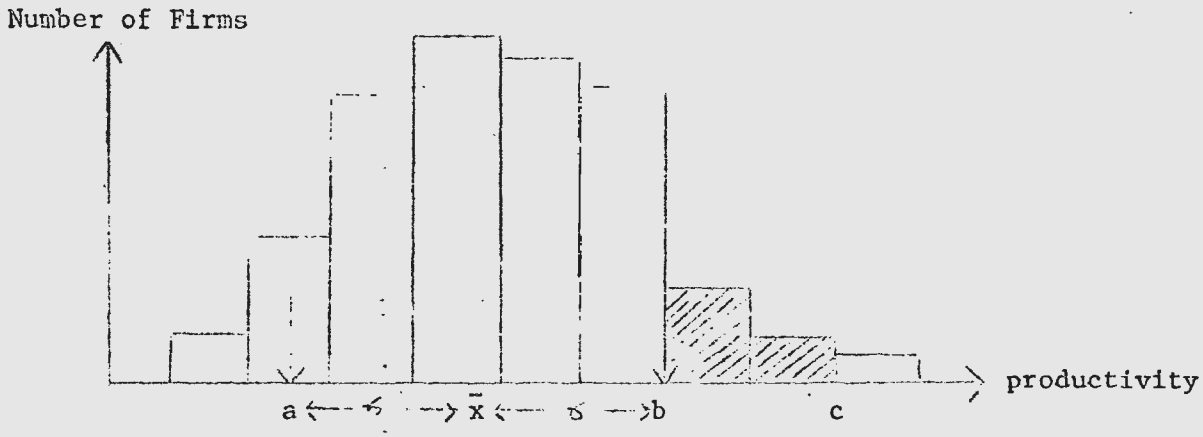
[6] For a detailed discussion of the two types of productivity measure see Solomon Fabricant, Basic Facts on Productivity Change (New York: National Bureau of Economic Research, Inc., Occasional Paper 63, 1959), pp. 3-13.

indexes computed for sample establishments in the lower sub-basins were used to identify the more "advanced" establishments in each industry and sector. In general, it was assumed that the establishments with the highest capital/output ratios fell in this category. Thus primary reliance was on the measures computed by formula (5). The measures computed by (4) were used largely as a check to help spot unusual sample establishments in each industry or sector.

If we assume for the moment that there are a large number of establishments in each industry and sector surveyed, a frequency distribution of P's might look something like Figure P-1.

Figure P-1



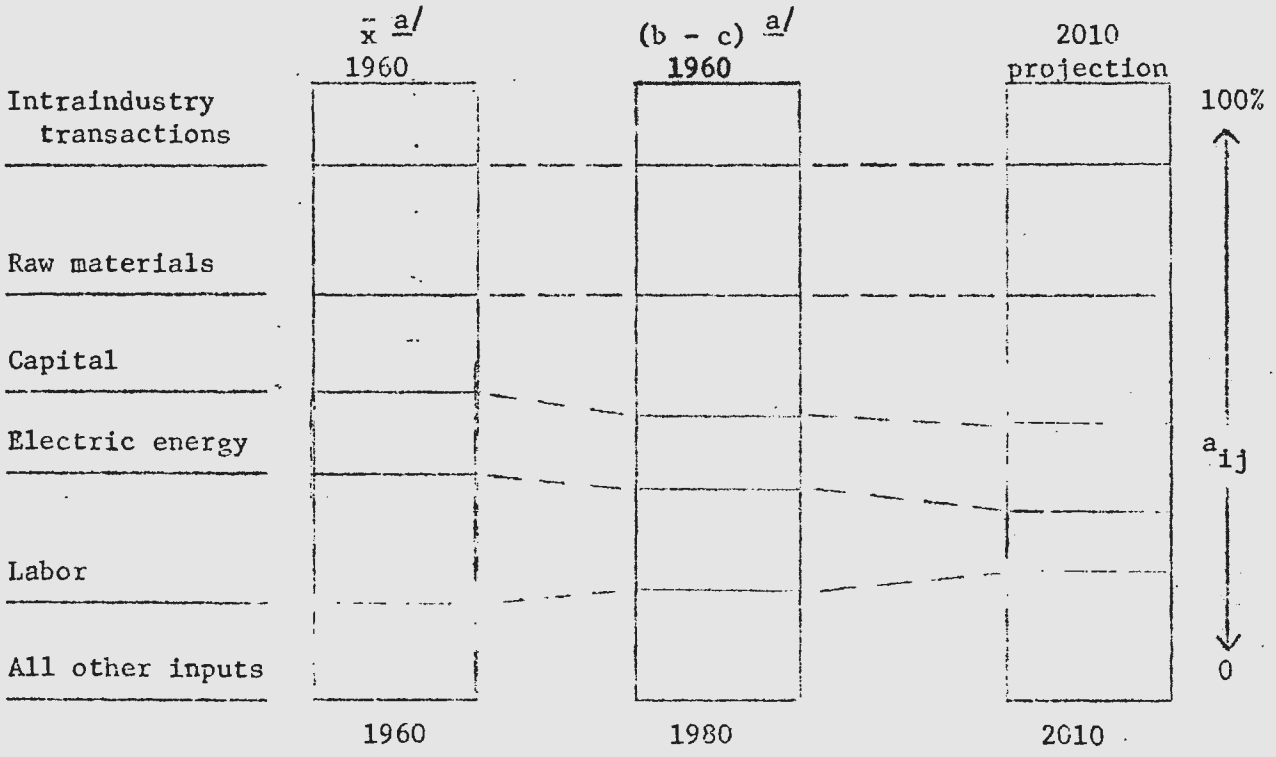
The $\bar{x}$ represents the mean, and the interval a to b represents the mean plus or minus one standard deviation. In a normal distribution this would include about 68 per cent of the firms. In this study, the a_{ij}'s are approximately representative of the firms with average productivity, or $\bar{x}$ in this distribution.

Consider for a moment the firms in the shaded interval (b - c) of Figure P-1. These are establishments with relatively high levels of productivity. In general, although this is not necessarily true, these will be newer firms with more advanced equipment than those in the interval (a - b). They will also be "better managed" than those which fall in the range of the mean plus or minus one standard deviation. Let us assume that the firms in the interval (b - c) are about twenty years "newer" on the

average than those which fall in the interval (a - b). We can make the further assumption that competitive pressures will force the firms in the interval (a - b) to try to emulate those in the interval (b - c), and that new firms coming into the industry will more closely resemble the newer firms than those in the interval (a - b). That is, we are assuming that there will be steady improvement in industry-wide productivity. If these assumptions are at all realistic the "average" firm in 1980 will roughly approximate the "superior" firms in 1960, and we can estimate the average input coefficients for 1980 from those of the establishments in the interval (b - c) in 1960. From these, a new table of a_{ij}'s can be constructed and used to make the 1980 projections. The input coefficients can then be extrapolated to 2010. This procedure is illustrated by the hypothetical example of Figure P-2.

Figure P-2

INPUT COEFFICIENTS FOR A HYPOTHETICAL INDUSTRY
AS A PER CENT OF TOTAL INPUTS



[a]Based on 1960 interview data. Figures at bottom of each column show years for which these input patterns will be used.

For purposes of this illustration assume that intraindustry transactions and the raw material coefficient in this industry remain unchanged. Assume, however, that there will be a substitution of capital for labor. The input coefficients for 1980 are the average coefficients for establishments in the 1960 interval (b - c) in Figure P-1. If we assume that this substitution will continue, the changes can be projected to 2010 to give the input coefficients shown by the third bar of Figure P-2.[7]

The question might be raised: Why select the firms in the interval (b - c) of Figure P-1? Why not take the "best" firm to the right of c in this Figure?

The answer is that an effort is being made to project a "representative" firm in 1980, and this is not necessarily the "best" firm in 1960. The Office of Productivity and Technological Developments of the U.S. Department of Labor at one time considered using the "best" (i.e. highest-productivity) firm in its surveys in making national projections of technological change. Upon investigation, however, it was found that the "best" firm in many cases was often so atypical that it would be unsafe to use it for projection purposes. Such firms may be relatively small, family-owned operations, and the persons who run the firm are highly motivated. They do not necessarily have the latest equipment, and are not necessarily the "best" firm in the industry in a technological sense. Hence, a safer assumption is that average productivity in some future year will be more nearly approximated by that found in a small sample of "representative" superior firms in the base period.[8]

Some Practical Considerations Involved in Applying the Simple Dynamic Model to the Sub-Basins

The simple model sketched above was based upon a number of assumptions, and few of these assumptions apply to this study. The major problem is that in only a few sectors -- and these are largely nonmanufacturing -- are there enough establishments in the sample to provide a

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[7] Such projections must be made cautiously rather than mechanically and would not necessarily be the linear extrapolations suggested by Figure P-2.

[8] This paragraph is based on comments made by Mr. Leon Greenberg, Bureau of Labor Statistics, at the Conference on Manpower Projections held at the Brookings Institution, Washington, D. C., June 25-26, 1964.

frequency distribution which even begins to approximate that sketched in Figure P-1. In the cases where there are enough establishments in the sample -- say twenty or more -- variations similar to those assumed in the model were found. Unfortunately, even in these cases not all of the questionnaires were complete enough to permit the mechanical calculation of new "average" coefficients for 1980. Some approximation was required, and here it became necessary to rely upon the extrapolation of national productivity trends to round out the picture. Also, there is no way of knowing even in these cases whether the superior establishments in the sample are "twenty years ahead of the times" when compared with the average establishments in 1960. In spite of these problem, it appears that the best estimates of a_{ij}'s for 1980 will be those computed from a small sample of superior establishments operating in 1960.

The problem is even more acute in the case of other sectors where our survey was limited to a small number of firms. Equally wide variations in "productivity" were found in these sectors, but it required discussion with the individual interviewers in most cases before a decision could be made about using one or two of the superior firms in 1960 as prototypes of the "average" firm in 1980. Again it was necessary to supplement the survey data with projections of national trends to estimate the input coefficients for these industries and sectors in 1980. The problem of extrapolation to 2010 was also a serious one, but if one assumes that "reasonable" input coefficients were projected to 1980 the latter problem may be viewed as manageable.

The Effects of Changing Patterns of Trade on Regional Input Coefficients

In regional input-output analysis particular attention must be directed to the influences of changing trade patterns on the region's input coefficients In his recent book, Miernyk gives a lucid example of this problem which might well have been drawn from the Colorado River Basin:

> Assume that in a base period, a region relies heavily upon some extractive activity -- say the mining of coal and various minerals. At one stage of the region's development, both the coal and ore might be shipped to other regions. Since

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> ore is in general a "weight-losing" material, however, at some point it will become economical to locate a concentrating mill close to the mines. The minerals will then become an input to the concentrating mill, and only the metal concentrate will be exported. If the production of this ore expands, however, it might soon become economical to locate a smelter in the region. The concentrate will then no longer be an export but will become an input to the smelter. The smelter, in turn, could stimulate the growth of various types of fabricating operations in the area, and these might attract satellite activities. The location of a smelter and of fabricating activities in the region would change the distribution pattern of coal mined in the area. The smelter would use coal as inputs, and this might also be true of some of the fabricating plants, so that relatively less coal would show up in the export column as some part of regional production became inputs to establishments in the area.[16]

The high degree of specialization found in regions of the country make such changes in trade patterns a potential threat to the stability of technical coefficients. Even if similar technology were assumed for all parts of the country, questions of interregional trade patterns and sector composition would somehow have to be handled in any effort to project through the use of input-output analysis.

Locational theory and empirical location studies have been helpful in making projections of structural changes in the sub-basin economies to 1980 and 2010. The first step was to determine the kinds of economic activities not now represented in the sub-basins which might locate there between now and 1980. Following this, it was necessary to estimate their total purchases and sales on the basis of population projections, and projected changes in the outputs of existing industries. National demand for the output of these industries (as well as of existing industries) was estimated. Then the share of national demand which will be supplied by industries in the sub-basins was determined. Probable changes in import and export patterns for each of the industries and sectors currently operating in the sub-basins was also estimated. None of this was easy, but it was necessary in order to anticipate changes in the structure of the sub-basin economies and to make the projected input-output tables operationally significant.

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[9] William H. Miernyk, The Elements of Input-Output Analysis, op. cit. pp. 71-72.

After projecting the activities that are most likely to appear in the sub-basins between now and 1980, the final step was to estimate their input coefficients (as well as their impacts on imports and exports). Here we were forced to rely upon preliminary input coefficients from other regional studies and on national coefficients which could be used as a first approximation to the regional coefficients. These were then adjusted to take into account differences in the characteristics of the regional economies and the national economy.

The many adjustments necessary to allow for structural change, and changes in trade patterns, required a number of assumptions and a certain amount of judgment. It must be emphasized that the end result is a series of projections, based upon probability or likelihood, rather than predictions. It is probably safer, however, to use the tools of location theory, and the experience of earlier location studies, in projecting the sub-basin economies to 1980 and 2010 than to make the assumptions that their present structures will remain unchanged, and that the input coefficients for 1960 will still apply in 1980 and 2010.

PROJECTIONS OF INTERINDUSTRY RELATIONS IN THE UPPER MAIN STEM SUB-BASIN, 1980 AND 2010[10]

A summary of the projections of final demand for each industry included in the processing sectors of the 1960 transactions table for the Upper Main Stem Sub-Basin appears in Table P-1. Following it, projected interindustry transactions tables and their derivitive tables of direct, and direct and indirect coefficients appear as Tables UMS-1980$_{a,b,c}$ and UMS 2010$_{a,b,c}$. The projections of final demand for each sector were made by the individuals responsible for that particular industry group.[11] Direct input coefficients for 1980 and 2010 for all processing industry sectors were initially made by Professor William H. Miernyk, Director, Regional Research Institute, West Virginia University. They were checked by the individuals primarily responsible for individual sectors.[11]

Projections of Final Demand for the Agricultural and Forestry Sectors

Projected outputs in agriculture are based on land in cultivation, cropping pattern, yield projections, and livestock productivity expectations.

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[10] The projections which follow have been described in various staff memoranda as "unconstrained." What is meant by this is that the quantity and quality of water is expected to be available for economic activity in the Upper Main Stem Sub-Basin in 1980 and 2010 is assumed to be at least equal to the 1960 water supply. In a final report on the economic study of the Colorado River Basin to be forthcoming shortly, this artificial constraint will be relaxed and the economic consequences of reduced water availability and deteriorating water quality will be considered.

[11] Projections of agricultural activity were made by Dr. Jay Andersen of the Economic Research Service, Department of Agriculture, Logan, Utah. The manufacturing, mining and electrical energy section projections were done by Dr. John H. Chapman, Jr., Assistant Professor of Economics at West Virginia University. Projections for the tertiary industries (trade, services, construction, government, etc.) were made under the direction of Dr. Bernard Udis, Director of the Bureau of Economic Research, University of Colorado, Boulder.

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Table UMS-P-1

1960 Final Demand, and Final Demand Projected to 1980 and 2010, by Sectors
In the Upper Main Stem Sub-Basin
(thousands of dollars)

Industry Sectors	1960 Final Demand	1980 Final Demand	1960 - 1980 % Change	2010 Final Demand	1960 - 2010 % Change
Range Livestock	$19,216	$ 6,942	- 63.9%	$ 7,901	- 58.9%
Feeder Livestock	3,627	18,149	400.4	31,862	778.5
Dairy	705	680	- 3.6	655	- 7.1
Food & Field Crops	4,131	4,396	6.4	4,758	15.2
Truck Crops	818	1,140	39.4	1,729	111.4
Fruit	5,252	7,682	46.3	12,900	145.6
Forestry	64	1,291	1,917.2	2,118	3,209.4
Other Agriculture	1,908	1,400	- 26.6	1,180	- 38.2
Coal	4,630	6,380	37.8	5,891	27.2
Oil & Gas	1,940	1,000	- 48.5	1,000	- 48.5
Uranium	75,568	72,640	- 3.9	70,000	- 7.4
Zinc	11,564	16,317	41.1	22,431	94.0
Other Mining	3,900	4,613	18.3	5,233	34.2
Food & Kindred Products	16,417	25,625	56.1	30,815	87.7
Lumber & Wood Products	4,764	5,868	23.2	9,770	105.1
Printing & Publishing	253	341	34.8	419	65.6
Fabricated Metals	824	1,418	72.1	2,328	182.5
Stone, Clay & Glass Products	319	384	20.4	406	27.3
Other Manufacturing	8,756	5,341	- 39.0	21,235	142.5
Wholesale Trade	17,155	37,088	116.2	83,567	387.1
Service Stations	2,358	5,706	142.0	12,857	445.3
Other Retail Trade	40,100	87,015	117.0	196,062	388.9
Eating & Drinking Places	12,651	28,530	125.5	64,283	408.1
Agricultural Services	- 0 -	28	*	116	*
Lodging	7,479	17,291	131.2	47,977	541.5
Other Services	12,578	35,105	179.1	111,946	790.0
Transportation	33,260	38,668	16.3	39,016	17.3
Electric Energy	4,450	5,341	20.0	8,561	92.4
Other Utilities	15,340	21,670	41.3	35,651	132.4
Contract Construction	68,055	96,428	41.7	133,494	96.2
Rentals & Finance	27,278	65,745	141.0	160,598	488.7

* Percentages are mathematically undefineable.
Source: Tables UMS-S, 1980-a and 2010-a.

Industry Producing		Industry Purchasing	1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food & Field Crops	5 Truck Crops	6 Fruit	7 Forestry	8 All Other Agriculture	9 Coal	10 Oil & Gas	11 Uranium	12 Zinc	13 All Other Mining	14 Food & Kindred Products	15 Lumber & Wood Products	16 Printing & Publishing	17 Fabricated Metals	18 Stone, Clay & Glass	19 All Other Manufacturing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating & Drinking Places	24 Agricultural Services	25 Lodging	26 All Other Services (Except Professional)	27 Transportation	28 Electric Energy	29 Other Utilities	30 Contract Construction	31 Rentals & Finance	32 Final Demand	33 Total Gross Output	
Agriculture		1. Range Livestock	2,918	15,269	52	0	0	0	0	318	0	0	0	0	0	4,523	0	0	0	0	0	0	0	0	61	0	0	0	0	0	0	0	6,942	30,083	1.
		2. Feeder Livestock	0	0	0	0	0	0	0	0	0	0	0	0	0	8,733	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18,149	26,882	2.
		3. Dairy	90	54	0	0	0	0	0	48	0	0	0	0	0	1,705	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	680	2,577	3.
		4. Food & Field Crops	0	296	0	0	0	0	0	0	0	0	0	0	0	2,192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,396	6,884	4.
		5. Truck Crops	0	0	0	0	0	0	0	0	0	0	0	0	0	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,140	1,210	5.
		6. Fruit	90	0	44	0	0	0	0	0	0	0	0	0	0	1,635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,682	9,451	6.
		7. Forestry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,367	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,291	3,658	7.
		8. All Other Agriculture	0	0	0	0	0	0	0	0	0	0	0	0	0	1,009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,400	2,409	8.
Mining		9. Coal	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	3	6	0	0	0	0	0	17	47	0	1,566	150	0	0	6,380	8,177	9.
		10. Oil & Gas	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000	1,015	10.
		11. Uranium	0	0	0	0	0	0	0	0	0	0	16,271	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72,640	88,911	11.
		12. Zinc	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16,317	16,333	12.
		13. All Other Mining	0	0	0	0	0	0	0	0	0	0	1,067	16	9	0	0	0	0	733	0	0	0	0	0	0	0	0	0	0	0	0	4,613	8,883	13.
Manufacturing		14. Food & Kindred Products	0	4,355	111	0	0	0	0	241	0	0	0	0	0	209	0	0	0	0	0	0	0	0	3,561	27	524	141	0	0	0	0	25,625	34,794	14.
		15. Lumber & Wood Products	30	0	0	0	0	9	0	0	0	0	178	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	0	5,868	6,229	15.
		16. Printing & Publishing	0	0	0	0	0	9	0	0	8	1	0	0	62	70	0	125	3	11	73	0	9	5,354	263	34	35	328	64	15	210	0	351	341	7,366	16.
		17. Fabricated Metals	0	0	0	0	0	0	0	0	0	0	445	278	107	0	0	0	3	0	18	0	0	0	0	0	0	0	0	15	0	288	0	1,418	2,570	17.
		18. Stone, Clay & Glass	0	0	0	0	0	0	0	0	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,301	0	384	2,832	18.
		19. All Other Manufacturing	511	27	57	503	39	132	77	12	82	15	356	131	53	418	56	29	162	147	110	43	9	272	29	191	35	47	7,252	91	270	1,582	175	5,341	18,253	19.
Trade	Retail	20. Wholesale Trade	301	27	28	89	11	66	26	14	0	14	356	98	133	244	12	15	3	8	55	85	9	272	1,372	68	122	703	706	15	120	575	88	37,088	42,724	20.
		21. Service Stations	301	27	26	151	4	47	44	26	0	6	89	0	9	209	31	7	3	17	18	43	0	91	29	55	0	0	1,219	15	30	431	88	5,706	8,722	21.
		22. All Other Retail	632	54	64	110	37	180	26	12	0	11	89	0	36	35	12	37	5	3	55	85	26	363	438	27	245	328	193	30	90	288	263	87,015	90,788	22.
		23. Eating & Drinking Places	30	0	3	0	0	0	0	0	0	1	0	0	0	35	0	7	0	0	55	43	9	91	0	0	0	47	64	15	30	144	88	28,530	29,191	23.
Services		24. Agricultural Services	722	430	271	503	520	4,291	0	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	28	6,829	24.
		25. Lodging	0	0	0	0	0	0	0	0	0	1	0	0	0	35	0	0	0	0	37	43	0	0	0	0	35	0	0	0	30	0	0	17,291	17,471	25.
		26. All Other Services (Except Professional)	90	54	3	76	1	38	7	14	8	43	178	49	36	209	31	44	26	17	73	513	140	2,269	263	55	734	1,688	2,182	152	600	1,150	1,052	35,105	46,897	26.
		27. Transportation	361	699	144	110	1	9	0	51	0	23	8,358	0	0	70	710	37	28	68	274	4,186	366	4,719	263	20	87	281	2,310	61	30	2,157	88	38,668	64,180	27.
Utilities		28. Electric Energy	120	27	36	28	5	38	0	17	237	10	445	572	187	348	137	88	15	45	219	214	253	1,361	525	164	594	1,641	64	1,596	120	144	614	5,341	15,205	28.
		29. Other Utilities	60	0	5	14	1	9	0	12	82	2	267	65	89	209	44	110	13	31	110	342	113	1,633	759	34	856	1,453	193	152	360	431	877	21,670	29,997	29.
		30. Contract Construction	0	0	0	0	0	0	0	0	0	16	89	16	0	35	0	15	0	0	128	256	52	726	642	0	367	281	257	46	1,200	42,994	263	96,428	143,811	30.
		31. Rentals and Finance	1,203	457	67	48	17	57	84	34	155	82	89	16	71	139	106	103	5	42	310	2,136	297	6,806	701	116	646	1,266	1,027	304	480	2,876	2,192	65,745	87,678	31.
		32. Final Payments	22,624	5,106	1,666	5,252	574	4,566	3,396	1,552	7,450	775	60,634	15,076	8,091	12,662	2,723	6,749	2,301	1,704	16,718	34,735	7,439	66,831	20,346	5,970	13,174	38,646	48,649	11,132	26,277	85,862	81,539			32.
		33. Total Gross Outlays	30,083	26,882	2,577	6,884	1,210	9,451	3,658	2,409	8,177	1,015	88,911	16,333	8,883	34,794	6,229	7,366	2,570	2,832	18,253	42,724	8,722	90,788	29,191	6,829	17,471	46,897	64,180	15,205	29,997	144,811	87,678			33.

Note: Each row shows sales by the industry at the left to all industries listed at the top of the table. Each column shows purchases by the industry listed at the top of the table from each industry listed down the left margin.

INTERINDUSTRY TRANSACTIONS (IN THOUSANDS OF DOLLARS)
UPPER MAIN-STEM SUB-BASIN 1980
Table UMS-1980-a

Industry Producing	Industry Purchasing	1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food & Field Crops	5 Truck Crops	6 Fruit	7 Forestry	8 All Other Agriculture	9 Coal	10 Oil & Gas	11 Uranium	12 Zinc	13 All Other Mining	14 Food and Kindred Products	15 Lumber and Wood Products	16 Printing & Publishing	17 Fabricated Metals	18 Stone, Clay & Glass Products	19 All Other Manufacturing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating and Drinking Places	24 Agricultural Services	25 Lodging	26 All Other Services (Except Professional)	27 Transportation	28 Electric Energy	29 Other Utilities	30 Contract Construction	31 Rentals and Finance	
Agriculture	1. Range Livestock	.097	.568	.020	.000	.000	.000	.000	.132	.000	.000	.000	.000	.000	.130	.000	.000	.000	.000	.000	.000	.000	.000	.000	.009	.000	.000	.000	.000	.000	.000	.000	1.
	2. Feeder Livestock	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.251	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	2.
	3. Dairy	.003	.002	.000	.000	.000	.000	.000	.020	.000	.000	.000	.000	.000	.049	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	3.
	4. Food and Field Crops	.000	.011	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.063	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	4.
	5. Truck Crops	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.002	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	5.
	6. Fruit	.003	.000	.017	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.047	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	6.
	7. Forestry	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.380	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	7.
	8. All Other Agriculture	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.029	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	8.
Mining	9. Coal	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.000	.000	.000	.000	.001	.002	.000	.000	.000	.000	.000	.000	.001	.001	.000	.103	.005	.000	.000	9.
	10. Oil and Gas	.000	.000	.000	.000	.000	.000	.000	.000	.000	.015	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	10.
	11. Uranium	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.183	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	11.
	12. Zinc	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	12.
	13. All Other Mining	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.012	.001	.001	.000	.000	.000	.000	.259	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.017	.000	13.
Manufacturing	14. Food and Kindred Products	.000	.162	.043	.000	.000	.000	.000	.100	.000	.000	.000	.000	.000	.006	.000	.000	.000	.000	.000	.000	.000	.000	.122	.004	.030	.003	.000	.000	.000	.000	.000	14.
	15. Lumber and Wood Products	.001	.000	.000	.000	.000	.001	.000	.000	.000	.000	.002	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	15.
	16. Printing and Publishing	.000	.000	.000	.000	.000	.001	.000	.000	.001	.001	.000	.000	.007	.002	.000	.017	.001	.004	.004	.000	.001	.059	.009	.005	.002	.007	.001	.001	.007	.000	.004	16.
	17. Fabricated Metals	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.005	.017	.012	.000	.000	.000	.001	.000	.001	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.002	.000	17.
	18. Stone, Clay and Glass Products	.000	.000	.000	.000	.000	.000	.000	.000	.018	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.016	.000	18.
	19. All Other Manufacturing	.017	.001	.022	.073	.032	.014	.021	.005	.010	.015	.004	.008	.006	.012	.009	.004	.063	.052	.006	.001	.001	.003	.001	.028	.002	.001	.113	.006	.009	.011	.002	19.
Trade (Retail)	20. Wholesale Trade	.010	.001	.011	.013	.009	.007	.007	.006	.000	.014	.004	.006	.015	.007	.002	.002	.001	.003	.003	.002	.001	.003	.047	.010	.007	.015	.011	.001	.004	.004	.001	20.
	21. Service Stations	.010	.001	.010	.022	.003	.005	.012	.011	.000	.006	.001	.000	.001	.006	.005	.001	.001	.006	.001	.001	.000	.001	.001	.008	.000	.000	.019	.001	.001	.003	.001	21.
	22. All Other Retail	.021	.002	.025	.016	.031	.019	.007	.005	.000	.011	.001	.000	.004	.001	.002	.005	.002	.001	.003	.002	.003	.004	.015	.004	.014	.007	.003	.002	.003	.002	.003	22.
	23. Eating and Drinking Places	.001	.000	.001	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.001	.000	.001	.000	.000	.003	.001	.001	.001	.000	.000	.000	.001	.001	.001	.001	.001	.001	23.
Services	24. Agricultural Services	.024	.016	.105	.073	.430	.454	.000	.024	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.000	.000	.000	.000	24.
	25. Lodging	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.001	.000	.000	.000	.000	.002	.001	.000	.000	.000	.000	.002	.000	.000	.000	.001	.000	.000	25.
	26. All Other Services (Except Professional)	.003	.002	.001	.011	.001	.004	.002	.006	.001	.042	.002	.003	.004	.006	.005	.006	.010	.006	.004	.012	.016	.025	.009	.008	.042	.036	.034	.010	.020	.008	.012	26.
Utilities	27. Transportation	.012	.026	.056	.016	.001	.001	.000	.021	.000	.023	.094	.000	.000	.002	.114	.005	.011	.024	.015	.098	.042	.052	.009	.003	.005	.006	.036	.004	.001	.015	.001	27.
	28. Electric Energy	.004	.001	.014	.004	.004	.004	.000	.007	.029	.010	.005	.035	.021	.010	.022	.012	.006	.016	.012	.005	.029	.015	.018	.024	.034	.035	.001	.105	.004	.001	.007	28.
	29. Other Utilities	.002	.000	.002	.002	.001	.001	.000	.005	.010	.002	.003	.004	.010	.006	.007	.015	.005	.011	.006	.008	.013	.018	.026	.005	.049	.031	.003	.010	.012	.003	.010	29.
	30. Contract Construction	.000	.000	.000	.000	.000	.000	.000	.000	.000	.016	.001	.001	.000	.001	.000	.002	.000	.000	.007	.006	.006	.008	.022	.000	.021	.006	.004	.003	.040	.299	.003	30.
	31. Rentals and Finance	.040	.017	.026	.007	.014	.006	.023	.014	.019	.081	.001	.001	.008	.004	.017	.014	.002	.015	.017	.050	.034	.075	.024	.017	.037	.027	.016	.020	.016	.020	.025	31.

Note: Each entry shows the input directly required from the industry at the left of the table to produce one dollar's worth of output by the industry at the top of the table.

DIRECT PURCHASES PER DOLLAR OF OUTPUT
UPPER MAIN STEM SUB-BASIN 1980
Table UMS - 1980 - b

Industry Purchasing \ Industry Producing			1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food and Field Crops	5 Truck Crops	6 Fruit	7 Forestry	8 All Other Agriculture	9 Coal	10 Oil and Gas	11 Uranium	12 Zinc	13 All Other Mining	14 Food and Kindred Products	15 Lumber and Wood Products	16 Printing & Publishing	17 Fabricated Metals	18 Stone, Clay and Glass Products	19 All Other Manufacturing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating & Drinking Places	24 Agricultural Services	25 Lodging	26 All Other Services	27 Transportation	28 Electric Energy	29 Other Utilities	30 Contract Construction	31 Rentals & Finance	
Agriculture	1.	Range Livestock	1.107919	.000116	.003347	.000030	.000001	.003402	.000423	.000013	.000824	.000000	.000000	.000000	.000033	.000462	.001113	.002014	.000033	.000037	.022247	.012045	.011838	.024067	.001316	.028519	.000061	.006233	.017773	.007730	.004152	.001390	.050164	1.
	2.	Feeder Livestock	.682156	1.043014	.012629	.022269	.000343	.010316	.000264	.004970	.001022	.000000	.000000	.000000	.000042	.171369	.000694	.002145	.000037	.000047	.023107	.010910	.010868	.018264	.001097	.041003	.000234	.009286	.041546	.009594	.004579	.001760	.052325	2.
	3.	Dairy	.037446	.011556	1.002418	.003028	.000092	.019317	.000022	.001335	.002283	.000000	.000000	.000000	.000053	.046042	.000059	.002847	.000061	.000073	.034849	.014268	.013154	.027536	.001385	.115516	.000135	.006902	.063861	.021821	.005124	.001985	.036689	3.
	4.	Food and Field Crops	.00853	.000102	.000023	1.000027	.000001	.000022	.000001	.000012	.001006	.000000	.000000	.000000	.000045	.000406	.000003	.001962	.000092	.000049	.078263	.014609	.023155	.016976	.000359	.073110	.000176	.014522	.021664	.009402	.004428	.001921	.013848	4.
	5.	Truck Crops	.004869	.000471	.000109	.000123	1.000004	.000105	.000003	.000054	.001908	.000000	.000000	.000000	.000043	.001877	.000007	.004618	.000068	.000060	.045631	.013920	.006795	.033388	.000269	.430626	.000112	.006913	.006894	.018185	.005108	.001626	.027314	5.
	6.	Fruit	.005139	.000496	.000114	.000130	.000004	1.000110	.000382	.000057	.001944	.000000	.000000	.000000	.000036	.001977	.001007	.004950	.000050	.000056	.028076	.012098	.008944	.021387	.000198	.454661	.000075	.009718	.006084	.018520	.004925	.001287	.018382	6.
	7.	Forestry	.000608	.000607	.000061	.000002	.000000	.000001	1.000600	.000001	.000130	.000000	.000000	.000000	.000015	.000027	.000001	.000672	.000024	.000013	.021486	.007223	.012106	.007261	.000125	.000001	.000051	.003077	.002056	.001188	.000874	.000672	.025505	7.
	8.	All Other Agriculture	.179739	.026765	.025880	.007012	.000213	.005991	.000071	1.003092	.001386	.000000	.000000	.000000	.000039	.106632	.000187	.001395	.000032	.000050	.015260	.010055	.014873	.010435	.000484	.034892	.000155	.010362	.029452	.012962	.007783	.001535	.027440	8.
Mining	9.	Coal	.000007	.000005	.000001	.000001	.000000	.000001	.000000	.000001	1.004547	.000000	.000000	.000000	.000001	.004710	.000022	.000001	.001409	.000104	.018098	.011557	.000315	.000213	.000267	.000107	.000001	.000035	.002131	.000898	.033476	.011149	.001025	.021128	9.
	10.	Oil and Gas	.000109	.000089	.000018	.000023	.000001	.000017	.000010	.000010	.001618	1.015228	.000000	.000000	.000539	.000355	.000025	.002657	.000091	.000431	.019277	.015683	.006867	.012163	.001322	.000016	.001077	.047601	.027972	.014944	.005482	.025105	.089510	10.
	11.	Uranium	.000017	.000014	.000003	.000004	.000000	.000003	.000931	.000002	.000892	.000000	1.223990	.000000	.014773	.000054	.002451	.000551	.006338	.000067	.019405	.006719	.003627	.001873	.000221	.000002	.000051	.007511	.121106	.008272	.004943	.003154	.004954	11.
	12.	Zinc	.000008	.000006	.000001	.000002	.000000	.000001	.000001	.000001	.004150	.000000	.000000	1.001001	.001066	.000025	.000002	.000200	.017101	.000108	.009660	.006231	.000113	.000223	.000091	.000001	.000031	.004040	.001232	.039804	.004882	.002088	.002741	12.
	13.	All Other Mining	.000010	.000008	.000002	.000002	.000000	.000002	.000000	.000001	.002589	.000000	.000000	.000000	1.001037	.000032	.000001	.007622	.012059	.000065	.007447	.015306	.001142	.004303	.000106	.000001	.000041	.005391	.002309	.024402	.011137	.001135	.010584	13.
Manufacturing	14.	Food and Kindred Products	.324611	.264823	.053814	.069383	.002110	.051477	.000144	.030597	.001977	.000000	.000000	.000000	.000078	1.055071	.000379	.003688	.000056	.000088	.030070	.014226	.013442	.012831	.001664	.047803	.001141	.012299	.022047	.018571	.009609	.003273	.030022	14.
	15.	Lumber and Wood Products	.000025	.000020	.000004	.000005	.000000	.000004	.380001	.000002	.002790	.000000	.000000	.000000	.000057	.000080	1.000002	.000897	.000063	.000084	.031156	.006416	.011968	.005457	.000319	.000004	.000078	.011658	.120480	.026508	.008962	.002092	.031226	15.
	16.	Printing and Publishing	.000051	.000042	.000009	.000011	.000000	.000008	.000002	.000005	.001579	.000000	.000000	.000000	.000097	.000167	.000004	1.017908	.000029	.000096	.005168	.002423	.001212	.005361	.001108	.000008	.000029	.007505	.006171	.014447	.016247	.004242	.016310	16.
	17.	Fabricated Metals	.000022	.000018	.000004	.000005	.000000	.000004	.000001	.000002	.001900	.000000	.000000	.000000	.000036	.000073	.000001	.001599	1.001077	.000055	.065101	.001583	.001342	.002399	.000247	.000003	.000138	.011515	.012936	.008301	.006127	.001295	.004404	17.
	18.	Stone, Clay and Class Products	.000023	.000018	.000004	.000005	.000000	.000004	.000001	.000002	.004770	.00000	.000000	.000000	.259326	.000074	.000002	.006645	.003203	1.000119	.057667	.007690	.006927	.002620	.000299	.000003	.000139	.009740	.027336	.025974	.015363	.002081	.021112	18.
	19.	All Other Manufacturing	.000149	.000121	.000025	.000032	.000001	.000024	.000004	.000014	.001525	.000000	.000000	.000000	.000240	.000483	.000011	.004548	.001049	.000204	1.008398	.003601	.001423	.003377	.003113	.000022	.002032	.005724	.016685	.014356	.007120	.011018	.019414	19.
Trade (Retail)	20.	Wholesale Trade	.000077	.000063	.000013	.000016	.000000	.000012	.000004	.000007	.000824	.000000	.000000	.000000	.000224	.000249	.000011	.000770	.000044	.000182	.013134	1.003670	.003085	.002769	.001253	.000011	.001042	.017420	.102921	.007325	.009929	.010422	.054827	20.
	21.	Service Stations	.000066	.000054	.000011	.000014	.000000	.000011	.000004	.000006	.003597	.000000	.000000	.000000	.000235	.000216	.000010	.001759	.000064	.000230	.006712	.002060	1.000985	.003591	.001190	.000010	.000031	.019587	.044629	.033966	.014906	.010318	.037970	21.
	22.	All Other Retail	.000083	.000067	.000014	.000018	.000001	.000013	.000005	.000008	.002204	.000000	.000000	.000000	.000309	.000269	.000014	.061172	.000062	.000265	.010358	.004567	.002315	1.005157	.001328	.000012	.000047	.030370	.055889	.020023	.021634	.014100	.081598	22.
	23.	Eating and Drinking Places	.039625	.032326	.006569	.008469	.000258	.006284	.000031	.003735	.002656	.000000	.000000	.000000	.000743	.128791	.000080	.011031	.000110	.000600	.007545	.049604	.003211	.017228	1.000434	.005835	.000223	.014010	.018705	.024182	.029495	.034504	.034509	23.
Services	24.	Agricultural Services	.011299	.001076	.000249	.000282	.000009	.000240	.000005	.000124	.002985	.000000	.000000	.000000	.000040	.004286	.000013	.005755	.000061	.000074	.029531	.010614	.008383	.004681	.000207	1.001452	.000081	.009846	.005737	.028536	.006539	.001244	.020921	24.
	25.	Lodging	.009815	.008007	.001627	.002098	.000064	.001556	.000017	.000925	.005619	.000000	.000000	.000000	.000751	.031900	.000046	.004018	.000125	.000649	.005254	.008777	.000837	.015327	.000318	.001445	1.002108	.047220	.008743	.041724	.052956	.034242	.044630	25.
	26.	All Other Services	.001061	.000866	.000176	.000227	.000007	.000168	.000005	.000100	.005516	.000000	.000000	.000000	.000270	.003449	.000013	.008339	.000071	.000284	.003079	.016143	.000397	.007788	.001215	.000156	.000060	1.039834	.009145	.041751	.033986	.011539	.032442	26.
Utilities	27.	Transportation	.000100	.000082	.000017	.000021	.000001	.000016	.000003	.000009	.000621	.000000	.000000	.000000	.000179	.000325	.000008	.002234	.000143	.000144	.118809	.012622	.020001	.004007	.001518	.000015	.000257	.038410	1.042023	.005359	.005934	.008306	.022369	27.
	28.	Electric Energy	.000061	.000050	.000010	.000013	.000000	.000010	.000002	.000006	.115786	.000000	.000000	.000000	.000668	.000199	.000006	.001779	.001152	.002180	.009030	.001600	.001318	.002565	.001221	.000009	.000033	.012815	.005463	1.122184	.013468	.006015	.026650	28.
	29.	Other Utilities	.000078	.000064	.000013	.000017	.000001	.000012	.000022	.000007	.005749	.000000	.000000	.000000	.001264	.000254	.000059	.007756	.000149	.001039	.010472	.004840	.001314	.003535	.001173	.000012	.001042	.022283	.003145	.006303	1.013766	.058455	.019708	29.
	30.	Contract Construction	.000077	.000063	.000013	.000016	.000001	.000012	.000543	.000007	.000523	.000000	.000000	.000000	.030220	.000250	.001428	.000926	.003246	.022853	.020402	.006954	.005013	.003443	.001587	.000011	.000054	.013967	.024587	.004222	.006177	1.427701	.032131	30.
	31.	Rentals and Finance	.000056	.000046	.000009	.000012	.000000	.000009	.000002	.000005	.000984	.000000	.000000	.000000	.000117	.000183	.000005	.004588	.000023	.000103	.002544	.001408	.001112	.003311	.001086	.000008	.000018	.013389	.001730	.008871	.011141	.005326	1.027044	31.

Note: Each entry shows the total dollar production directly and indirectly required from the industry at the top of the table per dollar of deliveries to final demand by the industry at the left.

DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR OF FINAL DEMAND
UPPER MAIN-STEM SUB-BASIN 1980
Table UMS-1980-c

Industry Producing		Industry Purchasing	1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food & Kindred Products	5 Truck Crops	6 Fruit	7 Forestry	8 All Other Agriculture	9 Coal	10 Oil & Gas	11 Uranium	12 Zinc	13 All Other Mining	14 Food & Kindred Products	15 Lumber & Wood Products	16 Printing & Publishing	17 Fabricated Metals	18 Stone, Clay, & Glass	19 All Other Manufacturing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating & Drinking Places	24 Agricultural Services	25 Lodging	26 All Other Services (Except Professional)	27 Transportation	28 Electric Energy	29 Other Utilities	30 Contract Construction	31 Rentals & Finance	32 Final Demand	33 Total Gross Output	
Agriculture		1. Range Livestock	4,216	25,505	70	0	0	0	0	264	0	0	0	0	0	6,314	0	0	0	0	0	0	0	0	108	0	0	0	0	0	0	0	7,901	44,377	1.
		2. Feeder Livestock	0	0	0	0	0	0	0	0	0	0	0	0	0	13,279	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31,862	45,141	2.
		3. Dairy	133	90	0	0	0	0	0	40	0	0	0	0	0	2,405	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	655	3,324	3.
		4. Food & Field Crops	0	497	0	0	0	0	0	0	0	0	0	0	0	2,806	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,758	8,061	4.
		5. Truck Crops	0	0	0	0	0	0	0	0	0	0	0	0	0	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,729	1,879	5.
		6. Fruit	222	0	60	0	0	16	0	0	0	0	0	0	0	2,455	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,900	15,653	6.
		7. Forestry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,106	0	0	0	1,787	0	0	0	0	0	0	0	0	0	0	0	2,118	8,011	7.
		8. All Other Agriculture	0	0	3	8	2	0	0	2	0	0	0	0	0	802	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,180	1,997	8.
Mining		9. Coal	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	137	0	3,352	505	0	0	5,891	9,954	9.
		10. Oil & Gas	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,000	1,016	10.
		11. Uranium	0	0	0	0	0	0	0	0	0	0	15,784	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70,000	85,784	11.
		12. Zinc	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22,431	22,453	12.
		13. All Other Mining	0	0	0	0	0	0	0	0	0	0	1,115	45	11	0	0	0	0	1,066	0	0	0	0	0	0	0	0	0	0	0	3,531	0	5,233	11,001	13.
Manufacturing		14. Food & Kindred Products	0	7,313	146	0	0	0	0	202	0	0	0	0	0	351	0	0	0	0	0	0	0	0	9,317	43	1,513	411	0	0	0	0	30,815	50,110	14.
		15. Lumber & Wood Products	44	0	0	0	0	16	0	0	0	0	172	0	0	0	0	0	0	0	596	0	0	0	0	0	0	0	0	0	208	0	9,770	10,805	15.
		16. Printing & Publishing	0	0	3	8	0	16	0	0	10	1	86	0	77	100	11	332	4	21	128	0	17	12,622	722	54	98	1,095	81	31	505	208	842	419	17,491	16.
		17. Fabricated Metals	0	0	0	0	0	0	0	0	0	0	515	404	132	0	0	0	8	0	43	0	0	0	0	0	0	0	0	31	0	415	0	2,328	3,876	17.
		18. Stone, Clay & Glass	0	0	0	0	0	0	0	0	179	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,531	0	406	4,116	18.
		19. All Other Manufacturing	799	45	80	596	62	235	176	50	109	17	429	225	77	852	108	385	248	218	298	573	17	1,425	131	346	98	548	9,359	282	618	2,493	421	21,235	42,555	19.
Trade	Retail	20. Wholesale Trade	488	90	37	113	19	125	56	12	0	15	343	135	176	401	22	35	4	12	128	191	35	814	3,346	108	390	2,601	895	63	225	831	210	83,567	95,487	20.
		21. Service Stations	444	45	37	177	6	78	96	22	0	6	86	22	11	351	65	17	4	25	43	95	0	204	66	87	0	0	1,628	63	56	623	210	12,857	17,423	21.
		22. All Other Retail	932	135	86	137	60	313	64	12	0	11	172	0	55	100	22	87	8	4	128	191	52	814	984	43	732	958	244	63	168	415	631	196,062	203,686	22.
		23. Eating & Drinking Places	44	0	3	0	0	0	0	0	0	2	86	0	0	50	0	17	0	0	85	95	17	204	0	0	0	137	81	31	56	208	210	64,283	65,612	23.
Services		24. Agricultural Services	1,154	767	352	596	810	6,997	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	116	10,816	24.
		25. Lodging	0	0	0	0	0	0	0	0	0	1	0	0	0	50	0	0	0	0	85	95	0	0	0	0	98	0	0	31	56	208	210	47,977	48,812	25.
		26. All Other Services (Except Professional)	133	90	3	89	2	63	16	14	20	43	172	67	55	351	54	105	47	25	298	1,241	279	5,090	590	87	2,148	5,066	2,848	376	1,235	1,662	2,736	111,946	136,948	26.
		27. Transportation	533	1,174	189	137	2	16	0	44	0	24	8,150	0	11	150	1,232	87	0	99	1,872	9,643	732	9,772	590	32	244	821	3,011	157	112	3,324	210	39,016	81,385	27.
Utilities		28. Electric Energy	266	45	50	32	9	78	0	16	299	12	515	808	242	601	249	227	47	74	596	573	540	3,054	1,247	260	1,660	5,750	81	3,478	281	208	1,473	8,561	31,331	28.
		29. Other Utilities	89	0	7	16	2	16	0	10	109	2	257	90	110	301	108	262	31	49	766	764	226	3,665	1,706	54	2,441	5,339	244	345	786	623	2,104	35,651	56,173	29.
		30. Contract Construction	0	0	0	0	0	0	0	0	0	0	86	22	0	50	0	17	27	0	213	573	122	1,629	1,706	0	1,074	958	407	157	2,583	63,978	631	133,494	207,745	30.
		31. Rentals and Finance	1,864	858	93	64	28	125	200	30	209	83	172	45	110	301	194	280	0	66	1,532	4,869	627	15,473	1,706	205	2,148	3,970	1,628	752	1,123	5,401	5,682	160,598	210,436	31.
		32. Final Payments	33,016	8,487	2,105	6,088	877	7,559	7,403	1,267	8,999	766	57,644	20,568	9,934	17,890	4,634	15,640	3,448	2,457	33,957	76,584	14,759	148,920	43,501	9,378	36,119	109,157	60,878	22,119	47,864	119,878	194,866			32.
		33. Total Gross Outlays	44,377	45,141	3,324	8,061	1,879	15,653	8,011	1,997	9,954	1,016	85,784	22,453	11,001	50,110	10,805	17,491	3,876	4,116	42,555	95,487	17,423	203,686	65,612	10,816	48,812	136,948	81,385	31,331	56,173	207,745	210,436			33.

Note: Each row shows sales by the industry at the left to all industries listed at the top of the table. Each column shows purchases by the industry listed at the top of the table from each industry listed down the left margin.

INTERINDUSTRY TRANSACTIONS (IN THOUSANDS OF DOLLARS)
UPPER MAIN-STEM SUB BASIN 2010
Table UMS-2010-a

Industry Producing \ Industry Purchasing		1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food & Field Crops	5 Truck Crops	6 Fruit	7 Forestry	8 All Other Agriculture	9 Coal	10 Oil & Ga	11 Uranium	12 Zinc	13 All Other Mining	14 Food & Kindred Products	15 Lumber & Wood Products	16 Printing & Publishing	17 Fabricated Metals	18 Stone, Clay & Glass	19 All Other Manufactur-ing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating & Drinking Places	24 Agricultural Services	25 Lodging	26 All Other Services	27 Transpor-tation	28 Electric Energy	29 Other Utilities	30 Contract Construc-tion	31 Rentals & Finance	
Agriculture	1. Range Livestock	.095	.565	.021	.000	.000	.000	.000	.132	.000	.000	.000	.000	.000	.126	.000	.000	.000	.000	.000	.000	.000	.000	.000	.010	.000	.000	.000	.000	.000	.000	.000	1.
	2. Feeder Livestock	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.265	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	2.
	3. Dairy	.003	.002	.000	.000	.000	.000	.000	.020	.000	.000	.000	.000	.000	.048	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	3.
	4. Food & Field Crops	.000	.011	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.056	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	4.
	5. Truck Crops	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.003	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	5.
	6. Fruit	.005	.000	.018	.000	.000	.001	.000	.000	.000	.000	.000	.000	.000	.049	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	6.
	7. Forestry	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.380	.000	.000	.000	.042	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	7.
	8. All Other Agriculture	.000	.000	.001	.001	.001	.000	.000	.001	.000	.000	.000	.000	.000	.016	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	8.
Mining	9. Coal	.000	.000	.000	.000	.000	.000	.000	.000	.002	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.001	.000	.107	.009	.000	.000	9.
	10. Oil & Gas	.000	.000	.000	.000	.000	.000	.000	.000	.000	.016	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	10.
	11. Uranium	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.184	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	11.
	12. Zinc	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	12.
	13. All Other Mining	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.013	.002	.001	.000	.000	.000	.000	.259	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.017	.000	13.
Manufacturing	14. Food & Kindred Products	.000	.162	.044	.000	.000	.000	.000	.101	.000	.000	.000	.000	.000	.007	.000	.000	.000	.000	.000	.000	.000	.000	.142	.004	.031	.003	.000	.000	.000	.000	.000	14.
	15. Lumber & Wood Products	.001	.000	.000	.000	.000	.001	.000	.000	.000	.000	.000	.002	.000	.000	.000	.000	.000	.014	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	15.
	16. Printing & Publishing	.000	.000	.001	.001	.000	.001	.000	.000	.001	.001	.001	.000	.007	.002	.001	.019	.001	.005	.003	.000	.001	.062	.011	.005	.002	.008	.001	.001	.009	.001	.004	16.
	17. Fabricated Metals	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.006	.018	.012	.000	.000	.000	.002	.000	.001	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.002	.000	17.
	18. Stone, Clay & Glass	.000	.000	.000	.000	.000	.000	.000	.000	.018	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.017	.000	18.
	19. All Other Manufacturing	.018	.001	.024	.074	.033	.015	.022	.025	.011	.017	.005	.010	.007	.017	.010	.022	.064	.053	.007	.006	.001	.007	.002	.032	.002	.004	.115	.009	.011	.012	.002	19.
Trade	20. Wholesale Trade	.011	.002	.011	.014	.010	.008	.007	.006	.000	.015	.004	.006	.016	.008	.002	.002	.001	.003	.003	.002	.002	.004	.051	.010	.008	.019	.011	.002	.004	.004	.001	20.
Retail	21. Service Stations	.010	.001	.011	.022	.003	.005	.012	.011	.000	.006	.001	.001	.001	.007	.006	.001	.001	.006	.001	.001	.000	.001	.001	.008	.000	.000	.020	.002	.001	.003	.001	21.
	22. All Other Retail	.021	.003	.026	.017	.032	.020	.008	.006	.000	.011	.002	.000	.005	.002	.002	.005	.002	.001	.003	.002	.003	.004	.015	.004	.015	.007	.003	.002	.003	.002	.003	22.
	23. Eating & Drinking Places	.001	.000	.001	.000	.000	.000	.000	.000	.000	.002	.001	.000	.000	.001	.000	.001	.000	.000	.002	.001	.001	.001	.000	.000	.000	.001	.001	.001	.001	.001	.001	23.
Services	24. Agricultural Services	.026	.017	.106	.074	.431	.447	.000	.006	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.000	.000	.000	.000	24.
	25. Lodging	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.000	.000	.001	.000	.000	.000	.000	.002	.001	.000	.000	.000	.000	.002	.000	.000	.001	.001	.001	.001	25.
	26. All Other Services	.003	.002	.001	.011	.001	.004	.002	.007	.002	.042	.002	.003	.005	.007	.005	.006	.012	.006	.007	.013	.016	.025	.009	.008	.044	.037	.035	.012	.022	.008	.013	26.
Utilities	27. Transportation	.012	.026	.057	.017	.001	.001	.000	.022	.000	.024	.095	.000	.001	.003	.114	.005	.000	.024	.044	.101	.042	.048	.009	.003	.005	.006	.037	.005	.002	.016	.001	27.
	28. Electric Energy	.006	.001	.015	.004	.005	.005	.000	.008	.030	.012	.006	.036	.022	.012	.023	.013	.012	.018	.014	.006	.031	.015	.019	.024	.034	.042	.001	.111	.005	.001	.007	28.
	29. Other Utilities	.002	.000	.002	.002	.001	.001	.000	.005	.011	.002	.003	.004	.010	.006	.010	.015	.008	.012	.018	.008	.013	.018	.026	.005	.050	.039	.003	.011	.014	.003	.010	29.
	30. Contract Construction	.000	.000	.000	.000	.000	.000	.000	.000	.000	.017	.001	.001	.000	.001	.000	.001	.007	.000	.005	.006	.007	.008	.026	.000	.022	.007	.005	.005	.046	.308	.003	30.
	31. Rentals & Finance	.042	.019	.028	.008	.015	.008	.025	.015	.021	.082	.002	.002	.010	.006	.018	.016	.000	.016	.036	.051	.036	.076	.026	.019	.044	.029	.020	.024	.020	.026	.027	31.

Note: Each entry shows the input directly required from the industry at the left of the table to produce one dollar's worth of output by the industry at the top of the table.

DIRECT PURCHASES PER DOLLAR OF OUTPUT
UPPER MAIN-STEM SUB-BASIN 2010
Table UMS-2010-b

Industry Purchasing \ Industry Producing		1 Range Livestock	2 Feeder Livestock	3 Dairy	4 Food & Field Crops	5 Truck Crops	6 Fruit	7 Forestry	8 All Other Agriculture	9 Coal	10 Oil & Gas	11 Uranium	12 Zinc	13 All Other Mining	14 Food & Kindred Products	15 Lumber & Wood Products	16 Printing & Publishing	17 Fabricated Metals	18 Stone, Clay & Glass	19 All Other Manufacturing	20 Wholesale Trade	21 Service Stations	22 All Other Retail	23 Eating & Drinking Places	24 Agricultural Services	25 Lodging	26 All Other Services	27 Transportation	28 Electric Energy	29 Other Utilities	30 Contract Construction	31 Rentals & Finance	
Agriculture	1. Range Livestock	1.105556	.000135	.003342	.000030	.000002	.005619	.001562	.000012	.001189	.000000	.000000	.000000	.000039	.000509	.001450	.002147	.000038	.000048	.024083	.013301	.011929	.024125	.001305	.031647	.000133	.006617	.018687	.010631	.004652	.001567	.053553	1.
	2. Feeder Livestock	.677824	1.045520	.012425	.021120	.000515	.012042	.001470	.002785	.001345	.000000	.000000	.000000	.000050	.171775	.001049	.002381	.000042	.000059	.025501	.012961	.011108	.019522	.001089	.043943	.000313	.009947	.042892	.012011	.005168	.002028	.057637	2.
	3. Dairy	.039236	.012546	1.002450	.002789	.000142	.020581	.001856	.001765	.002616	.000000	.000000	.000000	.000062	.047343	.000604	.004089	.000068	.000087	.038717	.014632	.014430	.028773	.001376	.117088	.000213	.007589	.066527	.023834	.005911	.002320	.041163	3.
	4. Food & Field Crops	.001126	.000138	.000049	1.000031	.000002	.000032	.003817	.001009	.001147	.000000	.000000	.000000	.000049	.000521	.001132	.003104	.000096	.000056	.080641	.015850	.023352	.018080	.000299	.074134	.000213	.015199	.025563	.010072	.005720	.002057	.017446	4.
	5. Truck Crops	.005533	.000530	.000134	.000118	1.000006	.000128	.002332	.001033	.002192	.000000	.000000	.000000	.000049	.001999	.000697	.004821	.000073	.000070	.049227	.015115	.006932	.034483	.000242	.431674	.000175	.007427	.008698	.019875	.005958	.001793	.030969	5.
	6. Fruit	.005556	.000519	.000112	.000115	.000006	1.001127	.001867	.000032	.002200	.000000	.000000	.000000	.000042	.001959	.001447	.005093	.000055	.000065	.031349	.013199	.008987	.022447	.000187	.448128	.000128	.010066	.007289	.019963	.005525	.001477	.022500	6.
	7. Forestry	.000009	.000008	.000001	.000002	.000000	.000002	1.001077	.000000	.000164	.000000	.000000	.000000	.000016	.000030	.000319	.000767	.000026	.000015	.022757	.007291	.012146	.008294	.000112	.000001	.000085	.003311	.002864	.001394	.001255	.000725	.028310	7.
	8. All Other Agriculture	.179956	.028619	.025836	.006363	.000324	.006663	.001801	1.002763	.001707	.000000	.000000	.000000	.000051	.107997	.000700	.001576	.000056	.000065	.036538	.010462	.015022	.011682	.000526	.017527	.000248	.011955	.032302	.015089	.008568	.001995	.030789	8.
Mining	9. Coal	.000009	.000008	.000002	.000002	.000000	.000002	.000611	.000000	1.005885	.000000	.000000	.000000	.004723	.000030	.000182	.001492	.000108	.018129	.012906	.000417	.000277	.000311	.000106	.000001	.000099	.003468	.001426	.035110	.012552	.001351	.023935	9.
	10. Oil & Gas	.000168	.000144	.000027	.000032	.000002	.000028	.001061	.000009	.002035	1.016260	.000000	.000000	.000594	.000544	.000338	.002829	.000102	.000500	.022199	.017079	.006998	.012251	.002339	.000025	.001225	.048201	.030111	.017989	.006348	.027276	.092208	10.
	11. Uranium	.000076	.000065	.000012	.000014	.000001	.000013	.001952	.000004	.001145	.000000	1.225490	.000000	.016031	.000245	.002756	.001952	.007599	.000083	.021530	.006942	.003842	.003200	.001443	.000011	.000077	.008048	.123490	.010138	.005523	.003647	.007684	11.
	12. Zinc	.000009	.000008	.000002	.000002	.000000	.000002	.000572	.000000	.004507	.000000	.000000	1.001001	.002079	.000030	.000171	.000243	.018138	.000124	.012062	.006340	.001182	.000262	.000092	.000001	.000084	.004351	.001610	.041553	.005278	.002520	.004414	12.
	13. All Other Mining	.000013	.000011	.000002	.000002	.000000	.000002	.000430	.000001	.002903	.000000	.000000	.000000	1.001047	.000041	.000129	.007775	.012075	.000078	.009070	.016427	.001216	.005349	.000112	.000002	.000087	.006776	.003797	.026041	.011534	.001531	.013361	13.
Manufacturing	14. Food & Kindred Products	.326393	.280197	.052633	.062294	.003172	.054444	.001894	.017053	.002521	.000000	.000000	.000000	.000091	1.057346	.000902	.004052	.000068	.000108	.036942	.016150	.014462	.014416	.001671	.049294	.001222	.013967	.024952	.022493	.010445	.003690	.035790	14.
	15. Lumber & Wood Products	.000028	.000024	.000004	.000005	.000000	.000005	.381581	.000001	.003154	.000000	.000000	.000000	.000073	.000090	1.000470	.002032	.000068	.000103	.033381	.006586	.013182	.005905	.000307	.000004	.000152	.012288	.121870	.028235	.012710	.002725	.034865	15.
	16. Printing & Publishing	.000062	.000053	.000010	.000012	.000001	.000010	.001138	.000003	.001897	.000000	.000000	.000000	.000078	.000201	.000339	1.020131	.000048	.000089	.024012	.002577	.001297	.005461	.001149	.000009	.000107	.007900	.007293	.016195	.016883	.003251	.019612	16.
	17. Fabricated Metals	.000024	.000021	.000004	.000005	.000000	.000004	.003112	.000001	.001774	.000000	.000000	.000000	.000258	.000079	.000931	.001645	1.002112	.000230	.065677	.001688	.001278	.002468	.000198	.000004	.000175	.013837	.003872	.015553	.010292	.011666	.004342	17.
	18. Stone, Clay & Glass	.000024	.000021	.000004	.000005	.000000	.000004	.002830	.000001	.003287	.000000	.000000	.000000	.259327	.000079	.000840	.007745	.003212	1.000101	.059792	.008118	.007084	.002955	.000259	.000004	.000202	.010626	.029698	.029094	.017406	.002464	.024615	18.
	19. All Other Manufacturing	.000134	.000115	.000022	.000026	.000001	.000022	.048028	.000007	.002113	.000000	.000000	.000000	.000219	.000435	.014218	.003941	.001057	.000204	1.014877	.004540	.002814	.004054	.002196	.000020	.002129	.011065	.049330	.017874	.020333	.009748	.042451	19.
Trade	20. Wholesale Trade	.000089	.000076	.000014	.000017	.000001	.000015	.000907	.000005	.001072	.000000	.000000	.000000	.000240	.000287	.000278	.000877	.000053	.000206	.019080	1.003872	.003303	.002837	.001263	.000013	.001132	.019002	.106938	.008922	.010506	.010970	.057326	20.
Retail	21. Service Stations	.000076	.000065	.000012	.000015	.000001	.000013	.000347	.000004	.004097	.000000	.000000	.000000	.000282	.000247	.000114	.001861	.000072	.000283	.007224	1.003223	1.001097	.003625	.001195	.000012	.000124	.019973	.045151	.036740	.015336	.012292	.041014	21.
	22. All Other Retail	.000094	.000080	.000015	.000018	.000001	.000016	.000745	.000005	.002454	.000000	.000000	.000000	.000325	.000304	.000234	.064490	.000070	.000293	.015628	.005733	.002352	1.005206	.001334	.000014	.000179	.030698	.052587	.020728	.022281	.014643	.084035	22.
	23. Eating & Drinking Places	.046374	.039811	.007478	.008851	.000451	.007735	.000566	.002423	.003160	.000000	.000000	.000000	.000900	.150228	.000252	.013412	.000132	.000759	.011185	.054336	.003724	.017777	1.000489	.007004	.000365	.014992	.020558	.026785	.030257	.041311	.039363	23.
Services	24. Agricultural Services	.012393	.001140	.000247	.000253	.000013	.000277	.001623	.000069	.003197	.000000	.000000	.000000	.000046	.004302	.000493	.005822	.000067	.000082	.034191	.010782	.008491	.004761	.000194	1.001518	.000146	.010236	.007013	.029120	.007187	.001456	.024253	24.
	25. Lodging	.010202	.008758	.001645	.001947	.000099	.001702	.000317	.000533	.006148	.000000	.000000	.000000	.000822	.033050	.000137	.004425	.000133	.000740	.006307	.010202	.000971	.016469	.000337	.001541	1.002249	.049974	.009423	.042892	.054880	.037029	.053450	25.
	26. All Other Services	.001080	.000927	.000174	.000206	.000010	.000180	.000345	.000056	.006863	.000000	.000000	.000000	.000340	.003497	.000116	.009670	.000091	.000368	.007175	.020510	.000527	.007906	.001254	.000163	.000183	1.041692	.010167	.050664	.042960	.014389	.036219	26.
	27. Transportation	.000109	.000093	.000018	.000021	.000001	.000018	.005784	.000006	.000796	.000000	.000000	.000000	.000218	.000353	.001720	.002289	.000151	.000184	.122141	.012987	.021254	.004137	.001427	.000016	.000313	.040407	1.047238	.006366	.008003	.010010	.029931	27.
Utilities	28. Electric Energy	.000086	.000074	.000014	.000016	.000001	.000014	.000628	.000004	.121376	.000000	.000000	.000000	.000777	.000278	.000195	.001948	.001175	.002352	.013197	.002947	.002539	.002688	.001249	.000013	.001221	.013858	.007471	1.130626	.015503	.009835	.032857	28.
	29. Other Utilities	.000091	.000078	.000015	.000017	.000001	.000015	.000660	.000005	.010069	.000000	.000000	.000000	.001511	.000296	.000256	.010033	.000177	.001343	.013408	.005105	.001420	.003641	.001196	.000014	.001153	.024873	.005002	.008167	1.016519	.068325	.025400	29.
	30. Contract Construction	.000105	.000090	.000017	.000020	.000001	.000017	.001632	.000005	.000604	.000000	.000000	.000000	.030995	.000339	.001767	.002544	.003299	.024603	.022865	.007247	.005200	.003617	.001608	.000016	.001558	.014725	.027320	.004893	.006992	1.446588	.042596	30.
	31. Rentals & Finance	.000076	.000065	.000012	.000014	.000001	.000013	.000135	.000004	.001106	.000000	.000000	.000000	.000126	.000245	.000045	.004678	.000025	.000115	.002803	.001522	.001133	.003350	.001089	.000011	.001065	.014631	.001882	.009202	.011457	.005619	1.029516	31.

Note: Each entry shows the total dollar production directly and indirectly required from the industry at the top of the table per dollar of deliveries to final demand by the industry at the left.

DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR OF FINAL DEMAND
UPPER MAIN- STEM SUB-BASIN 2010
Table UMS-2010-c

Most projections indicate a continued drop in number of farmers and farm laborers through the end of this century. This quite consistent with past trends in number of farms. In Table 2 (p. 71 of the agricultural chapter) the number of farms in the Upper Main Stem Sub-basin was shown to have fallen from 8,685 in 1939 to 5,731 in 1959. There is no reason to believe that this downward trend will cease until farms are much larger than at present.

Projected output from the farm sector would seem to have little relationship to the number of farms or farmers, however. If any relationship exists it would seem that as farm numbers go down and farms become larger and more commercialized, farm output may be expected to increase. The large farms tend to use modern technology and be more consistent in producing high yields. Subsistence and part-time farmers have particularly low production.

Projected Irrigation Development

The projections of acreage in agricultural production in an arid area such as the Upper Main Stem are dependent almost solely on the development of irrigated land. Projections made are based on the compacts in force for the Colorado River water allocation. Water quality is assumed to be no worse than at present.

As shown in Table 3 (p. 73 of agriculture chapter) earlier, acreage of land irrigated has fluctuated rather widely. The peak occurred in 1930. In many areas, the question of whether a field is irrigated or not is difficult to answer. Irrigations are sometimes just overflooding, or it may depend from year to year on crop prospects or water availability. Future developments in the area will stabilize irrigation practices as new lands and supplemental water for presently irrigated lands are developed. The Bureau of Reclamation's Upper Colorado River Storage Project is expected to be instrumental in development of the area. Projected acreages are shown in Table P-2.

Table UMS-P-3

Present and Projected Cropping Pattern on Irrigated Lands
In the Upper Main Stem Sub-Basin, 1960, 1980 and 2010

Crop Harvested	1960 Acreage	1960 Proportion of Irrigated Land	1980 Acreage	1980 Proportion of Irrigated Land	2010 Acreage	2010 Proportion of Irrigated Land
Corn	30,782	5.9 %	39,744	7.0 %	58,955	9.0 %
Sorghums	1,187	0.2	5,678	1.0	13,101	2.0
Small Grains:						
Winter Wheat	3,198	0.6	1,703	0.3	655	0.1
Spring Wheat	5,452	1.1	2,839	0.5	1,310	0.2
Oats	15,991	3.1	13,059	2.3	11,791	1.8
Barley	16,234	3.1	17,033	3.0	18,997	2.9
Rye	244	0.1	--	0.0	--	0.0
Dry Beans	9,984	1.9	10,220	1.8	11,136	1.7
Hay Crops:						
Alfalfa & Mixtures	115,705	22.3	127,749	22.5	150,662	23.0
Clover, Timothy, Etc.	88,370	17.0	107,877	19.0	137,561	21.0
Small Grains for Hay	3,745	0.7	2,839	0.5	1,965	0.3
Wild Hay	16,352	3.2	11,355	2.0	6,551	1.0
Other Hay	3,975	0.8	2,839	0.5	1,965	0.3
Potatoes	1,469	0.3	1,136	0.2	655	0.1
Sugar Beets	5,611	1.1	6,246	1.1	7,206	1.1
Vegetables	2,103	0.4	2,271	0.4	2,620	0.4
Fruit	15,098	2.9	17,601	3.1	21,617	3.3
Other Crops Harvested	7,834	1.5	8,516	1.5	9,826	1.5
Pasture & Other [a]	175,200	33.8	189,069	33.3	198,481	30.3
TOTAL	518,534	100.0	577,774	100.0	655,054	100.0

[a] These totals include pasture, for the most part. Cropland used only for pasture on irrigated farms totaled 168,376 acres. Some farms are only partially irrigated; other portions may be improved dry pasture.

situations on yields so these were not used directly. The procedure used was to plot out yields for the sub-basin for major crops for periods varying from a few up to 15 or 20 years, depending on data availability. A trend line was fitted (by inspection) to the yearly yield data. The 1960 normalized yield was then read from the graphs and used as the base for projections.

Most of the projections were based on estimates by Poli.[12] Adjustments from Poli's work are noted.

Yields projected are shown in Table P-4.

Table P-4. -- Base and Projected Yields for Selected Crops, Upper Main Stem Sub-Basin, Colorado River Basin, 1960, 1980 and 2010

(per acre yields)

Crop		Year		
		1960	1980	2010
Corn	Bu.	67	84	111
All wheat[a]	Bu.	17	21	27
Oats	Bu.	48	52	58
Barley	Bu.	48	55	63
Potatoes	Cwt.	194	234	295
Dry beans (irrig.)	Cwt.	16	20	26
Dry beans (non-irrigated)	Cwt.	3.7	4.7	6.1
Sugar Beets	Ton	18	22	27
Alfalfa[b]	Ton	2.5	3.1	4.1
All other hay[b]	Ton	1.5	2.1	3.0

Note: [a]Adjusted upward from Poli's state projections to reflect the differences from Eastern Colorado's major wheat area.

[b]Adjusted downward from Poli's state projections to reflect local conditions.

The greatest proportional increases in yields are in other hay, alfalfa, dry beans, and corn. Main reasons for increases in these crops are:

[12]Adon Poli, "Long-term production prospects for Western agriculture." Agricultural Economic Report No.33, U.S. Department of Agriculture, May, 1963.

(1) improvement in irrigation practices on these crops which have received inadequate water in the past, (2) lack of concentration on improvement in the past, leaving a larger potential increase.

For other crops such as fruit and vegetables, individual yield changes were not estimated. For the following table (Table P-5) which shows projected total output by sectors, yield increases have been estimated for some groups of crops in total.

Table P-5. -- Present and Projected Total Gross Output for Agricultural and Forestry Sectors, Upper Main Stem Sub-Basin, Colorado River Basin, 1960, 1980, 2010

Sector	Year 1960	1980	2010
	1,000 dollars		
Range livestock	28,284	30,083	44,377
Feeder livestock	4,010	26,882	45,141
Dairy	3,155	2,577	3,324
Food and field crops	5,793	6,884	8,061
Truck crops	862	1,210	1,879
Fruit	6,243	9,451	15,653
Forestry	1,952	3,658	8,011
All other agriculture	2,660	2,409	1,997
Agricultural services	4,754	6,829	10,816

Projected Total Gross Output and Final Demands for Sectors

Gross product projections for 1980 and 2010 were made from the acreage and yield projections for crops and from assumed continuation of upward trends in efficiency in livestock production. Prices do not contribute to changes in value of production, since 1960 prices were assumed for all periods.

Present and projected gross output for agriculture and forestry sectors are presented in Table P-5.

Range Livestock. Livestock projections were based primarily on a feed balance for the sub-basin and the persistent idea of many in the sub-basin that cattle feeding will increase greatly. Range livestock projected total output in Table P-5 is made up of a decline in sheep production and an increase in cattle production with an increased proportion of feed coming from farms and slightly less feed in total originating on Federal range lands. Sheep are projected to continue their downward trend except that use of specialized year-long range lands primarily useful for sheep will slow the trend. Thus, cattle are projected to increase in numbers at the expense of sheep and with more farm-produced feed to support them. A smaller share of the sales is projected into exports in coming years, primarily due to increased sales to feeders rather than exporting feeder cattle and lambs.

Feeder Livestock. Changes in this sector are the most pronounced of any projected. Continued availability of feeder stock, decreases in dairy cow numbers, and good increases in acreages and yields of feed crops suitable for fattening rations are main bases for the increase. Fairly large feed lots are operating now in the Grand Junction and Delta areas. Availability of municiple water in the Grand Junction area now is also an important factor in a build-up of the feeder industry.

A much smaller proportion of sales is projected for final demand sectors (mainly export) due to the expected external economics of local packing and processing as the industry develops. At present, major meat packers do little slaughtering of fattened livestock in the area because of limited availability of stock.

Dairy. Dairy projections are based on a complete transition to Grade A eligible milk and continuing at about the same number of cows as are presently producing Grade A milk. A good increase in production per cow is expected. Continued dependence on need for export outlets is assumed.

Food and Field Crops. Increases in acreage of sugar beets, malting barley and irrigated dry beans are expected. The acreage increases are about proportional to total cropland acreage increases. Acreages of dry land beans and all wheat are expected to decline, for the most part due to irrigation development on dry lands. Potato acreage is expected to continue

to decline as a result of a poor comparative advantage position relative to other potato-producing aresas. Yield increases play a major part in increased output.

Truck Crops. Vegetable acreage is projected to increase in proportion to increase in total acreage. Yields increases projected were about the mean of all those projected. Acreage and importance of this sector will remain fairly small.

Fruit. Recent cutbacks in fruit acreage have been mostly due to severe winter freezing. It is anticipated that more careful selection of areas which have best water and air drainage will result in a moderate rate of growth in fruit acreage. Yield increases are projected at fairly high levels. Export sales of quantities that are not consumed locally will remain high.

Forestry. Projections of forestry activity are the most difficult to make. Current timber cut or roundwood production has been estimated to be about one-third of allowable cut.[13] Fuller utilization will depend on development of access roads and harvesting methods for sparse stands and difficult geography as well as development of market outlets for some of the less desirable sizes and species. Though forestry activity apparently contracted somewhat in the 1950's on national forests in the area, the high level of demand for wood products is projected to have an impact on this area.

At present the timber industry is mainly sawmills with little or no integrated processing. Profitable conversion of residues to chips for pulp making would strengthen the Colorado lumber industry and encourage a bigger timber cut. The large amount of low-grade and small-diameter material standing in the woods represents another very important source of supply for a wood-fiber industry. A market for pulpwood offers the best possibilities for using mill residues as well as small dimension and low-grade roundwood. A recent study reports adequate supplies and

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[13] Robert L. Miller and Grover A. Choate, "The Forest Resource of Colorado." Forest Service, U.S. Dept. of Agriculture, U.S. Forest Service Resource Bull. INT-3. Personal communication with A. P. Caparosa, Grover Choate, and Alvin K. Wilson, Intermountain Forest & Range Exp. Sta., Ogden, U

facilities for a paper mill in Western Colorado.[14]

Projections for 1980 are based on a gradual increase in sawmilling. The stud mill which began operation in November 1963 in Montrose has a capacity of 140,000 board feet daily in two shifts. Other mills are expected to come into production in the next 15 years to satisfy lumber demands.

Projections for 2010 assume development of a 350-ton per day kraft pulp mill in the vicinity of Kremmling. This activity would substantially enhance the sawmilling industry as it would provide a profitable outlet for milling residue. About one-fifth of the chips for pulping could be provided by sawmills. The value of these sawmill residue chips would be about $600,000.[15] Much of the pulpwood supplies could be developed from pole timber and dead, but standing timber so that even with the necessary large increase in timber cut projected for 2010 the cut would still be within allowable limits.

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[14] Jay M. Hughes, "Pulp and Paper-making Opportunities in West-Central Colorado." U.S. Forest Service, Rocky Mountain Forest and Range Expt. Sta. Paper 73.

[15] Ibid., p. 22.

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Notes on the Projection of Final Demand for the Mining, Manufacturing and Electric Utility Industries

By and large, projections of final demand for the mining, manufacturing and electric utility industries followed the general procedures outlined earlier in this chapter. In several cases, however, the projected values show extremely slow or rapid growth, and these require the specific explanations which follow.

Oil and Gas. A decline in exploration activities is anticipated in the Upper Main Stem. Such activities constituted a major portion of final demand sales in 1960.

Uranium. An increase in final demand sales is expected until about 1969, after which time the anticipated end of the Government support program and uncertainties as to the future requirements for peaceful uses of atomic energy is seen contributing to a modest decline in final demand sales.

"All Other" Manufacturing. A decline resulted to 1980 because of anticipated closing of the gilsonite refinery in Mesa County due to the depletion of gilsonite deposits (See Green Sub-Basin report). This projection is based on the assumption that potential oil shale development will not use these facilities. However, the subsequent anticipated development of pulping operations should contribute to a reversal of the decline by 2010.

Projection of Final Demand for "All Other" Sectors

With the exception of the export segments of the tourist-oriented sectors, the following procedure was followed.[15]

The projections are based on a comparison of per capita final demand in each sector in the United States $\left(\frac{FD_i^{us}}{P^{us}}\right)$ with per capita final demand in the sub-basin $\left(\frac{FD_i^{sb}}{P^{sb}}\right)$.

[15] The special considerations that were taken into account in the tourist-oriented sectors are discussed in the concluding paragraphs of this section.

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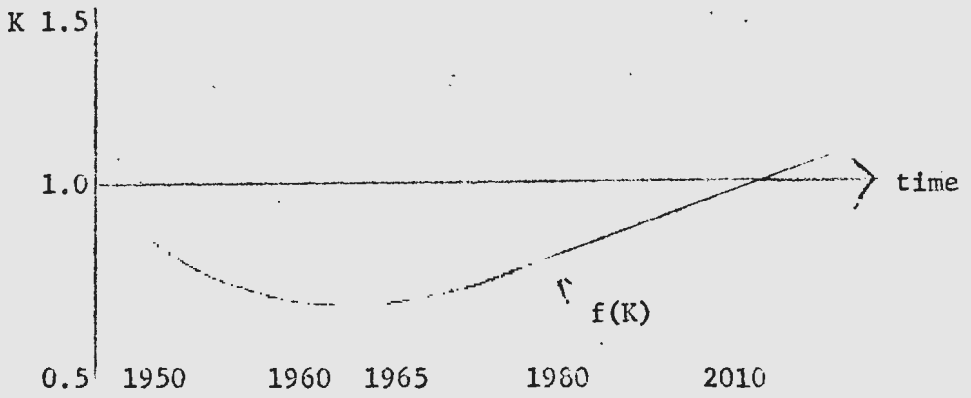
FD_i^{us} was derived from data in the ORRRC Report #23, pages 280-283. P^{us} was obtained from Resources for the Future, Inc. Using these data we were able to obtain a national per capita final demand expenditure estimate for both historical years (1950 and 1960) and for the projected years.

To obtain a sub-basin value for final demand in 1950, it was assumed that final demand constituted the same portion of TGO in 1950 that it did in 1960. Thus, having 1950 and 1960 final demand, it was possible to obtain $\left(\frac{FD_i^{sb}}{P^{sb}}\right)$ comparable to the U.S. figures derived earlier. It was assumed that that the area's per capita final demand for a given industry would converge towards that of the national counterpart industry at a steady rate of compound growth (logrithmic). By employing this annual growth rate, the 1960 ratio (K) can be projected to 1980 and 2010. Given the various values of K_t, final demand expenditures for industry "i" in a sub-basin may be found by:

$$FD_i^{sb} = K\left(\frac{FD_i^{us}}{P^{us}}\right)\left(P^{sb}\right).$$

From the medium projection of population we are able to obtain the medium projection of final demand for each sector.

One of the basic problems encountered in this method was that of projecting K. In most cases K converged towards the national mean in the 1950 to 1960 period. In such cases, K was projected at its 1950-1960 growth rate until a value of 1.00 was reached. From that time on, it was assumed that K would remain at 1.00 to 2010. There was a problem when K was diverging from the national average in the 1950-1960 period. In such cases, it was assumed that 1960 represented the point of greatest divergence, and that the growth trend of K would reverse itself towards eventual convergence with K equal to 1.00. Most of the time, it was assumed that K would reach 1.00 in 2010 and appropriate growth rates were employed in the 1960 to 2010 period to supply intermediate values for 1965 and 1980. This divergence pattern can be demonstrated graphically.



The divergence is greatest (K is the smallest) at 1960, slowly K recovers to an arbitrary 2010 value of 1.00.

In addition, a tourism variable, or weight, was introduced in the projections of several sectors, where applicable, as follows:

$$T_i^{sb} = X \cdot K_t \left(\frac{\sum W_i \cdot Y_i^d}{Y_{us}^d} \right)$$

where

T_i^{sb} = the tourism "weight" to be applied to the final demand data.

X = 1960 exports from the input-output table.

K_t = U.S. projected increase in tourist and recreation expenditures (ORRRC).

W_i = per cent of total tourists entering sub-basins that originated in state i, therefore

$\sum W_i$ = all tourists for a given year.

Y_i^d = disposable personal income in state i.

Y_{us}^d = disposable personal income in U.S.

The service sectors presented another problem. Since the ORRRC projections of final demand for the U.S. were made only for total services, it was decided that we should do the same. Lodging and Other Services were aggregated, projected as a whole, and disaggregated in a ratio similar to that of 1960 but with small allowances for projected changes in the distribution of total services.

The same procedure was used in the projections of total trade; however, another problem presented itself in the trade sectors. In this report, final demand for Eating and Drinking is shown as gross sales in the input-output table. The ORRRC projections of total trade included Eating and Drinking as part of their projections of margin sales; thus, it was necessary to convert our gross sales figure to margin sales for purposes of projecting. Once the projections were complete, the margin sales of Eating and Drinking were reconverted to gross sales.

Appendix

Summary Analysis of Projected I-O Tables

In order to facilitate analysis of the projected tables of input-output relations and coefficients which appeared above (Tables UMS $1980_{a,b,c}$ and UMS $2010_{a,b,c}$) a series of summary tables have been prepared which follow:

Table UMS-1980-d

Total Gross Output of Processing Sector Industries in the Upper Main Stem Sub-Basin

	Industry	Total Gross Output
1.	Contract Construction	$143,811,000
2.	Other Retail	90,788,000
3.	Uranium	88,911,000
4.	Rentals & Finance	87,678,000
5.	Transportation	64,180,000
6.	Other Services (Except Professional)	46,897,000
7.	Wholesale Trade	42,724,000
8.	Food & Kindred Products	34,794,000
9.	Range Livestock	30,083,000
10.	Other Utilities	29,997,000
11.	Eating & Drinking Places	29,191,000
12.	Feeder Livestock	26,882,000
13.	Other Manufacturing	18,253,000
14.	Lodging	17,471,000
15.	Zinc	16,333,000
16.	Electric Energy	15,205,000
17.	Fruit	9,451,000
18.	Other Mining	8,883,000
19.	Service Stations	8,722,000
20.	Coal	8,177,000
21.	Printing & Publishing	7,366,000
22.	Food & Field Crops	6,884,000
23.	Agricultural Services	6,829,000
24.	Lumber & Wood Products	6,229,000
25.	Forestry	3,658,000
26.	Stone, Clay & Glass Products	2,832,000
27.	Dairy	2,577,000
28.	Fabricated Metals	2,570,000
29.	Other Agriculture	2,409,000
30.	Truck Crops	1,210,000
31.	Oil & Gas	1,015,000

Source: Table UMS-1980-a.

Table UMS-1980-e

Processing Sector Industry Sales to Final Demand in the Upper Main Stem Sub-Basin

	Industry	Sales to Final Demand
1.	Contract Construction	$ 96,428,000
2.	Other Retail	87,015,000
3.	Uranium	72,640,000
4.	Rentals & Finance	65,745,000
5.	Transportation	38,668,000
6.	Wholesale Trade	37,088,000
7.	Other Services (Except Professional)	35,105,000
8.	Eating & Drinking Places	28,530,000
9.	Food & Kindred Products	25,625,000
10.	Other Utilities	21,670,000
11.	Feeder Livestock	18,149,000
12.	Lodging	17,291,000
13.	Zinc	16,317,000
14.	Fruit	7,682,000
15.	Range Livestock	6,942,000
16.	Coal	6,380,000
17.	Lumber & Wood Products	5,868,000
18.	Service Stations	5,706,000
19.	Other Manufacturing	5,341,000
20.	Electric Energy	5,341,000
21.	Other Mining	4,613,000
22.	Food & Field Crops	4,396,000
23.	Fabricated Metals	1,418,000
24.	Other Agriculture	1,400,000
25.	Forestry	1,291,000
26.	Truck Crops	1,140,000
27.	Oil & Gas	1,000,000
28.	Dairy	680,000
29.	Stone, Clay & Glass Products	384,000
30.	Printing & Publishing	341,000
31.	Agricultural Services	28,000

Source: Interindustry Transactions Table, UMS-1980-a.

Table UMS-1980-f

Sales to Final Demand by Processing Sectors Listed Below
As a Percentage of Total Gross Output in the
Upper Main Stem Sub-Basin

	Industry	Sales to Final Demand Divided by Total Gross Output %
1.	Zinc	99.90
2.	Lodging	98.97
3.	Oil & Gas	98.52
4.	Eating & Drinking Places	97.74
5.	Other Retail	95.84
6.	Truck Crops	94.21
7.	Lumber & Wood Products	94.20
8.	Wholesale Trade	86.81
9.	Uranium	81.70
10.	Fruit	81.28
11.	Coal	78.02
12.	Rentals & Finance	74.98
13.	Other Services (Except Professional)	74.86
14.	Food & Kindred Products	73.65
15.	Other Utilities	72.24
16.	Feeder Livestock	67.51
17.	Contract Construction	67.05
18.	Service Stations	65.42
19.	Food & Field Crops	63.86
20.	Transportation	60.25
21.	Other Agriculture	58.12
22.	Fabricated Metals	55.18
23.	Other Mining	51.93
24.	Forestry	35.29
25.	Electric Energy	35.13
26.	Other Manufacturing	29.26
27.	Dairy	26.39
28.	Range Livestock	23.08
29.	Stone, Clay & Glass Products	13.56
30.	Printing & Publishing	4.63
31.	Agricultural Services	0.41

Source: Tables UMS-1980-d and UMS-1980-e.

Table UMS-1980-h

Processing Sector Industries of the Upper Main-Stem Sub-Basin Ranked by the Magnitude of the Total Dollar Production Directly and Indirectly Required by the Sub-Basin Economy to Sustain a $1.00 Increase in Deliveries to Final Demand by the Industries Named.

	Industry	Direct & Indirect Requirements Per Dollar of Sales
1.	Feeder Livestock	2.175890
2.	Food & Kindred Products	2.075294
3.	Lumber & Wood Products	1.640398
4.	Truck Crops	1.611100
5.	Contract Construction	1.606433
6.	Fruit	1.600807
7.	Other Agriculture	1.534172
8.	Eating & Drinking Places	1.480793
9.	Dairy	1.469857
10.	Stone, Clay & Glass Products	1.451147
11.	Uranium	1.431928
12.	Lodging	1.330798
13.	Electric Energy	1.324293
14.	Range Livestock	1.307302
15.	All Other Retail	1.301892
16.	Oil & Gas	1.288240
17.	Food & Field Crops	1.277037
18.	Transportation	1.253533
19.	Wholesale Trade	1.230304
20.	All Other Services	1.215087
21.	Service Stations	1.182232
22.	Other Utilities	1.162532
23.	Agricultural Services	1.154270
24.	Fabricated Metals	1.120188
25.	Coal	1.111209
26.	All Other Mining	1.106734
27.	Other Manufacturing	1.104713
28.	Printing & Publishing	1.100239
29.	Zinc	1.094810
30.	Forestry	1.082527
31.	Rentals & Finance	1.081125

Source: Table of Direct and Indirect Requirement Coefficients UMS-1980-c.

Table UMS-1980-f

Number of Processing Sector Industries Responding in Amounts of at least $0.01 per dollar of Sales to Final Demand by the Industries Listed Below.

Industry	Intersections greater than $0.01
Food & Kindred Products	15
Other Agriculture	13
Eating & Drinking Places	12
Dairy	12
Feeder Livestock	12
All Other Retail	8
Oil & Gas	8
Food & Field Crops	8
Range Livestock	7
Lumber & Wood Products	7
Lodging	7
Contract Construction	6
Service Stations	6
Stone, Clay and Glass Products	6
Fruit	6
Truck Crops	6
Coal	5
All Other Mining	5
Wholesale Trade	5
Agricultural Services	5
All Other Services	5
Transportation	5
Electric Energy	4
Other Utilities	4
Other Manufacturing	4
Uranium	3
Forestry	3
Printing & Publishing	3
Fabricated Metals	3
Rentals and Finance	2
Zinc	2

Source: Table of Direct and Indirect Requirements per dollar of Final Demand, UMS-1980-c.

Table UMS-2010-d

Total Gross Output of Processing Sector Industries in the Upper Main Stem Sub-Basin

	Industry	Total Gross Output
1.	Rentals & Finance	$210,436,000
2.	Contract Construction	207,745,000
3.	Other Retail	203,686,000
4.	Other Services (Except Professional)	136,948,000
5.	Wholesale Trade	95,487,000
6.	Uranium	85,784,000
7.	Transportation	81,385,000
8.	Eating & Drinking Places	65,612,000
9.	Other Utilities	56,173,000
10.	Food & Kindred Products	50,110,000
11.	Lodging	48,812,000
12.	Feeder Livestock	45,141,000
13.	Range Livestock	44,377,000
14.	Other Manufacturing	42,555,000
15.	Electric Energy	31,331,000
16.	Zinc	22,453,000
17.	Printing & Publishing	17,491,000
18.	Service Stations	17,423,000
19.	Fruit	15,653,000
20.	Other Mining	11,001,000
21.	Agricultural Services	10,816,000
22.	Lumber & Wood Products	10,805,000
23.	Coal	9,954,000
24.	Food & Field Crops	8,061,000
25.	Forestry	8,011,000
26.	Stone, Clay & Glass Products	4,116,000
27.	Fabricated Metals	3,876,000
28.	Dairy	3,324,000
29.	Other Agriculture	1,997,000
30.	Truck Crops	1,879,000
31.	Oil & Gas	1,016,000

Source: Table UMS-2010-a.

Table UMS-2010-e

Processing Sector Industry Sales to Final Demand in the Upper Main Stem Sub-Basin

	Industry	Sales to Final Demand
1.	Other Retail	$196,062,000
2.	Rentals & Finance	160,598,000
3.	Contract Construction	133,494,000
4.	Other Services (Except Professional)	111,946,000
5.	Wholesale Trade	83,567,000
6.	Uranium	70,000,000
7.	Eating & Drinking Places	64,283,000
8.	Lodging	47,977,000
9.	Transportation	39,016,000
10.	Other Utilities	35,651,000
11.	Feeder Livestock	31,862,000
12.	Food & Kindred Products	30,815,000
13.	Zinc	22,431,000
14.	Other Manufacturing	21,235,000
15.	Fruit	12,900,000
16.	Service Stations	12,857,000
17.	Lumber & Wood Products	9,770,000
18.	Electric Energy	8,561,000
19.	Range Livestock	7,901,000
20.	Coal	5,891,000
21.	Other Mining	5,233,000
22.	Food & Field Crops	4,758,000
23.	Fabricated Metals	2,328,000
24.	Forestry	2,118,000
25.	Other Agriculture	1,180,000
26.	Oil & Gas	1,000,000
27.	Truck Crops	1,729,000
28.	Dairy	655,000
29.	Printing & Publishing	419,000
30.	Stone, Clay & Glass Products	406,000
31.	Agricultural Services	116,000

Source: Interindustry Transactions Table, UMS-2010-a.

Table UMS-2010-f

Sales to Final Demand by Processing Sectors Listed Below
As a Percentage of Total Gross Output in the
Upper Main Stem Sub-Basin

	Industry	Sales to Final Demand Divided by Total Gross Output %
1.	Zinc	99.90
2.	Oil & Gas	98.43
3.	Lodging	98.29
4.	Eating & Drinking Places	97.97
5.	Other Retail	96.26
6.	Truck Crops	92.02
7.	Lumber & Wood Products	90.42
8.	Wholesale Trade	87.52
9.	Fruit	82.41
10.	Other Services (Except Professional)	81.74
11.	Uranium	81.60
12.	Rentals & Finance	76.32
13.	Service Stations	73.79
14.	Feeder Livestock	70,58
15.	Contract Construction	64.26
16.	Other Utilities	63.47
17.	Food & Kindred Products	61.49
18.	Fabricated Metals	60.06
19.	Coal	59.18
20.	Other Agriculture	59.09
21.	Food & Field Crops	59.02
22.	Other Manufacturing	49.90
23.	Transportation	47.94
24.	Other Mining	47.57
25.	Electric Energy	27.32
26.	Forestry	26.44
27.	Dairy	19.71
28.	Range Livestock	17.80
29.	Stone, Clay & Glass Products	9.86
30.	Printing & Publishing	2.40
31.	Agricultural Services	1.07

Source: Tables UMS-2010-d and UMS-2010-e.

Table UMS-2010-h

Processing Sector Industries of the Upper Main Stem Sub-Basin Ranked by the Magnitude of the Total Dollar Production Directly and Indirectly Required by the Sub-Basin Economy to Sustain a $1.00 Increase in Deliveries to Final Demand by the Industries Named.

	Industry	Direct and Indirect Requirements Per Dollar of Sales
1.	Contract Construction	1.446588
2.	Uranium	1.225490
3.	Electric Energy	1.130626
4.	Range Livestock	1.105556
5.	Food & Kindred Products	1.057346
6.	Transportation	1.047238
7.	Feeder Livestock	1.045520
8.	Other Services (Except Professional)	1.041692
9.	Rentals & Finance	1.029516
10.	Printing & Publishing	1.020131
11.	Other Utilities	1.016519
12.	Oil & Gas	1.016260
13.	Other Manufacturing	1.014877
14.	Coal	1.005885
15.	Other Retail Trade	1.005206
16.	Wholesale Trade	1.003872
17.	Other Agriculture	1.002763
18.	Dairy	1.002450
19.	Lodging	1.002249
20.	Fabricated Metals	1.002112
21.	Agricultural Services	1.001518
22.	Fruit	1.001127
23.	Service Stations	1.001097
24.	Forestry	1.001077
25.	Other Mining	1.001047
26.	Zinc	1.001001
27.	Eating & Drinking Places	1.000489
28.	Lumber & Wood Products	1.000470
29.	Stone, Clay & Glass Products	1.000101
30.	Food & Field Crops	1.000031
31.	Truck Crops	1.000006

Source: Table of Direct and Indirect Requirement Coefficients, UMS-2010-c.

Table UMS-2010-i

Number of Processing Sector Industries Responding In Amounts of At Least $0.01 per Dollar of Sales to Final Demand by the Industries Listed Below.

Industry	Intersections greater than $0.01
Food & Kindred Products	16
Eating & Drinking Places	13
Other Agriculture	13
Feeder Livestock	13
Dairy	12
Lodging	9
Food & Field Crops	9
Range Livestock	8
Oil & Gas	8
Lumber & Wood Products	8
Other Retail Trade	8
Fruit	7
Stone, Clay & Glas Products	7
Other Manufacturing	7
Truck Crops	6
Wholesale Trade	6
Service Stations	6
Agricultural Services	6
Other Services (Except Professional)	6
Transportation	6
Other Utilities	6
Contract Construction	6
Electric Energy	5
Fabricated Metals	5
Other Mining	5
Coal	5
Uranium	4
Printing & Publishing	4
Zinc	3
Forestry	3
Rentals & Finance	2

Source: Table of Direct & Indirect Requirements per Dollar of Final Demand, UMS-2010-c.