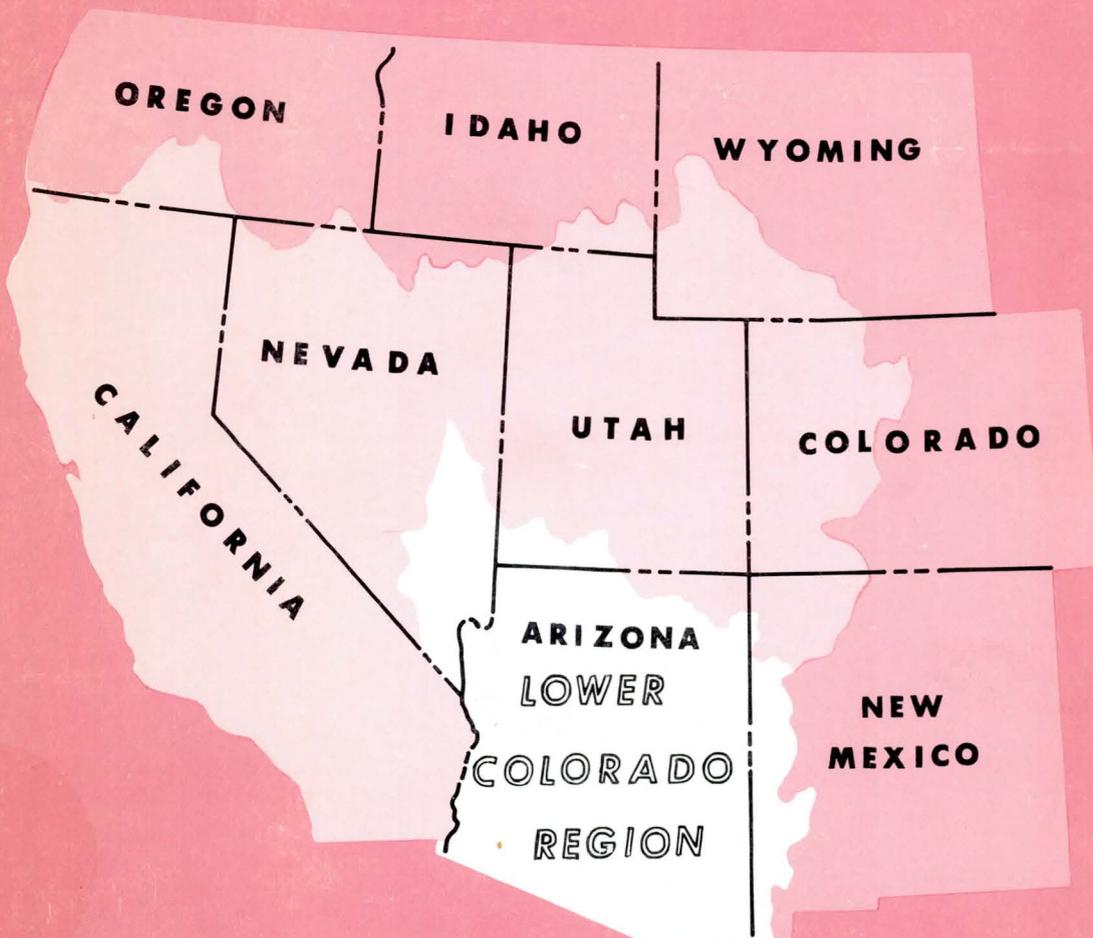


LOWER COLORADO REGION Comprehensive Framework Study

APPENDIX IV
ECONOMIC BASE AND PROJECTION
FOR 1980, 2000, 2020
JUNE 1971



PREPARED BY:

**LOWER COLORADO REGION STATE - FEDERAL
INTERAGENCY GROUP FOR THE
PACIFIC SOUTHWEST INTERAGENCY COMMITTEE**

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LOWER COLORADO REGION
COMPREHENSIVE FRAMEWORK STUDY

APPENDIX IV

THE ECONOMIC BASE AND PROJECTIONS

FOR

1980, 2000, AND 2020

This report of the Lower Colorado Region Framework Study State-Federal Interagency Group was prepared at field level and presents a framework program for the development and management of the water and related land resources of the Lower Colorado Region. This report is subject to review by the interested Federal agencies at the departmental level, by the Governors of the affected States, and by the Water Resources Council prior to its transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration.

ECONOMICS WORK GROUP

STATE-FEDERAL INTERAGENCY GROUP

June 1971

This appendix was prepared by the
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of the
LOWER COLORADO REGION STATE-FEDERAL INTERAGENCY GROUP
for the
PACIFIC SOUTHWEST INTERAGENCY COMMITTEE
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SUMMARY AND CONCLUSIONS

This study is a part of a comprehensive national-interregional framework study, commonly referred to as a Type I Study, made on an interagency basis under the auspices of the Water Resources Council. This appendix to the Main Report provides economic data and analyses pertaining to the Region's economy in the base period and for the projection time frame for use in formulating and appraising framework plans re water and related land requirements, and their effect upon people. The Region and subregions used in this appendix were delineated on an economic or political subdivision basis and are synonymous with the Water Resources Planning Areas for which primary or structural baseline projections were provided by the Water Resources Council. The base period is referred to as 1965 and, to the extent feasible, represents a normalized situation. The projection time frame extends 55 years into the future with three target years, 1980, 2000, and 2020.

Two sets of projections are portrayed and analyzed in this appendix, and the basis is provided whereby other alternative projections can be readily developed to broaden the scope of the analyses and reduce uncertainty in water resource planning. The baseline or OBE-ERS projections are first portrayed and analyzed relative to the base period and historical trends. The modified OBE-ERS projections are then presented and related to the OBE-ERS projections. The basis for developing other alternative projections to facilitate analyses of alternative levels and uses of water is presented in the concluding chapter. Analysis of price impacts, alternative levels of projected crop yields, and alternative projections of population and employment released by the Water Resources Council in June 1969, and their effect on the economy were analyzed.

The baseline projections are referred to as OBE-ERS projections since they were prepared for the Water Resources Council by the Office of Business Economics, U. S. Department of Commerce, and the Economic Research Service, U. S. Department of Agriculture. They are a part of a consistent set of national-interregional projections which equated national demand with supply and provided a first approach to consistent regional projections based upon historical trends in interregional production relationships. The projections provided for the Region and/or subregions were disaggregated by the Economics Work Group and a complete set of consistent projections developed for each of the three subregions--the Lower Main Stem, Little Colorado, and Gila. A summary of the OBE-ERS projections compared with the base year 1965 is portrayed in table 1.1.

The Lower Colorado Region is one of the fastest growing areas of the United States and this relationship is projected to continue. The OBE-ERS projections for the nation as a whole are based upon an assumed population growth rate of 1.3 percent. This is substantially lower than the OBE-ERS projected growth rate of 2.3 percent per annum for the Lower Colorado Region.

TABLE 1.1
A SUMMARY OF OBE-ERS PROJECTIONS RELATED TO THE BASE YEAR 1965
LOWER COLORADO REGION, BY SUBREGION

Area and Item	1965	OBE-ERS Projections		
		1980	2000	2020
	---1,000---	----- Percent of 1965 -----		
<u>Population</u>				
Region	1,877.0	141	227	354
LMS Subregion	345.2	161	296	509
L Colorado Subregion	125.0	144	176	209
Gila Subregion	1,406.8	136	215	329
<u>Employment</u>				
Region	765.7	150	248	391
LMS Subregion	134.8	166	312	539
L Colorado Subregion	33.7	163	223	270
Gila Subregion	507.2	145	233	360
<u>Personal Income Per Capita</u>	<u>Dollars</u>			
Region	2,292	174	309	535
LMS Subregion	2,593	174	296	495
L Colorado Subregion	1,049	274	534	1,040
Gila Subregion	2,329	169	300	521
<u>TGO, Producing Industries</u>	<u>\$1,000,000^{1/}</u>			
LMS Subregion				
Agriculture	123.3	150	207	267
Forestry	5.2	148	181	183
Mining	32.1	185	274	370
Manufacturing	197.1	297	776	1,862
Noncommodity producing industries	1,220.5	246	721	1,886
Total	1,578.2	243	677	1,720
L Colorado Subregion				
Agriculture	14.7	116	151	185
Forestry	7.3	101	101	93
Mining	112.2	143	163	123
Manufacturing	72.1	218	411	672
Noncommodity producing industries	138.4	194	387	657
Total	344.7	177	303	454
Gila Subregion				
Agriculture	458.4	179	223	277
Forestry	2.1	205	286	305
Mining	458.5	142	208	277
Manufacturing	1,759.1	246	646	1,583
Noncommodity producing industries	2,977.7	213	514	1,172
Total	5,655.8	215	507	1,155
<u>Value Added, Producing Industries^{2/}</u>				
LMS Subregion				
Agriculture	47.1	138	179	218
Forestry	3.9	157	191	191
Mining	16.0	186	265	346
Manufacturing	66.7	336	845	1,950
Noncommodity producing industries	598.5	264	790	2,099
Total	732.2	260	741	1,920
L Colorado Subregion				
Agriculture	8.4	111	140	169
Forestry	6.3	107	97	89
Mining	49.0	115	127	93
Manufacturing	18.6	272	487	809
Noncommodity producing industries	52.1	204	429	731
Total	134.4	171	293	444

See footnotes at end of table, page iif

TABLE 1.1
A SUMMARY OF OBE-ERS PROJECTIONS RELATED TO THE BASE YEAR 1965
LOWER COLORADO REGION, BY SUBREGION--CONTINUED

Area and Item	1965	OBE-ERS Projections		
		1980	2000	2020
	:\$1,000,000 ^{1/}	----- Percent of 1965 -----		
Gila Subregion	:	:	:	:
Agriculture	: 176.4	184	229	285
Forestry	: 1.8	199	278	290
Mining	: 252.3	125	163	200
Manufacturing	: 655.9	273	715	1,729
Noncommodity producing industries	: 1,521.8	214	505	1,137
Total	: 2,608.2	218	506	1,137
<u>Gross Regional Product</u>	:	:	:	:
Region	: 6,025.8	242	682	1,173
LMS Subregion	: 1,280.2	281	862	2,363
L Colorado Subregion	: 224.1	314	739	1,683
Gila Subregion	: 4,524.4	228	628	1,610
<u>Harvested Irrigated Acreage^{3/}</u>	:	:	:	:
Region	: 1,225.6	112	115	118
LMS Subregion	: 241.9	119	132	142
L Colorado Subregion	: 20.7	107	110	112
Gila Subregion	: 963.0	110	111	112
<u>Range Cows</u>	:	:	:	:
Region	: 498.6	105	115	123
LMS Subregion	: 66.0	103	106	109
L Colorado Subregion	: 69.9	107	117	122
Gila Subregion	: 362.7	105	115	126
<u>Cattle & Calves Marketed From Finishing Feed Lots</u>	:	:	:	:
Region	: 631.4	303	407	536
LMS Subregion	: 68.7	250	389	560
L Colorado Subregion	: 1.4	93	86	86
Gila Subregion	: 561.3	311	410	534
<u>Milk Cows (In Production)</u>	:	:	:	:
Region	: 58.7	78	89	107
LMS Subregion	: 7.0	76	86	103
L Colorado Subregion	: .8	63	50	38
Gila Subregion	: 50.9	79	90	109
<u>Net Exports or (Imports)</u>	:	----- 1,000 Tons -----		
Region	:	:	:	:
Feed grains	: 47.6	(1,022.8) ^{4/}	(1,471.6)	(2,115.5)
Hay	: 350.0	388.7	430.7	478.1
<u>Net Imports</u>	:	----- Percent of 1965 -----		
Region	:	:	:	:
Red meat	: 65.4	10	382	1,018
Chicken and turkey	: 88.3	162	269	427
Milk	: 646.2	142	257	432
Eggs	: 394.1	143	246	401

1/ All values are in 1960 dollars.

2/ Note that only producing industries are included here, not the total economy.

3/ Total harvested irrigated acreage, including double and multiple cropping.

4/ Imports

Population of the Region is projected to show the greatest relative gain, its projected population in 2020 being roughly 5 times the 1965 number. In contrast, the projected 2020 population for the Little Colorado Subregion is only a little more than double the 1965 number. The Lower Main Stem Subregion, with a population of 1.8 million in 2020, is projected to increase its share of the regional total to 26 percent from 18 percent in 1965; the Little Colorado Subregion is projected to have 262 thousand, 4 percent of the Region total compared with 7 percent in 1965; and the Gila Subregion is projected to have 4.6 million, 70 percent of the Region total compared with 75 percent in 1965. Hence, the Gila Subregion is projected to continue as the dominant subregion in terms of population, as such, and also in the proportion of the regional population which it includes. However, the higher growth rate in the Lower Main Stem Subregion should be recognized in framework planning.

The proportion of the Region's population living in urban areas is projected to increase from 74 percent in 1965 to 95 percent in 2020. The proportion in urban areas is even higher in the Lower Main Stem and Gila Subregions. The Little Colorado Subregion was predominantly rural in 1965, the rural population comprising two-thirds of the total. Nearly half the population is projected to be rural in 2020.

The population of the Region is younger on the average than that of the Nation as a whole. The Region ranks about average from an educational viewpoint, but there are great variations within the Region.

The employment projections, which are based upon a national assumption of full employment, are a little higher relatively than the population projections, due to a small projected increase in the participation rate (the proportion of the population employed). Employment in the Region is projected to increase to 2.6 million in 2020, nearly 4 times the 675 thousand employed in the base year. Table 1.1. Compared with 1965, employment in the Lower Main Stem Subregion in 2020 is projected to be up 5.4 times; in the Little Colorado Subregion, up 2.7 times; and in the Gila Subregion, up 3.6 times. Employment is projected to decline somewhat in agriculture, forestry, and mining, and to increase in all other industries, particularly in manufacturing and the service industries.

Personal income per capita, reflecting the assumed full employment, continued technological advances, etc., is projected to increase sharply throughout the projection time frame, the regional projection for 2020 being in excess of \$12,000, over five times the 1965 average of about \$2,300. Table 1.1. The Little Colorado Subregion is projected to have the largest relative increase, but since its average per capita income was low in 1965 the level in that subregion still will be below the average for the Region in 2020.

Among the five major types of industries in the Region, given in table 1.1, the noncommodity producing industries showed the highest gross

output in 1965. This group of industries stood out particularly in the Lower Main Stem Subregion, which points up the importance of service oriented industries in that subregion, notably in the Las Vegas, Nevada area. Manufacturing also was relatively important in the base period, particularly in the Gila Subregion. These two types of industries are projected to show by far the most rapid growth throughout the projection time frame. Hence, they will comprise an even larger part of the economy of the three subregions in 2020 than currently.

Value added (defined in the Glossary) by the five major types of industries in the Region is projected to show approximately the same relative growth over the projection time frame as total gross output. Table 1.1. The noncommodity producing sectors and manufacturing again stand out, both in terms of their relative importance in the base period and in terms of their relative growth over the projection period. Of the value added by the five types of producing industries in 2020, the non-commodity producing sectors are projected to contribute 90 percent in the Lower Main Stem, 64 percent in the Little Colorado, and 58 percent in the Gila Subregion. Comparable percentage figures for the manufacturing sectors are: 9 percent in the Lower Main Stem, 25 percent in the Little Colorado, and 38 percent in the Gila Subregion. Hence, it is evident that with the OBE-ERS projections, the major part of the value added to the economy by the producing industries in 2020 will be derived from the noncommodity and manufacturing sectors.

Estimated gross regional product (defined in the Glossary) totaled \$6 billion in 1965, and is projected to increase to \$107 billion in 2020, an increase of nearly 18 times. Table 1.1. The most rapid growth is projected for the Lower Main Stem Subregion. As a result, the Lower Main Stem Subregion is projected to produce 28 percent of the regional GRP in 2020, compared with 21 percent in 1965. The relative increase in the Lower Main Stem will be taken from the Gila Subregion where the proportion of the regional GRP produced is projected to decline to 68 percent in 2020, compared with 75 percent in 1965.

The irrigated harvested acreage (defined in the Glossary) in the Region is projected to increase from 1,225,600 acres in 1965 to 1,450,400 acres in 2020, an 18 percent increase. Table 1.1. The Lower Main Stem Subregion is projected to have a 42 percent increase over the 55-year projection period, substantially higher than the 12 percent increase in the other two subregions. The proportion of the regional acreage in the Lower Main Stem Subregion is projected to increase, therefore, to 24 percent compared with 20 percent in 1965. The offsetting proportional decline is expected to occur in the Gila Subregion where the proportion of the regional acreage is expected to decrease from 79 percent in 1965 to 75 percent in 2020.

The largest relative increase in acreage is projected to take place in food crops, primarily in vegetables and citrus. The Lower Main Stem

and Gila Subregions are well suited to production of these crops. The cotton acreage also was projected to increase substantially. The acreage of feed grains was projected to decline.

There is an abundance of land suitable for irrigated crop production. Therefore, if water and other requirements to place the land in production can be economically obtained, the projected increase in harvested irrigated acreage is feasible.

A wide range of livestock and livestock products are produced in the Region. The sheep, hog, and poultry enterprises, however, are relatively small. The three major enterprises are range, feedlot, and dairy.

The number of range cattle is projected to increase throughout the projection time frame. Range cows are projected to increase 23 percent. Table 1.1. To meet the OBE-ERS projected regional increase for red meat production, cattle and calves marketed from finishing feedlots in the Region would have to increase very sharply--from 631,400 in 1965 to 3,383,300 in 2020, a 5.4-fold increase. The number of cattle fattened in the Region has been increasing very rapidly in recent years, but the projection is substantially above the trend, particularly in 1980. It does not appear feasible for the Region to meet the projection.

With the OBE-ERS projections, the number of milk cows in the Region is expected to increase only about 7 percent by 2020. Milk production is projected to show a greater increase but the major part of the added requirement will be satisfied by the projected increase in production per cow.

In the base year, 1965, the Region was a net exporter of feed grains but with OBE-ERS projections substantial imports will be required in each of the projection years, net imports of feed grains required in 2020 amounting to over 2 million tons. Hay exports are projected to increase from the base year level of 350 thousand tons to 575 thousand tons in 2020.

With the OBE-ERS projections, food imports are expected to increase sharply. Table 1.1. Red meat import requirements will increase from 65 million pounds in 1965 to 666 million pounds in 2020, a tenfold increase. Net import requirements for each of the other items will increase more than 4 times during the 1965-2020 period.

The modified OBE-ERS projections were developed on the basis of modifications in the OBE-ERS projections made by the four Basin States, and by the Minerals, Power, and Economics Work Groups, with a view to making the projections more consistent with regional trends and anticipated conditions. Modified OBE-ERS projections related to the OBE-ERS projections are summarized in table 1.2.

TABLE 1.2

MODIFIED OBE-ERS PROJECTIONS RELATED TO THE		OBE-ERS PROJECTIONS, LOWER COLORADO REGION, BY SUBREGION		
Item and Area	:	Modified OBE-ERS as a Percent of OBE-ERS Projections		
		1980	2000	2020
<u>Population</u>	:			
Region	:	100.1	113	105
LMS Subregion	:	147	149	115
L Colorado Subregion	:	102	110	125
Gila Subregion	:	100	100	100
	:			
<u>Employment</u>	:			
Region	:	112	115	107
LMS Subregion	:	151	152	118
L Colorado Subregion	:	110	113	132
Gila Subregion	:	100	102	102
	:			
<u>TGO, Producing Industries</u>	:			
LMS Subregion	:	148	152	125
Agriculture	:	106	106	111
Forestry	:	100	100	100
Mining	:	212	174	159
Manufacturing	:	131	142	124
Noncommodity producing industries	:	153	155	126
L Colorado Subregion	:	239	183	185
Agriculture	:	103	106	111
Forestry	:	100	100	100
Mining	:	602	490	616
Manufacturing	:	117	110	130
Noncommodity producing industries	:	106	122	151
Gila Subregion	:	100	105	107
Agriculture	:	89	97	101
Forestry	:	100	100	100
Mining	:	100	100	100
Manufacturing	:	100.1	101	100.2
Noncommodity producing industries	:	101	110	113
	:			
<u>Value Added, Producing Sectors</u>	:			
LMS Subregion	:	148	151	124
Agriculture	:	106	105	110
Forestry	:	100	100	100
Mining	:	182	156	145
Manufacturing	:	132	148	123
Noncommodity producing industries	:	152	152	124
L Colorado Subregion	:	262	190	179
Agriculture	:	103	106	107
Forestry	:	100	100	100
Mining	:	728	580	685
Manufacturing	:	120	114	134
Noncommodity producing industries	:	107	117	140
Gila Subregion	:	100	107	110
Agriculture	:	77	99	103
Forestry	:	100	100	100
Mining	:	100	102	100
Manufacturing	:	100	102	101
Noncommodity producing industries	:	103	111	116
	:			
<u>Gross Regional Product</u>	:			
Region	:	113	115	106
LMS Subregion	:	147	149	116
L Colorado Subregion	:	123	123	128
Gila Subregion	:	100.2	101	101
	:			
<u>Irrigated Harvested Acreage</u>	:			
Region	:	106	109	109
LMS Subregion	:	113	106	107
L Colorado Subregion	:	112	122	132
Gila Subregion	:	103	110	109
	:			
<u>Cattle Marketed from Finishing Feedlots</u>	:			
Region	:	75	75	76
	:			
<u>Milk Cows</u>	:			
Region	:	133	169	190

A large increase was made in population projections for the Nevada portion of the Region, particularly in 1980 and 2000. Some increase also was made in the New Mexico and Utah portions, particularly in the latter part of the projection time frame. The Arizona portion of the Region was not changed. As a result, the modified OBE-ERS population projection for the Lower Main Stem Subregion is nearly 50 percent above the OBE-ERS projection in 1980 and 2000, and about 15 percent above in 2020. Table 1.2. The modified OBE-ERS projections for the Little Colorado Subregion reflect increases of 10 percent in 2000, and 25 percent in 2020. The population increase in the Gila Subregion was less than 1 percent in all target years.

The modified OBE-ERS employment projections roughly parallel the population projections. Minor differences are due to variations in the participation rates. Projections of per capita income were held at the OBE-ERS level and, therefore, projected total personal income increased in the same proportion as population.

The modified OBE-ERS projected total gross output of producing industries is substantially higher than the OBE-ERS projected output in the Lower Main Stem and Little Colorado Subregions. Table 1.2. The increases stem largely from a higher level of output in the mining, manufacturing and noncommodity producing industries in the Lower Main Stem Subregion. In the Little Colorado Subregion mining is the primary contributor, with manufacturing and noncommodity producing industries contributing significantly to the higher level of projected output in some of the projection years.

The modified OBE-ERS projections of value added by producing industries also are substantially higher than the OBE-ERS projections in the Lower Main Stem and Little Colorado Subregions. Table 1.2. The increases by industry follow a similar pattern as that for total gross output discussed above.

The modified OBE-ERS projected gross regional product is nearly 50 percent higher than the OBE-ERS projected level in the Lower Main Stem Subregion in 1980 and 2000, but declines to about 16 percent above in 2020. Table 1.2. Similar data for the Little Colorado Subregion indicate gross regional product to be about 23 percent above in 1980 and 2000, with an increase to 28 percent above in 2020. Very small changes are projected for the Gila Subregion.

The modified OBE-ERS projections for irrigated harvested acreage are substantially higher than the OBE-ERS projections for the Little Colorado Subregion, particularly for the years 2000 and 2020. Table 1.2. They also are somewhat higher in the other two subregions. For the Region as a whole, they are 6 percent higher than the OBE-ERS projections in 1980, and 9 percent higher in 2000 and 2020.

The modified OBE-ERS projections for livestock reflect two primary changes in the OBE-ERS projections; a reduction of about 25 percent in the number of cattle marketed from finishing feedlots and an increase of about 90 percent in the projections for milk cows by 2020. Table 1.2.

The modified OBE-ERS projections were compared with the OBE-ERS projections in terms of water and related land requirements and the effect on people as indicated by employment, value added and final demand. The amount of water required by the modified OBE-ERS projections, was greater in all subregions and projection years than the OBE-ERS requirements except for 1980 in the Gila Subregion, where it is about the same. In the Lower Main Stem Subregion the relative increases in employment, value added, and final demand were 2 to 8 times as large as the relative increase in water required. In the Little Colorado Subregion the relative increases in employment, value added, and final demand were about half the relative increase in water required in 1980. The analysis indicates some improvement is expected by 2020, but the relative increase in final demand still is somewhat below the relative increase in water required. In the Gila Subregion the relative increases in employment, value added and final demand were less than half the relative increase in water required in 2000 and 2020.

An input-output analysis was made of the economy of each of the subregions in the base year and in each of the target years to show the direct and indirect value added (defined in the Glossary) and the direct and indirect requirements for water, cropland harvested, and labor per \$1,000 of final demand (defined in the Glossary) for products of each sector. These relationships are referred to as "factors" in this appendix. Using these factors, tabulations were prepared to show the relationships for the economy of each subregion. As is generally recognized, value added related to total water directly and indirectly used varies greatly from sector to sector, the ratio being relatively high for most nonagricultural sectors and relatively low for the agricultural sectors. The relationships are similar with final demand and labor related to water used directly and indirectly. A major part of the Region's water is used directly and indirectly by the food and kindred products, eating and drinking places, and agricultural sectors to produce a relatively small amount of value to the Region's economy.

Significant changes are projected to take place in water use within the Region. The proportion of the Region's water used directly and indirectly by the nonagricultural sectors is projected to increase sharply throughout the projection time frame. Conversely, the proportion used directly and indirectly by the agricultural sectors is projected to decline.

Value added to the economy per acre foot of water used by the producing sectors as a group is projected to increase about 10 times from 1965 to 2020 in the Lower Main Stem and Gila Subregions, and about 3.6

times in the Little Colorado Subregion. The large increases are due primarily to an increase in the proportion of the total water used in those sectors of the economy where value added per unit of water is relatively high. However, a part of the increase is attributable to projected technological advances.

Since, as is generally recognized, value added to the economy related to water directly and indirectly used varies greatly from sector to sector, transferring water from one use to another may or may not have a beneficial effect on the economy. The factors relating value added, and direct and indirect requirements for water, land, and labor to final demand, referred to above, can be used as illustrated in the appendix to analyze the effects of alternative uses of water. These factors also can be used, as illustrated in the appendix, to analyze the effects of increasing or decreasing the amount of water available.

The modified OBE-ERS projections indicated some significant changes in production compared with the OBE-ERS projections. Since the OBE-ERS regional projections were a part of a coordinated set of national-inter-regional projections which equated demand with supply, an investigation was made to the extent data were available, to determine the effect the changes would have on prices of the commodities involved. The analysis indicated the higher level of production of vegetables and citrus with the modified OBE-ERS projections would depress prices somewhat throughout the projection time frame, the reduction in vegetable prices increasing to about 5 percent in 2000 and 2020, and the reduction in citrus prices increasing to about 4 percent in the year 2020. The reductions would be larger, of course, if other regions also exceed the baseline projections, as is the case in the California Region. The reduction in beef production and the increase in milk production are not expected to have much effect on prices of the commodities.

Changes in commodity prices indicated by alternative sets of projections should be considered in development of associated framework plans.

A sensitivity analysis indicates that with total crop production in the Region held constant at the OBE-ERS projected level, a 10 percent increase in projected yields causes approximately a 9 percent reduction in the acreage of cropland harvested in the Region, and reduces water required in the Region by roughly 450,000 acre feet, which amounts to about 7 percent of total water required in 1980 and 6 percent in 2020. A 10 percent decrease in projected crop yields causes approximately an 11 percent increase in irrigated cropland harvested, and increases total regional water requirements by approximately 550,000 acre feet, which comprises about 8.6 percent of total regional water requirements in 1980 and about 7 percent in 2020. The Gila Subregion accounts for about 75 percent of the change in water requirements in the Region.

The OBE June 1969 projections of population and employment for the Region were substantially lower than the OBE-ERS projections, particularly in the Lower Main Stem Subregion. The reduction in projected regional population was 5.6 percent in 1980, 12.0 percent in 2000, and 23.4 percent in 2020. Similar relative reductions were made in projected total employment. However, there was considerable variation by industry, changes in direct and indirect employment ranging from a regional reduction of 48 percent in manufacturing to a regional increase of 26 percent for mining employment. The result was that projected final demand of the Region was reduced 10 percent in 1980, 19 percent in 2000, and 31 percent in 2020. Projections of value added in the Region were reduced by similar proportions. The reduction in projected total water requirements ranged from 7.5 percent in 1980 to nearly 21 percent in 2020, and those for irrigated cropland harvested from 7 percent in 1980 to 16 percent in 2020.

Several additional socio-economic analyses to extend and supplement those included in this study would be beneficial in development of plans for the Region. Conventional "water requirements" methodology--matching of regional water demands and water supplies--is inadequate for water resources planning as it represents a "single-valued" solution to a complex investment decision process. Economic impacts of alternative regional framework plans should be included at all steps in the plan formulation process as they may concern study assumptions, alternative economic structures, alternative levels of water availability, technologies, single plan functions, or interregional shifts in agricultural production.

It is recommended that a permanent Economics Work Group or subcommittee of the Pacific Southwest Interagency Committee be established to facilitate continuation of interagency cooperation in these studies, together with periodic review, assessment, and updating of completed studies. The large measure of uncertainty involved in water resource planning serves to emphasize this recommendation.

LOWER COLORADO REGION COMPREHENSIVE FRAMEWORK STUDY

APPENDIX IV

THE ECONOMIC BASE AND PROJECTIONS
FOR 1980, 2000, AND 2020

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PHOTO CREDIT ABBREVIATIONS

BIA	Bureau of Indian Affairs
BR	Bureau of Reclamation
FS	Forest Service
NPS	National Park Service
SRP	Salt River Project

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INTRODUCTION

CHAPTER I - INTRODUCTION

This study pertains to the economic base of the Lower Colorado Region and to projections for 1980, 2000, and 2020. It is part of a comprehensive national-interregional framework study, commonly referred to as a "Type I study", being made under the auspices of the Water Resources Council, the basic objective of which is the formulation of framework plans to provide a broad guide to the best use, or combination of uses, of water and related land resources of the Region to meet foreseeable short-and long-term needs. Five major elements are involved:

1. Studies and projections of economic development,
2. Translation of such projections into needs for water and related land resource uses,
3. Appraisal of the availability of water supplies, both as to quantity and quality,
4. Appraisal of the availability of land resources, and
5. A description of the characteristics of present and future problems and the general approaches that appear appropriate for their solution.

PURPOSE AND SCOPE

As part of the Regional Comprehensive Framework Study, the purpose of this appendix is to provide economic data and analyses pertaining to the Region's economy in the base period and in the projection time frame which may be useful in formulating and appraising framework plans. The economic data and analyses presented pertain to the Lower Colorado Water Resource Region, as defined in a later section. The base period is referred to as 1965 and, as far as feasible, represents a normalized situation rather than the specific situation prevailing in that year. The projection time frame extends 55 years into the future with three target years; 1980, 2000, and 2020 being used in the study.

Specific objectives of the economic base and projections appendix are:

1. Portray and analyze the economy in the base period together with historical material pertinent to the projections.
2. Provide the baseline or 1968 OBE-ERS set of projections for use in the Regional framework study. The baseline projections

are referred to as the "OBE-ERS projections" since the primary or structural projections of the economy were developed by the Office of Business Economics, U. S. Department of Commerce, and the Economic Research Service, U. S. Department of Agriculture, for the Water Resources Council, as a part of a consistent set of national-inter-regional projections which equates national demand with supply and provides a first approach to consistent regional projections based on historical trends in inter-regional production relationships.^{1/} The "baseline" concept, in simplest terms, means that a particular set of projections is selected as a base against which all other projections are compared or analyzed as alternatives. The primary or structural baseline regional projections provided by the Water Resources Council were disaggregated and supplemented by the Economics Work Group to provide a complete set of internally consistent baseline projections for each of the three subregions of the Lower Colorado Region.

3. Analyze and critically review the OBE-ERS projections, including their relationship to the national baseline projections.
4. Provide the modified OBE-ERS projections, which comprise the set of projections used as a basis for the "plan" set forth in the General Program and Alternatives appendix. This set of projections is referred to as the "modified OBE-ERS projections" since they include modifications of the OBE-ERS projections as outlined in Chapter III of this appendix.
5. Analyze the modified OBE-ERS projections primarily in terms of their comparison to the OBE-ERS projections.

^{1/} Preliminary Report on Economic Projections for Selected Geographic Areas 1929 to 2020, Volume I, Draft for Comment and Criticism Not For Publication, United States Water Resources Council, Washington, D. C., March 1968; and Preliminary Projections of Economic Activity in the Agricultural, Forestry and Related Economic Sectors of the United States and Its Water Resource Regions 1980, 2000 and 2020, for use of the Water Resources Council and Cooperating Agencies for Comprehensive River Basin Planning, Prepared by Economic Research Service and Forest Service, U. S. Department of Agriculture, August 1967. In some cases the year 1968 is included in referring to these projections to clearly distinguish them from subsequent revisions. Projections provided in Volume I referred to above were revised by the Office of Business Economics and reissued by the Water Resources Council in June 1969. These revised projections, treated in Chapter IV, are referred to in this report as the OBE June 1969 projections to distinguish them from the 1968 OBE-ERS projections.

6. Analyze the OBE June 1969 projections relative to the 1968 OBE-ERS projections and portray the effect upon the economy of the Region.^{1/}
7. Provide analyses of pertinent socio-economic relationships in the base period and projected economy pertaining to water and related land resources.
8. Provide recommendations for additional socio-economic studies which are needed.

Since this study is basically designed to serve water resource planning, emphasis is placed on those sectors of the Region's economy which are resource oriented. All sectors of the economy are involved with natural resources in some way, but resource-oriented sectors, such as agriculture, are heavy users of natural resources. A large proportion of the analysis was focused on such industries.

RELATIONSHIP TO OTHER APPENDIXES

Being a part of the comprehensive framework study, this appendix was correlated as far as possible with other appendixes. The Economics Work Group worked closely with other work groups in exchange of data and material as needed for carrying out various aspects of the over-all study. Material provided other work groups encompassed a wide range of data pertaining to the population and economy of the Region in the base period and throughout the projection time frame. Material provided included the OBE-ERS and modified OBE-ERS projections, together with supplementary base period and projections material and analyses prepared by the work group to make the framework projections more meaningful and useful to the work groups. Similarly, considerable material provided by other work groups was utilized in this study.

The effort to correlate this appendix with others involved in the framework study was largely successful. The only significant difference occurred in the electric energy sector. After considerable effort to integrate the electric energy projections presented in the Power appendix into the economic models for the Region, the Economics Work Group concluded that these projections were not consistent with demands at the population, employment, and implicit economic activity levels projected by OBE-ERS. Thus, power projections consistent with OBE-ERS projections were developed by the Economics Work Group and used in economic analyses at that level. The power projections provided by the Power Work Group were used in studies at the modified OBE-ERS level.

ORGANIZATION OF THE REPORT

Material pertaining to the base period and the OBE-ERS projections, together with an analysis of the projections and their relationship to

the national baseline projections, is presented following the introduction. Then follows the modified OBE-ERS projections which are related to the base year and to the OBE-ERS projections. The concluding chapter includes analyses of pertinent socio-economic relationships in the base period and projected economy pertaining to water and related land resources, together with recommendations for further work. A glossary is included as a supplement at the end of the appendix.

A large volume of data was compiled and organized in the process of making this study. Only summary tabulations and the minimum of detailed tabulations are included in the appendix. The remaining tabulations which provide data pertinent to the study are to be compiled in a supplement, reproduced in mineograph or similar form for limited distribution.

REGION AND SUBREGION DELINEATION

The Lower Colorado Region was subdivided into three subregions for the Type I study: 1) Lower Main Stem, 2) Little Colorado, and 3) Gila. Several factors were considered in selection of subregion boundaries. One major factor was to develop logical and practical hydrologic subregions that could be utilized effectively in water resource planning. Another was the availability of existing data in the respective functional fields.

The Region and subregions were delineated by both hydrologic and by political subdivision or economic boundaries. See Map No. 1019-314-44. When necessary or desirable to distinguish between the two delineations, the words "hydrologic" or "economic" are used in conjunction with the Region or subregion involved.

Material in this appendix is based upon the economic Region and subregion delineation. These areas are synonymous with the water resource planning areas for which projections were provided by the Water Resources Council. The counties included in the three economic subregions are:

<u>Lower Main Stem</u>	<u>Little Colorado</u>	<u>Gila</u>
<u>Arizona</u>	<u>Arizona</u>	<u>Arizona</u>
Coconino	Apache	Cochise
Mohave	Navajo	Gila
Yuma		Graham
		Greenlee
<u>Nevada</u>	<u>New Mexico</u>	Maricopa
Clark	McKinley	Pima
Lincoln		Pinal
		Santa Cruz
		Yavapai
<u>Utah</u>		<u>New Mexico</u>
Washington		Catron
	IV-4	Grant
		Hidalgo



- EXPLANATION**
- Hydrologic region boundary
 - - - Hydrologic subregion boundary
 - Economic region boundary
 - - - Economic subregion boundary
 - ① Lower Main Stem
 - ② Little Colorado
 - ③ Gila
 - Lower Colorado Basin boundary
 - Existing dam and reservoir
 - Existing dam and intermittent lake



COMPREHENSIVE FRAMEWORK STUDY
 LOWER COLORADO REGION
GENERAL MAP
 MAP NO. 1019-314-44
 SCALE OF MILES
 OCTOBER 1970

SOURCES OF DATA

Data for this study were obtained from numerous published and unpublished sources including Federal, State and local government agencies, universities and private organizations. Baseline (OBE-ERS) Regional projections of population, employment, personal income, earnings per worker, and production of major groups of agricultural products consistent with the national projections were provided by the Water Resources Council.^{1/} Supplemental material and data were provided by the Office of Business Economics, U. S. Department of Commerce, and by the Economic Research Service, U. S. Department of Agriculture. Some data were obtained from informed individuals, who often developed the estimates in group consultation. The economic (input-output) models prepared in the 1960 Colorado Economic Base Study were of particular importance to the over-all study.^{2/} Maximum use was made of data compiled by other work groups involved in the Type I study.

Sources of data for various parts of the study are given throughout the report where the data are presented.

METHODS OF ANALYSIS

The methods of analysis varied depending on the economic measure under study. OBE-ERS population projections, for example, employed the component projection method, supplemented by trend analysis. Budget and regression analysis were used extensively in analyzing trends and crop yields, livestock production and the like. The input-output method of analysis was used in developing the level and pattern of economic activity in the base year and for structuring the economy in the selected "target" years.^{3/} The input-output models were also used in some of the analyses which were made. Projections also were used in the analysis to indicate relationships within the economy, need for water and related land resources, and socio-economic pressures that may develop, etc. Because of the dominant role of projections in the study and the potential of this type of analyses, the treatment of them is set out in a separate section.

^{1/} Preliminary Report on Economic Projections for Selected Geographic Areas 1929-2020, Volume I, U. S. Water Resources Council, Washington; D.C., March 1968, and Preliminary Projections of Economic Activity in the Agricultural, Forestry and Related Economic Sectors of the United States and Its Water Resource Regions 1980, 2000, and 2020, prepared by the Economic Research Service, U.S.D.A., for the use of the Water Resources Council and cooperating agencies, August 1967.

^{2/} Udis, Bernard, et al, An Interindustry Analysis of the Colorado River Basin in 1960 with Projections to 1980 and 2010, and supporting publications, June 1968.

^{3/} For a non-technical discussion of input-output analysis the reader is referred to The Elements of Input-Output Analysis by William H. Miernyk, Random House, New York.

THE NATURE OF PROJECTIONS AND THEIR ROLE IN THE PLANNING PROCESS

Projections generally are regarded as conditional estimates of the future. They are not absolutes or goals but conditional estimates of economic parameters in a future time period. Projections are based on knowledge of the past, on foreseeable developments, and on assumptions regarding the future. Use of past experience, observations, and relationships within the economy is essential in developing projections since they comprise the only indicators available of the future. Past trends may be modified, however, in the projection process based upon foreseeable developments which, of course, have their roots in past experience, and also by changing the assumptions used in making the projections. Assumptions define the "nature of the future", usually in broad general terms, to be used in making projections. Hence, the essence of the projection procedure is to study the past in order to construct an empirical picture of the economy, determine relationships which exist together with causal factors, develop a set of assumptions regarding the future, and trace the development of the economy consistent with past and assumed future conditions.

The objectives of the national-interregional comprehensive framework study encompassed development of the OBE-ERS or baseline set of projections, as outlined or defined above. Regional studies which are a part of the national-interregional framework study naturally need to use the baseline projections in their analyses to maintain over-all consistency in the national-interregional cooperative effort. A Regional study based on any other set of projections would cause problems since the coordinated supply-demand relationship of the framework study would be disrupted. Moreover, deviation from the baseline projections on the plus side implies a Regional comparative advantage greater than that used in developing the national-interregional framework projections. Similarly, deviation from the baseline projections on the minus side implies a Regional comparative disadvantage relative to that used in developing the framework projections. Hence, it is evident the baseline projections play a singular role in the framework studies.

However, the primary role of baseline projections in framework studies does not preclude use of other projections in such studies. In fact, use of alternative projections properly related to the baseline projections strengthens the analyses by broadening the scope of knowledge provided. An analysis based upon the baseline projections provides an indication of what the situation would be with those projections. Similarly, an analysis based on a second set of projections would indicate the situation with that set of projections. But, if the second set of projections is properly structured relative to the baseline projections, the two analyses can provide more knowledge than the sum of the two since the basis for inference is more than doubled; e.g., a basis for judgement is

provided regarding the area between the two projections, and possibly regarding the direction of change which is not provided by individual projections. Additional analyses, each based upon a different set of projections, properly structured relative to the baseline projections and to each other, would naturally broaden the scope of understanding regarding potential socio-economic problems, indicated shortages of resources, and other undesirable conditions and relationships within the economy, thereby facilitating development and activation of plans to alleviate such conditions.

Some of the more important uses of alternative projections in framework studies are to:

1. Indicate a modification of the Regional baseline projections made in the Regions. The modified OBE-ERS projections fall in this category. Views of Basin State representatives and study of historical and probable trends in the Region indicated that the Regional disaggregation of the national projections should be adjusted in some respects. The proposed adjustments were shown as modifications of the OBE-ERS projections and comprise an alternative set of projections.

As indicated above, a baseline set of national-interregional projections is based upon projected interregional relationships in production of goods and services. In other words, the comparative advantage of each of the Regions comprises a part of the national-interregional projection framework used in disaggregating the national baseline projections. Alternative projections which increase the Region's share of the national baseline projections are based upon the premise that the Region has a comparative advantage, for example, climate, greater than that recognized in the national-interregional projection framework, and vice-versa.

2. Indicate benefits to be derived from programs necessary to effectuate baseline projections. The analysis required to give this information involves developing an alternative set of projections without the programs and comparing the results with those derived from the baseline set of projections.
3. Analyze the effect of increasing or decreasing the baseline level of resource utilization. For example, what would be the effect of increasing the level of water availability above, or of reducing it below the level required by the OBE-ERS projections. Developing alternative projections of the economy consistent with the projected alternative level of resource availability will shed light on such questions.

4. Analyze the relative benefits to be derived from alternative uses of a given amount of resources. For example, alternative projections can be developed to compare the results of using a given quantity of water to produce citrus versus using the same quantity of water to produce vegetables. This type of analysis is made by increasing the projected size of one sector and decreasing the projected size of another sector.
5. Provide a sensitivity analysis of the baseline or alternative (subject) projections. Since projections usually are of the point or line type, the basis for judgement can be improved by broadening the line to a band by developing alternative projections on both sides of the baseline or the subject projections. Moreover, since many projections involve rates of growth--rate of population growth, rate of increase in crop yields, etc.,--the band outlined by the alternative projections will often increase in width throughout the projection time frame. The increasing probability of error as the projection time frame is extended also can be appropriately reflected by a band gradually increasing in width.
6. Indicate the effect of a new sector of economic activity, not included in the baseline projections, being developed during the projection period, and vice versa. This type of alternative is difficult to develop due to lack of a historical base to indicate the structure of the projected economy with the sector added (or dropped) and probable relationships among the sectors.

ASSUMPTIONS

As indicated above, projections are based in part upon assumptions regarding the future. As a part of the national-interregional comprehensive framework study, the baseline (OBE-ERS) projections were formulated within a set of national assumptions. The most significant of these are summarized below, together with applicable Regional assumptions. Some assumptions pertaining to specific aspects of the study are given later where those aspects are discussed.

National Assumptions

1. There will be no major wars or serious political, social, economic, or physical developments which will seriously affect the long-run growth pattern of the economy.
2. Water will play the same role in stimulating or depressing economic growth in the future as in the past.

3. Population of the United States, 194.6 million people in 1965, is projected to grow at an average annual rate of 1.3 percent (U.S. Census, Series C level) over the 1965-2020 projection period. This projection reflects a substantial decline in fertility rates from the 1962-65 level.
4. National policies designed to insure a high level of long-run economic growth consistent with full employment in a free enterprise economy will prevail. Gross National Product (expressed in 1958 dollars) was \$616.7 billion in 1965 and is projected to grow at an average annual rate of 4.0 percent over the projection period.
5. The civilian labor force, 75.6 million people in 1965, and civilian employment, 72.2 million people in 1965, is projected to grow at an average annual rate of 1.5 percent over the projection period. Military strength is assumed to be 2.7 million in 1970, and 2.6 million for 1975 and subsequent years. Unemployment is projected to remain constant at an average annual rate of 4.0 percent.
6. Personal income per capita (expressed in 1958 dollars) was \$2,542 in 1965 and is projected to grow at an average annual rate of 2.9 percent over the projection period.
7. Base-period normal price relationships among inputs, and between inputs and outputs, will continue throughout the projection period.
8. Education levels of individual workers are expected to rise and, coupled with added capital, contribute to increased labor productivity. Product per capita (expressed in 1958 dollars) was \$3,169 in 1965 and is projected to grow at an average annual rate of 2.6 percent over the projection period.
9. Development and adoption of new types of products, processes, production methods, and occupational skills will continue and contribute to increased efficiency and labor productivity. Private economy product per man-hour (expressed in 1958 dollars) was \$4.42 in 1965 and is projected to grow at an average annual rate of 3.0 percent over the projection period.
10. Since no attempt was made to look into the future and identify specific details of the future economy, it was assumed that the impact of new products, new activities, new technologies, etc., that will inevitably come into being, will be subsumed under the labels by which the economy is currently identified.

11. Credit availability, tenure arrangements, zoning, and taxation policies will not interfere with adjustments, including firm consolidation, purchase of new equipment, and application of new technologies.
12. Government programs are expected to exist during the projection period; however, market forces will be assumed to be the dominant factor in allocation of resources. This implies a gradual decrease in production constraints and greater market influence during the projection period.

Regional Assumptions

1. Since the regional baseline (OBE-ERS) projections were derived from national projections, the general national assumptions also apply to the regional projections. However, projected average annual rates of increase for the population, employment, personal income per capita, productivity, and gross regional product parameters will be more than, or less than, national rates, depending upon future regional conditions. With the OBE-ERS level of development population is projected to grow at an average annual rate of about 2.3 percent over the 55-year period in the Lower Colorado Region, compared with 1.3 percent for the United States.
2. The consensus in the Region was that water availability had not significantly retarded economic growth in the Region and, therefore, it was assumed water will be available in sufficient quantity and quality to support the OBE-ERS projections of the regional economy.
3. The production of various products was assumed to be sufficiently profitable to induce projected production.
4. The above general assumptions and qualifications essentially apply also to the modified OBE-ERS projections. However, with the modified OBE-ERS projections, population is projected to increase at an average annual rate of 3.0 percent from 1965 to 1980, 2.5 percent from 1980 to 2000, and 1.9 percent from 2000 to 2020, the average annual increase for the 55-year period being 2.4 percent.
5. Modifications to the OBE-ERS projections for the Lower Colorado Region were assumed to leave the price level unchanged. In other words, a perfectly elastic demand for products of the Region was assumed. However, the effect on commodity prices of eliminating this assumption is analyzed in Chapter IV.

THE ECONOMIC BASE
AND OBE·ERS PROJECTIONS

CHAPTER II - THE ECONOMIC BASE AND 1968 OBE-ERS PROJECTIONS

The Lower Colorado Region has an abundance of most resources needed for growth and development of the economy. There is an abundance of land well suited for irrigated agriculture, urban development, recreation, open areas, and wildlife. Large reserves of a number of important metals provide a firm base for mining and the minerals industry. Forests of the Region provide a base for industries producing industrial timber products, pulpwood, and finished products.

The climate of the Region is a major asset. Year-long production of a wide range of crops including high quality citrus, winter vegetables, and specialty crops yields products vital to the health and well-being of the nation. The mild, dry climate contributes significantly to efficient production of finished beef in large mechanized feedlots.



Photo 1. Value of lettuce produced during the winter months in the Region for major markets was \$54 million in 1965.

BIA

The climate also contributes to manufacturing in the Region. With the Region being an enjoyable and healthful place in which to live, workers are available or can be readily attracted for employment in manufacturing. Even more important, the dry climate facilitates economical manufacturing. Even more important, the dry climate facilitates economical manufacture and storage of various products. It is particularly important in manufacture of electrical components, especially high voltage equipment; in apply surface coatings such as metallic coatings; in various chemical processes; and in manufacture of precision equipment.

The Region is recognized as an outstanding retirement area, and as a desirable area for a number of health problems due to the warm winter weather, clean air, low humidity, and a maximum of sunshine. These same factors, along with invigorating yet moderate winter and summer temperatures at higher elevations, all coupled with natural and singular beauty of landscape, make the Region a desirable recreational and tourist area.



Photo 2.

BR Photo 3

Water skiing and snow skiing can be enjoyed the same day within a 2-hour drive.

The OBE-ERS projections comprise a consistent set of national-inter-regional projections which equate national supply with demands and provide a first approach to consistent Regional projections based upon historical trends in interregional production. The national projections were

developed within the framework of assumptions given above on the basis of a broad and comprehensive body of time series data including national income and product, flow of funds, interindustry sales and purchases (input-output transactions), balance sheets, agricultural production and consumption of crops and livestock products, imports and exports, per capita consumption, and the like. The national projections were then disaggregated to provide regional projections for the component river basins of the Nation. Hence, the OBE-ERS projections comprise a consistent set of national-interregional baseline projections which indicate the type of economy and potential socio-economic problems and pressures on resources which may or may not be acceptable to the regional and national segments of society. Plans may then be developed to guide action taken to prevent development of socio-economic problems. Water resource planning is to guide action in water resource development to meet socio-economic goals and to forestall foreseeable adverse effects.

The regional baseline (OBE-ERS) projections provided by the Water Resources Council were in terms of aggregates such as population, personal income, employment in total and for selected sectors, earnings of workers, and production requirements for groups of crops and livestock products. As a part of the regional framework study these aggregate or summary projections were further disaggregated and supplemented to provide a coordinated projection framework for the economy of the Region. Throughout this study these projections are referred to as the OBE-ERS or baseline projections even though only the aggregate or summary projections were developed by the Office of Business Economics and the Economic Research Service.

POPULATION

The Lower Colorado Region is one of the fastest growing areas in the United States from a population standpoint. In 1965 the estimated population of the Region was 1,877,000. This represented an increase of over 200 percent in the previous 25 years, compared with an increase of less than 50 percent for the United States as a whole. The OBE-ERS projected growth for the Region from 1965 to 2020 shows an increase of about 250 percent, compared with a projected increase for the United States of slightly over 100 percent.

Within the Region, a major part of the population is in the Gila Subregion. Table 2.1 and Figure 2.1. However, the proportion of the Region's population residing in the Gila Subregion is projected to decline slightly over time, from 75 percent in 1965 to 70 percent in 2020. Population of the Lower Main Stem Subregion, on the other hand, is projected to increase at a relatively faster rate than that of the Gila Subregion, the proportion of the Region population in the Lower Main Stem Subregion increasing from 18 percent in 1965 to 26 percent in 2020. The Little Colorado Subregion has a relatively small proportion of the Region population and it is projected to decline from 7 percent in 1965 to 4 percent in 2020.

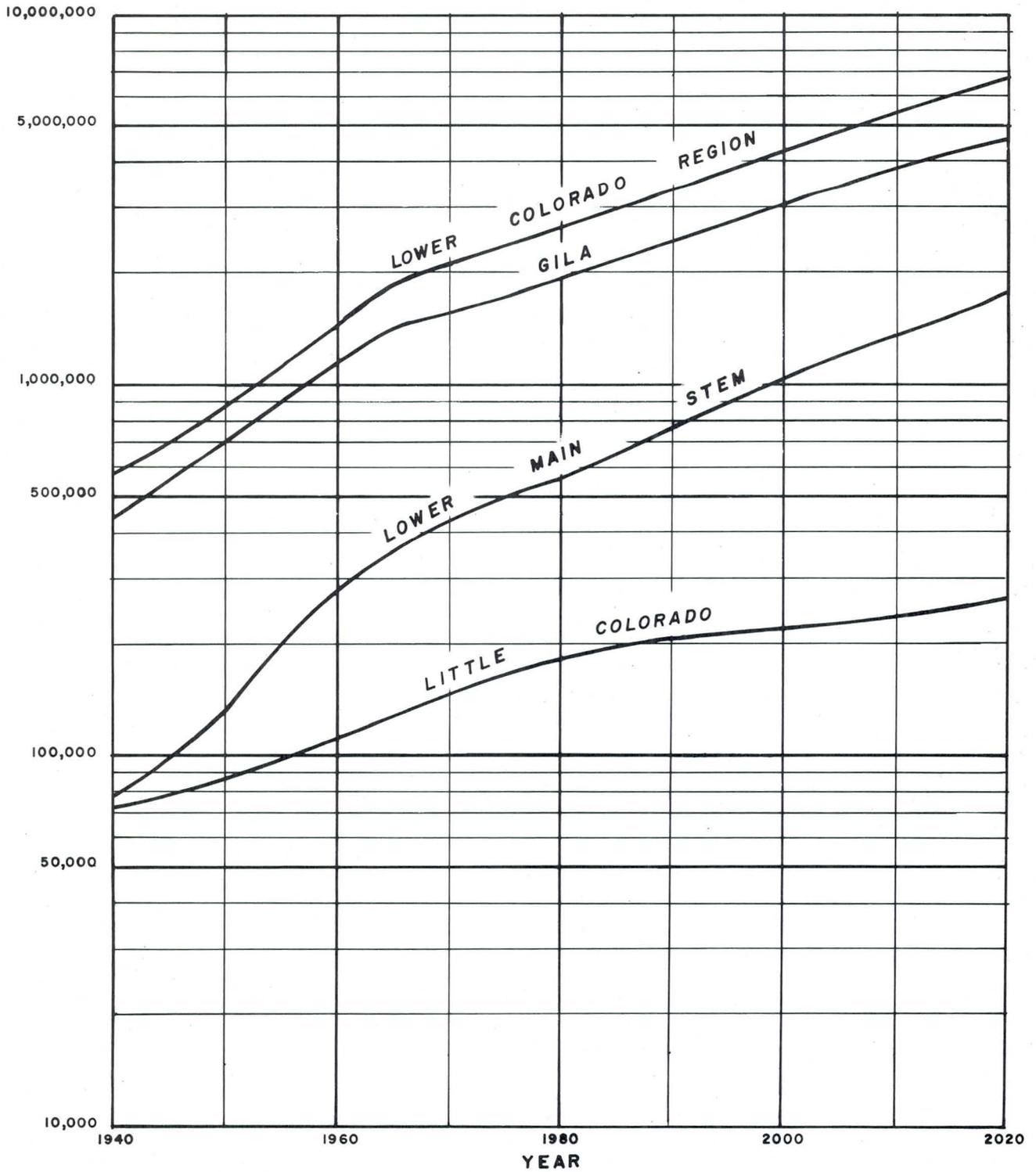
TABLE 2.1
POPULATION FOR 1965
AND
OBE-ERS PROJECTIONS TO 1980, 2000 AND 2020
LOWER COLORADO REGION

Area	1965	OBE-ERS Projections		
		1980	2000	2020
		----- 1,000 -----		
<u>Lower Colorado Region</u>	1,877.0	2,644.1	4,263.2	6,639.2
LMS Subregion	345.2	556.2	1,023.2	1,756.0
Arizona	120.7	147.1	197.7	290.5
Nevada	213.9	397.5	812.7	1,451.5
Utah	10.6	11.6	12.8	14.0
L Colo Subregion ^{1/}	125.0	180.0	219.6	261.7
Arizona	85.5	124.8	152.2	181.4
New Mexico	39.5	55.2	67.4	80.3
Gila Subregion ^{1/}	1,406.8	1,907.9	3,020.4	4,621.5
Arizona	1,379.4	1,870.8	2,970.7	4,531.4
New Mexico	27.4	37.1	49.7	90.1
Arizona total	1,585.6	2,142.7	3,320.6	5,003.3
Nevada total	213.9	397.5	812.7	1,451.5
New Mexico total	66.9	92.3	117.1	170.4
Utah total	10.6	11.6	12.8	14.0

^{1/} The initial OBE-ERS projections provided for the Little Colorado Subregion were too low to be consistent with the historical and anticipated future trend. After considerable study, the Water Resources Council approved a transfer of sufficient projected population from the Gila to the Little Colorado Subregion to alleviate this situation, it being recognized that with the substantially larger population in the Gila Subregion the transfer would not significantly affect its projected population.

FIGURE 2.1

LOWER COLORADO REGION
POPULATION 1940 - 65 AND OBE-ERS
PROJECTIONS TO 1980, 2000 AND 2020.



Urban and Rural Population

A larger proportion of the population of the Lower Colorado Region lived in urban centers^{1/} in the base period than for the United States as a whole. Table 2.2. This is due in large part to the heavy concentration of population in the three major cities of Las Vegas, Nevada,

TABLE 2.2
PROPORTION OF POPULATION CLASSIFIED AS
URBAN AND RURAL IN 1960 AND 1965 WITH OBE-ERS PROJECTIONS
TO 1980, 2000 AND 2020
LOWER COLORADO REGION, BY SUBREGION

Area and Residence	1960 ^{1/}	Esti- mate 1965	OBE-ERS Projections		
			1980	2000	2020
----- Percent -----					
Region					
Urban	74	80	88	92	95
Rural	26	20	12	8	5
LMS Subregion					
Urban	71	78	88	92	96
Rural	29	22	12	8	4
L Colo Subregion					
Urban	28	36	45	51	57
Rural	72	64	55	49	43
Gila Subregion					
Urban	78	84	92	95	97
Rural	22	16	8	5	3
United States					
Urban	70	-	-	-	-
Rural	30	-	-	-	-

^{1/} Source: Based upon U. S. Census.

and Phoenix and Tucson in Arizona. However, the population of the Little Colorado Subregion was largely rural in 1960.

^{1/} In general, the urban population comprises all persons living urbanized areas, including the densely settled urban fringe of urbanized areas, and in places of 2,500 inhabitants or more outside urbanized areas.

Projected trends in the Region indicate that the proportion of the population living in urban centers will continue to increase during the projection years. On a regional basis urban population will increase over the projection period while the projected trend for rural population is downward. However, in actual numbers, the Little Colorado Subregion rural population is projected to increase about 40 percent by 2020.

Age

Although the Lower Colorado Region is known as an outstanding retirement area, in 1960 only 6.7 percent of the population was 65 and over. This compares with 9.3 percent for the United States. On the other hand, 40 percent of the Region's population was under 18 years of age compared with 36 percent for the United States as a whole. The median age for all people was 24.7 years compared with 29.5 for the United States.

Education

The Region as a whole ranks about average from an educational viewpoint. However, there are great variations within the Region.

The proportion of the population 5 to 34 years of age enrolled in school, as reported in the 1960 U. S. Census, is shown in table 2.3. The Region, Lower Main Stem Subregion, and Gila Subregion percentages do not differ greatly from those for the United States. But the Little Colorado Subregion percentages in the two younger age groups are low.

The proportion of the population 25 years of age and older who had completed a specified number of years of school in 1960 is shown in table 2.4. In this comparison 4 percent of the Region's population was without any formal education in 1960, double the United States' percentage.

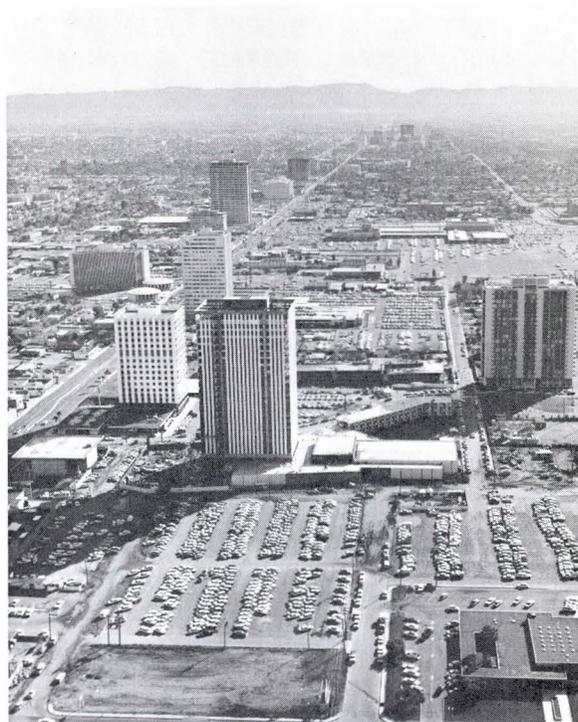


Photo 4.

Central business corridor, Phoenix, Arizona. Photo courtesy of Phoenix Chamber of Commerce.

TABLE 2.3
 PROPORTION OF POPULATION OF SPECIFIED AGES ENROLLED IN SCHOOL
 IN 1960, LOWER COLORADO REGION BY SUBREGION, AND THE UNITED STATES^{1/}

Area	Age in Years				
	5-13	14-17	18-19	20-24	25-34
	----- Percent -----				
<u>Region</u>	88	87	45	15	6
LMS Subregion	90	91	41	10	5
L Colo Subregion	79	80	43	14	7
Gila Subregion	88	87	46	16	6
United States	89	88	42	15	5

^{1/} Source: 1960 U. S. Census

TABLE 2.4
 PROPORTION OF POPULATION 25 AND OVER WHO HAD COMPLETED
 SPECIFIED YEARS OF SCHOOL IN 1960, LOWER COLORADO REGION, BY SUBREGION
 AND UNITED STATES^{1/}

Area and Sex	Years of School Completed							:Median :Yrs Com- pleted
	:None	:Elementary : 1-7	: 8	:High School: : 1-3	: 4	: College : 1-3	: 4&Over:	
	----- Percent -----							
<u>Region</u>								
Male	4	18	15	19	22	11	11	10.0
Female	4	15	13	20	29	12	7	10.4
LMS Subregion								
Male	3	15	14	21	26	12	9	11.0
Female	3	11	12	23	33	12	6	11.5
L Colo Subregion								
Male	24	22	11	16	15	6	6	7.7
Female	30	18	9	15	17	6	5	7.2
Gila Subregion								
Male	3	18	16	18	22	12	11	10.0
Female	2	15	14	20	29	12	8	10.6
United States								
Male	2	22	18	19	21	9	10	10.3
Female	2	18	17	20	28	9	6	10.9

^{1/} Source: 1960 U. S. Census

Many Indians in the Region have not attended school. This conclusion is indicated by the fact that one-fourth to one-third of the population of the Little Colorado Subregion who were 25 or older in 1960 had not completed one year of schooling. At the other end of the scale, the Region compares favorably with the United States in the proportion of the population 25 and over with college training. However, here again the Little Colorado Subregion shows up poorly. Similar relationships are evidenced by the median years of school completed shown in table 2.4.

EMPLOYMENT

There were about 675,700 people employed in the Lower Colorado Region in 1965, of which 134,800 were in the Lower Main Stem Subregion, 33,700 were in the Little Colorado Subregion, and 507,200 were in the Gila Subregion. Table 2.5. According to the 1960 U. S. Census, about 30 percent of the employees were females compared with 32 percent for the Nation as a whole.

Employment in the Region is projected to increase at a rapid rate, the 2020 total being nearly 4 times the 1965 level. Continuing past trends, the most rapid rate of increase is projected for the Lower Main Stem Subregion where the 2020 employment is projected to be 5.4 times employment in 1965. The Gila Subregion's employment is projected to increase 3.6 times during the same period while the projected increase in the Little Colorado Subregion is 2.7 times the 1965 level.

The rapid growth of employment projected for the Region stems primarily from the rapid growth in population, but partly from an increase in the participation rate--the proportion of the population employed. Table 2.5. Continuing the historical trend, the participation rate is projected to move up from 0.36 in 1965 to 0.40 in 2020. The rate is projected to increase in all three subregions, the largest increase being in the Little Colorado Subregion primarily because of the low participation rate in the base period.

A projected decrease in unemployment will be associated with projected increased employment and the projected increase in the participation rate. Estimated unemployment rates for the area in 1965 were: Lower Colorado Region, 4.3 percent; Lower Main Stem Subregion, 5 percent; Little Colorado Subregion, 9 percent; and Gila Subregion, 4 percent.

The employment patterns within the Lower Colorado Region and subregions are shown in table 2.6. The shift from the traditional agricultural and mining employment to a more varied economy is readily noted in the projections. Whereas agriculture, including agricultural service

TABLE 2.5
 EMPLOYMENT AND THE PARTICIPATION RATE 1940-65
 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020
 LOWER COLORADO REGION BY SUBREGION

Area	1940	1950	1965	OBE-ERS Projections		
				1980	2000	2020
----- Employment ^{1/} --1,000 -----						
<u>Region</u>	175.9	288.5	675.7	1,016.8	1,678.7	2,642.4
LMS Subregion	24.7	46.5	134.8	224.0	421.0	727.1
L Colo Subregion:	23.7	25.3	33.7	54.9	75.3	91.1
Gila Subregion	127.5	216.7	507.2	737.9	1,182.4	1,824.2
----- Participation Rate ^{2/} -----						
<u>Region</u>	0.302	0.329	0.360	0.385	0.394	0.398
LMS Subregion	0.323	0.380	0.3905	0.403	0.411	0.414
L Colo Subregion:	0.325	0.298	0.270	0.305	0.343	0.348
Gila Subregion	0.295	0.327	0.3605	0.387	0.391	0.395

^{1/} Total employment, including the Armed Forces. Projections for the Little Colorado and Gila Subregions are not the same as the 1968 OBE-ERS published projections due to the population transfer explained in footnote 1, table 2.1.

^{2/} Percent of population. Participation rates for all except 1965 and projected participation rates for the Gila Subregion are from Preliminary Report on Economic Projections for Selected Geographic Areas 1929 to 2020, Volume I, Water Resources Council, March 1968. Rates for 1965 and projected participation rates for the Gila Subregion were calculated.

businesses, employed 21 percent of the labor force in 1940, in 1965 it had dropped to about 6 percent and is projected to drop even further to a little over 1 percent by the year 2020. Mining also dropped from about 9 percent in 1940 to 2.6 percent in 1965, and further to only about 0.6 percent in 2020. One of the major increases in employment is in the manufacturing sector which grew from 9 percent in 1940 to 13 percent in 1965, and should reach 17 percent of total employment by 2020. The services sector had the most dramatic change from historic trends. In 1940 it had 21 percent of total employment, which grew to 26 percent in 1965 and will reach 37 percent by 2020.

TABLE 2.6
EMPLOYMENT BY INDUSTRY IN 1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO REGION BY SUBREGION

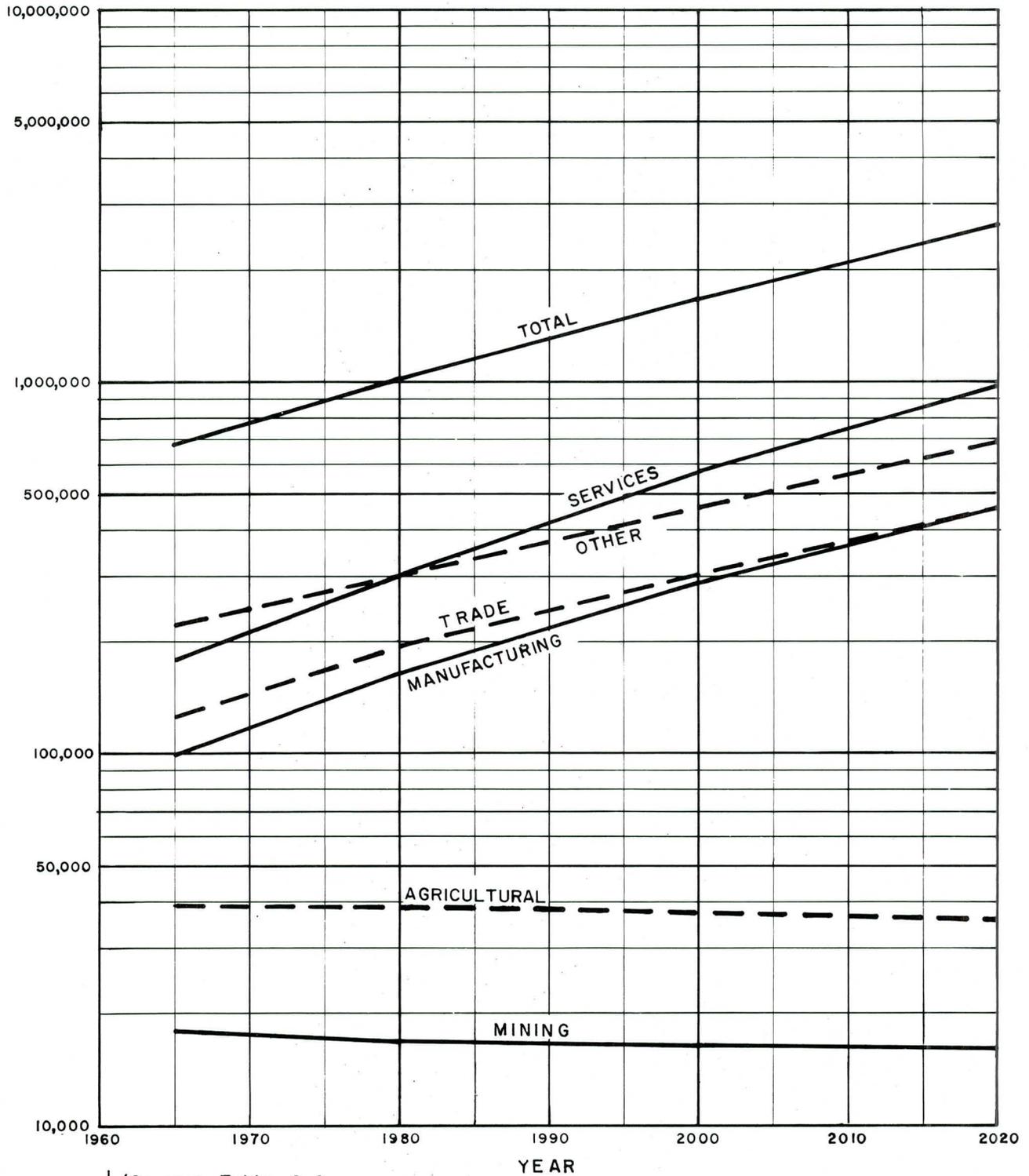
Area and Industry	1965	OBE-ERS Projections		
		1980	2000	2020
----- 1,000 -----				
<u>Region</u>				
Agriculture ^{1/}	39.20	38.49	37.86	35.64
Forestry ^{2/}	.91	.99	.90	.78
Mining	17.90	16.60	16.40	16.20
Manufacturing	90.87	163.43	284.60	459.46
Trade	125.90	193.20	302.20	456.50
Services	178.20	305.00	575.80	977.70
Transportation	21.50	31.40	44.00	57.00
Contract construction	56.60	79.30	120.90	182.30
Rentals	32.10	54.90	94.00	155.90
Utilities	20.40	29.50	44.00	56.90
Other ^{3/}	92.12	103.98	158.08	244.01
Total	675.70	1,016.79	1,678.74	2,642.39
<u>LMS Subregion</u>				
Agriculture	9.25	9.40	9.99	9.64
Forestry ^{2/}	.33	.37	.36	.32
Mining	.90	.70	.60	.60
Manufacturing	9.00	18.40	31.50	50.80
Trade	24.40	43.90	75.20	129.40
Services	47.60	90.00	189.50	343.40
Transportation	4.50	6.50	10.50	15.40
Contract construction	11.80	17.70	31.20	51.60
Rentals	4.50	9.40	20.90	40.70
Utilities	3.90	6.00	11.30	15.10
Other ^{3/}	18.62	21.66	39.92	70.14
Total	134.80	224.03	420.97	727.10
<u>L Colorado Subregion</u>				
Agriculture ^{1/}	3.18	2.62	2.43	2.10
Forestry ^{2/}	.46	.41	.32	.26
Mining	.80	.70	.70	.60
Manufacturing	5.67	10.83	14.40	17.26
Trade	6.30	11.30	15.40	18.40
Services	7.90	13.10	18.80	23.40
Transportation	2.90	4.40	6.00	7.20
Contract construction	3.40	5.10	6.00	7.10
Rentals	.60	1.40	2.70	3.30
Utilities	1.30	2.30	3.00	3.60
Other ^{3/}	1.24	2.74	5.57	7.85
Total	33.75	54.90	75.32	91.07
<u>Gila Subregion</u>				
Agriculture ^{1/}	26.77	26.47	25.44	23.90
Forestry ^{2/}	.12	.21	.22	.20
Mining	16.20	15.20	15.10	15.00
Manufacturing	76.20	134.20	238.70	391.40
Trade	95.20	138.00	211.60	308.70
Services	122.70	201.90	367.50	610.90
Transportation	14.10	20.50	27.50	34.40
Contract construction	41.40	56.50	83.70	123.60
Rentals	27.00	44.10	70.40	111.90
Utilities	15.20	21.20	29.70	38.20
Other ^{3/}	72.26	79.58	112.59	166.02
Total	507.15	737.86	1,182.45	1,824.22

1/ Includes agricultural service businesses.

2/ Includes only employees involved in timber harvesting. Practically all forests are on government owned land and are managed by government employees. The number of government employees involved in forest management amounted to about 57 percent of total forestry employment in 1965, and is projected to equal 61 percent in 1980, 72 percent in 2000, and 79 percent in 2020.

3/ Government (including armed forces), professional services, domestic, and miscellaneous employment.

FIGURE 2.2
 EMPLOYMENT IN SELECTED INDUSTRIES IN 1965
 AND OBE-ERS PROJECTIONS FOR 1980, 2000,
 AND 2020, LOWER COLORADO REGION 1/



1/Source: Table 2.6

Within the Region there is, of course, some variation in the relative importance of the various industries employment-wise, and also in the relative employment growth over time. While "services" stand out in all three subregions, it stands out particularly in the Lower Main Stem Subregion, both in terms of relative importance in the base period and in terms of the relative growth of employment. "Trade" is of roughly equal relative importance in the three subregions and its relative importance in terms of employment doesn't change much over the projection period. Employment in "manufacturing" is a smaller proportion of total employment in the Lower Main Stem Subregion than in the other two subregions, and this relationship is projected to continue. Agriculture is of relatively greater importance employment-wise in the Little Colorado Subregion than in the other two subregions. However, its relative importance in terms of employment declines throughout the projection time frame in all three subregions.

PERSONAL INCOME

Total personal income (wages, salaries, profits, and other income) in the Lower Colorado Region, in terms of 1958 dollars, is projected to grow at a rapid even though slower rate than historically. Table 2.7. The projected annual compound regional growth rate for the 1965-2020 period is 5.5 percent compared with 7.8 percent for the 1940-65 period. Hence, the projected regional growth rate, while rapid, is substantially lower than the historical rate. The historical and projected rates for the three subregions, together with those for the Region and the United States, are as follows:

	Total Personal Income:	
	<u>Annual Compound Growth Rate, Percent</u>	
	<u>1940-65</u>	<u>Projected 1965-2020</u>
LMS Subregion	8.9	6.1
Little Colorado Subregion	3.3	5.8
Gila Subregion	7.9	5.3
Region	7.8	5.5
United States excluding overseas	4.3	4.3

The regional growth in total personal income substantially exceeds that for the Nation as a whole. The national annual compound growth rate for both the 1940-65 and the 1965-2020 periods was about 4.3 percent. Hence the regional historical growth rate is nearly double the national

TABLE 2.7
PERSONAL INCOME 1940-1965 AND OBE-ERS PROJECTIONS
FOR 1980, 2000, AND 2020, LOWER COLORADO REGION, BY SUBREGION

Area	Estimated			OBE-ERS Projections		
	1940	1950	1965	1980	2000	2020
<u>Total Personal Income, Million Dollars^{1/}</u>						
Region	650.7	1,436.4	4,302.1	10,547.1	30,158.2	81,452.5
LMS Subregion	105.7	253.7	895.1	2,508.7	7,851.8	22,529.6
L Colo Subregion:	58.1	84.2	131.1	517.5	1,230.0	2,854.9
Gila Subregion	487.0	1,098.4	3,276.4	7,520.9	21,076.4	56,068.0
<u>Per Capita Personal Income, Dollars^{1/}</u>						
Region	1,117	1,638	2,292	3,989	7,074	12,268
LMS Subregion	1,372	2,052	2,593	4,510	7,674	12,830
L Colo Subregion:	796	985	1,049	2,875	5,601	10,909
Gila Subregion	1,126	1,644	2,329	3,942	6,978	12,132
<u>Per Capita Relative - United States = 1.00</u>						
Region	.859	.907	.901	.970	.988	.988
LMS Subregion	1.055	1.137	1.019	1.097	1.072	1.034
L Colo Subregion:	.612	.546	.412	.699	.782	.879
Gila Subregion	.866	.917	.915	.959	.974	.978

^{1/} Subregions may not add to Region total due to rounding. Personal income is in 1958 dollars. Data for 1940 and 1950, projections of total personal income for the Lower Main Stem Subregion, and projections of per capita personal income and per capita relatives for the three subregions are from the publication Preliminary Report on Economic Projections for Selected Geographic Areas 1929-2020, Volume I, Water Resources Council, March 1968. Projected total personal income for the Little Colorado and Gila Subregions is the product of per capita income and population. Projected Regional total personal income is the sum of subregion totals. Data for 1965 were estimated on the basis of available data, including the input-output models.

growth rate, while the regional projected growth rate exceeds the national rate by nearly 30 percent.

The growth in total personal income is due in large part to growth in population. However, it is also due in part to an increase in personal income per capita, as comparison of the following annual compound growth rates with those given above for total personal income indicates;

Personal Income Per Capita:
Annual Compound Growth Rate, Percent

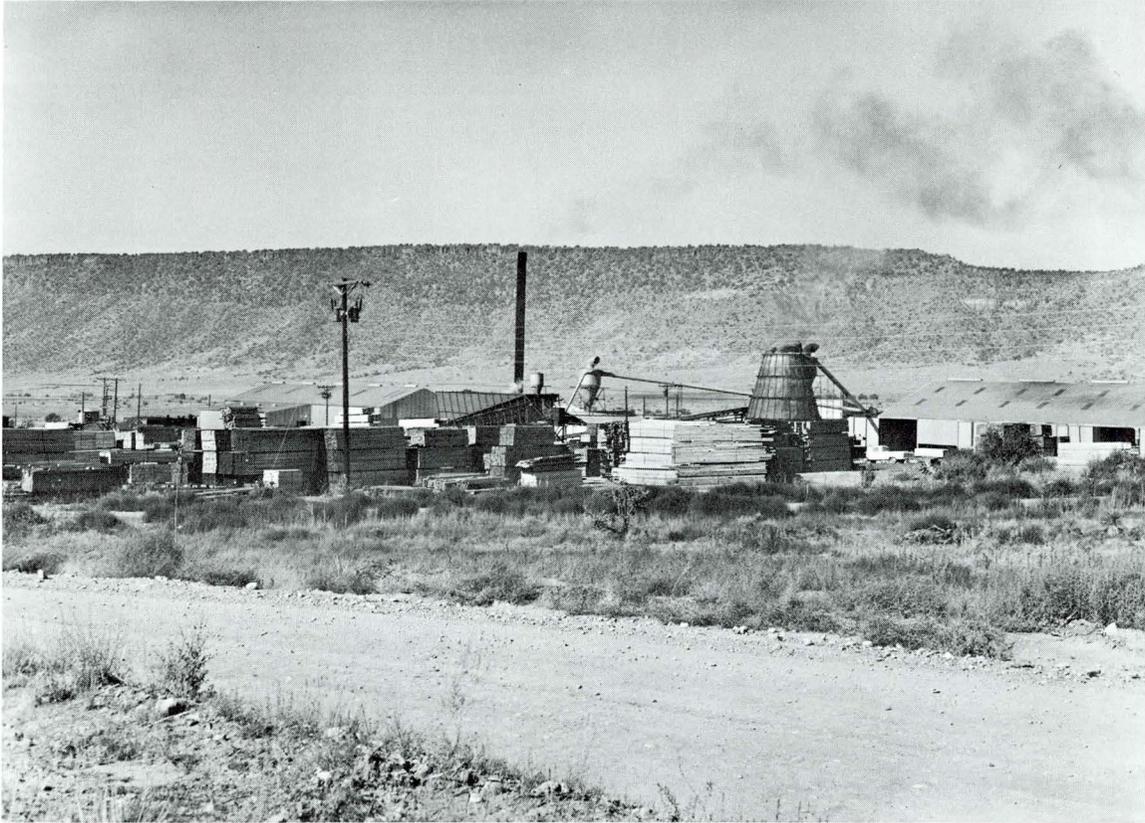
	<u>1940-65</u>	<u>Projected 1965-2020</u>
LMS Subregion	2.6	3.0
Little Colorado Subregion	1.1	4.4
Gila Subregion	3.0	3.1
Region	2.9	3.1
United States excluding overseas	2.7	2.9

On a per capita basis, personal income is projected to grow more rapidly in the future than in the past quarter century. The increase is particularly sharp in the Little Colorado Subregion. The rate of per capita income growth in the Region has, and is projected to continue to exceed that of the Nation.

On a dollar basis, per capita personal income in the Lower Colorado Region increased from \$1,117 in 1940 to \$2,292 in 1965 and is projected to increase to \$12,000 in 2020. Table 2.7. Since the amounts are in constant dollars they reflect a real increase in income undiluted by inflation.

The projected increases in personal income per capita probably will be derived from a combination of three sources: an increase in the employment participation rate, particularly in the Little Colorado Subregion; an increase in productivity per worker; and an increase in profits and other income derived from interest on investments and the like. Variation in personal income per capita in the base period also is accounted for in large measure by these three factors.

Per capita personal income in the Lower Colorado Region is only about 90 percent of the national average, but is projected to nearly equal the national average in each of the target years. Table 2.7. The Lower Main Stem Subregion is relatively better off in terms of personal income than the other two subregions, probably due to higher personal income in the Las Vegas area. Personal income per capita in the Lower Main Stem is slightly higher than the national average and is projected to continue so. However, the other two subregions fall below the national average, particularly the Little Colorado Subregion. Even with the sharp and large increase projected, personal per capita income in the Little Colorado Subregion lags throughout the projection time frame, reaching only 88 percent of the national average by 2020. The dominant reason for the lower per capita income in this subregion is undoubtedly associated with the rural population which is primarily made up on Indians on reservations. The opportunities of employment on reservations are low and the literacy



BIA

Photo 5. Establishment of new industries such as this sawmill on the Fort Apache Indian Reservation will provide needed employment opportunities.

levels and capabilities for fitting into the economic revenue-producing channels outside the reservations likewise impede employment opportunities for the Indians in the Little Colorado Subregion.

The Gila Subregion also has a large Indian rural population, and most of the people of Spanish descent and the Negro people are likewise located in this Subregion. Although opportunities of employment are higher in the Gila Subregion, the low income status of these people tends to depress the total per capita income level. Moreover, with most of the Lower Colorado Region irrigated agriculture being located in the Gila Subregion, the itinerant farm labor, which is primarily hand labor of short duration, tends to depress per capita income. The projections indicate rightfully a softening of these depressant conditions; however, in all probability the relative ranking of per capita income among the three subregions will remain the same throughout the projection period.

ECONOMIC ACTIVITY

The economy of the Lower Colorado Region is made up of a wide range of activities. The five major types of industries or activities and their relative magnitude in the base year, with projections to 1980, 2000, and 2020 are shown by subregion in table 2.8.

Total gross output in 1965 for the producing sectors in the Lower Main Stem, Little Colorado and Gila Subregions amounted to about \$1.6 billion, \$.3 billion and \$5.7 billion respectively. The primary-secondary industries defined as agriculture, forestry, mining and manufacturing accounted for 23 percent of total processing output in the Lower Main Stem Subregion in 1965. The tertiary or non-commodity producing industries accounted for the balance or 77 percent. The same relationships in the Little Colorado Subregion in 1965 were primary-secondary industries, 59 percent, and tertiary industries, 41 percent; while the Gila Subregion reported 47 percent and 53 percent respectively. This points up the importance of service oriented industries in the Lower Main Stem Subregion --reflecting the Las Vegas complex, and to some extent, outdoor recreation.

It is noted that the primary industries, particularly mining and agriculture, play a dominant role in the Little Colorado Subregion. The economy of the Gila Subregion, however, shows considerably more balance between primary-secondary and tertiary industrial activity.

The regional projections reflect change in the composition of the economy. The Gila Subregion in 2020, for example, remains almost identical with regard to the distribution between primary-secondary and tertiary activity. At the same time, however, manufacturing is expected to increase from about 31 percent of industrial output in 1965 to almost 43 percent in 2020.

With a high of 77 percent of total industrial output from tertiary industries in 1965, the Lower Main Stem is expected to increase further by 2020, showing almost 85 percent from tertiary industries. Manufacturing in the Lower Main Stem remains about the same as a percent of total industrial output--increasing from 12 percent in 1965 to about 13.5 percent in 2020.

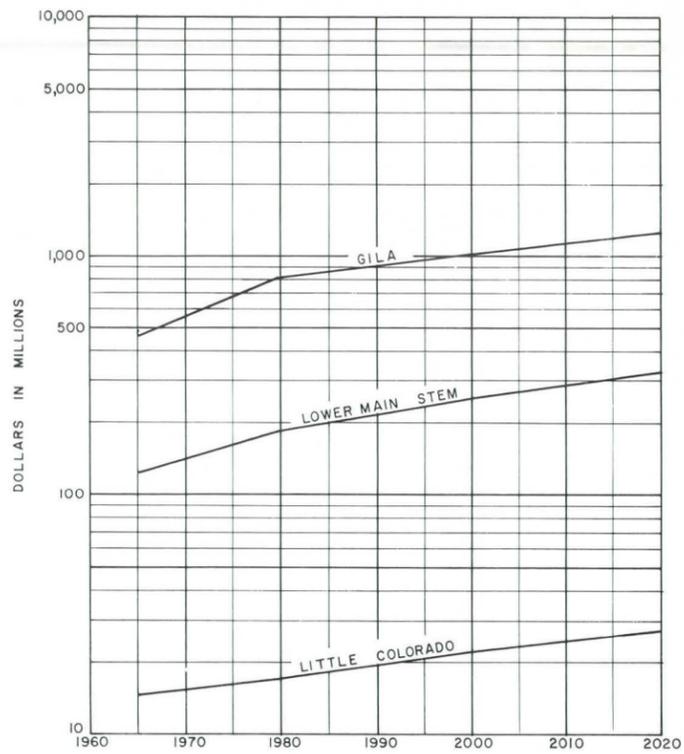
The composition of the Little Colorado Subregion economy shows the greatest change over the projection period. An almost exact reversal occurs with regard to primary-secondary versus tertiary industries. Primary-secondary industries decreased from 60 percent of total industrial output in 1965 to 42 percent in 2020, while tertiary industries increased from 40 percent to 58 percent respectively. Mining output, as a percent of total, declines sharply during the projection period. Manufacturing

TABLE 2.8
TOTAL GROSS OUTPUT BY INDUSTRY AND ASSOCIATED TOTAL PRIMARY INPUTS
BY SUBREGION, LOWER COLORADO REGION, IN 1965 WITH OBE-ERS PROJECTIONS
FOR 1980, 2000 AND 2020

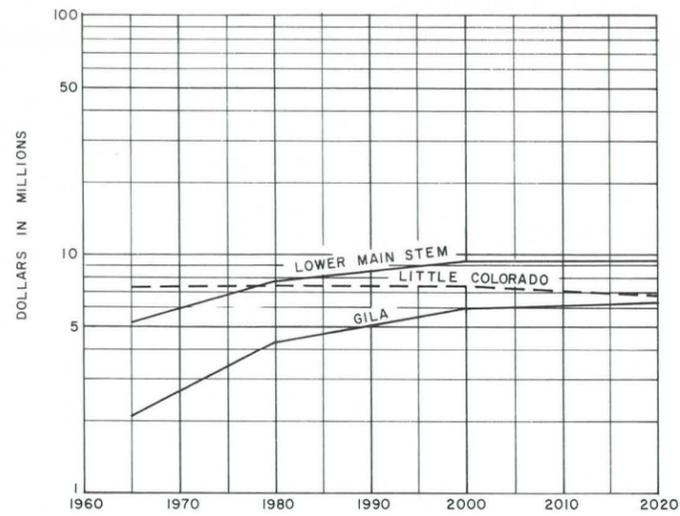
Item	1965	OBE-ERS Projections		
		1980	2000	2020
----- Million 1960 Dollars -----				
<u>LMS Subregion</u>				
Producing Industries				
Agriculture	123.3	185.2	255.1	329.8
Forestry	5.2	7.7	9.4	9.5
Mining	32.1	59.5	87.9	118.8
Manufacturing	197.1	584.5	1,529.5	3,670.0
Non-commodity				
Producing Industries	1,220.5	3,001.1	8,797.3	23,022.9
Total	1,578.2	3,838.0	10,679.2	27,151.0
Value added	1,280.2	3,596.1	11,036.4	30,357.4
Imports	776.4	1,823.6	4,847.2	12,704.1
<u>L Colo Subregion</u>				
Producing Industries				
Agriculture	14.7	17.1	22.2	27.2
Forestry	7.3	7.4	7.4	6.8
Mining	112.2	160.7	183.4	138.5
Manufacturing	72.1	157.0	296.0	484.5
Non-commodity				
Producing Industries	138.4	268.1	535.3	909.5
Total	344.7	610.3	1,044.3	1,566.5
Value added	224.1	703.4	1,655.6	3,771.8
Imports	205.5	406.3	790.5	1,525.3
<u>Gila Subregion</u>				
Producing Industries				
Agriculture	458.4	819.3	1,022.1	1,269.1
Forestry	2.1	4.3	6.0	6.4
Mining	458.5	652.0	953.0	1,268.0
Manufacturing	1,759.1	4,330.0	11,370.7	27,850.0
Non-commodity				
Producing Industries	2,977.7	6,347.5	15,307.1	34,904.3
Total	5,655.8	12,153.1	28,658.9	65,297.8
Value added	4,524.4	10,316.3	28,414.4	72,846.3
Imports	2,257.8	4,464.0	10,927.9	27,255.8

FIGURE 2.3
 TOTAL GROSS OUTPUT BY INDUSTRY AND ASSOCIATED PRIMARY INPUTS BY SUBREGION, LOWER COLORADO REGION, IN 1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020^{1/}

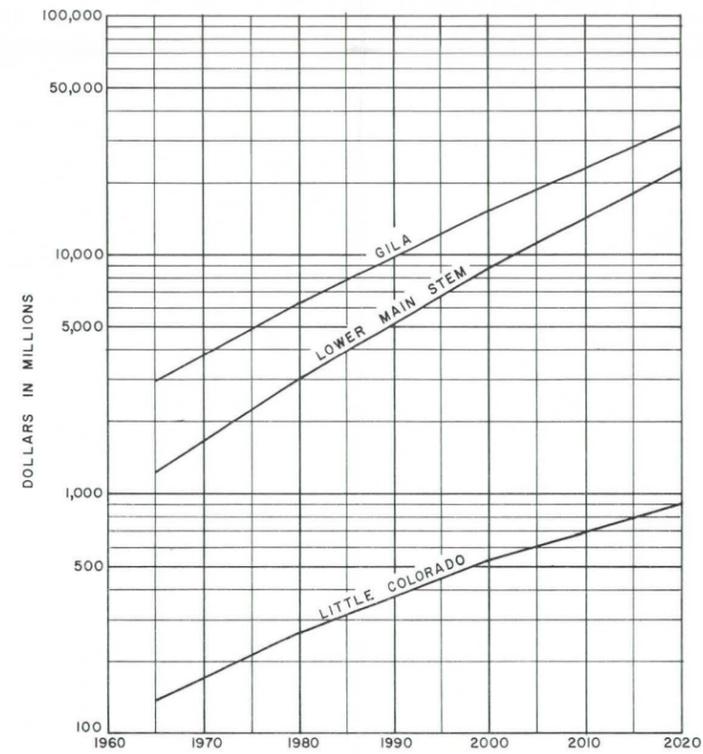
AGRICULTURE



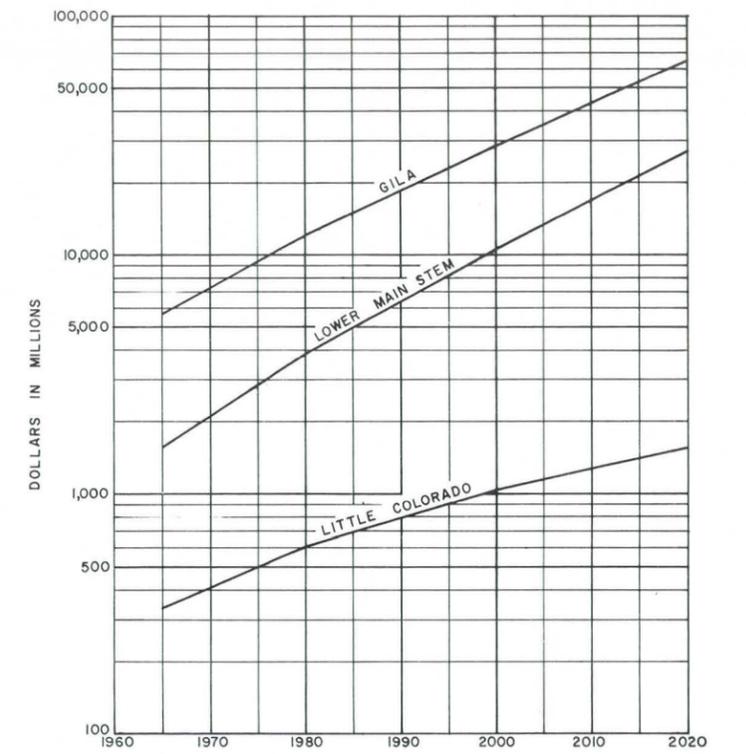
FORESTRY



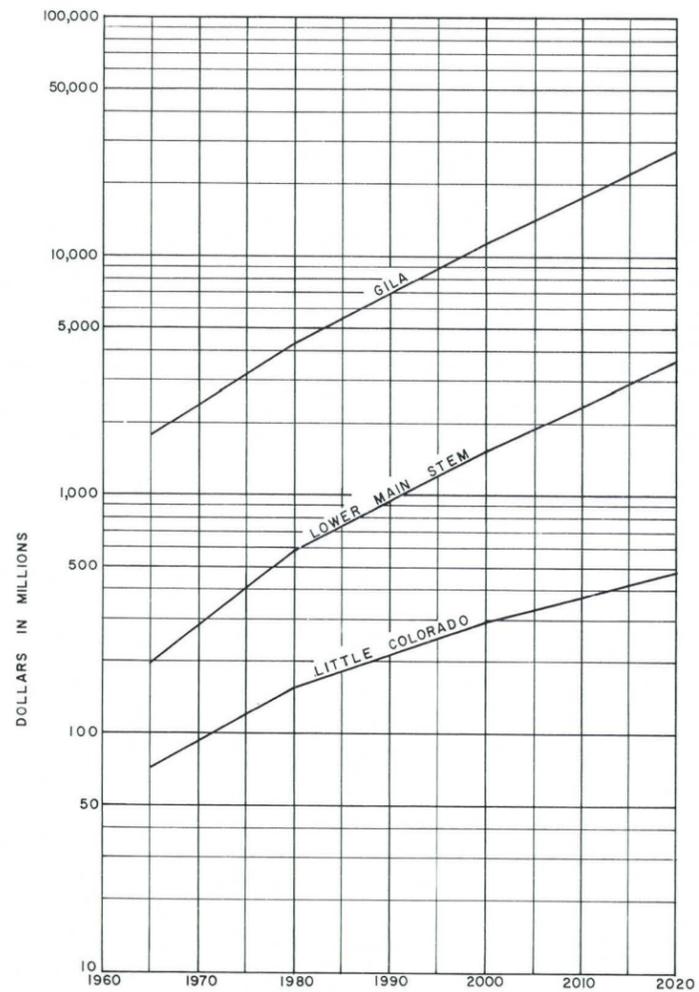
NON-COMMODITY PRODUCING INDUSTRIES



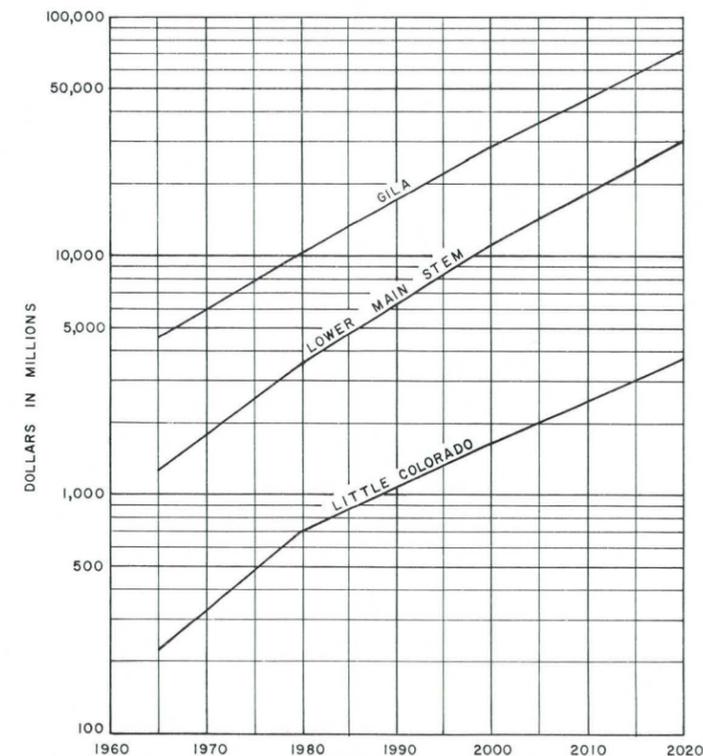
TOTAL TGO OF PRODUCING INDUSTRIES



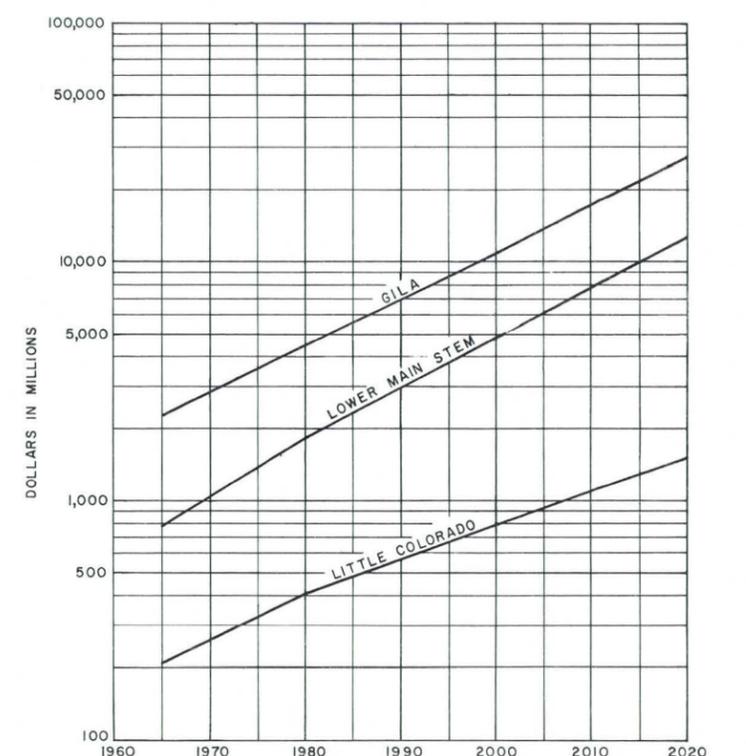
MANUFACTURING



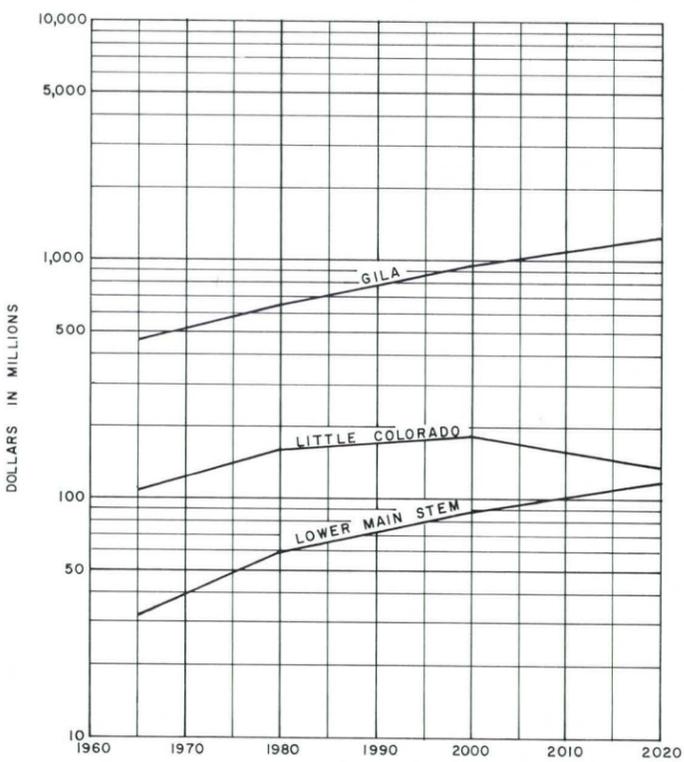
VALUE ADDED



IMPORTS



MINING



^{1/} SOURCE: TABLE 2.8

output, however, shows an increase from 21 percent in 1965 to 31 percent by 2020. As mentioned above, relatively rapid growth is expected for the tertiary industries in the Little Colorado Subregion economy.

Value added, made up largely of government payments and income payments, amounted to about \$1.2 billion in 1965 and is expected to increase to \$30.4 billion by 2020 in the Lower Main Stem Subregion. Value added in the Little Colorado Subregion shows an increase from \$.2 billion in 1965 to approximately \$3.8 billion in 2020. The Gila Subregion, which accounted for 75 percent of total value added for the Lower Colorado Region in 1965, increased from \$4.5 billion in 1965 to \$72.8 billion by 2020.

In order to complete the measurement of regional accounts in terms of broad categories of the economy, it is necessary to measure gross regional product. Gross regional product (GRP) as opposed to the flow of income and payments discussed above, is defined as the sum of four major expenditure components: 1) personal consumption expenditures, 2) government purchases of goods and services, 3) gross private investment, and 4) net export of goods and services. The goods and services included in GRP are largely associated with market items and every effort is made to eliminate double counting, or to measure only the value of final goods and services produced. Such was not the case with the complete input-output table where the value of goods and services produced is counted at each point in the production process and therefore measures all transactions.

The present level and potential growth of GRP depends largely on demographic, economic, and technological factors. In addition, the influence of public and private programs on the regional economy is of major importance. Thus, GRP will differ from region to region depending upon resource availability and utilization.

In table 2.9, GRP is given by subregion, showing major expenditure components for 1965 with OBE-ERS projections to 1980, 2000 and 2020. Consumption expenditures in this table represent expenditures by households on consumer goods and services, and contributes the largest share to the gross subregional product in all subregions. Government expenditures, representing government spending for goods and services in the subregion, contributes the next largest share to gross subregional product in all subregions.

Gross investment expenditures represent capital investment in homes, industrial facilities, equipment, and other long-term business needs, including net inventory change of final goods and services.

Net exports of goods and services represent the net export balance after all imports into the subregion have been deducted. As indicated in

the table, all subregions show net import in 1965. However, the Gila Subregion changes to a net export by 1980 and the Lower Main Stem by 2000. In the case of the Little Colorado Subregion, as with many small and less developed economic areas, the net export balance remains negative throughout the projection period.

TABLE 2.9
GROSS REGIONAL PRODUCT BY SUBREGION, LOWER COLORADO REGION, 1965 WITH OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020

Area and Item	1965	OBE-ERS Projections		
		1980	2000	2020
:----- Million 1960 Dollars -----:				
<u>LMS Subregion</u>				
Consumptive expenditures:	811.0	2,233.5	7,062.4	20,411.7
Government expenditures :	269.3	795.6	2,488.0	7,080.4
Gross investment expend- itures :	290.6	623.1	1,471.9	2,847.3
Net exports or (imports): of goods & services :	<u>(90.7)</u>	<u>(56.1)</u>	<u>14.1</u>	<u>18.0</u>
Gross subregional prod- uct :	1,280.2	3,596.1	11,036.4	30,357.4
<u>L Colo Subregion</u>				
Consumptive expenditures:	127.8	465.6	1,053.3	2,565.9
Government expenditures :	127.5	256.8	549.9	984.4
Gross investment expend- itures :	51.3	119.3	235.2	451.2
Net exports or (imports): of goods & services :	<u>(82.5)</u>	<u>(138.4)</u>	<u>(182.8)</u>	<u>(229.6)</u>
Gross subregional prod- uct :	224.1	703.3	1,655.6	3,771.9
<u>Gila Subregion</u>				
Consumptive expenditures:	2,753.6	6,466.8	18,743.3	49,775.1
Government expenditures :	959.6	2,015.2	5,497.4	14,034.0
Gross investment expend- itures :	822.5	1,811.0	4,097.7	8,913.0
Net exports or (imports): of goods & services :	<u>(11.3)</u>	<u>23.3</u>	<u>76.0</u>	<u>124.2</u>
Gross subregional prod- uct :	4,524.4	10,316.3	28,414.4	72,846.3
<u>Gross Regional Product</u>	6,028.7	14,615.7	41,106.4	106,876.3

Agriculture

In 1965 there were about 7.9 thousand farms (including ranches) in the Lower Colorado Region of which 20 percent were in the Lower Main Stem Subregion, 6 percent were in the Little Colorado Subregion, and 74 percent in the Gila Subregion. These figures exclude Indian reservations or parts of reservations counted as single units in the U. S. Census of Agriculture. There were 41 of these in the Region in 1964; 7 being in the Lower Main Stem Subregion, 24 in the Little Colorado Subregion, and 8 in the Gila Subregion. The average size farm^{1/} in the Region was 3,300 acres, the average being 2,350 acres in the Lower Main Stem Subregion, 7,500 acres in the Little Colorado Subregion, and 3,100 acres in the Gila Subregion.

Of the 7.9 thousand farms in the Region, about 5.6 thousand, or 70 percent, were classified as irrigated in the 1964 U. S. Census of Agriculture. In the Lower Main Stem Subregion 80 percent of the farms were classified as irrigated, compared with about 60 percent for the Little Colorado Subregion, and 70 percent for the Gila Subregion. Only a small amount of the land in these farms was irrigated. "Land irrigated in census year"^{1/} averaged 213 acres per farm for the Region, 192 acres per farm for the Lower Main Stem Subregion, 56 acres per farm for the Little Colorado Subregion, and 230 acres per farm for the Gila Subregion.^{2/}

Of the 7.9 thousand farms in the Lower Colorado Region, about 5.4 thousand were classified as "commercial" farms^{1/} in the 1964 U. S. Census, indicating that in general they sold farm products valued at \$2,500 or more. Commercial farms^{1/} comprised 69 percent of all farms in the Region, 65 percent in the Lower Main Stem Subregion, 48 percent in the Little Colorado Subregion, and 71 percent in the Gila Subregion. About one-third of the commercial farms in the Region were in Economic Class I, the largest size group. Table 2.10. The Gila and Lower Main Stem Subregions also had a high proportion of Class I commercial farms. However, the proportion dropped sharply in the Little Colorado Subregion where only 2 percent of the farms were in Economic Class I. The relatively small proportion of commercial farms in the Little Colorado Subregion and their relatively small size is a reflection of the low income of many farms in that area. Moreover, many additional people living on Indian reservations in the area who derive a major part of their income from agriculture

^{1/} Excluding Indian reservations.

^{2/} All farms reporting any land irrigated in 1964 were counted as irrigated farms in the U. S. Census of Agriculture. Only that part of the land in irrigated farms that was watered by artificial means at any time in 1964 was included in land irrigated.

have very low incomes. Hence, it is evident that a large proportion of the predominantly rural population of the Subregion realized low income in the base period.

Farms in the Lower Colorado Region, as a whole, are larger on the average than farms in the United States. Commercial farms comprised about 70 percent of all farms in both areas in 1964, but relatively more farms were in the larger classes in the Lower Colorado Region than in the United States. Table 2.10. In the Lower Colorado Region one farm in three sold \$40,000 or more of products in 1964 compared with only one in fifteen for the Nation as a whole.

TABLE 2.10
DISTRIBUTION OF COMMERCIAL FARMS BY ECONOMIC CLASS
IN THE LOWER COLORADO REGION AND THE UNITED STATES, 1964^{1/}

Economic Class	: Value of Farm : : Products Sold : : Per Farm	Commercial Farms, 1964				
		: United States :	: Lower Colo: Region ^{2/} :	: LMS :Subr ^{2/} :	: L Colo :Subr ^{2/} :	: Gila :Subr ^{2/} :
	(\$1,000)	Percent				
Class I	: 40 or more	7	32	28	2	34
Class II	: 20.0 to 39.9	12	14	15	15	14
Class III	: 10.0 to 19.9	22	14	14	19	14
Class IV	: 5.0 to 9.9	23	14	15	27	13
Class V	: 2.5 to 4.9	20	14	16	22	13
Class VI	: Under 2.5	16	12	12	15	12
Total	:	100	100	100	100	100

^{1/} Source: U. S. Census of Agriculture, 1964.

^{2/} Excludes Indian reservations.

The larger commercial farms of the Lower Colorado Region are viable businesses managed by capable businessmen who generally have ready access to financial resources needed to implement decisions. The managers are cognizant of changing conditions and able to take advantage of opportunity.



Photo 6

BIA Photo 7



BIA



Photo 8.

BIA

Irrigated crop production is big business in the Region. Large investments are necessary to develop and maintain cropland for top production and efficient use of water.

Value Added and Total Gross Output

Value added (VA) and total gross output (TGO) from agricultural sectors in the Lower Colorado Region for 1965 and for 1980, 2000, and 2020 are given in table 2.11. Value added includes payments to Federal, State and local governments for taxes, grazing permits, irrigation water, licenses, etc., wages paid to labor, salaries, depreciation allowances, interest income of individuals, and proprietor's profits. Therefore, value added is derived from the payments side of the model and is equivalent to gross regional product, which is derived from sales on the production side when received for the total economy. Total gross output is defined on a commodity basis and includes (a) total value of production whether for open-market sales, for placement under loan with the Commodity Credit Corporation, for inventory accumulation for use on the farm, or for home consumption; and (b) government farm program and cost share payments for installation of conservation practices.

In working with total gross output figures it should be kept in mind that they are designed to include double accounting. For example, feed produced on the farm by the forage, feed and food crops sector may be "sold" to the feeder livestock sector. In this case the value of the feed would be included in the TGO for the forage, feed and food crops sector, and it also would be reflected in the value of the fattened cattle in the feeder livestock sector. As another example, a feeder calf produced by the range livestock sector may be sold to the feeder livestock sector. The value of the calf is included in the range livestock sector TGO and again in the feeder livestock TGO when the fed animal is marketed --since the feeder livestock TGO includes the value of the finished animal, not just the gain put on in the feedlot. To the extent that double accounting is involved, the total gross output of the Region exceeds the gross regional product.

Total gross output for the agricultural sectors includes the following in addition to government payments where applicable:

Range livestock includes the value of cattle and calves, sheep and lambs, goats and kids, and wool and mohair produced, and government payments.

Feeder livestock includes the value of fed cattle and calves, and manure produced.

Dairy includes the value of milk and cream, dairy cattle and calves, and manure produced.

Forage, feed and food crops includes the value of hay, feed grains, food grains, safflower, sugar beets, and dry beans produced.

TABLE 2.11
 VALUE ADDED AND TOTAL GROSS OUTPUT FROM AGRICULTURAL SECTORS IN THE THREE
 SUBREGIONS OF THE LOWER COLORADO REGION FOR 1965 AND OBE-ERS PROJECTIONS
 TO 1980, 2000, AND 2020

Subregion and Sector	1965		OBE-ERS Projections					
			1980		2000		2020	
	VA	TGO	VA	TGO	VA	TGO	VA	TGO
----- Million 1960 Dollars -----								
<u>LMS Subregion</u>								
Range livestock :	10.1	17.6	10.1	18.0	10.7	19.3	11.4	20.7
Feeder livestock:	1.7	14.5	4.8	36.2	7.7	56.3	11.4	81.0
Dairy :	1.5	4.0	1.4	3.8	1.7	4.9	2.2	6.3
Forage, feed & food crops :	9.2	14.8	11.2	19.0	13.8	24.3	15.8	28.9
Cotton :	10.4	15.4	18.8	28.9	26.4	41.1	33.0	52.2
Veg & melon prod:	5.0	27.9	6.5	37.6	7.7	48.8	8.9	62.8
Citrus :	5.6	21.4	6.7	29.7	9.3	44.2	11.0	56.6
All other agric :	3.6	7.7	5.4	12.1	7.1	16.2	9.0	21.3
Total <u>1/</u> :	47.1	123.3	64.8	185.3	84.3	255.1	102.6	329.8
<u>L Colo Subregion</u>								
Range livestock :	7.1	12.2	8.0	14.2	10.1	18.7	12.5	23.2
Feeder livestock:	0.08	0.3	0.06	0.3	0.05	0.3	0.04	0.3
Dairy :	0.09	0.2	0.06	0.2	0.05	0.2	0.05	0.2
Forage, feed & food crops :	0.8	1.3	.8	1.5	0.9	1.7	1.0	1.9
All other agric :	0.3	0.7	.4	0.9	0.6	1.3	0.6	1.6
Total <u>1/</u> :	8.37	14.7	9.32	17.1	11.70	22.2	14.18	27.2
<u>Gila Subregion</u>								
Range livestock :	29.9	57.3	29.7	58.7	31.0	61.5	32.3	64.3
Feeder livestock:	16.3	118.4	118.2	365.1	164.2	485.6	222.2	632.0
Dairy :	13.0	32.4	12.7	31.3	19.9	40.0	30.2	51.2
Forage, feed & food crops :	32.4	55.3	41.5	74.1	49.3	91.1	54.4	105.6
Cotton :	54.1	113.7	78.7	178.3	83.6	199.2	91.5	230.1
Vegetables <u>2/</u> :	20.1	46.7	28.3	61.9	35.9	80.5	45.3	104.0
Citrus :	2.7	13.7	3.4	18.1	4.2	23.2	5.1	28.3
All other agric :	7.9	20.8	12.4	31.8	15.8	40.9	20.9	53.5
Total <u>1/</u> :	176.4	458.3	324.8	819.3	403.8	1,022.0	502.0	1,269.0

1/ Totals may not equal sum of items due to rounding.

2/ Includes melons.

Cotton includes the value of lint and seed produced and, therefore, includes the ginning activity.

Vegetables and Melon Products include the value of broccoli, cabbage, cantaloupes, carrots, cauliflower, celery, honeydew and watermelons, lettuce, onions, potatoes, and other vegetables produced.

Citrus includes the value of grapefruit, lemons, oranges, tangerines and other citrus produced.

All Other Agriculture includes the value of poultry and poultry products, hogs, non-citrus fruits and nuts, and miscellaneous crops and livestock produced. In the Little Colorado Subregion some of the above sectors are not shown since little or none of the product is produced. However, the value of any such product which is produced is included in all other agriculture.

The value added to the economy by agricultural production in the Region in 1965 totaled \$232 million; 76.1 percent being produced in the Gila Subregion, 20.3 percent in the Lower Main Stem Subregion, and 3.6 percent in the Little Colorado Subregion. Range Livestock, cotton, and vegetables were important contributors.

The rate of regional agricultural growth is projected to be substantially greater in the early part of the period than subsequently, the increase being 72 percent for the 1965-80 period compared with about 25 percent for each of the two latter periods. The greatest rate of growth is projected for the Gila Subregion, with the Lower Main Stem Subregion being a close second. The Little Colorado Subregion is projected to lag considerably both in timing and in amount of increase.

In the Lower Main Stem Subregion the major sectors in 1965, in order of relative dollar importance, were vegetable and melon products, citrus, range livestock, cotton, forage, feed and food crops, and feeder livestock. The projected rate of growth differs greatly among the sectors. Feeder livestock production is projected to increase most rapidly, the sector TGO in 2020 being more than 5.5 times the 1965 level and accounting for 25 percent of the Subregion agricultural TGO. Cotton production in 2020 is projected to be about 3.4 times that in 1965 but still will account for only about 15 percent of the Subregion agricultural TGO since the 1965 base is relatively small. In 2020 vegetable production is projected to be 2.2 times and citrus production 2.6 times the 1965 level. With these increases they will rank second and third among the sectors in TGO, being crowded out of their current top ranking positions by the rapid growth of feeder livestock.

In the Little Colorado Subregion the range livestock sector is dominant, producing 85 percent of the subregion agricultural TGO in the base period. It is projected to nearly double by 2020, showing about the same relative growth as the Subregion TGO. The type of agriculture in the subregion is not projected to change materially.

In the Gila Subregion feeder livestock and cotton tied for first place among the agricultural sectors in 1965, each accounting for about 25 percent of the subregion TGO derived from agriculture. Range livestock and the forage, feed and food sector each produced about 12 percent of the subregion agricultural TGO. Vegetables produced 10 percent, dairy 7 percent, and citrus accounted for only 3 percent of the total. The feeder livestock sector is projected to grow at a very rapid rate, value added by the industry being more than 13 times and TGO more than 5 times the 1965 level by 2020. Vegetables and citrus are projected to grow at a much lower rate with production a little more than doubling by 2020. The cotton TGO also is projected to double by 2020. The remaining sectors show lower growth rates, the range livestock sector being projected to increase only 12 percent by 2020. These variations in growth rates produce some changes in the composition of agriculture in the subregion. The feeder livestock sector becomes increasingly dominant over time, accounting for 44 percent of value added and one-half of the subregion agricultural TGO in 2020. Cotton continues to rank second in 2020 with 18 percent of the TGO. The range livestock sector gradually declines in relative importance, while the vegetable sector gradually increases in relative importance in the three projection years.

Crop Production

Production of various crops or groups of crops in the Lower Colorado Region in 1965 and projections for 1980, 2000 and 2020 are given in table 2.12. The crops were classified by commodity group to correspond with the OBE-ERS grouping, and the projections were correlated with the projections indexes given for the Region, adjusted to Series C population projections.^{1/} Since the indexes related to groups of crops, projections of individual crops were based upon historical trends and judgement of informed individuals adjusted as necessary to conform to the production indexes. The implications of projected livestock production were considered in the feed crop projections. A few crops were included which were not considered at the national level in establishing the projections indexes; viz, irrigated pasture, range, safflower and bermuda grass seed. These crops were included since they contribute substantially to the economy of the Region.

^{1/} See: Preliminary Projections of Economic Activity in the Agricultural, Forestry and Related Economic Sectors of the United States and Its Water Resource Regions, 1980, 2000 and 2020, prepared by the Economic Research Service and Forest Service, U. S. Department of Agriculture, August, 1967.

Crop Yields

Yields of major crops in the Region for 1965 and projections for 1980, 2000 and 2020 are summarized in table 2.13. With a view of providing a consistent base for projections, yields for the 5-year period 1963-67 were averaged, to the extent data were available, to provide a normalized 1965 yield. In developing the projections, yields of all crops were individually projected on an area basis to maintain consistency with location of crop production. These area projections were then weighted by acres in deriving projections by subregions, which were used in the analysis. In turn, the subregion projections were weighted by acres to obtain summary projections for the Region. Only the summary regional yields for major crops are shown in the table to give a general indication of the level of projections. Tabular material for all crops, by subregion, are included in the Appendix IV supplement.

Region and subregion base period and projected yields of selected major crops are portrayed graphically in figure 2.2. Historical data were not available on a county basis to permit portraying long-term yield trends for the Region and subregions. However, such data were available for some crops for the State of Arizona. Since Arizona comprises most of the Lower Colorado Region, historical trends of yields for the State are portrayed in comparison with the projected yields.

A few crop yields were projected to approximately double by 2020, but most showed smaller increases. Cotton, grain sorghum and alfalfa show projected increases in the 80-90 percent range, while vegetable and

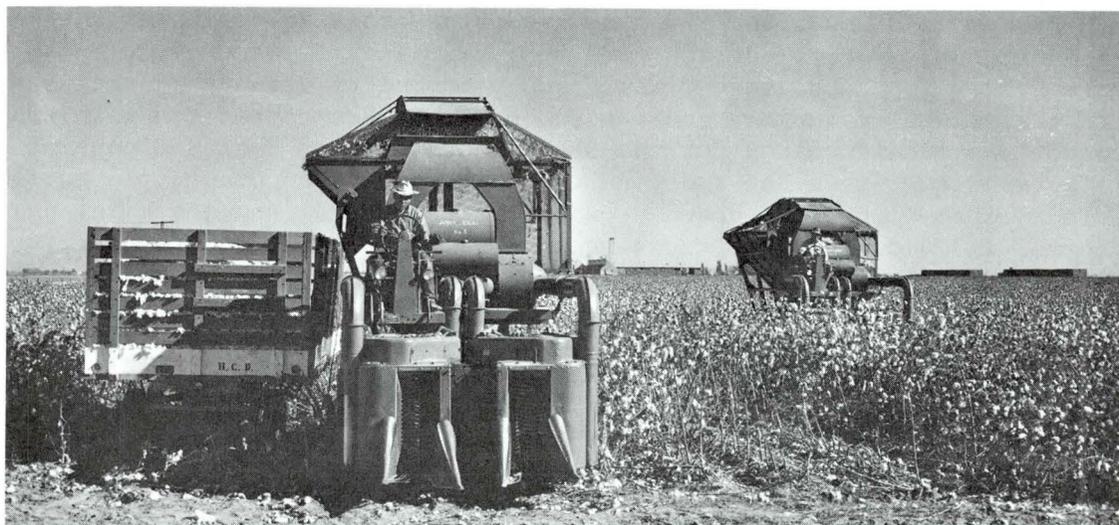


Photo 9. High yields and excellent quality make cotton one of the most profitable crops grown in the Region.

SRP

TABLE 2.12
CROP PRODUCTION IN 1965 AND OBE-ERS PROJECTIONS
FOR 1980, 2000 AND 2020, LOWER COLORADO REGION

Item	Unit	1965				OBE-ERS Projections		
		Normalized	1980	2000	2020			
<u>Feed crops</u>								
Feed grains	Mil. lbs.	1,317.2	1,089.3	1,465.0	1,727.4			
Hay	Thou. ton	1,214.6	1,490.0	1,733.9	1,970.2			
Silage	Thou. ton	473.9	445.5	524.7	606.8			
Irrigated pasture ^{1/}	Thou. AUM	345.0	552.0	804.0	1,103.0			
Range ^{2/}	Thou. AUM	7,876.0	8,058.0	8,804.0	9,439.0			
<u>Food crops</u>								
Wheat	Mil. lbs.	74.2	255.9	296.7	338.1			
Vegetables	Thou. cwt	15,333.1	20,743.1	26,925.9	34,695.2			
Potatoes	Thou. cwt	2,374.5	2,694.4	3,552.4	4,656.0			
Dry beans	Thou. lbs	2,106.3	3,419.3	4,289.4	5,460.5			
Citrus	Thou. ton	352.8	479.0	670.6	842.8			
Sugar beets	Thou. ton	-	980.0	1,120.0	1,260.0			
<u>Oil and fiber crops</u>								
Cotton lint	Mil. lbs.	342.9	553.9	644.3	758.1			
Cotton seed	Thou. ton	332.4	537.7	627.4	739.4			
Safflower	Mil. lbs.	38.6	90.0	180.0	252.0			
Flaxseed	Thou. lbs.	760.0	528.0	666.0	768.0			
<u>Other crops</u>								
Bermuda grass seed	Thou. lbs.	8,670.0	8,240.0	8,620.0	9,860.0			

^{1/} Single use. (AUM - Animal Unit Month).

^{2/} Range production as used in the study is defined as animal unit month (AUM) of forage harvested by domestic livestock animals from non-croplands, including non-cropland pasture.

TABLE 2.13
CROP YIELDS PER HARVESTED IRRIGATED ACRE IN 1965 (NORMALIZED)
AND PROJECTIONS FOR 1980, 2000, AND 2020, LOWER COLORADO REGION

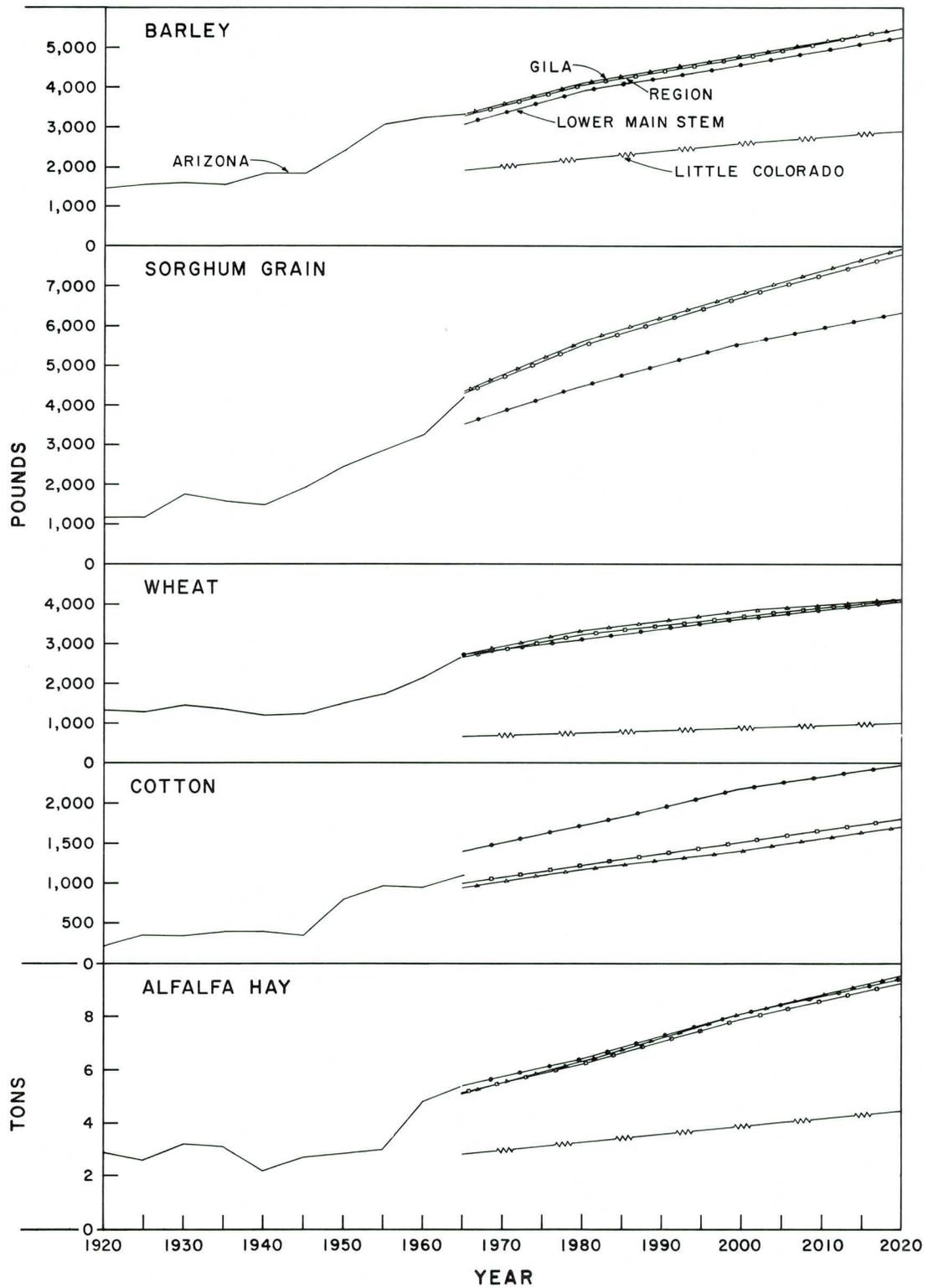
Crop	1965 Yield ^{2/}	Projected Yields ^{1/}					
		Quantity			Index(1965=100)		
		1980	2000	2020	1980	2000	2020
-----Pounds-----							
Barley	3,293	4,068	4,763	5,458	124	145	166
Sorghum grain	4,297	5,506	6,690	7,766	128	156	181
Wheat	2,681	3,216	3,703	4,108	120	138	153
Cotton	1,007	1,233	1,511	1,808	122	150	180
-----Ton-----							
Alfalfa hay	5.14	6.23	7.91	9.24	121	154	180
Citrus	9.0 ^{3/}	9.6	11.2	13.0	106	124	144
-----Cwt-----							
Vegetables	169 ^{3/}	196	212	235	116	125	139

^{1/} The unrounded figures are not intended to imply preciseness in projections. The projections, originally made on an area basis, were rounded but this feature was lost when area projections were combined, weighted by acres, to obtain projections by Region.

^{2/} Normalized as far as feasible. Arizona and New Mexico County yields were normalized by averaging 1963-67 yields published in Arizona Agricultural Statistics, Arizona Crop and Livestock Reporting Service, and in New Mexico Agricultural Statistics, New Mexico Department of Agriculture cooperating with the U. S. Department of Agriculture. Yields for Nevada and Utah Counties were based primarily upon U. S. Census data and judgement of informed individuals.

^{3/} Arizona Fruit and Vegetable Standardization Service.

FIGURE 2.4
LOWER COLORADO REGION
YIELD PER HARVESTED ACRE OF SPECIFIED CROPS
 ACTUAL 1920 TO 1965
 PROJECTIONS TO 1980, 2000, AND 2020



citrus yields were projected to increase only about 40 percent. Compared with historical trends for the State of Arizona, and with yields currently being realized by the better farmers, the projections appear realistic with some individuals feeling they are conservative.

The crop yield projections were based upon the judgement of agricultural technicians from State universities and Federal agencies involved in the Region, modified as necessary to achieve consistency among crops and among regions of the Pacific Southwest. Available information pertaining to crop yields was compiled and summarized for reference by the technicians including historical yield data, data on use of commercial fertilizers, cultural practices and the like. Data were obtained from the Agricultural Stabilization and Conservation Service, U. S. Department of Agriculture, showing yields of individual crops being produced by the top farmers and by the average of all farmers in each county. Use also was made of yield data for the Soil Resource Groups in the Region, obtained along with other information in group interviews of county agricultural technicians. A framework of assumptions regarding the future also was provided the technicians for use in making the projections. The assumptions of the Type I Study, given above, were supplemented by the following specific assumptions:

1. The projections reflect the average (modal) level of performance reasonably expected of all farm operators with the average (modal) level of management expect to prevail in each of the target years.
2. Government programs in agricultural extension and research will continue at present levels and the average (modal) level of management of all farmers and ranchers will continue to improve.
3. The quality of water and land used in crop production will not change enough to have a significant effect on the level of the yields.
4. Marketing and transportation facilities will be adequate to handle the projected agricultural production.

A number of factors have contributed to the dramatic increase in crop yields in the past 25 years, and are expected to contribute to that projected for the future. One, sometimes overlooked, is the natural climatic advantage of irrigated agriculture in the Region. Another is the high level of managerial ability of farmers in the Region and the level of financial resources at their command which permits quick adoption of technological developments and improved practices, both in solving production problems and in raising the level of production. Increased application of commercial fertilizers, herbicides, insecticides, and the like also contribute to increased yields. Use of commercial nitrogen fertilizer in Arizona amounted to only about 10 thousand tons in 1950,

but increased to nearly 65 thousand tons by 1965. This increase contributed materially to the rapid increase in crop yields. By 1965 use of commercial fertilizer was widespread and, consequently, additional use of fertilizer in the future is not expected to have such a pronounced influence on yields.

Range Carrying Capacity

Carrying capacity of rangelands, including noncropland pasture, was developed for the base year 1965 and for the projection years by a task force comprised of technicians in Federal and State agencies concerned directly with this phase of agriculture. Table 2.12. The projections were based upon the assumptions of the Type I Study supplemented by the following specific assumptions:

1. As the population increases, becomes more mobile and demands more participation in outdoor recreation activities, the grazing capacity of the Region's range and forest wildlands will decrease due to pressure exerted by these and other competing uses.
2. Development and adoption of new technology will increase the production capability of forage producing lands. This will offset to some degree the tendency for decreases in production caused by population increases.
3. Of the various land uses, range livestock forage production is the most vulnerable, directly and indirectly, to reduction caused by increases in competing uses that result from increases in population.

Range carrying capacity in the Lower Colorado Region was relatively low in the base period when compared with the original production capability of the range lands. Severe overuse with little or no control over management practices on grazing lands of the Region was prevalent during the late 1800's and early 1900's.

Desirable grasses became less abundant and were replaced by less desirable species. These factors, combined with normal cycles of low precipitation caused a severe decline in the quantity and quality of forage produced.

Grazing capacity varies widely from one part of the Region to another and even within major land types. Table 2.14 and photographs 10, 11 and 12 give an indication of the variance by broad land types.

Capacities also vary widely from year to year, primarily on the lower desert lands. Here a large percentage of the forage is produced by annual vegetation which is dependent upon above-normal precipitation.

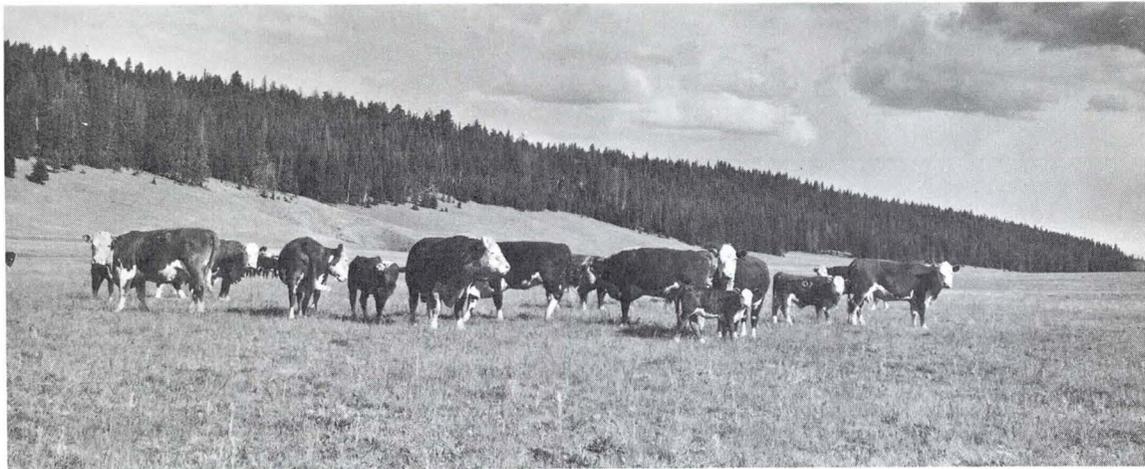


Photo 10.

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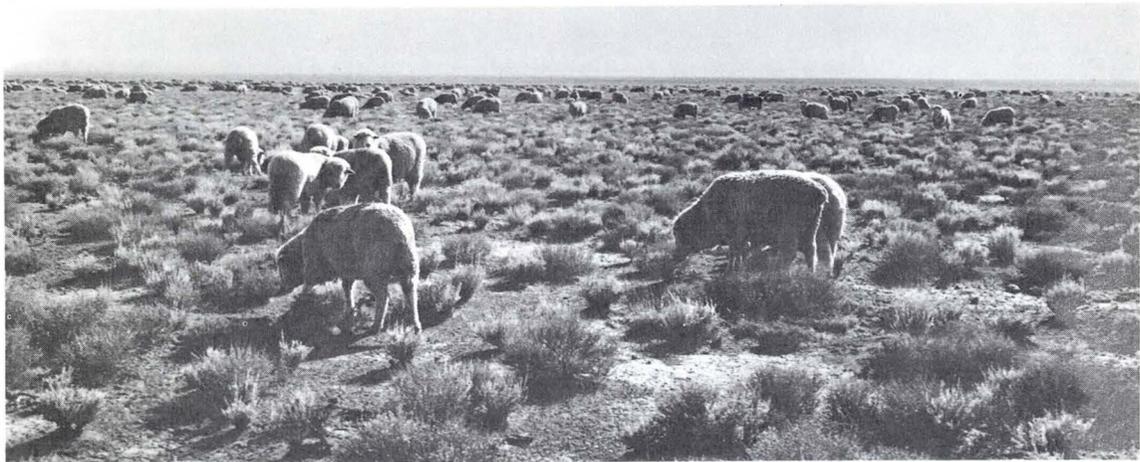


Photo 11.

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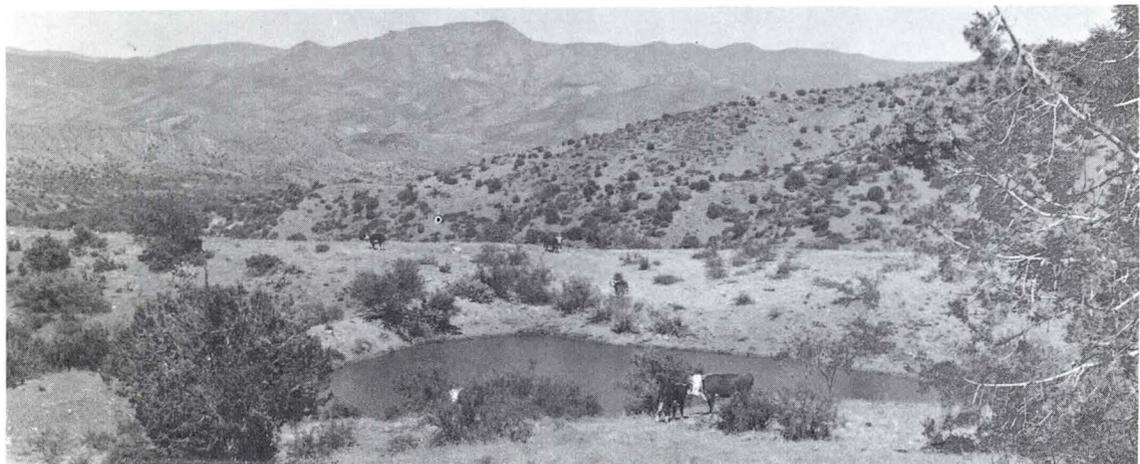


Photo 12.

FS

Range livestock operations are dependent on the productivity of rangeland and season of forage growth.

TABLE 2.14
VARIATION IN GRAZING CAPACITY BY BROAD LAND TYPES,
LOWER COLORADO REGION, BY SUBREGION

Subregion	Land Type	General Location	Grazing Capacity in AUM's/Sec./Yr ^{1/}
LMS	Desert	West and south	Up to 48 ^{2/}
	Foothills	East and central	Up to 72
	Mountains and plateaus	North and northeast	Up to 120
L Colorado	Upland	North and central	Up to 72
	Foothills	Varies	Up to 96
	Mountains	West, south & east	Up to 144
Gila	Desert	West and central	Up to 60 ^{2/}
	Foothills	Varies	Up to 72
	Uplands	South and east	Up to 240
	Mountains	North and east	Up to 144

^{1/} Animal Unit Months per section per year.

^{2/} Not reliable on a yearly basis.

Significant forage production from annuals occurs on the average of once every five years. The other land types have perennial vegetation and a more dependable climatic pattern. Thus they have less annual fluctuation in grazing capacity.

The acceptance and use of new technology is expected to provide for substantial increases in forage yields. Projections for the year 2020 as shown in table 2.12 reflect realization of most of the potential productive capacity of native rangeland. To obtain substantially greater production would require conversion to irrigated cropland.

Cropland Harvested

Harvested crop acres for 1965 and projections for 1980, 2000 and 2020 consistent with the production and yield figures referred to above are given in table 2.15. Practically the entire harvested acreage in the Lower Colorado Region is irrigated and therefore, the analysis relates primarily to these areas. The relatively small acreage of nonirrigated crops in the Region is shown in the latter part of the table.

The harvested acre figures given in the table were calculated in a manner consistent with Crop and Livestock Reporting Service practices in

TABLE 2.15
HARVESTED CROP ACRES IN 1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020
LOWER COLORADO REGION, BY SUBREGION^{1/}

Crop and Area	1965	OBE-ERS Projections		
		1980	2000	2020
----- 1,000 Irrigated Acres -----				
<u>Feed crops</u>				
Barley and oats				
Region	160.5	161.9	143.7	112.5
LMS Subregion	17.5	17.7	15.7	12.2
L Colorado Subregion	.3	.3	.3	.2
Gila Subregion	142.7	143.9	127.7	100.1
Sorghum and corn for grain				
Region	184.3	79.3	117.9	144.2
LMS Subregion	14.4	6.0	9.1	11.5
L Colorado Subregion	2.3	1.7	1.4	1.0
Gila Subregion	167.6	71.6	107.4	131.7
Alfalfa hay				
Region	218.7	221.8	206.2	204.4
LMS Subregion	74.0	76.4	77.5	77.6
L Colorado Subregion	6.2	6.7	7.2	7.3
Gila Subregion	138.5	138.7	121.5	119.4
Other feed crops ^{2/}				
Region	111.0	114.6	118.9	123.5
LMS Subregion	23.8	24.5	24.1	23.9
L Colorado Subregion	8.4	8.3	8.7	9.2
Gila Subregion	78.8	81.8	86.1	90.4
<u>Food crops</u>				
Wheat				
Region	26.6	78.5	79.1	81.2
LMS Subregion	5.8	17.7	17.8	18.1
L Colorado Subregion	.6	2.0	2.0	2.0
Gila Subregion	20.2	58.8	59.3	61.1
Vegetables				
Region	90.1	104.3	124.6	146.3
LMS Subregion	36.7	46.3	57.3	64.7
L Colorado Subregion	.5	.6	.6	.8
Gila Subregion	52.9	57.4	66.7	80.8
Citrus, total				
Region	39.0	50.0	60.0	65.0
LMS Subregion	22.9	30.0	38.0	42.0
Gila Subregion	16.1	20.0	22.0	23.0
Other food crops ^{3/}				
Region	24.4	71.9	76.3	81.7
LMS Subregion	5.1	7.0	8.3	9.6
L Colorado Subregion	.5	.6	.6	.6
Gila Subregion	18.8	64.3	67.4	71.5

See footnotes at end of table, page

TABLE 2.15
HARVESTED CROP ACRES IN 1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020
LOWER COLORADO REGION, BY SUBREGION^{1/} (Continued)

Crop and Area	1965	OBE-ERS Projections		
		1980	2000	2020
----- 1,000 Irrigated Acres -----				
<u>Oil and fiber crops</u>				
All cotton				
Region	345.8	449.2	426.5	419.3
LMS Subregion	30.5	46.2	52.3	58.4
Gila Subregion	315.3	403.0	374.2	360.9
Safflower and flaxseed				
Region	12.4	30.2	50.2	60.3
LMS Subregion	.7	5.0	10.0	15.0
Gila Subregion	11.7	25.2	40.2	45.2
<u>Other crops^{4/}</u>				
Region	12.8	12.0	12.0	12.0
LMS Subregion	10.6	10.0	10.0	10.0
L Colorado Subregion	1.9	2.0	2.0	2.0
Gila Subregion	.3	-	-	-
<u>Total irrigated harvested</u>				
Region	1,225.6	1,373.9	1,415.4	1,450.4
LMS Subregion	241.9	287.0	320.1	343.0
L Colorado Subregion	20.7	22.1	22.8	23.1
Gila Subregion	963.0	1,064.8	1,072.5	1,084.2
<u>Total nonirrigated harvested^{5/}</u>				
Region	20.9	19.4	17.4	15.4
LMS Subregion	5.3	5.1	4.8	4.5
L Colorado Subregion	15.6	14.3	12.6	10.9

^{1/} Items may not add to totals due to rounding. Harvested crop acres may exceed acres of land from which crops are harvested due to double or multiple cropping. (See text.) Data for 1965 were obtained from Arizona Agricultural Statistics, Arizona Crop and Livestock Reporting Service; New Mexico Agricultural Statistics, New Mexico Department of Agriculture; U. S. Census of Agriculture; and from unpublished sources.

^{2/} Miscellaneous tame hay, irrigated wild hay, silage and irrigated cropland pasture.

^{3/} Potatoes, dry beans, noncitrus fruit and nuts, and sugar beets. The sugar beet plant was built following 1965 and the projection was put at 40,000 acres, the sugar plant capacity. This accounts in part for the large acreage increase in the Region and Gila Subregion.

^{4/} Bermuda grass seed and "other" crops.

^{5/} Corn for grain, primarily in the Little Colorado Subregion, wheat primarily in the Utah portion of the Lower Main Stem Subregion, and dry beans in the Little Colorado Subregion.

the various states; i.e., they are the number of acres of crops harvested and may exceed the acres of land from which crops are harvested due to double or multiple cropping. For example, if two crops of lettuce were harvested from the same acre of land in 1965, the harvested acres of lettuce are shown as two, even though only one acre of land was involved. An exception is that the acres from which hay was harvested were counted only once, even though several cuttings were taken during the year.

Meeting the OBE-ERS projections for crop production in the Lower Colorado Region will require an increase in the acreage of irrigated crops harvested. The increases from 1965 for the three projection years are 12 percent for 1980, 15 percent for 2000, and 18 percent for 2020. The projected relative increases by subregion are as follows:

	<u>1965</u>	<u>Projections (1965 = 100)</u>		
		<u>1980</u>	<u>2000</u>	<u>2020</u>
Region	100	112	115	118
LMS Subregion	100	119	132	142
L Colorado Subregion	100	107	110	112
Gila Subregion	100	110	111	112

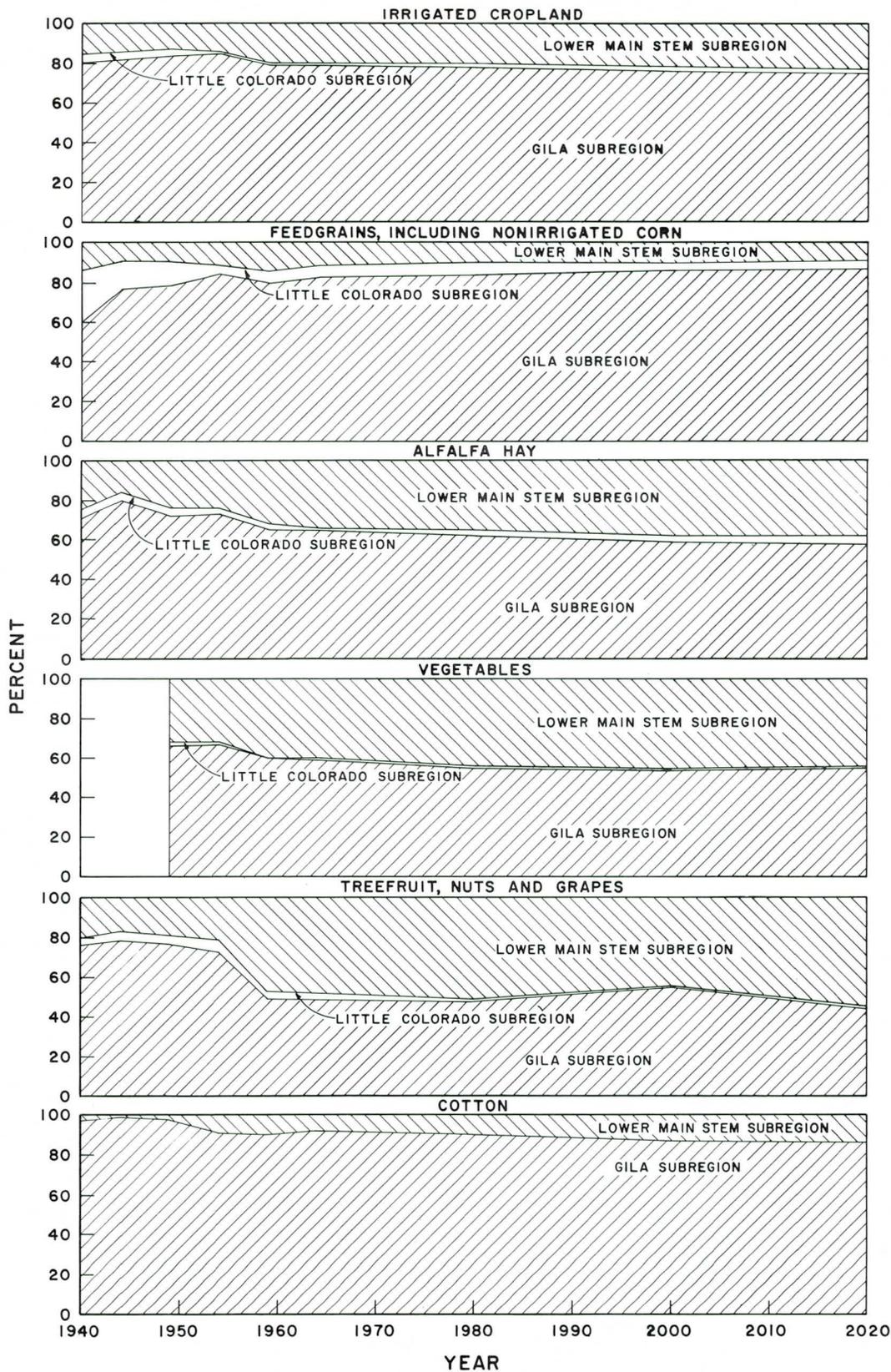
The relatively larger projected increase in irrigated crops harvested in the Lower Main Stem Subregion is in accord with historical trends. See figure 2.5. The proportion of irrigated cropland harvested in the Gila Subregion reached a peak in census year 1949 and has been declining since that time. The proportion in the Lower Main Stem Subregion has been increasing since census year 1949. These trends are expected to continue.

The largest relative increase in the acreage of irrigated crops harvested in the Region is projected to take place in food crops. The Regional acreage is projected to increase about 70 percent by 1980, and to more than double by 2020. Percentage increases for the three subregions are as follows:

	<u>1965</u>	<u>Projections (1965 = 100)</u>		
		<u>1980</u>	<u>2000</u>	<u>2020</u>
Region	100	169	188	207
LMS Subregion	100	143	172	191
L Colorado Subregion	100	147	149	153
Gila Subregion	100	186	199	219

The largest relative increases are projected in the Gila and Lower Main Stem Subregions. The larger relative increase in the Gila Subregion compared with the Lower Main Stem Subregion is due to introduction of sugar beets for sugar following 1965. The projected 40,000 acres, the

FIGURE 2.5
LOWER COLORADO REGION
SUBREGIONAL SHARES IN PERCENTAGE
IRRIGATED CROPLAND AND SELECTED CROPS HARVESTED
 CENSUS YEARS 1940-1965
 PROJECTIONS TO 1980, 2000, AND 2020



sugar beet plant capacity, compares with 32,000 acres harvested (indicated) in 1969 and 16,700 acres harvested in 1968, and assumes there will be no restrictions on the acreage of sugar beets planted for sugar production.

Vegetables and citrus, the two major food crops in terms of acreage, both are projected to increase about 65 percent by 2020. The increase to 1980 and 2000 is sharper, however, for citrus than for vegetables, the increase for the latter being relatively small in the forepart of the projections period but accelerating in the latter part. The expansion in vegetable acreage is projected to be relatively larger in the Lower Main Stem Subregion than in the Gila Subregion. The relative increase in citrus acreage in the Lower Main Stem Subregion is nearly double the relative increase in the Gila Subregion.

The proportion of the projected Regional acreage of vegetables and of all fruit and nuts in each of the subregions, compared with 1965 and historical data from the U. S. Census, is portrayed in figure 2.5. The proportion of the vegetable acreage in the Lower Main Stem Subregion increased substantially from Census Year 1954 to Census Year 1959. A small relative increase has continued since then and is projected to continue to the end of the century. However, by 2020 the proportion of the vegetable acreage in the Gila Subregion was projected to increase slightly.

The proportion of the fruit and nut regional acreage in the Lower Main Stem Subregion increased sharply from Census Year 1954 to Census Year 1959. Figure 2.5. The proportion has continued to increase somewhat since

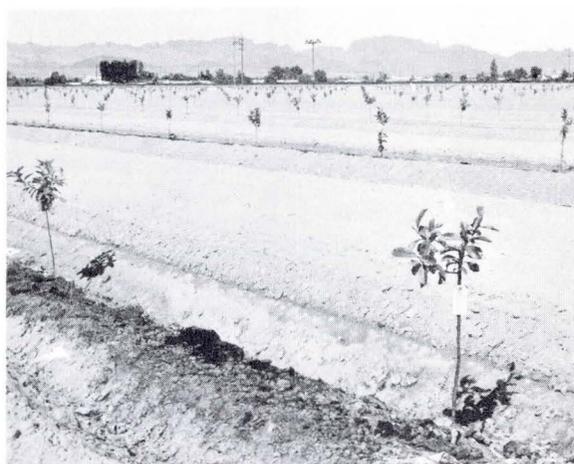


Photo 13.

BIA



Photo 14.

BIA

High value crops like citrus and lettuce are projected to increase in acreage.

that time and is projected to gradually increase except for the period 1965 to 1980. Due to the substantial acreage being planted to pecans in the Gila Subregion, the proportion of the regional acreage in each of the three subregions is expected to be about the same in 1980 as in 1965.

Oil and fiber crops, as a group, rank second in the projected relative increase in harvested acreage. Cotton, the dominant crop in this group and currently the dominant farm crop in the Region in terms of harvested acres, is projected to show a 30 percent increase by 1980, but thereafter the projected relative increase declines to 21 percent by 2020. The following figures give the picture:

Region	<u>1965</u>	<u>Projections (1965 = 100)</u>		
		<u>1980</u>	<u>2000</u>	<u>2020</u>
	100	130	123	121
LMS Subregion	100	152	172	192
Gila Subregion	100	128	119	114

The trend in the Gila Subregion is similar, although a little lower, and the drop following 1980 a little sharper than for the Region. In contrast, the trend in the projected harvested cotton acreage in the Lower Main Stem Subregion is sharply upward to 1980 and moderately upward thereafter to 2020.

The proportion of the projected harvested cotton acreage in each of the two subregions producing the crop is portrayed in figure 2.5 in comparison with the distribution in 1965 and in U. S. Census years 1939-59. It is anticipated that the proportion of the regional acreage in the Lower Main Stem Subregion will gradually increase. The relatively high yields in the subregion serve to encourage expansion of cotton production. However, competition of other crops for suitable developed land, and the cotton allotment program, retard expansion.

Feed crops as a group (feed grains, hay, silage and irrigated pasture) are at the bottom of the totem pole in terms of projected increase in harvested acreage. The OBE-ERS projected regional harvested acreage of feed crops is nearly 15 percent below the 1965 acreage as indicated by the following figures:

Region	<u>1965</u>	<u>Projections (1965 = 100)</u>		
		<u>1980</u>	<u>2000</u>	<u>2020</u>
	100	86	87	87
LMS Subregion	100	96	97	97
L Colorado Subregion	100	99	102	103
Gila Subregion	100	83	84	84

The projected harvested acreage of feed crops in 1980 is lower than the 1965 acreage in all three subregions. Thereafter small increases are projected compared with 1980, the increase in the Little Colorado Subregion raising the acreage level slightly above that in 1965. The acreage in the Lower Main Stem Subregion was projected near the 1965 level, with most of the reduction being projected in the Gila Subregion.

All of the projected regional reduction in feed crop acreage in 1980, and practically all of the reduction in 2000 and 2020 is in feed grains (barley, corn, oats, and grain sorghum). The regional acreage of hay, silage, and irrigated pasture (single use) is projected to increase slightly in 1980, compared with 1965, and to decrease only slightly in the other two projection years.



BIA

Photo 15. To reduce costs, progressive managers adopt new methods to harvest forage.

The projected location of feed grain production within the Region is about the same as in recent years. Figure 2.5. This does not appear to be the case, however, for forage crops. Hay production in the Gila Subregion was projected to approximately equal livestock feed requirements, most of the production for export being projected in the Lower Main Stem Subregion. As a result the proportion of the regional acreage of alfalfa hay, the major forage crop, is projected to continue to increase gradually in the Lower Main Stem Subregion and decline slightly in the Gila Subregion.

Regional Shares of National Crop Production

In considering the OBE-ERS projections of various crops for the Region the question may be raised: How do the projections for the Region compare with those for the Nation? Do the projections provide for the Region to produce the same, a larger, or a smaller proportion of the national production in the future? To answer these questions the proportion that regional production of major crops is of the national production was computed for the base period and for the projection years as portrayed in the following tabulation. The period 1959-61, the base used by OBE-ERS in making the projections, was used in this comparison since comparable national data for the regional base period were not available.

Crop	1959-61	Projections		
		1980	2000	2020
Percent LCR Production is of U. S. Production				
Feed grains	0.282	0.276	0.300	0.289
Wheat	0.242	0.228	0.232	0.229
Vegetables	3.760	3.368	3.358	3.353
Citrus	2.167	4.354	4.756	4.708
Cotton	5.178	6.853	6.851	6.852

For feed grains, the Lower Colorado Region was projected to produce about the same proportion of the national production as in the base period. The proportion drops about 5 percent for wheat, and about 10 percent for vegetables. On the other hand, the proportion increased by about one-third for cotton and doubled for citrus.

Feasibility of Achieving Projected Crop Production

There is little question from a physical resource point of view that the OBE-ERS projections for crop production in the Lower Colorado Region can be met assuming water required is available. This conclusion is indicated by an analysis of both aggregate and individual crop production.

A brief summary of land suitable for irrigated crop production and of requirements for such land, based upon material prepared by the Land Use Work Group, is given in table 2.16. In the base year, 1965, there were 38.9 million acres of land suitable for irrigated crop production in the Region. Of this, 1.6 million acres had been developed. It was estimated that over time the acreage needed for urban uses will expand and take some of the land developed for irrigation. On the other hand, it was anticipated that the acreage of idle and fallow land developed for irrigation will decline over time. As a result, the OBE-ERS projections can be met by development of only about 125 thousand acres of new land in the Region by 2020. As is shown in the table, over 37 million acres of undeveloped land suitable for irrigated crop production will remain

TABLE 2.16
 AREA SUITABLE AND USED FOR IRRIGATED CROP PRODUCTION
 IN THE
 LOWER COLORADO REGION, BY SUBREGION, 1965
 AND
 PROJECTIONS FOR 1980, 2000 and 2020

Item	Subregions (Economic)			Region (Economic)
	Lower Main Stem	Little Colorado	Gila	
	----- 1,000 Acres -----			
1. Suitable for irrig. crop use, 1965	12,347.0	6,534.0	20,025.0	38,906.0
2. Developed for irrig. crop use, 1965 ^{1/}	274.4	28.5	1,251.5	1,554.4
3. Undeveloped for irrig. crop use, 1965	12,072.6	6,505.5	18,773.5	37,351.6
Developed for irrig. crop use in 1965 taken for urban use by:				
4. 1980	.8	.5	26.4	27.7
5. 2000	3.9	.9	100.4	105.2
6. 2020	9.2	1.3	193.5	204.0
Developed for irrig. crop use in 1965 remaining in:				
7. 1980 (Item 2 - Item 4)	273.6	28.0	1,225.1	1,526.7
8. 2000 (Item 2 - Item 5)	270.5	27.6	1,151.1	1,449.2
9. 2020 (Item 2 - Item 6)	265.2	27.2	1,058.0	1,350.4
Developed for irrig. crop use needed in:				
10. 1980	291.9	26.7	1,219.1	1,537.7
11. 2000	314.5	26.4	1,168.2	1,509.1
12. 2020	327.9	25.7	1,121.0	1,474.6
To be developed for irrig. crop use by:				
13. 1980 (Item 10 - Item 7)	18.3	-	-	18.3
14. 2000 (Item 11 - Item 8)	44.0	-	17.1	61.1
15. 2020 (Item 12 - Item 9)	62.7	-	63.0	125.7
Suitable for irrig. crop use remaining undeveloped in:				
16. 1980 (Item 3 - Item 13)	12,054.3	6,505.5	18,773.5	37,333.3
17. 2000 (Item 3 - Item 14)	12,028.6	6,505.5	18,756.4	37,290.5
18. 2020 (Item 3 - Item 15)	12,009.9	6,505.5	18,710.5	37,225.9

^{1/} Harvested acres plus planted but not harvested, plus idle and fallow, less double cropped acreage.

in the Region after requirements for meeting the OBE-ERS projections have been met.

The situation in each of the subregions is similar to that in the Region, in that ample land suitable for irrigation is available. However, relatively more land will need to be developed in the Lower Main Stem Subregion than in the other two subregions. In fact, projections for the Little Colorado Subregion could be met with no new land development. The same is true for the Gila Subregion in 1980.

Livestock Production

Production of livestock and livestock products in the base year 1965, and OBE-ERS projections for 1980, 2000, and 2020, together with projected relative increases, are given in table 2.17. The projected quantities given for the Lower Colorado Region were provided as supplementary material to the projection indexes given on page 52 of Preliminary Projections of Economic Activity in the Agricultural, Forestry, and Related Economic Sectors of the United States and Its Water Resource Regions, 1980, 2000 and 2020, August 1967, adjusted to Series C population projections.

TABLE 2.17
LIVESTOCK AND LIVESTOCK PRODUCTS PRODUCED IN THE BASE YEAR 1965,
AND OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020
LOWER COLORADO REGION

Product	:Estimated: OBE-ERS Projections			
	: 1965	: 1980	: 2000	: 2020
	:----- 1,000 lbs. -----			
Beef and veal - liveweight	:435,614.0	828,192.4	1,102,647.0	1,447,040.0
Lamb and mutton - liveweight	: 20,376.0	18,508.7	24,479.0	32,130.0
Pork - liveweight	: 10,964.0	3,068.8	4,095.0	5,270.0
Broilers - liveweight	: 840.0	4,123.7	5,278.0	6,800.0
Turkeys - liveweight	: 2,303.0	17,741.5	23,114.0	29,835.0
Milk	:587,202.0	591,936.0	771,120.0	995,422.0
	:----- 1,000 -----			
Eggs	:238,444.0	203,251.5	266,631.0	346,632.0
	:----- Index: 1965 = 100 -----			
Beef and veal, pork, and lamb and mutton	: 100	182	242	318
Broilers	: 100	491	628	810
Turkeys	: 100	770	1,004	1,295
Milk	: 100	101	131	170
Eggs	: 100	85	112	145

The OBE-ERS projections provide for a large expansion in production of livestock and livestock products in the Lower Colorado Region.

With 1965 as a base, production of red meats (liveweight) combined is projected to increase 82 percent by 1980, 142 percent by 2000, and 218 percent by 2020. Broiler production is projected to increase nearly 5 times by 1980, 6¼ times by 2000, and more than 8 times by 2020. Turkey production is projected to increase nearly 8 times by 1980, 10 times by 2000, and 13 times by 2020. Projected increases for milk and eggs are much smaller however. Projected production of milk in 1980 is about the same as 1965 production, but increases moderately thereafter to 2020, when it is 70 percent above 1965. Egg production is projected to decline in 1980 following which a moderate increase will be needed, with 2020 production being 45 percent above 1965. The feasibility or practicality of these projections will be analyzed subsequently after material on production, per head or unit, and on livestock numbers is given.

Estimated production per head or unit, used in deriving the livestock numbers given below, is shown in table 2.18. Except for milk production, no differentiation was made among subregions. Since beef and veal production takes place on the range, in the feedlot, and as a by-product of milk production, unit production is shown for each of these categories.

Production of beef per head or unit is expected to increase substantially in the future due in large part to improved management and breeding. Increased use of irrigated pastures and supplemental feeding, coupled with improved breeding stock, continuing range improvement, and other improved management practices, will materially increase the calf crop, reduce death losses, and contribute to more rapid growth of young stock. Some increase in the relative importance of yearlings also will add to the gain produced by range cattle.

As breeding and management produce higher quality feeders, it is anticipated that feedlot cattle will be carried to moderately heavier weights in response to the expanded market for beef. The average size of milk cows is expected to increase due to a continuing increase in breed size and to a continuing shift to the larger breeds (primarily holsteins). As a result the amount of beef produced per milk cow is expected to increase materially.

The projected increase in liveweight gain per head of sheep and lambs is due in large part to the increasing relative importance of non-Indian sheep which produce more lambs per ewe and greater gain per head than sheep owned by Indians. The number of ewes in Indian herds is projected to decrease 20 percent from 1965 to 2020, whereas the number of ewes in non-Indian herds is projected to increase nearly 20 percent. In addition, the non-Indian lamb crop was projected to increase materially, from 102 percent in 1965 to 195 percent in 2020. Some increase also was projected for the number of inshipments, and for related gain per head.

TABLE 2.18
 PRODUCTION OF LIVESTOCK
 AND LIVESTOCK PRODUCTS PER HEAD OR UNIT
 LOWER COLORADO REGION

Item and area	Estimated:		Projected	
	1965	1980	2000	2020
	----- Pounds -----			
<u>Beef and veal</u>				
Liveweight gain per animal unit of range cattle	339	367	395	423
Liveweight gain per head of cattle and calves marketed from finishing feedlots	254	270	285	300
Liveweight gain per milk cow 2+ and over Jan. 1	292	343	393	443
<u>Lamb and mutton</u>				
Liveweight gain per head of sheep and lambs	36	38	48	61
<u>Pork</u>				
Liveweight gain per head marketed	215	220	225	225
<u>Broilers</u>				
Market liveweight	3.0	3.25	3.50	3.70
<u>Turkeys</u>				
Market liveweight	18	18	20	22
<u>Milk</u>				
Production per milk cow (in production)				
Lower Colorado Region	10,002	12,932	14,775	15,816
LMS Subregion	9,163	12,300	14,200	15,400
L Colorado Subregion	3,634	5,800	8,300	10,300
Gila Subregion	10,214	13,100	14,900	15,900
<u>Eggs</u>				
Produced per hen	221	243	271	300

Increases in liveweight gain per head for hogs, broilers, and turkeys reflect the technician's judgement of anticipated increases resulting from changes in management practices in response to market demands. Increases

in milk production per cow reflect improvements anticipated in breeding, heavier feeding of concentrates, and a shift to relatively more holsteins in the dairy herd. Increases in egg production per hen are anticipated due to continued breed improvement, to elimination of low producing hens and flocks, and to improvement in other management practices.

Livestock Numbers

Livestock numbers for 1965 and projected numbers for 1980, 2000, and 2020 are given in table 2.19. The projected numbers were derived on the basis of projected aggregate production and projected production per head or unit.

Estimated numbers of horses and mules, including colts, in 1965 and projections for 1980, 2000 and 2020 also are shown in table 2.19.

The numbers include horses on Indian reservations, non-Indian farm and ranch horses, and urban horses. Information on Indian reservation horses, provided by the Bureau of Indian Affairs, indicates the number is declining sharply. The decline is expected to continue, the regional total dropping from 17,700 in 1965 to 5,900 in 2020. Non-Indian farm and ranch horses in the Region were estimated to total 30,300 in 1965 on the basis of the 1959 U. S. Census and were projected at this level. The number of urban horses in the Region was

estimated to total 30,000 in 1965 on the basis of surveys and related information provided by the Arizona State Horseman's Association. The number has been increasing rapidly in recent years and this trend is expected to continue. On the basis of projections of "participation days in horse-back riding", provided by the Recreation Work Group, the number of urban horses was projected to increase to 137,200 in 2020.



D. V. Gilbert

Photo 16. Show horses are popular.

Regional Share of National Livestock and Livestock Product Production

Regional production of the various types of livestock and livestock products is related to national production of these items in the following tabulation. As with crop production, the period 1959-61, the base used by OBE-ERS in making projections, was used in the comparison since comparable national data for the regional base period were not available.

TABLE 2.19
LIVESTOCK NUMBERS ESTIMATED FOR 1965
WITH OBE-ERS PROJECTIONS TO 1980, 2000 AND 2020, LOWER COLORADO REGION

Area	1965 (Normalized)	OBE-ERS Projections		
		1980	2000	2020
----- 1,000 -----				
Range cows 2+ years, Jan. 1				
Region	498.6	523.0	571.1	612.8
LMS Subregion	66.0	68.2	70.1	72.0
L Colorado Subregion	69.9	74.6	82.1	85.2
Gila Subregion	362.7	380.2	418.9	455.6
Range cattle: Number of animal units				
Region	757.9	800.2	879.4	949.9
LMS Subregion	157.1	163.0	168.3	173.5
L Colorado Subregion	136.6	149.1	165.0	172.2
Gila Subregion	464.2	488.1	546.1	604.2
Cattle and calves in finishing feedlots: Number marketed				
Region	631.4	1,916.2	2,571.1	3,383.3
LMS Subregion	68.7	171.8	266.9	384.8
L Colorado Subregion	1.4	1.3	1.2	1.2
Gila Subregion	561.3	1,743.1	2,303.0	2,997.3
Milk cows (in production)				
Region	58.7	45.8	52.2	62.9
LMS Subregion	7.0	5.3	6.0	7.2
L Colorado Subregion	.8	.5	.4	.3
Gila Subregion	50.9	40.0	45.8	55.4
All sheep and lambs				
Region	562	486	510	526
LMS Subregion	85	66	85	100
L Colorado Subregion	349	319	298	277
Gila Subregion	128	101	127	149
Hogs: Number marketed				
Region	51.0	14.0	18.2	23.5
LMS Subregion	8.3	2.3	3.0	3.8
L Colorado Subregion	3.4	.9	1.2	1.6
Gila Subregion	39.3	10.8	14.0	18.1
Broilers: Number marketed				
Region	280.0	1,269.0	1,508.0	1,838.0
LMS Subregion	-	51.0	60.0	74.0
L Colorado Subregion	-	13.0	15.0	18.0
Gila Subregion	280.0	1,205.0	1,433.0	1,746.0
Turkeys: Number marketed				
Region	128.0	985.6	1,155.7	1,356.2
LMS Subregion	.7	443.5	520.1	610.3
L Colorado Subregion	.2	-	-	-
Gila Subregion	127.1	542.1	635.6	745.9
Laying hens, Jan. 1				
Region	1,080.0	836.0	984.0	1,155.0
LMS Subregion	75.0	58.0	68.0	80.0
L Colorado Subregion	33.0	25.0	30.0	35.0
Gila Subregion	972.0	753.0	886.0	1,040.0
Horses and mules, including colts				
Region	78.0	83.3	126.0	173.4
LMS Subregion	12.4	13.9	21.8	30.3
L Colorado Subregion	15.6	10.9	10.3	9.7
Gila Subregion	50.0	58.5	93.9	133.4

	1959-61	1980	OBE-ERS Projections	
			2000	2020
	Percent LCR	Production is	of U. S. Production	
Beef and veal	1.544	1.820	1.820	1.820
Pork	.025	.012	.012	.012
Lamb and mutton	1.064	1.135	1.132	1.134
Broilers	.066	.040	.040	.040
Turkeys	.444	.519	.519	.519
Milk	.380	.425	.425	.425
Eggs	.297	.278	.280	.280

Some increase was projected in the Region's share of national production for beef and veal, lamb and mutton, turkeys and milk. Decreases were projected for pork, broilers and eggs.

Livestock Product-Food Balance

Indicated net imports of livestock and livestock products needed to meet estimated and projected consumption requirements are shown in Table 2.20. Production of livestock and livestock products is taken from tabulations presented above. Estimated consumption in the Region is the product of national average per capita consumption of the various products and regional population.

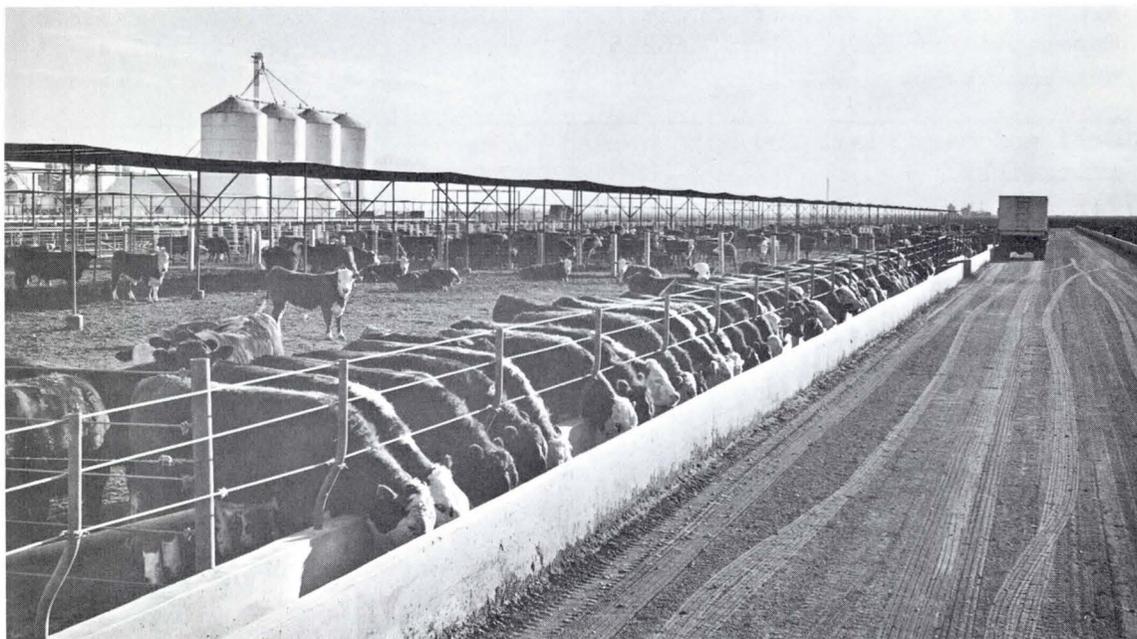


Photo 17. The dry, warm desert climate is an ideal location for highly mechanized cattle feeding operations. Phoenix Chamber of Commerce

TABLE 2.20
ESTIMATED PRODUCTION AND CONSUMPTION OF LIVESTOCK
AND LIVESTOCK PRODUCTS, AND INDICATED NET IMPORTS FOR 1965
WITH OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020,
LOWER COLORADO REGION

Item	Estimated	OBE-ERS Projections		
	1965	1980	2000	2020
	----- Million Pounds -----			
Red meat ^{1/2/}				
Production	467.0	849.8	1,131.2	1,484.4
Consumption ^{3/}	532.4	856.4	1,380.8	2,150.3
Net imports	65.4	6.6	249.6	665.9
:				
Chicken and Turkey ^{2/4/}				
Production	3.1	21.8	28.4	36.6
Consumption ^{3/}	91.4	164.6	265.5	413.3
Net imports	88.3	142.8	237.1	376.7
:				
Milk				
Production	587.0	591.9	771.1	995.4
Consumption ^{3/}	1,233.2	1,507.1	2,430.0	3,784.3
Net imports	646.2	915.2	1,658.9	2,788.9
:				
Eggs				
Production	238.4	203.3	266.6	346.6
Consumption ^{3/}	632.5	766.8	1,236.3	1,925.4
Net imports	394.1	563.5	969.7	1,578.8
:				

^{1/} Beef and veal, lamb and mutton, and pork.

^{2/} Liveweight.

^{3/} Per capita 1959-61 and projected national consumption given in Technical Supplement on Projected National Requirements for Agricultural Products for Type I Comprehensive River Basin Studies multiplied by the 1965 and projected regional population.

^{4/} Chicken production includes broilers only, consumption includes all chickens.

The Lower Colorado Region currently depends on imports to meet a part of the food requirements for livestock and livestock products, and the OBE-ERS projections indicate that reliance on imports will increase in the future. Net imports of red meat are projected to increase 10 times by 2020, even considering the very large projected increase in cattle feeding in the Region. Imports of poultry, milk and eggs are projected to increase over 4 times by 2020.

Probability of Achieving the Livestock Projections

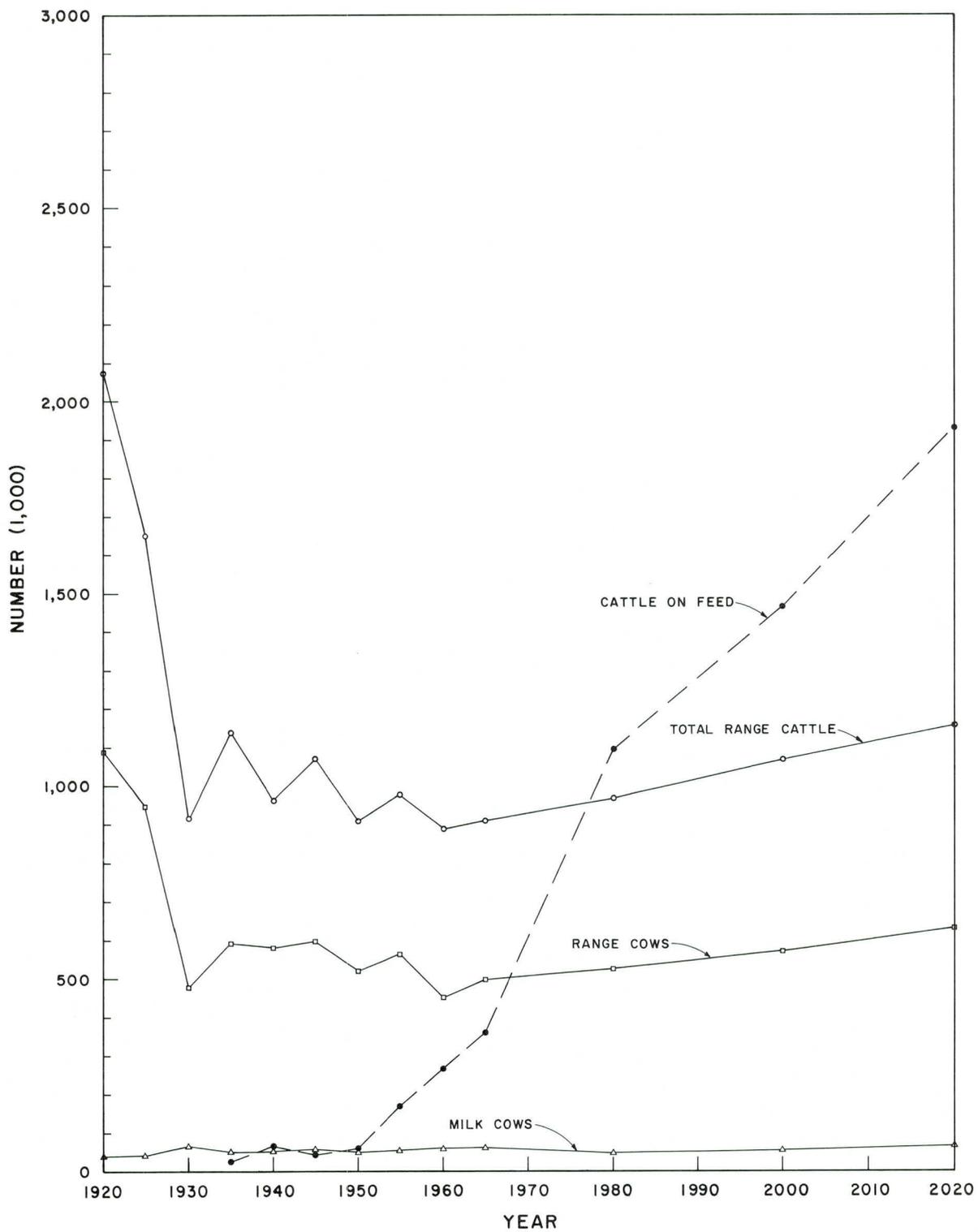
The projections for beef and veal production for the Lower Colorado Region are ambitious and do not appear to be fully supported by historical trends. The analysis leading to this conclusion was based upon three separate projections for beef and veal production; one for range cattle, another for the dairy enterprise, and the third for feedlot production. In this context the dairy enterprise included the milk cows and replacement heifers (including heifer calves), the feedlot included all cattle in finishing feedlots, and range cattle comprised the remainder including cattle kept on farms and those in growing feedlots. An analysis was first made to determine the numbers of cattle and related liveweight production of beef and veal for these three categories in the base year 1965 (normalized by averaging the five years 1963-67, and removing changes in inventory during the period). Beef and veal production for the range category was then projected on the basis of animal unit months of range and pasture projected to be available, and projected feeding efficiencies and management practices. Similarly, the number of milk cows and replacement heifers required to produce the projected milk requirements was estimated, and the related beef and veal production was calculated. Subtracting projected beef and veal production for these two categories from the total projected regional allocation left the projected amounts to be produced in finishing feedlots.

The feasibility of achieving the projections for beef and veal production depend primarily upon the feasibility of projected range and feedlot production since these enterprises are the major beef and veal producers. Moreover, beef and veal production from the dairy enterprise is basically a by-product of milk production and, therefore, depends upon the projections for milk.

As indicated by figures given in table 2.19, and as portrayed in figure 2.6, the number of range cattle is projected to increase a little. The number of range cows is projected to increase 23 percent from 1965 to 2020. Animal units of range cattle are projected to increase about 25 percent during the same period. The projected total number of range cattle on hand January 1 show a similar increase. While these projected increases are relatively small, averaging slightly less than 0.5 percent per year, they contrast with the historical trend which has been downward.

The estimated number of cattle in the Region reached a peak in the late teens but declined sharply during the following decade. The estimated number of range cattle totaled 2,080 thousand January 1, 1920 (including any cattle on feed, which were not reported separately until 1930), but declined to 912 thousand by 1930. Figure 2.6. The number increased to 1,137 thousand in 1935 but thereafter showed a small, though erratic decline. The number of range cows and heifers 2 years and older showed a similar trend. The number declined from 1,087 thousand January 1, 1920 to 478 thousand January 1, 1930.

FIGURE 2.6
 LOWER COLORADO REGION
 ESTIMATED CATTLE NUMBERS JANUARY 1, 1920-1965 BY 5-YEAR INTERVALS
 OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020



During the following decade a small increase occurred but after the early 1940's the decline resumed, averaging about 0.5 percent annually for 1940-65 period. Hence it appears the long-term trend in range cattle numbers has been downward in the Region. However, considering the projected moderate increase in range carrying capacity and the recent and projected increase in use of irrigated pastures and supplemental feeding, the projected numbers of range cattle appear reasonable and achievable providing the projections of range carrying capacity and supplemental feeding upon which they are based are achieved.

It appears improbable that the projections for feedlot production of beef and veal will be achieved, particularly the 1980 projection. This conclusion is indicated by historical trends and by consideration of the size of the feedlot enterprise which would be needed to produce the projected quantities of beef and veal.

Historical trends for the Region are portrayed in figure 2.6. During the 1930's and 1940's the number of cattle fed was relatively small, the number on feed January 1 ranging from about 30,000 to about 60,000 head. The estimated number on feed in the Region January 1, 1950 was 59,500 and from that time on the number climbed rapidly, reaching 360,000 January 1, 1965.

On the basis of this trend it is estimated that the number of cattle on feed in the Region January 1 increased about 20,000 annually during the period 1950-65. The number of cattle marketed during the year from finishing feedlots is about 75 percent greater than the number on feed January 1, according to 1965 normalized relationships in Arizona. Hence it is estimated that the number of cattle marketed from finishing feedlots in the Region increased about 35,000 annually during the period 1950-65. Extrapolation of this linear trend gives projected numbers of 1,155,000 for 1980; 1,855,000 for 2000; and 2,555,000 for 2020.

Obviously, projection of the 1950-65 trend falls far short of meeting the projected requirements--40 percent in 1980, 28 percent in 2000, and 24 percent in 2020. Moreover, it should be recognized that the increase in cattle feeding capacity in the Region was very rapid during the 1950-65 period, perhaps more rapid than is likely to be sustained over a period of years.

Since the number of livestock and poultry needed to produce the projections for lamb and mutton, pork, milk, and eggs is either lower or only slightly higher than the number in 1965, there appears to be little question that these projections will be achieved--and exceeded. Relatively large increases will be required in the broiler and turkey enterprises. However, it should be recognized that these enterprises were very small in 1965. Hence, the projections probably will be achieved or exceeded. Indications are that over 2 million broilers will be produced annually in the Gila Subregion before 1980.

Feed-Livestock Balance

On the basis of crop and livestock data presented above, feed balances were prepared for 1965 and for the projection years to indicate the estimated regional and subregional net exports or imports of feed which will be encountered if production is equivalent to the OBE-ERS projections. The supply side of the feed balance was obtained from feed crop production, given above, plus wheat fed which was estimated at 5 percent of production on the basis of the relative amount fed in the base period. The utilization side of the feed balances included feed required for livestock production given above, and feed grains used for seed and food. The latter two items were projected on the basis of utilization in the base period, it being assumed that all the corn produced for grain in the Lower Main Stem and Little Colorado Subregions would be used for these purposes. Feed required by livestock was derived on the basis of feeding efficiencies given in table 2.21. Feeding efficiencies for range cattle, feedlot cattle, sheep and lambs, and milk production were developed on the basis of material obtained from technicians in state and federal agencies in the Region, primarily the University of Arizona. Feeding efficiencies for hogs, broilers, turkeys and eggs are national efficiencies provided as supplementary material to the OBE-ERS projections. As figures

TABLE 2.21
ESTIMATED FEED REQUIRED PER POUND OF OUTPUT IN 1965, BY TYPE OF LIVESTOCK PRODUCT,
WITH PROJECTIONS TO 1980, 2000 AND 2020, LOWER COLORADO REGION^{1/}

Commodity	1965		1980		2000		2020	
	LBS 2/	TDN 3/						
Cattle and calves ^{4/}	12.06	9.29	9.61	7.40	8.84	6.81	8.14	6.27
Range cattle ^{5/}	15.49	11.93	14.77	11.37	14.19	10.93	13.71	10.56
Feedlot cattle ^{6/}	7.25	5.58	6.83	5.26	6.44	4.96	6.06	4.67
:								
Sheep and lambs	14.03	10.80	13.64	10.50	12.30	9.47	10.31	7.94
Indian	17.53	13.50	17.53	13.50	17.53	13.50	17.53	13.50
Other	11.17	8.60	10.13	7.80	9.74	7.50	8.18	6.30
:								
Hogs	5.80	4.47	4.80	3.70	4.50	3.46	4.20	3.23
Broilers	3.00	2.31	2.80	2.16	2.60	2.00	2.40	1.85
Turkeys	5.30	4.08	4.90	3.77	4.70	3.62	4.50	3.46
Eggs (Hens)	3.71	2.86	3.22	2.48	2.94	2.26	2.81	2.16
Milk ^{7/}	1.05	.81	.96	.74	.91	.70	.88	.68
LMS Subregion	1.09	.84	.99	.76	.90	.69	.88	.68
L Colo Subregion	2.18	1.68	1.60	1.23	1.23	.95	1.01	.78
Gila Subregion	1.04	.80	.95	.73	.91	.70	.88	.68
:								

1/ Feed required per pound of liveweight gain for all except eggs and milk, which are per pound of product. Feeding efficiencies for range cattle, feedlot cattle, sheep and lambs, and milk production were developed on basis of material obtained from technicians in State and Federal agencies in the Region, primarily the University of Arizona. Feeding efficiencies for hogs, broilers, turkeys, and eggs are national efficiencies provided as supplementary material to the OBE-ERS projections.

2/ Corn equivalent @ .77 TDN per pound.

3/ Pounds of Total Digestible Nutrients with the following TDN values: Grain .77, supplement .65, hay .54, and pasture and range 365 TDN per AUM.

4/ Includes feed for replacement dairy heifers and beef and veal from the dairy sector.

5/ Includes all cattle other than milk cows and replacement dairy heifers, and cattle in finishing feedlots.

6/ Cattle in finishing feedlots; those in growing feedlots are included in range cattle.

7/ Includes feed for milk cows only.

in the table indicate, continued substantial improvement in feeding efficiencies is anticipated throughout the projection period.

Net exports or imports indicated by the feed balances are given in table 2.22. A small amount of feed grains was exported from the Region (net of imports) in 1965. However, relatively large imports (net of exports) are needed in the projection years to meet the OBE-ERS projections due in large part to the size of the projected cattle feeding operation. The Lower Main Stem and Little Colorado Subregions both show feed grain deficits in 1965 and in each of the projection years. The major part, however, of the regional feed grain deficit in the projection years occurs in the Gila Subregion.

The feed balance analysis indicated that about 350 thousand tons of hay were exported (net of any imports) in 1965. With the OBE-ERS projected production for 1980, hay exports from the Region are projected to increase to 388.7 thousand tons. Since production was budgeted to project the 1965-80 linear trend of hay exports, exports are projected to increase to 478 thousand tons in 2020. All of the hay exports (net) in the projection years come from the Lower Main Stem Subregion.

Since silage and range and pasture are utilized where produced, production was budgeted to balance utilization in the analysis.

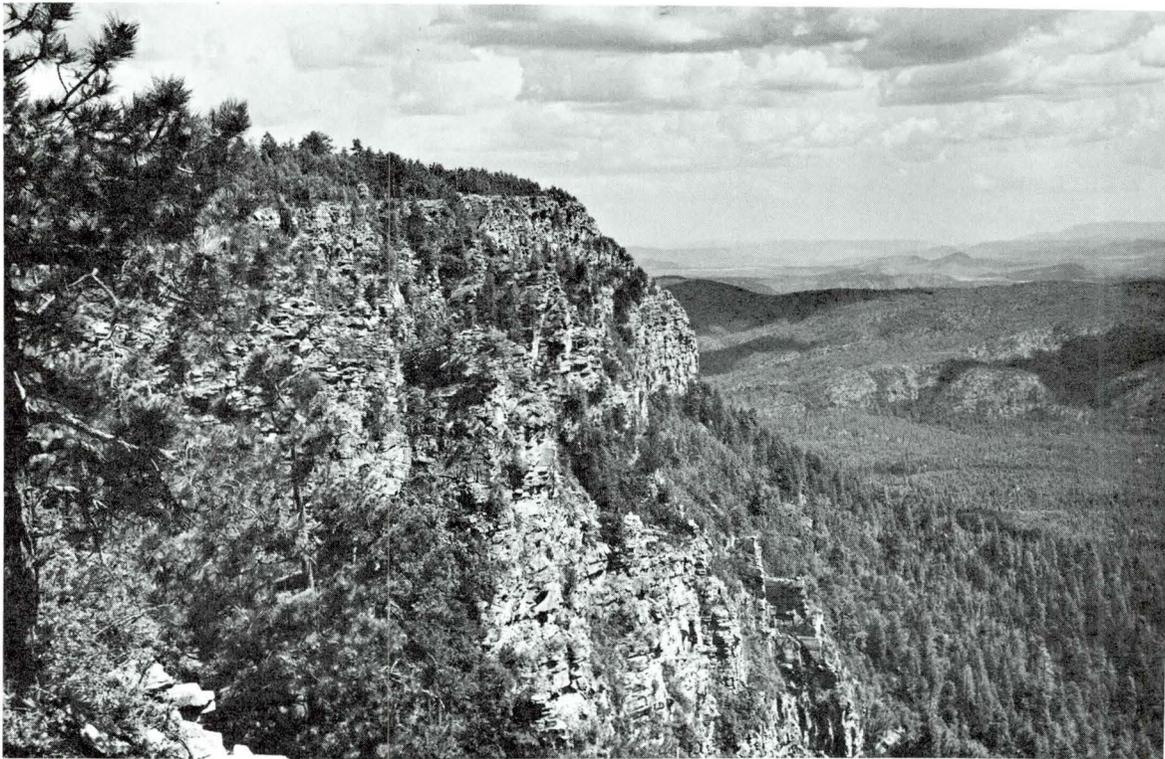
TABLE 2.22
NET EXPORTS OR (IMPORTS) INDICATED BY FEED BALANCES FOR 1965
AND WITH OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO REGION, BY SUBREGION

Item	1965	OBE-ERS Projections		
	: Normalized:	1980	2000	2020
		----- 1,000 tons -----		
<u>Feed grains</u>				
Region	: 47.6	(1,022.8) ^{1/}	(1,471.6)	(2,115.5)
LMS Subregion	: (16.7)	(110.3)	(188.9)	(295.8)
L Colo Subregion	: (8.3)	(7.3)	(9.4)	(11.6)
Gila Subregion	: 72.6	(905.2)	(1,273.3)	(1,808.1)
<u>Hay</u>				
Region	: 350.0	388.7	430.7	478.1
LMS Subregion	: 340.0	407.2	502.4	575.7
L Colo Subregion	: 0	0	0	0
Gila Subregion	: 10.0	(18.5)	(71.7)	(97.6)

^{1/} Net imports are enclosed in parentheses.

Forestry

Nearly 30 million acres, about 35 percent of the land in the Lower Colorado Region, are classed as forest land. Of this acreage, 34 percent is in the Lower Main Stem Subregion; 27 percent is in the Little Colorado Subregion; and 39 percent is in the Gila Subregion. These forest lands produce many goods and services simultaneously which are valuable to man.



FS

Photo 18. Multiple use management of forest lands provides for maximum sustained use of resources for the benefit of people.

Forest Land Management

Forest lands in the Lower Colorado Region are managed for the production of timber products, livestock forage, recreation opportunities, wildlife habitat, mineral resources, watershed values, industrial operations, and esthetic values. Management involves activities to prevent and suppress forest fires, construction of roads, trails, communication facilities, and other administrative improvements, insect and disease control, land ownership adjustments and other land use and management activities. Twelve percent of the forest land in the Lower Colorado Region is owned

by individuals or corporations, 19 percent is included in Indian reservations, and 69 percent is in public ownership--federal, state, and local. Management activities on the public-owned and Indian reservation lands are largely the responsibility of the federal or state government agencies and required 1,500 man-years employment in 1965. The number is projected to increase to 3,800 by 2020. Table 2.23. State government employees comprised less than 1 percent of the 1965 total but are projected to equal 8.5 percent by 2020.

TABLE 2.23
FEDERAL AND STATE GOVERNMENT EMPLOYMENT IN FOREST LAND MANAGEMENT IN 1965
BY TYPE OF ACTIVITY, AND OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020
LOWER COLORADO REGION^{1/}

Activity	OBE-ERS Projections											
	1965			1980			2000			2020		
	Fed.	St.	Total	Fed.	St.	Total	Fed.	St.	Total	Fed.	St.	Total
	Man Years											
Timber management	195	5	200	240	8	248	300	10	310	440	10	450
Livestock forage management	180	0	180	190	3	193	240	30	270	270	35	305
Recreation	152	0	152	300	45	345	530	80	610	700	100	800
Wildlife habitat management	24	0	24	70	10	80	215	12	227	310	12	322
Watershed management	63	0	63	225	23	248	420	47	467	540	60	600
Fire control	343	0	343	355	25	380	365	30	395	380	40	420
Multi-purpose activities	465	0	465	575	15	590	625	25	650	700	40	740
Subtotal	1,422	5	1,427	1,955	129	2,084	2,695	234	2,929	3,340	297	3,637
Research	69	7	76	122	14	136	129	26	155	136	27	163
Total	1,491	12	1,503	2,077	143	2,220	2,824	260	3,084	3,476	324	3,800

^{1/} Employment does not include emergency fire fighters and other emergency workers.

Value Added and Total Gross Output

The value derived from many aspects of forestry is reflected through other sectors of the economy, value derived from timber and wood products alone being included in the forestry sector. Forests in the Region have provided timber and timber products for use by man throughout time. Primitive Indian tribes made use of forest products, as did the Spanish explorer and missionaries, and later the mountain men, miners and settlers. The first sawmills were built in the 1870's to supply timber for the mines and mining communities in the southeastern part of the Region. During

this same period logging and timber harvesting operations developed to supply railroad ties, bridge timbers and camp construction lumber along the railroads, and dwellings and ranch buildings in the farming communities of central Arizona, southern Utah and Nevada. In 1946 there were 71 sawmills in the Region utilizing 350 million board feet of timber annually, and by 1965 the annual production of saw timber had increased to 475 million board feet although the number of mills had declined to 31. The Snowflake Pulp and Paper Mill, in the Little Colorado Subregion, went into operation in 1961 and by 1965 the volume of pulp wood harvested annually from the forest lands of the Region had reached 150,000 cords.

The value added to output of the economy of the Lower Colorado Region by the forestry sector totaled \$12 million in 1965 and is projected to increase to over \$18 million by 2020. Table 2.24. These amounts

TABLE 2.24
VALUE ADDED AND TOTAL GROSS OUTPUT FROM THE FORESTRY SECTOR
FOR 1965 WITH OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO REGION, BY SUBREGION

Area	OBE-ERS PROJECTIONS							
	1965		1980		2000		2020	
	VA	TGO	VA	TGO	VA	TGO	VA	TGO
	:----- Thousand 1960 Dollars -----:							
LMS Subregion	3,926	5,170	6,153	7,688	7,492	9,440	7,485	9,510
L Colo Subregion	6,290	7,310	6,722	7,430	6,130	7,383	5,585	6,842
Gila Subregion	1,798	2,090	3,587	4,293	4,994	6,033	5,219	6,366

include wages and salaries paid by the forest industry (excluding government employees involved in forest management), profits, payments to the government in the form of stumpage fees, taxes, etc., and depreciation allowed on improvements and equipment.

Over half of the value added to the regional economy by the forestry sector in 1965 was produced in the Little Colorado Subregion. However, by 2020 the Lower Main Stem Subregion is projected to be the largest producer of forest products. While the Gila Subregion produced only about 15 percent of the value added to the economy of the Region by the forestry sector in 1965, its contribution is projected to nearly triple by 2020 and nearly equal that of the Little Colorado Subregion.

In 1965 the total gross output of timber harvested was \$5.2 million in the Lower Main Stem Subregion, \$7.3 million in the Little Colorado Subregion, and \$2.1 million in the Gila Subregion. The total value figure represents the gross returns for stumpage, including harvesting costs and a profit margin at the point where the logs were loaded on trucks or rail cars ready for delivery to the mill. Stumpage value averaged \$11.00 per thousand board feet cut. Logging costs, or the cost of felling, bucking, skidding, loading on trucks or rail cars, log yard expense, administration expense, depreciation and profit margin totaled \$19.00 per thousand board feet harvested. By 2020 total gross output is projected to nearly double in the Lower Main Stem Subregion, decline slightly in the Little Colorado Subregion, and more than triple in the Gila Subregion.



Photo 19. Efficient timber harvesting requires modern equipment.

FS

Timber Production

Production of various types of timber products in the Lower Colorado Region in 1965, with projections for 1980, 2000, and 2020 are presented in table 2.25. The 1965 quantities are for timber actually harvested. The projections are correlated with the production projections in

TABLE 2.25
TIMBER PRODUCTS HARVESTED IN 1965 AND OBE-ERS PROJECTIONS
FOR 1980, 2000 AND 2020
LOWER COLORADO REGION BY SUBREGION

Area and product	1965	OBE-ERS Projections		
		1980	2000	2020
<u>LMS Subregion</u>				
Saw logs	25,865	31,441	35,068	31,404
Veneer logs	0	7,234	9,001	10,164
Pulpwood	2,494	2,875	7,048	9,937
Other ^{1/}	719	1,669	2,378	2,731
Total	29,078	43,219	53,495	54,236
<u>L Colo Subregion</u>				
Saw logs	36,363	22,444	18,678	13,348
Veneer logs	0	8,533	10,188	10,770
Pulpwood	4,042	9,924	11,292	12,817
Other ^{1/}	740	1,669	2,378	2,806
Total	41,145	42,570	42,536	39,741
<u>Gila Subregion</u>				
Saw logs	11,219	20,964	24,203	22,071
Veneer logs	0	0	5,690	8,039
Pulpwood	172	2,598	2,972	4,399
Other ^{1/}	269	649	1,104	1,514
Total	11,660	24,211	33,969	36,023
<u>Region</u>				
Saw logs	73,447	74,849	77,949	66,823
Veneer logs	0	15,767	24,879	28,973
Pulpwood	6,708	15,397	21,312	27,153
Other ^{1/}	1,728	3,987	5,860	7,051
Total	81,883	110,000	130,000	130,000

^{1/} Includes: excelsior bolts, chemical wood, poles, piling, mine timbers, posts, boxbolts, and a miscellaneous assortment of similar items.

Preliminary Projections of Economic Activity in the Agricultural, Forestry and Related Economic Sectors of the United States and Its Water Resource Regions, 1980, 2000, and 2020, August 1967.

Timber products are classified according to their use. In 1965, 90 percent of the timber products harvested in the Lower Colorado Region was saw logs, while only 8 percent was pulpwood and 2 percent was other



Photo 20. Pulpwood provides a market for thinnings needed to increase the growth of remaining trees. FS

products. By 2020 saw logs are projected to decrease to only 52 percent of the total timber products with 22 percent being veneer logs, 21 percent pulpwood, and 5 percent other products.

Timber production as projected is based upon the assumption that use of lumber and other wood products will continue to increase along with population, gross national product, etc. It is also assumed that

plywood plants and particle board plants will be put in operation and pulp mill capacity will expand as needed.

Timber Resources

Ownership and management: Of the 6,124,000 acres of land in the Lower Colorado Region capable of producing commercial timber products, 666,000 acres were reserved for recreation, wilderness, scenic, and other uses in 1965, leaving 5,458,000 acres of commercial timber land. Table 2.26.

TABLE 2.26
AREA OF COMMERCIAL FOREST LAND BY OWNERSHIP IN 1965
AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020, LOWER COLORADO REGION

Ownership	1965	OBE-ERS Projections		
		1980	2000	2020
----- 1,000 Acres -----				
National Forest	3,782	3,746	3,593	3,540
Bureau of Land Management	13	6	0	0
State and County	45	44	43	42
Indian	1,269	1,267	1,265	1,263
Private	349	295	252	199
Total	5,458	5,358	5,153	5,044

Of this, 71 percent was in public ownership, primarily in National forests, and 23 percent in Indian reservations, primarily in the Little Colorado Subregion. Only 6 percent was in individual private ownership.

Over time the acreage of commercial timber land is expected to gradually decline, the projected regional acreage in 2020 being 5,044,000. Other uses, such as recreation, are expected to gradually take over additional commercial forest land. Commercial forest land in private ownership is expected to be gradually taken over for residential use. These trends are expected to be more marked in the Gila Subregion than in the other two subregions.

Volume by stand classes: In the base year, 1965, the 5.5 million acres of commercial forest land in the Region were supporting some 6,791 million cubic feet of saw timber and 679 million cubic feet of pole-sized timber. Table 2.27. Although trees of all sizes occur in all pole and mature stand size classes, 56,000 acres of commercial

TABLE 2.27
AREA OF COMMERCIAL TIMBERLAND AND RELATED VOLUME OF TIMBER IN 1965,
AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020
LOWER COLORADO REGION

Item	Unit	1965	OBE-ERS Projections		
			1980	2000	2020
<u>Saw timber</u>					
Area	1,000 Ac.	5,049	4,930	4,693	4,564
Volume	Mil.Cu.Ft.	6,791	6,490	5,913	4,400
<u>Pole timber</u>					
Area	1,000 Ac.	168	195	245	300
Volume	Mil.Cu.Ft.	679	860	1,270	2,600
<u>Sapling & seedling</u>					
Area	1,000 Ac.	56	85	125	160
<u>Nonstocked area</u>					
Area	1,000 Ac.	185	148	80	20
<u>Total</u>					
Area	1,000 Ac.	5,458	5,358	5,143	5,044
Volume	Mil.Cu.Ft.	7,470	7,350	7,183	7,000

timberland were stocked with only seedling and sapling tree sizes and 185,000 acres were not stocked and not producing any type of timber product.

The 5.0 million acres of commercial forest land projected for the Region in 2020 are expected to support some 4,400 million cubic feet of saw timber and 2,600 million cubic feet of pole-size timber. Timber on 160,000 acres will be limited to seedling- and sapling-sized trees and the area of nonstocked forest land is projected to drop to 20,000 acres.

Mineral Industry

Mining has played an important role in the Lower Colorado Region since territorial days when prospectors were lured westward with expectations of gold and silver bonanzas. Before the era of the railroad, only the high valued gold and silver were mined because of the remoteness of the region and the lack of economical transportation. During the early 1880's improved transportation facilities contributed to interest in and development of lower valued minerals in the area. The most abundant of these, and the one receiving the most attention, was copper. While copper is central in the mining story of the Lower Colorado Region, other minerals--notably lead, gold, silver, zinc, gravel, sand, and stone also have been important. Recently, the extraction of uranium ore also has been of economic importance.

Value Added and Total Gross Output

Value added and total gross output of the mining industry in the Lower Colorado Region in 1965 and projections for 1980, 2000 and 2020 are shown in table 2.28. These data are based upon the 1960 Colorado River Basin economic base study and data provided by the Bureau of Mines. Except for uranium, the data reflect the estimated value of minerals at the mine. Mineral processing costs are included in the appropriate manufacturing sector. Due to data availability, the uranium sector was defined to include ore value plus full value of processed ore (U_3O_8).

As the first major industry of the Region, mining has been basic in the economic development of the Lower Colorado Region. In 1965 the value added to the economy of the Region by the mining industry was \$312.5 million, over 5 percent of the Region total. Indications are that the mining industry will continue to grow both in volume and in relative importance.

The major part of the mining in the Lower Colorado Region is located in the Gila Subregion, which accounted for 81 percent of the Region value added in 1965 and is projected to account for 83 percent by 2020. Value added in the Little Colorado Subregion accounted for 14 percent of the Region total in 1965 but is projected to decline to 8 percent in 2020 due to the relatively slower growth rate of mining in that subregion. The Lower Main Stem Subregion produced only about 5 percent of the Region output in 1965 but is projected to gradually expand its share to 9 percent by 2020.

Copper is by far the dominant metal in the Region, comprising about 72 percent of the total value added in the mining industry in 1965, the projection for 2020 increasing to 78 percent. Uranium, by far the most important mineral in the Little Colorado Subregion, ranks second in the

TABLE 2.28
 VALUE ADDED AND TOTAL GROSS OUTPUT OF MINING SECTORS
 IN THE THREE SUBREGIONS OF THE LOWER COLORADO REGION FOR 1965
 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020^{1/}

Subregion and Sector	1965		OBE-ERS Projections					
	VA	TGO	1980		2000		2020	
	VA	TGO	VA	TGO	VA	TGO	VA	TGO
:----- Million 1960 Dollars -----:								
<u>LMS Subregion</u>								
Uranium	1.1	3.1	1.1	3.1	1.0	3.1	1.0	3.1
All other mining:	14.9	29.0	28.6	56.4	41.4	84.8	54.3	115.7
Total	16.0	32.1	29.7	59.5	42.4	87.9	55.3	118.8
<u>L Colo Subregion</u>								
Coal	.4	1.1	5.9	16.0	5.8	16.0	0	0
Oil and gas	.2	0.7	16.4	50.0	21.9	70.0	11.9	40.0
Uranium	40.6	105.2	30.8	89.2	29.5	89.2	28.3	89.2
All other mining:	3.0	5.1	3.3	5.5	4.8	8.2	5.3	9.3
Total	44.2	112.1	56.4	160.7	62.0	183.4	45.5	138.5
<u>Gila Subregion</u>								
Copper	224.3	388.5	290.3	549.0	391.8	808.0	468.4	1,071.0
All other mining:	28.0	70.0	25.4	103.0	29.4	145.0	35.0	197.0
Total	252.3	458.5	315.7	652.0	421.2	953.0	503.4	1,268.0

^{1/} Based upon data provided by the Bureau of Mines, U. S. Department of Interior. Except for uranium, the figures reflect the estimated value of the minerals at the mine, the processing costs being included in appropriate manufacturing sectors. The uranium figures include the cost of ore concentration. All values are in 1960 dollars.

Region accounting for 13 percent of total value added in the mining industry. However, its relative importance is projected to gradually decline to only 4.6 percent by 2020. Data regarding these and other metals and minerals produced in the Lower Colorado Region are given in the following sections.

Copper

The story of copper in the Lower Colorado Region is centered around the Gila Subregion, where, for more than eighty years, the copper mines have poured forth an endless stream of metal into the nation's industries. Significant copper resources in the Gila Subregion occur in Grant County, New Mexico, and in every Arizona county except Maricopa. In addition to

high grade copper, ore deposits in Grant County, New Mexico, range relatively high in precious metal content. This area is expected to contribute strongly to future mineral development. Arizona, on the other hand, leading in copper production for more than 50 years, has raised its proportion of United States production from 45.7 percent in 1956 to 52.0 percent in 1965.

Since the turn of the century, copper production in the Lower Colorado Region has been plagued by fluctuating prices and changes in demand. However, the relative stability of the national economy since World War II has done much to stabilize the demand for copper. With the exception of intermittent drops, production has climbed steadily during the post-war years. Production is expected to continue to increase, the projected 2020 output being nearly 3 times the output in 1965. Plans to expand capacity and new project developments already scheduled should contribute substantially to many areas in the Lower Colorado Region, including both traditional mining districts and areas where historically mining has not been of major importance. Technology should keep pace with the declining metal content of available copper ores.

The current trend in mineral production is toward large, mass production operations. Thus, most of the productive capacity of Arizona's copper industry is in the hands of four firms; Kennecott Copper, Phelps-Dodge, American-Smelting & Refining, and Magma Copper, which produce about 72 percent of the total Arizona output.

Although every county in the Region contributed to mineral production in 1965, the bulk of the mineral output, 85 percent, came from the Gila Subregion. Output of copper and associated metals in the Gila Subregion furnished 75 percent of the total value of mineral production within the Lower Colorado Region in 1965, and almost 58 percent of all copper ores mined in the United States. As an economic factor in the



Photo 21.

Over half the total United States copper is mined in the Region. Photo courtesy of Kennecott Copper Corporation.

Gila Subregion, copper mining provides a major source of income and employment. Though copper mining accounts for only about 3 percent of total employment in the Region within the primary producing industries, primary metals, largely dependent upon copper mining, account for about 10 percent of the Region's industrial employment.

Interindustry input requirements of the copper industry in the Lower Colorado Region represent a relatively small part of total outlays. The largest single input to the copper industry is provided by the transportation sector of the economy. Interindustry sales, on the other hand, account for essentially all of the industry's output. Well over 90 percent of total output is sold to the primary metals sector.

The copper industry is a major industrial consumer of water and water resource development does have a substantial effect on the industry. Increased quantities of water available at certain mining properties and improvements in leach methods contributed to a substantial increase in copper production during 1964 and 1965.

Uranium

A relative newcomer to the mining industry, uranium, has found an important place in the economy of the Lower Colorado Region. As early as 1902, deposits of vanadinite (a vanadium and lead-bearing mineral that sometimes is accompanied by uranium mineralization) had been located in the Little Colorado Subregion but the mineral had no apparent use or commercial value. Development of uranium deposits began in 1942 when uranium became important as a source of nuclear energy. Since then the tempo of development has been rapid, and today uranium mining ranks first in the Little Colorado Subregion. In 1965 \$73 million worth of uranium ore was extracted and processed into "yellow cake" in the counties of the Little Colorado Subregion. Uranium emerged as an important mineral resource in the Lower Main Stem Subregion in 1957, and by 1965 over \$3 million worth of ore was extracted and processed.

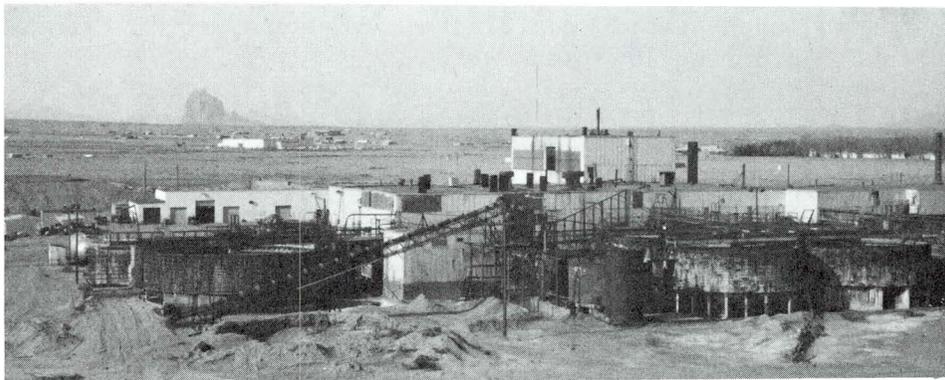
Whereas there have been commercial uranium operations in the Gila Subregion since 1956, the value of output, about \$4 million, represents only a small percentage of the subregion's total mineral output. All Arizona counties in the Gila Subregion have indications of uranium mineralization, but only a few of these deposits have been opened up to commercial exploitation.

Uranium "yellow cake" is sold only to the Federal Government since Atomic Energy Commission (AEC) Acts of 1946 and 1954 give the United States Government title to all special nuclear materials in the country. Private enterprise can acquire them only through license or contract. Due to security conditions, little is known about the first years of uranium mining in parts of the Region. Although restrictions were dropped in 1956, individual county data on uranium production are still difficult to locate.

Paradoxically, in the decade ending in 1966, the total number of uranium operations increased; however, the amount and value of ore produced in the Region was essentially unchanged. Some operations closed in 1965 as a result of production exceeding scheduled deliveries under AEC allocation.

Water resource requirements in the uranium industry are not of major importance. Uranium mines use relatively small amounts of water, whereas mills use substantially more for recovering "yellow cake".

The future of the uranium industry in the Region is promising. Increased demands in private sectors are expected to largely offset reduced use for defense.



Foote Mineral Co.

Photo 22. The Little Colorado Subregion is an important source of uranium for nuclear power plants. Famous landmark "Shiprock" is on the horizon.

An increased need for uranium in private reactors used for scientific experiments and power production caused a modest boom in 1966, and it is felt this trend will continue. Because many of the reactors planned for use by public utility companies will not be completed until 1970-75, increased demand for uranium will not be felt appreciably before then. In addition, the rising need for electric power and the sudden acceptance of nuclear power plants, caused the AEC to revise upwards by about 50 percent their 1966 estimates for uranium requirements by 1980. Too, as the result of technical improvements which have made nuclear power generation competitive with other power sources, commitments for the construction of nuclear plants increased beyond expectations during the decade to 1965.

Other Metallics

The Lower Colorado Region has for many years been responsible for the production of a wide range and variety of metallic minerals. Other than copper and uranium, the four most important metals in order of value are zinc, gold, silver, and lead. Because these metals are often recovered as by-products of copper mining operations, they have experienced a production history in recent times that somewhat parallels that of the copper industry.

Zinc, first reported in 1905 in the Gila Subregion, experienced rapid initial growth. However, production has declined for a number of years and it appears unlikely that output will increase from the current level throughout the projection time frame.

Gold has continued to contribute to the economy of the Region for over 80 years. Recently, consumption of gold has increased, especially in industrial and defense applications. The national gold situation reveals relatively small, widely scattered, and low-grade deposits. Production in the United States declined appreciably in the first half of the twentieth century. However, because output of gold in the Region is almost entirely a by-product of copper mining, future production of gold is expected to increase along with copper production.

Silver in the Gila Subregion is obtained chiefly as a by-product of copper processing. In 1966, for example, 88 percent of the total amount of silver produced in Arizona was recovered from copper ore processing. Thus, future silver production probably will be dependent largely on the output of copper. Silver production in the Gila Subregion in the base year 1965 was \$7.5 million compared to the national figure of \$51.5 million. In 1963, the State of Arizona ranked along with Idaho, Utah, Montana, and Colorado as one of the five leading states in silver output.

One of the major problems facing the silver industry today is rising demand which far outstrips present production. Recent resource development and research programs to develop new sources and more efficient use of silver ore are essentially long-range, and results cannot be expected in the near future. However, because of its by-product nature, silver production in the Region should continue to grow along with the copper industry.

Lead, sixth metal in importance among metallic minerals produced in the Region, has maintained a leading position as an important industrial metal. Recently, demand for lead has risen substantially as research and developments in the industrial field have resulted in new applications and improvements in production techniques. In the year 1965, regional output approached \$2.7 million compared to the national output of \$94 million. The future of lead production in the Region is expected to continue its upward trend as mining operations expand to meet rising industrial consumption, especially in the field of transportation.

Some additional metals produced in the Lower Colorado Region include tungsten, molybdenum, mercury, beryllium, vanadium, iron ores, manganese and manganese ores. These metals comprise but a small percentage of the total value of all mineral output in the Region.

Nonmetallic Minerals

Although extractive industries in the Lower Colorado Region produced a wide variety of nonmetallic minerals in the base year 1965, practically all of the production was in the sand and gravel, and the stone and clay sectors, other nonmetallic minerals accounting for only about 3 percent of the 1965 mineral production. Within the Region, major deposits of nonmetallic minerals have occurred primarily in the Gila and the Lower Main Stem Subregions. In 1965 these two subregions alone produced over 94 percent of the total value of sand and gravel, and stone, clay and glass in the Lower Colorado Region.

Sand and gravel production is important in both the Gila and the Lower Main Stem Subregions. The continued increase in population and expansion of urban areas have given impetus to the sand and gravel industries by creating new demands for homes, industrial buildings, highways, defense, public works, and industrial uses. Because of relatively high transportation costs, development has occurred near points of consumption where materials meeting requirements are available. The upward trend of production is expected to continue.

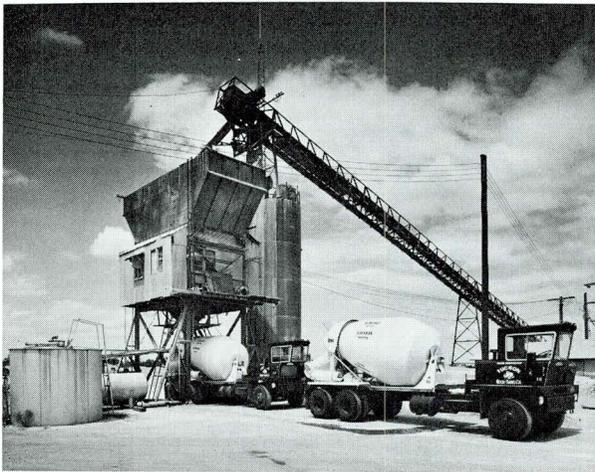


Photo 23. Sand and gravel production is dependent on activity in the construction industry.

Like sand and gravel, stone and clay are produced principally in the Gila and the Lower Main Stem Subregions. In 1965 total output of stone and clay in the Lower Colorado Region was \$6.2 million and it is estimated that production will increase with the upward trend of population.

The significance of mineral fuels in the Lower Colorado Region rests almost entirely within the boundaries of the Little Colorado Subregion. As early as 1882, coal was being mined in significant quantities in this subregion, and today it occupies a strong place in the economy. With railroads converting from coal-fired steam

to diesel-powered locomotives in the middle 1950's, demand for coal in the Little Colorado Subregion dropped sharply. Production fell from 135,068 tons in 1949 to 75,584 tons in 1960. By 1965, however, production



Photo 24. Strip mining of coal. Costly rehabilitation of mined area is required. BIA

had again expanded. In that year the Region was producing about 341,000 tons of coal for generation of electrical energy. Additional coal production will be realized as the Mohave and Navajo generating plants become operational.

Commercially workable deposits of oil and natural gas, and helium have been known to exist in the Little Colorado Subregion for some time. Active exploration, however, did not begin until the early 1950's. Historically, the development of oil and gas has been slow, and extraction

is not an important economic activity in the Region. While helium wells have been developed, they have been capped as a part of the United States Government's conservation program and are not now in production.

Manufacturing

The manufacturing industry has contributed significantly to recent expansion of the economy in the Lower Colorado Region. The most striking feature of the manufacturing industry in the Region is its relatively recent arrival on the economic scene. Prior to the 1940's, population of the Region was small and the Region was industrially isolated. Development of manufacturing was impeded by the great distances separating the Region from the Nation's major markets. However, after the second World War, the manufacturing element of the regional economy began to develop.

An understanding of trends in the manufacturing industry necessitates some knowledge of where and why industries choose to locate in a particular region. Historically, industrial development in the Lower Colorado Region has been characterized by plants which serve local markets, industries that are materials oriented and develop in response to regional or national demand, and those industries in which transportation costs on products are a relatively minor consideration. Then too, there is little doubt that population growth has a favorable effect on the increase of manufacturing and activity. Yet, the Lower Colorado Region is predominantly a rural area and is characterized by low population density. Although some types of plants locate in small cities and rural areas, it is important to realize that the majority of industries are situated near large urban areas where transportation networks, repair and service facilities, and an adequate labor supply are readily accessible. For these reasons, major manufacturing industries have located in or near major urban areas in the Region.

Two counties within the Gila Subregion, Maricopa and Pima, have realized most of the manufacturing growth in the Region. In the Gila Subregion, sharp gains in manufacturing are evidenced by employment figures which increased six times from 1940 to 1960, from 9.0 thousand to 54.6 thousand. The present Phoenix metropolitan area (Maricopa County) ranking first in size in the Region, experienced a sharp growth rate in population and employment during the 1950's. Population increased from 331,770 in 1950 to 663,510 in 1960, and employment in manufacturing increased from 55 percent to 71 percent of total employment over the same period. Tucson (Pima County), has experienced similar growth in population and employment which has contributed substantially to Pima's manufacturing economy.

Value Added and Total Gross Output

Value added and total gross output of manufacturing sectors in 1965 in the three subregions of the Lower Colorado Region, together with projections for 1980, 2000 and 2020 are given in table 2.29. In compiling

TABLE 2.29
 VALUE ADDED AND TOTAL GROSS OUTPUT OF MANUFACTURING SECTORS IN THE THREE SUBREGIONS
 OF THE LOWER COLORADO REGION FOR 1965, AND OBE-ERS PROJECTIONS FOR 1980, 2000,
 AND 2020

Subregion and Sector	1965		OBE-ERS Projections					
	VA	TGO	1980		2000		2020	
	VA	TGO	VA	TGO	VA	TGO	VA	TGO
----- Million 1960 dollars -----								
<u>LMS Subregion</u>								
Food & kindred products	11.4	31.4	55.9	125.0	130.0	310.0	251.9	660.0
Lumber & wood products	10.1	24.5	32.2	67.7	80.0	178.0	177.9	429.5
Chemicals	7.8	31.1	19.4	72.6	47.7	193.8	133.6	456.0
Printing & publishing	8.1	13.7	26.9	45.6	74.3	127.4	181.7	315.5
Fabricated metals	1.5	2.9	4.2	7.9	10.8	20.9	25.7	50.4
Stone, clay & glass	7.2	21.5	21.6	59.3	57.8	155.8	149.5	376.0
All other manufacturing	20.6	72.0	63.9	206.4	163.3	543.6	410.1	1,382.6
Total ^{1/}	66.7	197.1	223.9	584.5	563.8	1,529.5	1,330.4	3,670.0
<u>L Colorado Subregion</u>								
Food & kindred products	0.3	0.9	4.0	6.5	9.9	16.0	22.6	37.0
Lumber & wood products	9.4	32.6	30.4	77.6	53.5	149.8	88.0	252.4
Paper & pulp	5.0	17.6	6.9	24.6	9.7	36.9	14.4	58.0
Printing & publishing	0.6	1.1	1.4	2.7	2.5	5.2	4.1	8.8
All other manufacturing	3.3	19.9	7.9	45.6	14.9	88.1	21.3	128.3
Total ^{1/}	18.6	72.1	50.5	157.0	90.5	296.0	150.4	484.5
<u>Gila Subregion</u>								
Food & kindred products	63.2	261.9	106.5	520.0	156.5	1,150.0	442.1	2,500.0
Lumber & wood products	7.9	23.7	27.0	71.0	72.2	195.0	170.6	485.0
Furniture & fixtures	4.7	13.9	12.3	35.0	33.2	98.7	78.7	244.0
Paper & pulp	4.1	15.5	18.9	60.0	39.4	120.0	78.3	230.0
Chemicals	15.5	50.6	63.9	190.0	278.1	880.0	758.9	2,680.0
Primary metals	46.5	490.7	64.4	750.0	193.7	1,400.0	415.9	2,540.0
Printing & publishing	54.1	87.4	144.8	260.0	379.1	720.0	925.9	1,800.0
Fabricated metals	19.5	57.3	51.7	170.0	133.8	470.0	304.5	1,180.0
Textiles & apparel	15.7	32.0	49.9	96.0	158.0	320.0	552.1	1,180.0
Leather & leather goods	0.3	0.6	.5	1.0	1.5	3.0	3.8	8.0
Stone, clay & glass	27.5	58.6	84.1	175.0	238.1	490.0	609.4	1,220.0
All other manufacturing	396.9	666.9	1,165.6	2,002.0	3,007.7	5,524.0	7,000.9	13,783.0
Total ^{1/}	655.9	1,759.1	1,789.6	4,330.0	4,691.1	11,370.7	11,341.0	27,850.0

^{1/} Columns may not add to total due to rounding.

1965 data, heavy reliance was placed on the 1965 Annual Survey of Manufacturers to update the 1960 Colorado River Basin economic base study. Since this publication shows only state output totals, output for most sectors was estimated on the basis of employment and value of output per worker. In developing output of the printing and publishing sector, data from State Tax sources were used for all Arizona counties.

Value added to the economy of the Lower Colorado Region in 1965 by the manufacturing industry totaled \$741 million, about 12 percent of the

Region total. By 2020 value added in manufacturing is expected to reach \$12,821.8 million, almost unchanged as a percent of total value added in the Region. It is worth noting that although manufacturing has gained considerably in importance in the Region's economy, in the base period relatively few products were processed beyond the earliest stages of transforming raw materials into finished goods. However, expansion plans and new developments underway and projected are expected to extend the manufacturing process to include considerably more finished goods along with an expansion of the over-all volume.

The major part of the manufacturing in the Region is located in the Gila Subregion which accounted for nearly 88 percent of the value added from manufacturing in 1965. The Lower Main Stem and Little Colorado Subregions accounted for 9.0 percent and 3.0 percent, respectively. The rate of growth of manufacturing in the Gila Subregion is projected to approximately equal that in the Region as a whole. The Lower Main Stem Subregion is projected to grow somewhat faster, the 2020 value added increasing to 10.0 percent of total value added in the Region. On the other hand, the growth rate in the Little Colorado Subregion is projected to be less than half that of the Region, the 2020 value added dropping to 1.0 percent of that for the Region. As is evident from table 2.29, the manufacturing industry of the Lower Colorado Region is diversified and contains several singularly important sectors. Because of time and money limitations, it was not feasible to consider each individual sector in detail in this report. However, six of the more significant sectors, food and kindred products, lumber and wood products, and furniture, pulp and paper, chemicals and allied products, printing and publishing, and textiles and apparel, are considered in some detail in the following sections. Other manufacturing sectors are discussed generally in a section headed "All Other Manufacturing".

Food and Kindred Products

The food processing industry in the Lower Colorado Region has for many years been characterized by relatively small plants. This characteristic is due primarily to the fact that the industry mainly has served a limited regional market. Widespread availability of raw materials, coupled with long distances between markets have historically limited large-scale plant operations. However, modern technological developments have led to a sharp drop in the number of plants in the last quarter of a century, despite increasing output and employment.

Food plants are becoming more mechanized and concentrated in the Region's larger cities. The areas best suited for development of these industries appear to be portions of the Gila Subregion (Maricopa County) and the Lower Main Stem Subregion (Yuma and Mohave Counties). It is

possible too, that if crop production is adequate, the Gila and Lower Main Stem Subregions could become favorable centers for processing citrus fruits and juices.



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Photo 25. Harvesting and processing citrus and vegetables requires a great deal of hand labor and provides employment for unskilled workers.

Some of the more important activities included in the food and kindred product's sector are soft drink bottlers, bakeries, dairies, meat packers, cottonseed oil mills, and specialty canning food firms. Others are: breweries, candy, manufactured ice, vegetable and fruit, packing and canning, pickled vegetable canning, flour mills, and frozen foods. With the exception of soft drink bottling firms which are located in each of the subregions, most sector activity is in the Gila and Lower

Main Stem Subregions; in 1965 these two subregions accounted for 99 percent of all food and kindred products output in the Lower Colorado Region. Goods produced in this sector are sold largely within the Region. Estimates of goods exported in 1965 as a percent of total output, for example, were 5 percent in the Lower Main Stem Subregion, 23 percent in the Little Colorado Subregion, and 17 percent in the Gila Subregion.

In looking to the future, most food and kindred products activity will continue to be concentrated in Maricopa and Pima Counties. Water use by this segment of the industry will become more concentrated at fewer locations with resulting impacts on local water supply and pollution problems. The subregions are sufficiently large in area to indicate that despite trends toward larger production units, each subregion will tend to become more "self-sufficient" with respect to the food industry.

Lumber and Wood Products, and Furniture

The lumber and wood products industry, which is significant especially in the Little Colorado Subregion, consists of all operations

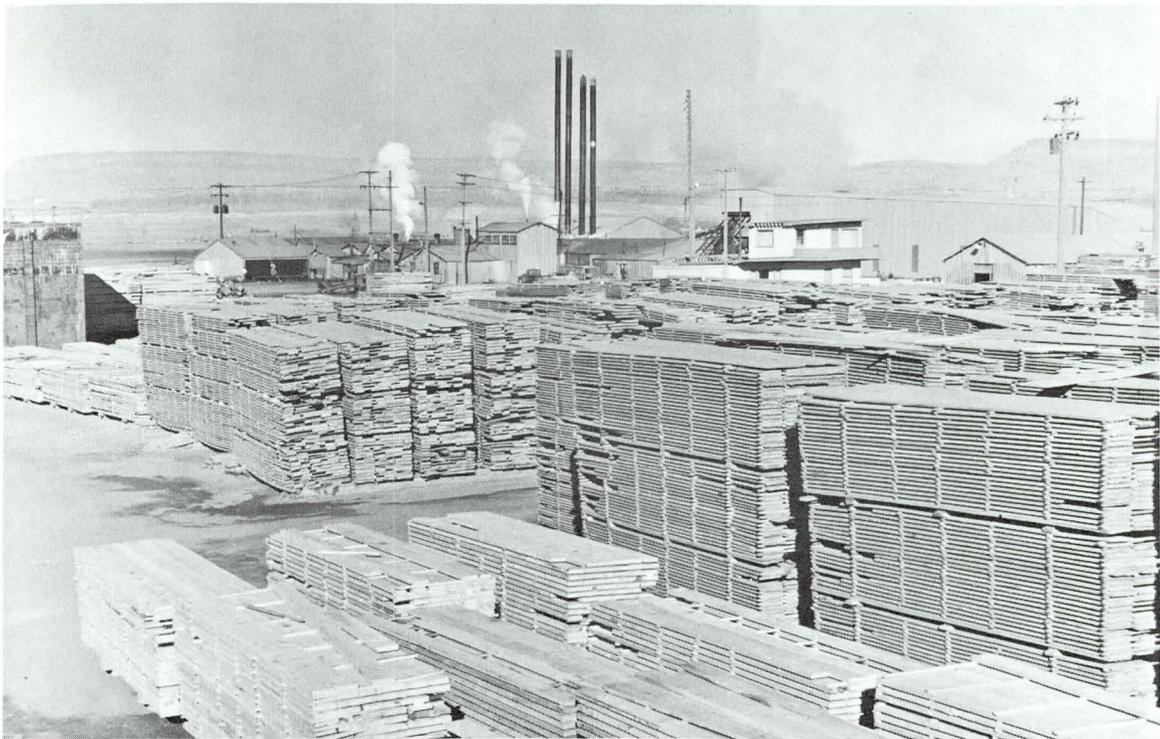


Photo 26. Lumber manufacturing is a significant economic activity in the Region.

which process timber except the pulp and paper industry. Because the outputs of this industry serve as inputs to the furniture industry, these two sectors of the economy are very closely related. Almost 10 percent of the employees in all manufacturing in the Region, work in establishments producing and processing lumber and other industrial wood products. The total output of timber products exclusive of paper and pulp in the Lower Colorado Region for 1965 amounted to about 75 million cubic feet. Of the 37 wood conversion plants in 1965, 33 were saw mills, 2 manufactured house logs, and 2 excelsior and poles. Fifteen of the saw mills were located in the Little Colorado Subregion, 5 in the Lower Main Stem Subregion, and 13 in the Gila Subregion. The house log manufacturing plants were both located in the Gila Subregion and the excelsior plants were in the Lower Main Stem Subregion.

There were no particle board manufacturing plants in the Region in 1965. Projections indicate that by 1980, two particle board plants, one in the Lower Main Stem Subregion (Flagstaff)^{1/} and one in the Little Colorado Subregion (McNary), will be in operation. Projections indicate that by 2020 two additional particle board plants will be constructed in the Little Colorado Subregion, one at Window Rock utilizing mill waste from the Navajo Planing and Saw Mill, and Woodworking Plant and one in

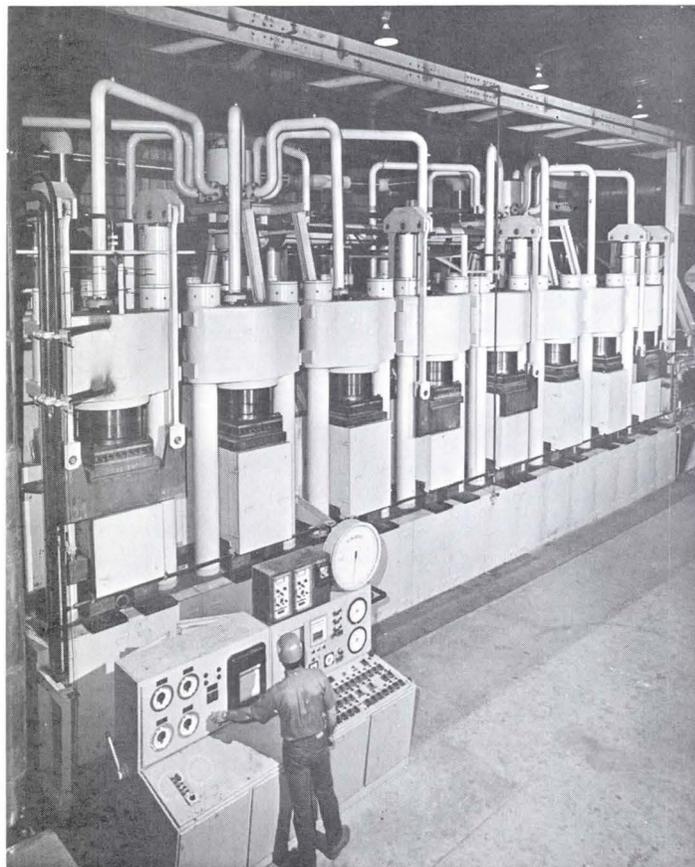


Photo 27. This giant single-opening press, one of the largest in the country, produces a special type of particle board called Kachina-Board at the Flagstaff, Arizona plant of Southwest Forest Industries. The equipment manufactures KachinaBoard measuring 42 feet by 8½ feet and from 1/8-inch to 1/2-inch in thickness. Photo courtesy of Southwest Forest Industries.

^{1/} Began production of particle board in 1969.

New Mexico. Each of the four plants are projected to have a capacity of about 27 million square feet of 3/4-inch particle board per year utilizing about 36,000 tons of raw material and providing an estimated 50 man-years employment annually.

There were no plywood plants in the Region in 1965; however, projections indicate that there may be two plants completed by 1980 in the Lower Main Stem Subregion, and one in the Little Colorado Subregion. All three plants will operate in conjunction with saw mills, and will result in a corresponding decrease in saw mill capacity. Each of the three plants will have a capacity of about 80 million square feet of 3/8-inch plywood per year and will provide an estimated 240 man-years employment.

Projections indicate that the production of lumber and wood products will increase to year 2000, with a slight decrease in lumber production between 2000 and 2020. Table 2.30. The production of wood for veneer and plywood is expected to expand from about 16 million cubic feet in 1980 to about 29 million cubic feet by the year 2000.

TABLE 2.30
 PRODUCTION OF LUMBER AND OTHER WOOD PRODUCTS IN 1965
 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020
 LOWER COLORADO REGION BY SUBREGION

Item	1965	OBE-ERS Projections		
		1980	2000	2020
		----- 1,000 cubic feet -----		
<u>Lumber</u>				
Region	73,447	74,849	77,949	66,823
LMS Subregion	25,865	31,441	35,068	31,404
L Colo Subregion	36,363	22,444	18,678	13,348
Gila Subregion	11,219	20,964	24,203	22,071
<u>Veneer (plywood)</u>				
Region	0	15,767	24,879	28,973
LMS Subregion	0	7,234	9,001	10,164
L Colo Subregion	0	8,533	10,188	10,770
Gila Subregion	0	0	5,690	8,039
<u>Other ind. wood products</u>				
Region	1,728	3,987	5,860	7,051
LMS Subregion	719	1,669	2,378	2,731
L Colo Subregion	740	1,669	2,378	2,806
Gila Subregion	269	649	1,104	1,514
<u>Total lumber and wood products</u>				
Region	75,175	94,603	108,688	102,847
LMS Subregion	26,584	40,344	46,447	44,299
L Colo Subregion	37,103	32,646	31,244	26,924
Gila Subregion	11,488	21,613	30,997	31,624

The secondary manufacture of wood products is a small factor in the Lower Colorado Region forest industry. The potential exists for expansion of mill work operations because of a large volume of lumber shipped out of the Region for remanufacture. Production of such items as molding, trim, window sash and doors is projected to increase over the projections period.

The expected growth of local markets in the Lower Colorado Region should lead to a growth of the lumber industry through substitution of locally produced products for imported wood and wood products. By 2020 the industry in the Lower Colorado Region is projected to reach \$1.2 billion, over 14 times 1965 production. In general, it appears that Ponderosa pine, which occupies over 90 percent of the commercial area in the Lower Colorado Region, will develop at a rate in excess of the other larger western producing areas. Lumber production in the Gila and Little Colorado combined should constitute 63 percent of the regional total by 2020.

The furniture industry, particularly the household segment, has traditionally been concentrated in the northeastern and north central sections of the country. However, in recent years a new trend has been developing as part of the industry has drifted on to the South. The principal reasons for this shift seem to be low-cost labor and the availability of raw materials. Because labor costs and labor productivity are particularly favorable in the Lower Colorado Region, the economy of the area could experience a more rapid expansion in furniture production. Projections for 2020 indicate that the Gila Subregion will lead production with \$485 million, followed closely by the Lower Main Stem with \$430 million, and the Little Colorado with \$252 million.

Pulp and Paper

The pulp and paper industry goes hand-in-hand with the lumber industry. Some prerequisites for a strong pulp and paper industry include a well-established lumber industry, and the availability of an adequate water supply. In 1965 the pulp and paper mill in the Little Colorado Subregion was converting about 6.65 million cubic feet of round wood and 5.5 million cubic feet of plant by-products to pulp and paper products annually. A small pulp mill in the Lower Main Stem Subregion was converting approximately 50,000 cubic feet of round wood to pulp per year. In 1965 the pulp and paper and allied products in the Region employed about 1,700 people.

Although the pulp and paper industry did not begin in the Lower Colorado Region until the 1950 decade, it is the fastest growing timber industry in the Region. Projections indicate that the pulping capacity in the Little Colorado Subregion will be expanded from an estimated 500 tons per day in 1965 to more than 1,200 tons per day before 1980. The existing pulping capacity in the Lower Main Stem Subregion will be

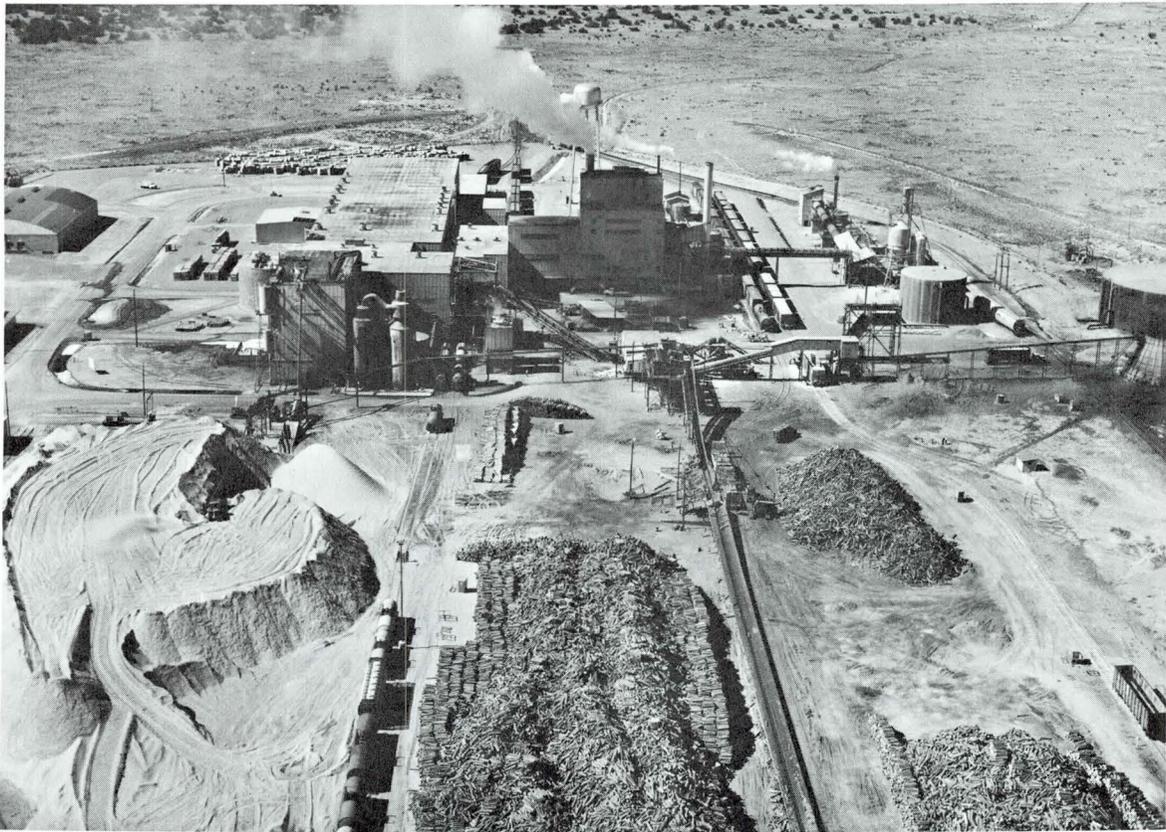


Photo 28. Southwest Forest Industries' paper mill at Snowflake, Arizona, produces 500 tons a day of newsprint and linerboard and employs more than 400 people. Photo courtesy of Southwest Forest Industries.

expanded from the present (1965) capacity of 60 tons per day to an estimated 400 tons per day by 2020. Both types of raw material (round wood and plant by-products) are projected to rise sharply. The present output of 6.7 million cubic feet of round wood is projected to increase to 27.2 million cubic feet and plant by-products volume from 5.5 million cubic feet to 33.5 million cubic feet annually. Table 2.31. It is expected that by the end of the projection period a pulp and paper industry will be capable of supplying the needs of virtually all the Lower Colorado Region and of generating substantial export income as well.

TABLE 2.31
 PRODUCTION OF PULPWOOD IN 1965 AND OBE-ERS PROJECTIONS
 FOR 1980, 2000, AND 2020, LOWER COLORADO REGION BY SUBREGION

Item	:	1965	OBE-ERS Projections			
			:	1980	:	2000
	:		----- 1,000 cubic feet -----			
<u>Round wood</u>	:					
Region	:	6,708	15,379	21,312	27,153	
LMS Subregion	:	2,494	2,875	7,048	9,937	
L Colo Subregion	:	4,042	9,924	11,292	12,817	
Gila Subregion	:	172	2,598	2,972	4,399	
	:					
<u>Plant by-product</u>	:					
Region	:	5,472	13,300	24,400	33,500	
LMS Subregion	:	1,224	5,700	10,300	14,400	
L Colo Subregion	:	3,816	4,800	7,200	8,700	
Gila Subregion	:	432	2,800	6,900	10,400	
	:					
<u>Total</u>	:					
Region	:	12,180	28,697	45,712	60,653	
LMS Subregion	:	3,718	8,575	17,348	24,337	
L Colo Subregion	:	7,858	14,724	18,492	21,517	
Gila Subregion	:	604	5,398	9,872	14,799	

Textiles and Apparel

For many years, the textile industry has been centered in New England although segments of it have been located in many parts of the country. In recent years however, the industry has begun to migrate to new locations in the South and the West. The Lower Colorado Region has gained a portion of this industry primarily because of low labor costs. The availability of raw materials and reasonable access to markets may strengthen the textile industry in the Region. Today, sizeable markets for the specialized styles which have become associated with the Region already have been developed in the Gila Subregion. Thus, in the future, the Lower Colorado Region, and the Gila Subregion in particular, may become an important center of an integrated textile industry in the Southwest. Output of the textile and apparel sector in the Gila Subregion in 2020 is projected to be 37 times the output in 1965.

Looking ahead, the Lower Colorado Region shows great capability for growth in garment making. The principal reasons are relatively low-cost Indian labor on reservations and in the border areas of the Gila. Expansion of casual and sportswear production also is anticipated.

Chemicals and Allied Products

The chemical industry in the Lower Colorado Region is characterized by the use of numerous materials and the vast amount of products into which they are transformed. For this reason, it is somewhat difficult to project specific products or areas of future growth. Locational analysis is further complicated by the rapid pace of technological advances and the development of new products.

The firms included in this classification include those engaged in manufacturing of fertilizers, insecticides, explosives, paints, plastics, pharmaceuticals, and many other chemicals. Chemical production is important in both the Gila and Lower Main Stem Subregions. The Gila Subregion has diversified chemical industries, the largest being the production of explosive, primarily for local mining. The Lower Main Stem Subregion claims chemicals as the largest of any individual manufacturing industry in the area, valued at \$31.1 million in 1965, 30 percent of the five major sector total. By 2020 the chemical industry of the Lower Main Stem Subregion is projected to grow fifteenfold.

The manufacturing of pharmaceutical preparations should be considered a possibility for the future of the Region. Because of the variety of raw materials required in drug manufacturing, the availability of materials has traditionally been an important factor in the location of plants. However, because of the relatively high value of the products in relation to their weight, transportation costs need not tie the industry to the manufacturing location. Yet, the development of drug industries in the Lower Colorado Region is still only a remote possibility.

Printing and Publishing

At present, except in the Gila Subregion, the printing and publishing industry of the Lower Colorado Region consists almost entirely of newspaper publishing. In the Gila, however, the printing and publishing industry is an important sector. Almost 82 percent of the total number of firms in this sector are located in two Arizona counties, Maricopa and Pima. Firms are about evenly divided between those specializing in printing on a job basis and those publishing newspapers and periodicals.

Although present production is based primarily on newspaper publishing, it is estimated that in the future there will be a more rapid growth in other segments of the industry--especially in commercial printing. The Gila should continue to dominate the industry contributing over 84 percent to the regional total by 2020.

Other Manufacturing

Manufacturing, other than the six types discussed above, comprises a large share of the total volume and value of output. In 1965 it accounted

for about 70 percent of all manufacturing in the Region. Of particular importance in this category are the following manufacturing sectors; stone, clay and glass products, primary metals, and fabricated metals. In 1965, these three segments of the manufacturing industry employed 17 percent of all manufacturing employees in the Region and contributed about one-third of the total value of manufacturing output. In addition, other significant industries in the Region include machinery (nonelectrical and electrical), transportation equipment, and instruments and related products. These industries are examined briefly below with respect to location and expansion of present and future firms.

Stone, Clay and Glass--The production of stone, clay and glass is becoming a significant industry in the Gila and Lower Main Stem Subregions because of the relatively rapid population growth of the metropolitan areas. Most of the growth of the stone, clay and glass industry in the Region has been related directly or indirectly to construction activity. The major establishments in these subregions are brick and structural clay tile firms, concrete brick and block, other concrete products, ready-mix concrete, gypsum products, and cut stone and stone products firms.

There are two industries--cement and glass containers--which are relatively underdeveloped in the Region. However, the output of cement in the Gila Subregion may be expected to grow, and as Las Vegas grows, establishment of a cement plant in the Lower Main Stem Subregion may be possible after 1980. Because of high transport costs on the finished product, glass container plants are often located near their markets. Since there are no plants in this industry in the Gila Subregion, the reason is probably lack of sufficient demand. It is certain, however, that continued growth of manufacturing in the Gila will generate demand for containers. However, it should be pointed out that substitution of other packaging materials such as plastics, aluminum, and paperboard in the food and beverages field may delay or replace glass container manufacturing in the Region.

Primary metals--The major contributor to the primary metals industry in the Lower Colorado Region is the primary copper industry. Although



Photo 29. At mills, such as this one at Hurley, New Mexico, ore is crushed and copper minerals are concentrated. The concentrate is then shipped to a smelter for further refinement.

the Region supplies over 50 percent of all copper produced in the United States there is a relatively small amount of copper refining capacity in the Region. Present refineries are situated in eastern locations because of greater access to markets. In the future, however, some segments of the primary metals industry may be expected to grow relative to local and regional industrial demand. Thus, small iron and steel, copper and other nonferrous foundries may be expected to expand along with the Region's industrial growth.

In the Gila Subregion, the primary metals industry has the largest total gross output of any manufacturing sector. In 1965 it represented 28 percent of the total manufacturing output in the Subregion. It also has the strongest degree of interdependence with other processing sectors. This is due to the availability of raw materials such as copper, lead, gold, and silver ores from the mining sectors.

Fabricated Metals--Like stone, clay and glass, the growth of fabricated metals in the Region is related directly or indirectly to industrial and construction markets. Since fabricated products are often produced on a job-order basis, a market location is quite often necessary. The fabricated metals sector should gain strength as the Region becomes more developed.

Most of the activity in this industry group is in the Gila Subregion, which in 1965 had 95 percent of the total metal fabrication in the Lower Colorado Region. Some of the different types of firms operating within the sector are cutlery, sheet metal shops, fabricated structural steel, electroplating, and metal coating. The majority of firms, however, were involved with sheet metal and electroplating.



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Photo 30. Reynolds Aluminum Corporation, Phoenix, Arizona

Nonelectric Machinery, Electric Machinery, Transportation Equipment, Instruments and Related Products--Included in these categories are, among others, aircraft, missile components, scientific instruments, and computing machine industries. These and other similar industries are unique because they are part of a small number of industries able to serve national markets. For this reason, continued industrial growth, particularly in the Gila Subregion, will depend in large part on the growth of national markets which these categories may serve.

Whereas transportation costs are not significant in determining location, other factors such as the availability of labor, climate, and proximity to other firms and nearby research facilities are quite often important. Usually, firms in these categories locate in relatively few metropolitan areas throughout the country. The clustering of firms in the Phoenix metropolitan area today indicates that continued growth in that area can be expected.



Noncommodity Producing Industries

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Photo 31. Motorola Plant facilities, Scottsdale, Arizona

Although gains within the noncommodity sectors have not been as spectacular as those of manufacturing, these industries do paint a picture of steady growth and economic expansion in the area. In recent times, the economic base of the Region's economy has been characterized not only by growth, but also by constant change. While natural resources continue as a cornerstone, other capital and human resources have greatly broadened the economic foundation.

Value Added and Total Gross Output

Value added and total gross output of the non-commodity producing sectors in the Lower Colorado Region in 1965, together with projections for 1980, 2000, and 2020, are given in table 2.32. Data for the base period 1965 were derived from the 1960 Lower Colorado Basin economic base study supplemented by data from the 1963 Census of Business and a wide range of current data on sales, trade, services, employment, personal income, taxes, transportation, and the like. Revenue and related data obtained from the Interstate Commerce Commission, the Civil Aeronautics Board, the Arizona Highway Department, the Federal Power Commission, and several private companies also were used in developing data for related sectors.

Value added by the noncommodity producing sectors to the economy of the Region in 1965 totaled \$2,172 million, about 36 percent of the Region total. Total value added for these sectors as a group is projected to increase at a rapid rate in the future, the 2020 value added being nearly 14 times that of 1965. Notwithstanding this rate of growth, the relative contribution of the noncommodity producing sectors to the economy will decrease, the 2020 value added by the group comprising 28 percent of the Region total.

TABLE 2.32
 VALUE ADDED AND TOTAL GROSS OUTPUT OF NONCOMMODITY PRODUCING SECTORS
 IN THE THREE SUBREGIONS OF THE LOWER COLORADO REGION FOR 1965 AND OBE-ERS PROJECTIONS
 FOR 1980, 2000 AND 2020

Subregion and Sector	1965		OBE-ERS Projections					
	VA	TGO	1980		2000		2020	
	VA	TGO	VA	TGO	VA	TGO	VA	TGO
----- Million 1960 dollars -----								
<u>LMS Subregion</u>								
Wholesale trade	31.1	83.5	77.6	206.0	208.2	559.0	441.2	1,200.0
Service stations	9.5	21.3	23.9	52.6	64.3	142.9	160.4	362.0
Eating & drinking	21.6	69.6	52.6	172.8	140.2	466.0	350.5	1,180.0
All other retail	80.0	162.3	219.9	399.6	585.8	1,087.1	1,596.1	3,000.0
Agricultural services	9.9	31.0	14.2	45.0	20.0	63.5	26.0	82.9
Lodging	118.8	183.9	327.1	506.0	1,061.2	1,652.5	2,921.9	4,580.0
All other services	106.6	205.8	303.3	566.4	984.9	1,850.0	2,710.0	5,119.0
Transportation	33.6	107.3	54.0	175.0	137.5	448.5	306.7	997.5
Electric energy	18.1	59.4	42.6	140.0	104.7	350.0	271.9	840.0
All other utilities	18.9	40.1	49.0	94.3	128.1	245.8	303.5	579.5
Contract construction	43.8	137.5	99.7	288.4	261.2	769.5	624.8	1,860.0
Rentals & finance	106.6	118.8	316.6	355.0	1,031.8	1,162.5	2,852.0	3,222.0
Total ^{1/}	598.5	1,220.5	1,580.4	3,001.1	4,728.0	8,797.3	12,564.9	23,022.9
<u>L Colorado Subregion</u>								
Wholesale trade	5.3	13.9	11.7	28.1	22.5	54.9	37.6	93.2
Service stations	3.0	4.8	6.1	9.7	11.9	19.0	18.0	32.3
Eating & drinking	2.7	10.5	5.2	21.1	9.8	41.2	16.1	70.0
All other retail	11.4	21.3	25.2	42.9	48.4	83.8	81.5	142.5
Lodging	2.8	5.8	5.4	11.1	10.6	22.3	18.7	40.0
All other services	5.9	13.9	11.3	26.5	22.2	53.3	48.9	95.4
Transportation	2.8	29.8	4.3	47.2	8.0	89.5	13.9	158.3
Electric energy	1.1	6.6	.9	17.0	2.9	33.0	10.5	55.0
All other utilities	3.9	5.2	6.2	8.3	11.5	15.8	19.9	27.8
Contract construction	3.8	15.4	4.6	24.8	8.9	39.9	10.9	63.0
Rentals & finance	9.4	11.2	25.8	31.4	66.7	82.6	104.8	132.0
Total ^{1/}	52.1	138.4	106.5	268.1	223.6	535.3	380.8	909.5
<u>Gila Subregion</u>								
Wholesale trade	138.6	303.0	251.3	606.5	632.7	1,600.0	1,198.6	3,183.0
Service stations	21.7	41.0	47.4	82.4	109.0	192.4	240.8	431.5
Eating & drinking	60.4	168.2	117.0	337.0	268.0	786.0	595.7	1,765.0
All other retail	331.9	620.0	690.1	1,242.0	1,603.7	2,904.0	3,851.8	7,000.0
Agricultural services	13.8	32.1	19.3	45.6	22.2	52.7	25.5	61.1
Lodging	29.3	62.0	71.7	157.0	204.2	455.0	511.5	1,160.0
All other services	137.0	328.0	348.6	826.0	992.5	2,387.0	2,506.0	6,119.0
Transportation	80.5	214.3	157.8	428.0	314.6	869.0	626.2	1,762.0
Electric energy	90.6	153.6	232.1	390.0	548.9	925.0	1,284.8	2,100.0
All other utilities	71.1	157.8	147.2	335.0	311.6	715.0	677.2	1,557.7
Contract construction	137.1	417.5	257.9	804.0	517.5	1,824.0	953.7	3,915.0
Rentals & finance	409.8	480.2	921.3	1,094.0	2,165.7	2,597.0	4,830.2	5,850.0
Total ^{1/}	1,521.8	2,977.7	3,261.7	6,347.5	7,690.5	15,307.1	17,301.9	34,904.3

^{1/} Totals may not equal sum of items due to rounding.

The major part of the output of the noncommodity producing industries is in the Gila Subregion, followed in order by the Lower Main Stem and the Little Colorado Subregions. The rate of growth is projected to be most rapid in the Lower Main Stem Subregion where the 2020 total gross output is projected to be nearly 19 times the 1965 output, compared with 12 times for the Gila Subregion and 6.5 times for the Little Colorado Subregion.

Wholesale and Retail Trade

The wholesale and retail trade industry in the Lower Colorado Region mirrors the change in composition that the industry has undergone nationally. The concentration and consolidation of retailing by both national and local chains is as pronounced here as anywhere, and the abundance of shopping centers in the Region is probably greater. The wider ownership of automobiles and the accessibility of shopping centers with ample parking facilities underline this growth.

Through the years, the retail trade sector has shown an increased share in the over-all economic growth of the Region due to steadily increasing population and personal income. However, due to the great expansion of manufacturing, government activities, and services during recent years, employment in trade, though growing rapidly in absolute terms, has tended to lag by comparison with other regional industries. The lag is entirely within the retail sector and is more specifically limited to durable goods. A wide range of businesses, including vendors of automobiles, building materials, clothing, hardware, farm equipment, furniture, appliances, cameras, jewelry, and sporting goods have been efficient in their use of manpower and employ proportionately fewer persons today than in 1950. In contrast, food and liquor stores have increased their proportion of employment slightly.

In recent years, improved transportation facilities, the growth of personal income and retail sales have increased the importance of Phoenix and Tucson as trade centers. The development of greater trade with Mexico accounts for the importance of Nogales as a Region wholesale trade center. For the past decade, in fact, the international trade through Nogales has expanded considerably and includes imports of seafoods, fresh vegetables, and fruits from Mexico.

In looking to the future, some changes in the nature of the trade industries in the Lower Colorado Region are indicated. Higher incomes are expected to continue to encourage a greater patronage of restaurants resulting in a larger number of jobs in this sector. Recent interest in the Phoenix area as a regional distribution center may increase the relative share of employment in wholesale firms within the next decade; however, automation of warehousing activities is expected to limit the expansion of such employment to some degree. Most food stores are already of the self-service variety, but further automation is expected. Most growth, therefore, is expected in the personal services portions of the retail trade sector.

In summary, then, it appears that expansion of population and income levels will keep the demand for consumer goods at a high level. The distribution of employment within this industrial group will probably be similar to present proportions. Thus, the wholesale and retail trades

are expected to employ 193,000 persons by 1980, and by the year 2020 employment should exceed 457,000 persons.

Services

By far the largest segment of the labor force, employing 23.8 percent of the regional total, the "services" is one of the fastest growing industries in the Region. A varied group of businesses are included under the rather inclusive heading of "services". These are the medical, legal, personal and domestic services; business services; and the repairing of automobiles, electrical equipment, and watches. Also included are a number of educational, charitable, religious, and non-profit organizations. Most of these are obviously supplementary functions which are dependent upon the size and growth of the economy as a whole.

Service industries include hotels and other lodging facilities, as well as places of recreation and amusement. Within the Lower Colorado



Photo 32. Las Vegas, Nevada, caters to the tourist who likes a game of chance, spectacular shows, and sun.

BR

Region these business activities cater in large measure to tourists and consistently generate economic growth of a primary nature.

Throughout the United States, employment in the entire service group of industries has risen faster than over-all employment, and constitutes the most rapidly expanding sector except for government. A rising level of national income has been able to support larger and more specialized services. New service industries have been created and old ones expanded to handle the more mechanized and automated production facilities upon which high income levels depend. The Lower Colorado Region has followed this national pattern. During the decade from 1950-60, employment in the service industries more than doubled, exceeding the rate of growth in the over-all nonagricultural sector, and at the same time achieving a considerable measure of diversification.

The services industry today reflects an increasing trend away from self-sufficiency and a concomitant need for specialized services in the home. There has been an accelerated reliance upon paid services that were formerly supplied within the household. In addition, new service industries have been created because of new and increased complexity of modern mechanisms. The advent of television, for example, was followed immediately by the TV repairman.

Other services increasing in importance include automobile and electrical repair, exterminating services, laundry and cleaning plants, and diaper services which have all found a growing market in homes within the Region. At the same time, beauty parlors, reducing salons, gymnasiums, and other businesses have boomed. Then too, recreation demands have included a desire to play golf, bowl, go boating, and ride horses. These services and facilities are often combined with and form a part of the flourishing tourist industry.

Within recent years, as the population of the area more than doubled, the number of people employed in the medical and legal professions, and their allied services, increased proportionately. Modern advancements in medicine to some degree account for the rapid growth of jobs that require increased technical skills.

Employment in services has gained over 50 percent in the last five years compared with an over-all increase in nonagricultural employment of about one-third in the 1955-65 period. By 2020, regional services will employ 977,700 persons as compared with 1960 employment of 135,000 persons.

Recreation and Travel

Tourism in the Lower Colorado Region is unique in that there are two quite separate and distinct industries. A winter tourist who travels to the desert south to escape from freezing cold climates is complemented by

a summer tourist who is seeking the refreshing coolness of the mountain and plateau north. For this reason there is no seasonality for the Region as a whole. Few other areas can claim such diversity. Unfortunately, each of the areas individually suffers from a slow season.

In the north, the highland climate contains one of the most popular recreational areas in the Region. Here, where the Grand Canyon, Indian tribes, and a wealth of other attractions draw tourists, seasonality is marked. Seasonal patterns are not as extreme in the south where considerable summer travel helps to balance the sun-seeking winter visitor.

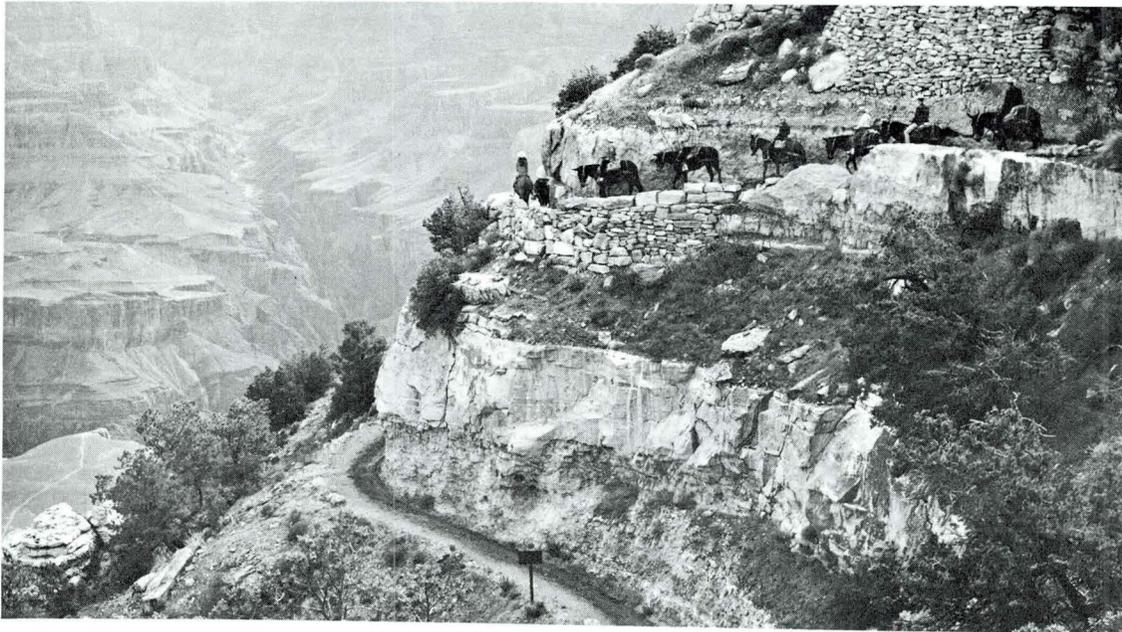


Photo 33. Spectacular scenic attractions such as the Grand Canyon beckon the tourist to the cool, high country during the summer.

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In the desert south, outdoor recreation is, to a large degree, dependent upon the presence of water. However, winter use of the desert has become popular in recent years. Popular recreation sites include almost all lakes and flowing river channels, as well as numerous dry desert areas offering a wide variety of recreation activities. There is some evidence that these seasonal patterns are tending to level out in the Region as improved transportation, better accommodations, and promotional attractions lengthen the "season".

One difficulty in analyzing this sector of the economy lies in the impossibility of determining the exact size of the industry. Such a wide variety of goods and services are provided to tourists and non-tourists alike, and even the most travel-oriented businesses also cater to local residents. However, it is estimated that about 80 percent of the expenditures made by tourists and other transients are primarily for food and drink, lodging, gasoline and automobile services, amusement and recreation; and other forms of transportation. The firms which provide these products form the core of the tourist-travel industry. Most eating and drinking places, as well as hotels, motels, and resorts would never have come into existence without the tourist.

Outdoor recreation, the pleasure-oriented segment of the tourist industry, continues to be a major industry in the Region. It provides an important source of the basic income entering the economy from outside the area. Recreational expenditures by both residents and non-residents in 1960 totaled \$335 million, or 12.3 percent of all spending in the Region. The demand for recreation is expected to increase markedly in future years. In 1965 the total demand for recreation was 138 million recreation days and is projected to total 918 million in 2020, a 565 percent increase.

Recreation expenditures by individuals from outside the sub-region have been estimated in cooperation with the Recreation Work Group for 1965 with projections for the years 1980, 2000, and 2020. These estimates, by type of expenditure, are shown for each subregion in table 2.30. A review of these tables reveals the importance of outdoor recreation as a source of basic income to the local economy. These "new dollars" shown as the direct recreation expenditure by the nonresident in the various economic sectors, generate indirect output as they are transmitted throughout the whole economy. This indirect output has been evaluated in the economic models and shown for each sector in table 2.33.

Because Americans face the prospect of more leisure time in the future, there will be a continuing demand for more travel in the Region

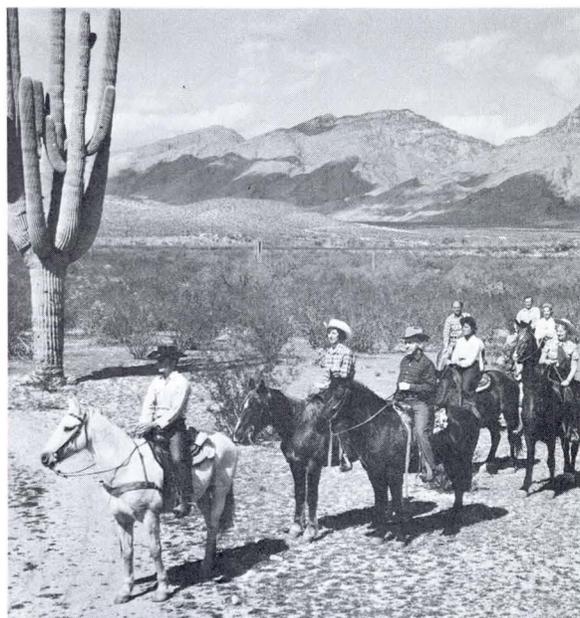


Photo 34. Dude ranches are popular to the sun-seeking winter visitors.

TABLE 2.33
NONRESIDENT OUTDOOR RECREATION EXPENDITURES AND INDIRECT OUTPUT GENERATED BY SECTOR IN 1965
AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020, LOWER COLORADO REGION BY SUBREGION

Area, sector and item	1965	OBE-ERS Projections		
		1980	2000	2020
----- Thousand 1960 dollars -----				
<u>LMS Subregion</u>				
Service stations ^{1/}				
Recreation expenditures	3,941	6,699	11,546	18,048
Indirect output generated	1,067	1,922	3,452	5,541
Eating and drinking				
Recreation expenditures	20,434	34,738	59,872	93,588
Indirect output generated	12,952	21,202	38,355	62,894
Other retail ^{1/}				
Recreation expenditures	7,239	12,307	21,211	33,157
Indirect output generated	2,172	3,818	7,030	11,328
Lodging				
Recreation expenditures	39,408	66,994	115,465	180,489
Indirect output generated	9,226	16,179	28,988	46,750
Other services				
Recreation expenditures	48,165	81,880	141,124	220,595
Indirect output generated	9,944	17,732	31,865	50,878
Total recreation expenditures	119,187	202,618	349,218	545,877
Total Indirect output generated	35,361	60,853	109,510	177,391
<u>L Colorado Subregion</u>				
Service stations ^{1/}				
Recreation expenditures	1,160	1,972	3,399	5,314
Indirect output generated	174	346	612	938
Eating and drinking				
Recreation expenditures	4,358	7,409	12,769	19,960
Indirect output generated	1,050	2,130	4,064	6,792
Other retail ^{1/}				
Recreation expenditures	631	1,072	1,847	2,888
Indirect output generated	127	272	477	702
Lodging				
Recreation expenditures	4,028	6,848	11,802	18,448
Indirect output generated	486	961	1,892	3,174
Other services				
Recreation expenditures	641	1,090	1,878	2,936
Indirect output generated	85	165	300	470
Other manufacturing				
Recreation expenditures	2,197	3,735	6,437	10,062
Indirect output generated	264	724	1,361	2,132
Total recreation expenditures	13,015	22,126	38,132	59,608
Total indirect output generated	2,186	4,598	8,706	14,208
<u>Gila Subregion</u>				
Service stations ^{1/}				
Recreation expenditures	5,823	9,899	17,062	26,670
Indirect output generated	1,885	3,761	6,918	11,442
Eating and drinking				
Recreation expenditures	51,096	86,863	149,711	234,020
Indirect output generated	24,402	51,479	92,148	144,972
Other retail ^{1/}				
Recreation expenditures	7,626	12,964	22,345	34,928
Indirect output generated	1,870	4,437	7,985	12,832
Lodging				
Recreation expenditures	29,307	49,822	85,869	134,226
Indirect output generated	10,995	21,961	40,418	66,871
Other services				
Recreation expenditures	25,932	44,084	75,981	118,768
Indirect output generated	6,937	14,346	26,703	44,945
Total recreation expenditures	119,784	203,632	350,968	548,612
Total indirect output generated	46,089	95,984	174,172	281,062

^{1/} Consistent with the input-output approach, entries in "recreation expenditures" row for all years were adjusted from Recreation Work Group data to reflect gross margins only (operating costs and net revenues).

with a resulting increase in demand for accommodations, services, amusements, and other tourist-oriented businesses. In fact, because national and local trends for income, population, and levels of education and skill are moving steadily upward, there is much evidence that the Region's recreational resources will need to be continually expanded to accommodate the increased demand.

Transportation, Utilities, and Communication

The Southern Pacific and Santa Fe mainline tracks traverse the Region providing both passenger and freight service to the rest of the Nation. In 1965, total carloads of railroad freight originating within the Region had an estimated value of \$104 million.

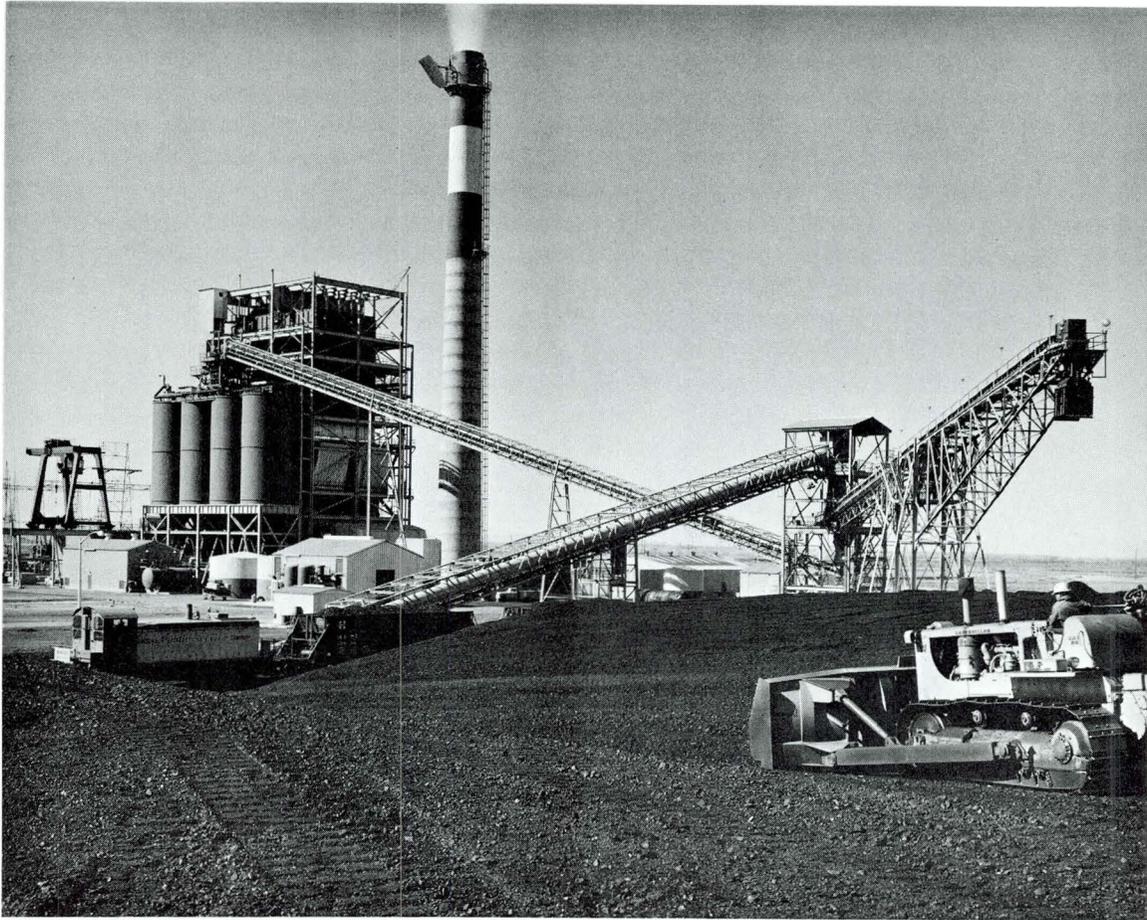
Major airlines, including Western, TWA, Continental, Delta, United, and American, serve Phoenix, Tucson and Las Vegas. Frontier, Air West, Valley, and Apache also serve other communities in the Region. In 1965 the total number of passengers (arriving and departing) in Phoenix, Tucson, and Las Vegas combined, exceeded 4 million. Air transportation throughout the Lower Colorado Region was valued at \$94.6 million in 1965.

In addition, air cargo has increased rapidly. During the period 1951-1962, air cargo tonnage for Phoenix and Tucson increased 189 percent. Air freight promises to become increasingly important to the economy of the Region because it offers a rapid means of transport for high value, low weight products to distant buyers.

The trucking industry has also contributed much to the Region's economic growth. In 1965 the freight carriers in Arizona provided a revenue of \$138.7 million. Trucks provide fast, flexible, and efficient means of moving goods both within the Region and throughout the Nation. Overnight and second morning service links the Region's retailers, wholesalers, and manufacturers with markets throughout the southwest, including such major markets as Los Angeles, San Diego, San Francisco, Las Vegas, Salt Lake City, Denver, Wichita, Tulsa, Oklahoma City, Fort Worth, Dallas, San Antonio and Albuquerque.

Highway transportation throughout the Region is excellent. Major highways including Interstates 40, 8, 10 and 17 service both public and private travel interests. In 1965, in the State of Arizona, there were 5,278 miles of highway, and vehicle miles traveled by local and foreign passenger cars and commercial vehicles totaled more than 12.6 million.

Low cost electricity and natural gas are readily available in the Region. Commercial radio and television broadcasting stations have expanded at a fairly rapid rate in the Region. Data for the entire Region are not available. However, in 1950, Arizona had 27 commercial radio broadcasting stations and 1 commercial television station. As of 1962,



Arizona Public Service
Photo 35. Placed in service in 1962, this \$21 million coal-fired power plant has a capacity of 115,000 kilowatts and consumes 1,200 tons of coal per day.

this number had increased to 62 commercial radio broadcasting stations-- a 130 percent increase--and 9 commercial television stations. Comparatively, the number of commercial radio stations in the United States increased from 3,117 in 1950 to 4,535 in 1962--a 45 percent increase.

Although there are a number of telephone companies operating in the Region, the Mountain Bell Telephone Company is the largest, owning all the long-distance lines in the Region. Mountain Bell has improved its equipment, and in recent years installed a microwave system which incorporates one-half of all its long-distance circuits.

The high degree of industrial specialization in our country depends on efficient transportation lines, availability of sufficient utilities,

and adequate communication facilities. This sector of the economy serves an especially vital role in the Lower Colorado Region because of the great distances to and from the major population centers of the Nation. However, because of automation and other technological factors, it is very difficult to estimate the number of employees for future years in these particular industries. We do know that the process of decreasing the ratio of employees to the quantity of service provided will continue to create displacement of employees.

Contract Construction

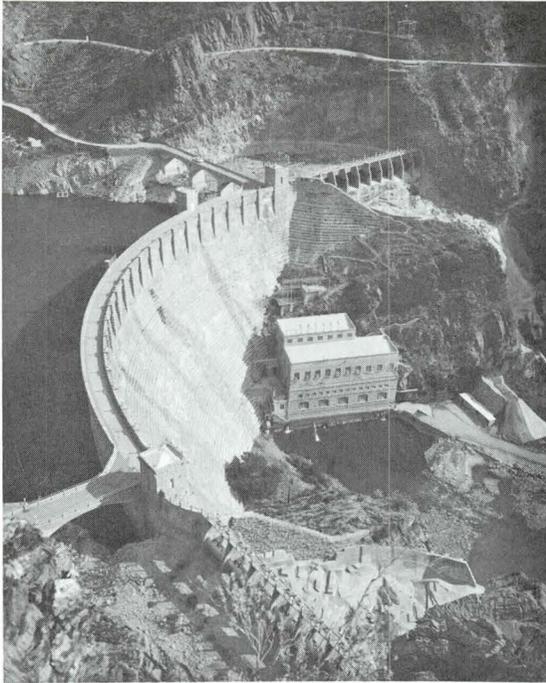
For many years the construction industry has occupied an important economic position in the Lower Colorado Region. Throughout history, massive construction projects have been initiated to overcome the natural disadvantages of heat, drought, distance, and terrain. Today, Arizona boasts per capita investment in railways, highways, electric power transmission lines, dams, irrigation canals, and deep wells.

The second World War marked the beginning of significant military construction within the Lower Region. The climate and topography of the Region have also facilitated the building of large military installations which have helped to foster growth within the construction industry. Defense manufacturing plants that accompanied these military installations did their part to boost the construction industry in the Region. Even today, the military continues to employ large numbers of construction workers in the state as installations are built, maintained, and enlarged.

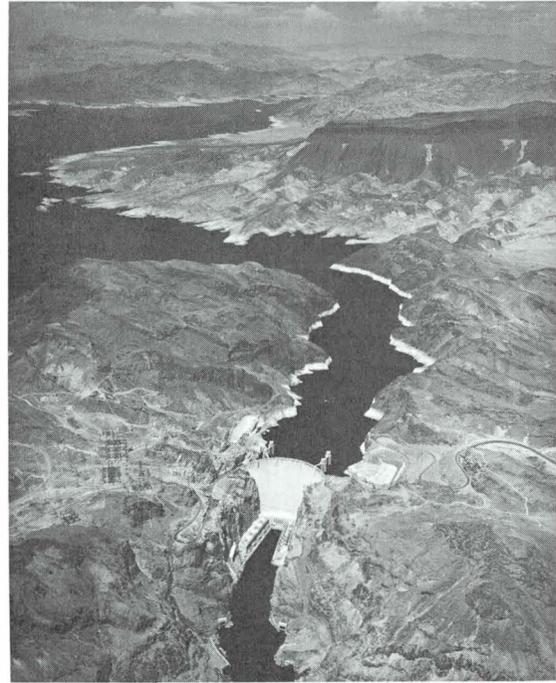
The State and Federal Government was the second largest customer of the construction industry, surpassed only by domestic investment. In 1960 the two levels of government accounted for over 27 percent of final demand purchases in the Lower Colorado Region.

Another factor that has helped to mold the construction industry in the Region is the huge population boom in the major metropolitan areas. A new dimension, that of mass produced housing, has given employment to thousands in the building trades and complemented an industry which had tended toward heavy engineering. Toward the end of the 1950-1960 decade over 20,000 free-standing homes were being completed each year in Maricopa and Pima Counties. In 1965 employment in contract construction accounted for over 8 percent of the labor force of the two counties combined. In the Phoenix area alone, over 150 square miles of desert and agricultural land have been replaced by residential tracts.

Since 1904, when construction of the Theodore Roosevelt Dam was authorized, large public works have constituted an important part of the Region's construction industry. This first significant United States reclamation project was followed by a series of other dams on the Salt, Gila, Verde, and Colorado Rivers. The building and maintenance of roads also constitutes an important segment of total employment in construction.



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Photo 36. Roosevelt Dam

Photo 37. Hoover Dam

Control of the Salt River flows by completion of Roosevelt Dam in 1911 was the stimulus which ignited the economic growth in the Region. Construction of Hoover Dam (1935) has made possible the continued economic expansion.

The interstate and local highway programs, anticipated construction of the Central Arizona Project, development of a regional air transportation facility, and other public construction indicates that a high level of expenditure will continue throughout the foreseeable future. However, the relative growth of the construction industry is projected to be somewhat slower than that for the economy as a whole. For example, employment in the year 2020 is estimated to be 182,300 as compared to the 1960 employment of 49,000. This represents a 272 percent increase in the contract construction industry; whereas, the services industry is estimated to increase its employment by 624 percent over the same period.

Finance, Insurance, and Real Estate

Lower Colorado Region financial, insurance and real estate services have experienced a substantial rate of growth over the past decade. The banking industry especially reveals a dynamic pattern of growth. Because Arizona law permits state-wide branch banking, several large banks have developed. In the late 1950's the number of banks within the state was

reduced to only eight, partly because of mergers. Since that time, competitive factors have encouraged the establishment of new banks and, as of 1965, the number had doubled to sixteen banks operating in the state.

Commercial banks have traditionally participated actively in the economic development of the Region. This is reflected in the high ratio of loans to deposits; in 1965, for all Arizona banks, the volume of loans was 69 percent of deposits. By 1960, insurance benefit payments had risen significantly and the disbursements for surrenders, dividends, deaths, endowments, etc., amounted to \$41 million. Today, insurance companies provide the greatest single source of mortgage funds in the Region. Real estate is an important business in the Region. Privately owned land, although comprising only about 35 percent of the total land area, encompasses an area larger than New Jersey and Connecticut combined. Included in this privately owned area is probably some of the most productive and most valuable irrigated land in America.

Future activities in this sector of the economy will increase primarily as a result of continuing in-migration and unprecedented building activity in the rapidly expanding urban areas. It appears that the public contract portions of the industry will witness the most rapid growth as increases due to the expanding population result in greater demand for these types of services. Future employment is estimated to approach 156,000 persons in the year 2020, as compared with 1960 employment of only 24,600 persons.

Government

Government, including Federal, State and local, has made a major contribution to economic development in the Lower Colorado Region. Large remote areas, characteristic of much of the Region, have been used by the military for training and testing purposes. The need for water and power has required large reclamation projects, and in recent decades the discovery of large deposits of uranium for which the Federal Government was the only market^{1/}, together with normal government activities induced large government expenditures in the Region.

The Region has also contributed substantial government revenue. In 1965, total government revenues were greater than total government expenditures in the Lower Main Stem and Gila Subregions, since the economies of these two subregions were relatively well developed. In the Little

^{1/} Public Law 88-489, signed August 26, 1964, amended the Atomic Energy Act of 1954 and provided for a transition from government to private ownership of nuclear materials.

Colorado Subregion, however, government expenditures were about 5 times government revenues, mainly as a result of government purchases of uranium.

Government revenues are projected to increase at an annual compound rate of about 6.2 percent in the Lower Main Stem, 5 percent in the Gila, and 4.8 percent in the Little Colorado Subregion between 1965 and 2020. The larger rate of increase in the Lower Main Stem Subregion is due primarily to a higher projected population growth rate than in the other two subregions.

The projected annual compound growth rates of government expenditures are about the same as projected revenue rates in the Lower Main Stem and Gila Subregions. The projected growth rate for government expenditures in the Little Colorado Subregion is 3.8 percent. The lower rate in the Little Colorado Subregion assumes that private industry will buy a substantial part of the uranium in the latter part of the projection period.

The Government sector accounted for 10 percent of total employment in the Region in 1965. Projections indicate that the proportion will drop slightly by 2020. The military is held at a constant figure roughly 5 percent below the 1965 level from 1980 to 2020. Thus, the projected increase in employment is in civilian governments--national, state and local.

MODIFIED OBE - ERS PROJECTIONS

CHAPTER III - MODIFIED OBE-ERS PROJECTIONS

The modified OBE-ERS projections reflect increases in the OBE-ERS projections of population and irrigated acreage made by the Basin States, increases in OBE-ERS projections of uranium production and "all other mining" output provided by the Mineral Resources Work Group, an increase in electric power projections to reflect projections by the Electric Power Work Group, and some increases and decreases made in the projections by the Economics Work Group, together with modifications in other projections emanating from these changes. Population projections were raised in Nevada, New Mexico, and Utah to more adequately reflect a) historical trends in the Nevada portion of the Region, its potential for expansion in the tourist industry and related commercial development, and the increasing population movement from the Southern California area; b) economic advances by Indians, anticipated developments in mining, probable gains in employment associated with the developing interstate highway system, and anticipated expansion of recreational activities; and c) growth of the Utah portion of the Region as a retirement area, and as a summer home and vacation area. No change was made in population by Arizona.

The irrigated acreage projections were raised by all four States. The States felt the OBE-ERS projections did not adequately reflect projected irrigation development of Indian lands and probable development of ground water basins in the Region. In addition, New Mexico anticipated further irrigation development from provisions of P. L. 90-537 which authorized the Colorado River Basin Project. Utah projected an increase in irrigated acreage on the Dixie Project.

Modifications by the Economics Work Group pertained primarily to vegetables, citrus, noncitrus fruit and nuts (pecans), cotton, red meat, and milk. The projected acreages of vegetables, citrus, and noncitrus fruit and nuts were increased to more adequately reflect recent and anticipated trends. OBE-ERS projections for cotton in 1980 and 2000 were reduced to eliminate the sharp increase projected from 1965 to 1980, making the increase more gradual over the projection time frame. OBE-ERS projections of red meat production were reduced throughout the projection time frame since the projections exceeded the historical trend and the level of production considered feasible in the judgement of informed individuals in the Region. Projections of milk production were increased in accordance with historical trends of production in the Region. These modifications of livestock product projections, in turn, caused some modification in the projected acreage of roughages.

The modified OBE-ERS projections are presented in a similar manner to the OBE-ERS projections. However, less detail is included. A major objective was to further portray the relationship of the modified OBE-ERS projections to the OBE-ERS projections and the manifold effect of the modifications on the economy and the people.

POPULATION

Modified OBE-ERS population projections for the Lower Colorado Region, by subregion and state, and their relationship to the OBE-ERS projections are given in table 3.1. The modified OBE-ERS projections reflect a regional annual growth rate of 3.0 percent to 1980, 2.7 percent

TABLE 3.1
POPULATION FOR 1965
MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020
AND THEIR RELATIONSHIPS TO OBE-ERS PROJECTIONS
LOWER COLORADO REGION

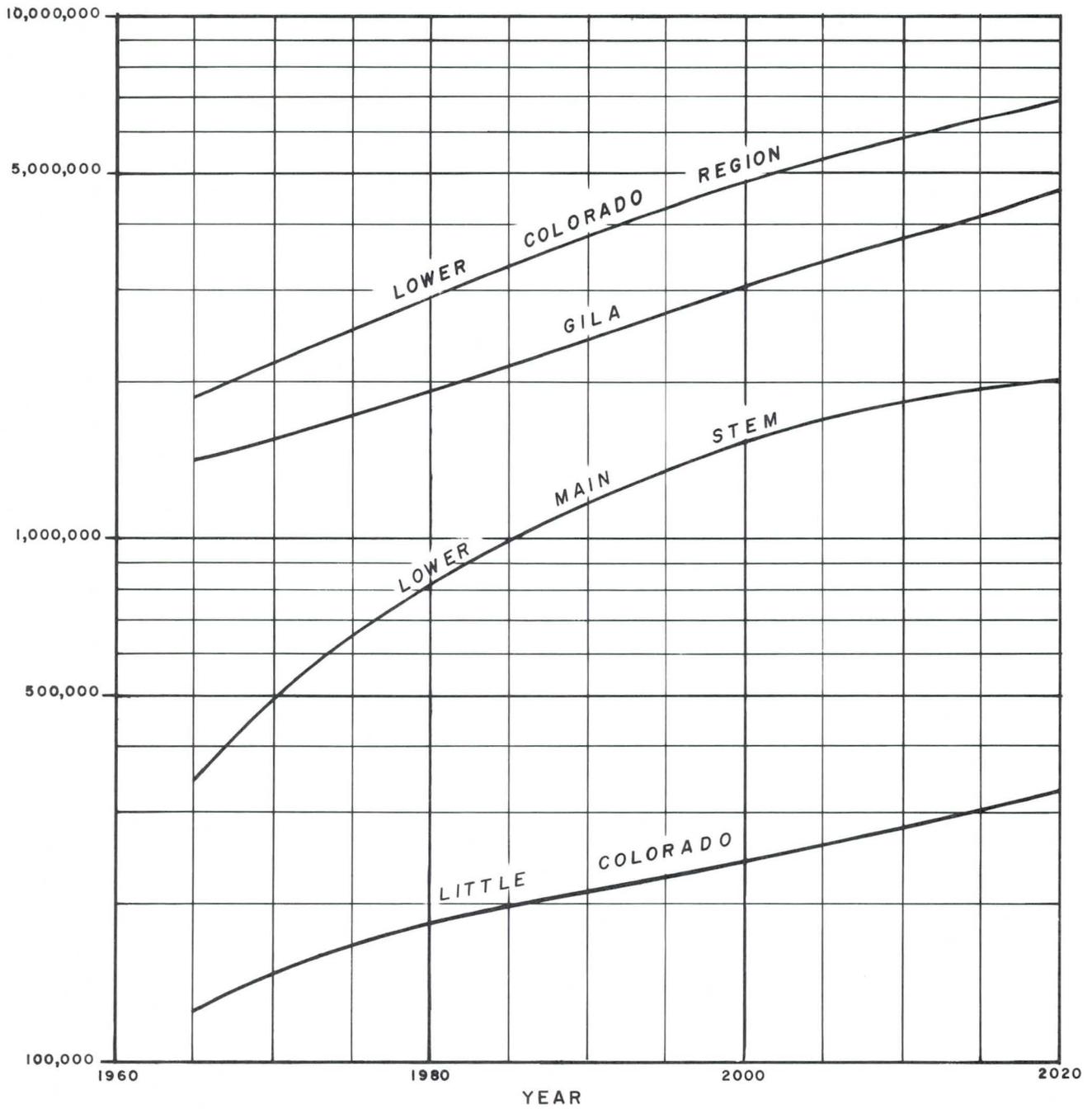
Area	1965	Modified			Modified OBE-ERS as		
		OBE-ERS Projections			Percent of OBE-ERS		
		1980	2000	2020	1980	2000	2020
		1,000			Percent		
Lower Colorado Region	1,877.0	2,910.6	4,796.7	6,983.1	110.1	112.5	105.2
LMS Subregion	345.2	815.6	1,519.7	2,020.5	146.6	148.5	115.1
Arizona ^{1/}	120.7	147.1	197.7	290.5	100.0	100.0	100.0
Nevada	213.9	653.5	1,305.0	1,708.0	164.4	160.6	117.7
Utah	10.6	15.0	17.0	22.0	129.3	132.8	157.1
L Colo Subregion	125.0	183.5	240.4	326.4	101.9	109.5	124.7
Arizona ^{1/}	85.5	124.8	152.2	181.4	100.0	100.0	100.0
New Mexico	39.5	58.7	88.2	145.0	106.3	130.9	180.6
Gila Subregion	1,406.8	1,911.5	3,036.6	4,636.2	100.2	100.5	100.3
Arizona ^{1/}	1,379.4	1,870.8	2,970.7	4,531.4	100.0	100.0	100.0
New Mexico	27.4	40.7	65.9	104.8	109.7	132.6	116.3
Arizona total ^{1/}	1,585.6	2,142.7	3,320.6	5,003.3	100.0	100.0	100.0
Nevada total	213.9	653.5	1,305.0	1,708.0	164.4	160.6	117.7
New Mexico total	66.9	99.4	154.1	249.8	107.7	131.6	146.6
Utah total	10.6	15.0	17.0	22.0	129.3	132.8	157.1

^{1/} Same as OBE-ERS projections.

to 2000, and 2.4 percent to 2020 compared with the OBE-ERS projected regional annual growth rate of about 2.3 percent and the projected annual growth rate for the Nation of 1.3 percent.

FIGURE 3.1

LOWER COLORADO REGION
POPULATION FOR 1965 AND MODIFIED
OBE-ERS POPULATION PROJECTIONS
TO 1980, 2000 AND 2020.



The modified OBE-ERS projections for Arizona are the same as the OBE-ERS projections while those for each of the other three states are higher than the OBE-ERS projections. The greatest increase was in Nevada, particularly in the projections for 1980 and 2000. With the modified OBE-ERS projections the 1965 population of the Nevada portion of the Region will increase three times by 1980, six times by 2000, and eight times by 2020. The modified OBE-ERS projected increases for the other states were more gradual over time, the increase by 2020 being 273 percent for the New Mexico counties and 108 percent for Washington County, Utah. The corresponding increase for Arizona was 215 percent.

EMPLOYMENT

Modified OBE-ERS projections of employment for the Lower Colorado Region and each of the three subregions, together with related participation rates and the relationship of modified OBE-ERS projected employment are given in table 3.2. The modified OBE-ERS employment projections are substantially higher than the OBE-ERS projections in the Lower Main Stem and Little Colorado Subregions. In the Lower Main Stem Subregion the increase is 51 percent in 1980, 52 percent in 2000, and 18 percent in 2020. Corresponding percentage increases for the Little Colorado Subregion are 10, 13, and 32. The increases stem primarily from the increase in modified OBE-ERS population projections compared with the OBE-ERS projections. However, a small part of the increase stemmed from a relatively larger increase in business activity, compared with population, in the modified OBE-ERS projections compared with the OBE-ERS projections. As a result the modified OBE-ERS projected participation rates are a little higher than the OBE-ERS rates.

As is implied by the higher employment projections, the rate of increase in employment is substantially sharper in the Lower Main Stem and Little Colorado Subregions with the modified OBE-ERS than with the OBE-ERS projections. With the modified OBE-ERS projections, 2020 employment is nearly 6.5 times 1965 employment in the Lower Main Stem Subregion and over 3.5 times 1965 employment in the Little Colorado Subregion. In the Gila Subregion, the modified OBE-ERS projected employment is only slightly higher than the OBE-ERS projections, the 2020 modified OBE-ERS projection being 3.7 times the 1965 level.

Modified OBE-ERS employment projections by industry are given in table 3.3. Employment coefficients (employment per dollar of total output) developed for use in the OBE-ERS analyses also were used with the modified OBE-ERS projections. Hence, the OBE-ERS and modified OBE-ERS projections are directly comparable. Major increases in the modified OBE-ERS projections compared with the OBE-ERS projections in the Lower Main Stem Subregion occurred in agriculture, mining, manufacturing, trade, services, utilities and other industries. Significant increases occurred in the Gila Subregion in agriculture, transportation and utilities.

TABLE 3.2
 EMPLOYMENT AND THE PARTICIPATION RATE IN 1965,
 MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020 AND RELATIONSHIP
 OF THE EMPLOYMENT PROJECTIONS TO OBE-ERS PROJECTIONS, LOWER COLORADO REGION

Area	Estimated	Modified OBE-ERS Projections		
	1965	1980	2000	2020
	----- Employment ^{1/} 1,000 -----			
<u>Region</u>	675.7	1,138.3	1,934.5	2,833.5
LMS Subregion	134.8	337.7	639.6	859.2
L Colo Subregion	33.7	60.5	85.3	119.8
Gila Subregion	507.2	740.1	1,209.6	1,854.5
	----- Participation Rate ^{2/} -----			
<u>Region</u>	.360	.391	.403	.406
LMS Subregion	.3905	.414	.421	.423
L Colo Subregion	.270	.329	.355	.367
Gila Subregion	.3605	.387	.398	.400
	----- Modified OBE-ERS employmt as pct of OBE-ERS employmt -----			
<u>Region</u>		111.9	115.2	107.2
LMS Subregion		150.7	151.9	118.2
L Colo Subregion		110.1	113.2	131.5
Gila Subregion		100.3	102.3	101.7

^{1/} Total employment, including the armed forces.

^{2/} Participation rates for 1965 are the same as in the corresponding table for the OBE-ERS projections. Projected participation rates were calculated by dividing employment by population.

PERSONAL INCOME

The same subregional personal income per capita was used for the modified OBE-ERS projections as was projected for the OBE-ERS level of development. Hence, total personal income in each of the subregions increased in direct proportion to population. Since a larger proportion of the population was in the Lower Main Stem Subregion with the modified OBE-ERS than with the OBE-ERS projections, personal income per capita in the Region as a whole averaged slightly higher with the modified OBE-ERS than with the OBE-ERS projections.

TABLE 3.3
 EMPLOYMENT BY INDUSTRY FOR 1965, AND MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020
 AND THEIR RELATIONSHIP TO OBE-ERS PROJECTIONS, LOWER COLORADO REGION

Area and Industry	Esti- mated 1965	Modified			Mod OBE-ERS Projectns		
		OBE-ERS Projections			as Pct of OBE-ERS Projectns		
		1980	2000	2020	1980	2000	2020
		1,000			Percent		
<u>Region</u>							
Agriculture ^{1/}	39.20	38.45	43.05	43.16	99.9	113.7	121.1
Forestry ^{2/}	.91	.99	.90	.78	100.0	100.0	100.0
Mining	17.90	19.06	18.09	17.05	114.8	110.3	105.2
Manufacturing	90.87	172.12	304.52	477.95	105.5	107.0	104.0
Trade	125.90	229.54	381.33	503.26	118.8	126.2	110.2
Services	178.20	353.65	673.60	1,043.58	116.0	117.0	106.7
Transportation	21.50	36.19	56.88	66.02	115.2	129.3	115.8
Contract construction	56.60	80.21	121.62	183.53	101.1	100.6	100.7
Rentals	32.10	56.80	95.61	156.83	103.5	101.7	100.6
Utilities	20.40	35.86	58.65	82.74	121.6	133.3	145.4
Other ^{3/}	92.12	115.37	180.22	258.60	111.0	114.0	106.0
Total	675.70	1,138.24	1,934.47	2,833.50	111.9	115.2	107.2
<u>LMS Subregion</u>							
Agriculture ^{1/}	9.25	9.04	11.34	11.70	96.2	113.5	121.4
Forestry ^{2/}	.33	.37	.36	.32	100.0	100.0	100.0
Mining	.90	1.29	.94	.85	184.3	156.7	141.7
Manufacturing	9.00	25.19	46.31	62.86	136.9	147.0	123.7
Trade	24.40	79.65	150.52	169.56	181.4	200.2	131.0
Services	47.60	138.09	283.93	399.45	153.4	149.8	116.3
Transportation	4.50	11.29	15.49	17.56	173.7	147.5	114.0
Contract construction	11.80	18.61	31.20	51.52	105.1	100.0	99.8
Rentals	4.50	11.11	21.93	40.60	118.2	104.9	99.8
Utilities	3.90	10.36	16.89	22.41	172.7	149.5	148.4
Other ^{3/}	18.62	32.66	60.71	82.50	155.4	152.1	117.6
Total	134.80	337.66	639.62	859.23	150.7	151.9	118.2
<u>L Colorado Subregion</u>							
Agriculture ^{1/}	3.18	2.69	2.54	2.29	102.7	104.5	109.0
Forestry ^{2/}	.46	.41	.32	.26	100.0	100.0	100.0
Mining	.80	2.47	2.05	1.20	352.9	292.9	200.0
Manufacturing	5.67	12.55	15.89	23.14	115.9	110.3	134.1
Trade	6.30	11.70	17.60	24.62	103.5	114.3	133.8
Services	7.90	13.30	20.30	31.40	101.5	108.0	134.2
Transportation	2.90	4.40	6.50	8.10	100.0	108.3	112.5
Contract construction	3.40	5.10	6.30	7.90	100.0	105.0	111.3
Rentals	.60	1.50	2.90	4.20	107.1	107.4	127.3
Utilities	1.30	3.29	4.51	7.06	143.0	150.3	196.1
Other ^{3/}	1.24	3.05	6.36	9.59	111.3	114.2	122.2
Total	33.75	60.46	85.27	119.76	110.1	113.2	131.5
<u>Gila Subregion</u>							
Agriculture ^{1/}	26.77	26.72	29.17	29.17	100.9	114.7	122.1
Forestry ^{2/}	.12	.21	.22	.20	100.0	100.0	100.0
Mining	16.20	15.30	15.10	15.00	100.7	100.0	100.0
Manufacturing	76.20	134.38	242.32	391.95	100.1	101.5	100.1
Trade	95.20	138.19	213.21	309.08	100.1	100.8	100.1
Services	122.70	202.26	369.37	612.83	100.2	100.5	100.3
Transportation	14.10	20.50	34.89	40.36	100.0	126.9	117.3
Contract construction	41.40	56.50	84.12	124.11	100.0	100.5	100.4
Rentals	27.00	44.19	70.78	112.03	100.2	100.5	100.1
Utilities	15.20	22.21	37.25	53.27	104.8	125.4	139.5
Other ^{3/}	72.26	79.66	113.15	166.51	100.1	100.5	100.3
Total	507.15	740.12	1,209.58	1,854.51	100.3	102.3	101.7

^{1/} Includes agricultural service businesses.

^{2/} Includes only employees involved in timber harvesting.

^{3/} Government (including armed forces), professional services, domestic, and miscellaneous employment.

ECONOMIC ACTIVITY

Output of the five major industries or activities in the Region for the modified OBE-ERS projections, together with related value added and import projections, are shown in table 3.4. Reflecting the higher population and employment projections, the modified OBE-ERS projections are higher in most instances than the OBE-ERS projections. This is true particularly for the Lower Main Stem and Little Colorado Subregions where the modified OBE-ERS population projections were substantially higher than the OBE-ERS projections.

In the Lower Main Stem Subregion, modified OBE-ERS total gross output of the five producing industries was projected about 50 percent above the OBE-ERS projections in 1980 and 2000, and about 25 percent above in 2020. Practically all of the projected increase is in the mining, manufacturing, and noncommodity producing industries. Agricultural output is projected to be only slightly higher than OBE-ERS projected output and forest output was projected at the same level as OBE-ERS. Value added was projected to increase nearly 50 percent in 1980 and 2000, but only 16 percent in 2020 compared with the OBE-ERS projections. Imports were projected independently for the subregion, using base year relationships as a guide. Imports at the modified OBE-ERS level were approximately 60 percent above the OBE-ERS level by the year 2000 but declined to about 35 percent above in 2020.

Due principally to a sixfold increase in mining the Little Colorado Subregion, modified OBE-ERS projected output of the five producing industries as a group, is more than double the OBE-ERS level in 1980. However, the increase drops to about 85 percent in 2000 and 2020. Value added was projected to be about 24 percent above the OBE-ERS level in 1980 and 2000, and about 28 percent above in 2020. Imports were projected to be more than double the OBE-ERS level in 1980, but only 9 percent above by 2020.

The modified OBE-ERS projections of output for the five producing industries and of value added in the Gila Subregion are only slightly higher than the OBE-ERS projections since the modified OBE-ERS population projections were very little higher than the OBE-ERS projections. Output of the five producing industries was projected to be about 7 percent above the OBE-ERS level in 2020, while value added is projected to be less than 1 percent above the OBE-ERS level. Imports were projected at about the same level as for the OBE-ERS projections.

Estimates of gross regional product (GRP) by subregion for the modified OBE-ERS projections are given in table 3.5. As a result of higher population projections and the effects of increased agricultural output throughout the period, the Lower Main Stem and Little Colorado Subregions show a substantial increase in gross subregional product above the OBE-ERS projection level discussed earlier in this report.

TABLE 3.4
TOTAL GROSS OUTPUT BY INDUSTRY AND ASSOCIATED TOTAL PRIMARY INPUTS
FOR 1965 AND MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020,
AND THEIR RELATIONSHIP TO OBE-ERS PROJECTIONS

Subregion and Item	Esti- mated 1965	:	Modified OBE-ERS Projections			:Mod OBE-ERS as Pct : of OBE-ERS Proj.							
	1965	:	1980	:	2000	:	2020	:	1980	:	2000	:	2020
	:----- Million 1960 dollars -----						----- Percent -----						
<u>LMS Subregion</u>													
Producing industries	:												
Agriculture	:	123.3	196.9	269.9	365.8	106.3	105.8	110.9					
Forestry	:	5.2	7.7	9.4	9.5	100.0	100.0	100.0					
Mining	:	32.1	126.3	153.2	189.0	212.3	174.3	159.1					
Manufacturing	:	197.1	766.3	2,168.4	4,557.4	131.1	141.8	124.2					
Noncommodity producing industries	:	1,220.5	4,586.6	13,634.3	28,931.7	152.8	155.0	125.7					
Total	:	1,578.2	5,683.8	16,235.2	34,053.4	148.1	152.0	125.4					
Value added	:	1,280.2	5,298.5	16,464.6	35,233.8	147.3	149.2	116.4					
Imports	:	776.4	2,673.6	7,791.6	17,071.6	146.6	160.7	134.4					
<u>L Colorado Subregion</u>													
Producing industries	:												
Agriculture	:	14.7	17.6	23.6	30.1	102.9	106.3	110.7					
Forestry	:	7.3	7.4	7.4	6.8	100.0	100.0	100.0					
Mining	:	112.2	967.5	897.7	852.8	602.0	489.5	615.7					
Manufacturing	:	72.0	183.1	325.2	629.4	116.6	109.9	129.9					
Noncommodity producing industries	:	138.4	284.5	654.1	1,375.1	106.1	122.2	151.2					
Total	:	344.7	1,460.1	1,908.0	2,894.2	239.2	182.7	184.8					
Value added	:	224.1	867.7	2,042.2	4,834.9	123.4	123.4	128.2					
Imports	:	205.5	855.0	1,129.7	1,663.8	210.4	142.9	109.1					
<u>Gila Subregion</u>													
Producing industries	:												
Agriculture	:	458.4	726.0	991.5	1,289.9	88.6	97.0	101.6					
Forestry	:	2.1	4.3	6.0	6.4	100.0	100.0	100.0					
Mining	:	458.5	652.0	953.0	1,268.0	100.0	100.0	100.0					
Manufacturing	:	1,759.1	4,335.2	11,486.7	27,908.2	100.1	101.0	100.2					
Noncommodity producing industries	:	2,977.7	6,442.5	16,773.8	39,501.8	101.5	109.6	113.2					
Total	:	5,655.8	12,160.0	30,211.0	69,974.3	100.1	105.4	107.2					
Value added	:	4,524.4	10,342.9	28,706.2	73,491.8	100.2	101.0	100.9					
Imports	:	2,257.8	4,364.0	11,027.9	27,055.8	100.0	100.9	99.3					

TABLE 3.5
GROSS REGIONAL PRODUCT BY SUBREGION, LOWER COLORADO REGION, 1965
WITH MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020

Subregion and Item	1965	: Modified OBE-ERS Projections		
		: 1980	: 2000	: 2020
		----- Million 1960 dollars -----		
<u>Lower Main Stem</u>				
Consumptive expenditures	811.0	3,320.3	10,456.7	23,176.3
Government expenditures	269.3	1,170.0	3,602.4	7,511.8
Gross investment expenditures	290.6	839.9	2,401.3	4,512.1
Net exports or (imports) of goods and services	<u>(90.7)</u> ^{1/}	<u>(31.7)</u>	<u>4.2</u>	<u>33.6</u>
Gross subregional product	1,280.2	5,298.5	16,464.6	35,233.8
<u>Little Colorado</u>				
Consumptive expenditures	127.8	476.7	1,209.1	3,215.4
Government expenditures	127.5	357.6	692.4	1,202.0
Gross investment expenditures	51.3	172.2	298.4	573.3
Net exports or (imports) of goods and services	<u>(82.5)</u>	<u>(138.8)</u>	<u>(157.7)</u>	<u>(155.8)</u>
Gross subregional product	224.1	867.7	2,042.2	4,834.9
<u>Gila</u>				
Consumptive expenditures	2,753.6	6,552.5	19,096.8	50,107.6
Government expenditures	959.6	1,960.6	5,364.0	13,530.3
Gross investment expenditures	822.5	1,817.5	4,178.9	9,780.9
Net exports or (imports) of goods and services	<u>(11.3)</u>	<u>12.3</u>	<u>66.5</u>	<u>73.0</u>
Gross subregional product	4,524.4	10,342.9	28,706.2	73,491.8
<u>Lower Colorado Region</u>				
Gross regional product	6,028.7	16,509.1	47,213.0	113,560.5

^{1/} Imports.

The increase above OBE-ERS projections in the Lower Main Stem Subregion, for example, is approximately 50 percent in 1980 and 2000, declining to about 16 percent above in 2020. Similar data for the Little Colorado Subregion are approximately 23 percent above in 1980 and 2000, gross subregional product increasing to about 28 percent above by 2020. Estimated growth in gross subregional product for the modified OBE-ERS projections, or course, is associated with independent population projections and indreased agricultural output which accounts for the varying growth rates discussed above.

Estimates of gross subregional product for modified OBE-ERS projections in the Gila Subregion are only slightly above the OBE-ERS level due to small differences in the independent population projections. In fact, the increase is 1 percent or less in all target years.

Agriculture

Value Added and Total Gross Output

Modified OBE-ERS projections of value added and total gross output of agriculture are given in table 3.6. Corresponding figures for 1965 also are shown for comparison. In computing the value added and total gross output figures, commodity prices were held constant at the base period level (1960) throughout the projection time frame, the same as with the OBE-ERS projections. Hence, the modified OBE-ERS projected value and output figures are comparable with the base period and also with the OBE-ERS projections. Moreover, changes in the dollar output figures reflect changes in quantities of products produced.

The modified OBE-ERS projected TGO exceeded the OBE-ERS TGO in the Lower Main Stem and Little Colorado Subregions, throughout the projection time frame, the 2020 milified OBE-ERS agricultural output being 11 percent greater than the OBE-ERS output in each Subregion. In contrast, the Gila Subregion modified OBE-ERS dollar output is lower than the OBE-ERS output in 1980 and 2000, and only 1.5 percent above in 2020. The relationships are similar for value added. The modified OBE-ERS value added for 2020 is 10 percent above the OBE-ERS level in the Lower Main Stem Subregion, and 8 percent above in the Little Colorado Subregion. However, in the Gila Subregion value added with the modified OBE-ERS projections is lower than with the OBE-ERS projections in 1980 and 2000, but 3 percent higher in 2020.

Changes in the modified OBE-ERS projected agricultural output compared with the OBE-ERS projections are the result of some sectors being increased and others being decreased. Major increases were made in the modified OBE-ERS projections in the vegetable, citrus, dairy, and all other agricultural sectors. A modest increase was made in the forage, feed and food sector in 1980. The only major reduction made was in the feeder livestock sector. A substantial reduction was made in the cotton

TABLE 3.6
 VALUE ADDED AND TOTAL GROSS OUTPUT FROM AGRICULTURAL SECTORS IN THE THREE SUBREGIONS
 OF THE LOWER COLORADO REGION IN 1965 AND MODIFIED OBE-ERS PROJECTIONS
 FOR 1980, 2000 AND 2020

Subregion and Sector	1965		Modified OBE-ERS Projections					
	VA	TGO	1980		2000		2020	
	VA	TGO	VA	TGO	VA	TGO	VA	TGO
----- Million 1960 dollars -----								
<u>LMS Subregion</u>								
Range livestock ^{1/}	10.1	17.6	10.1	18.0	10.7	19.3	11.4	20.7
Feeder livestock	1.7	14.5	3.6	27.2	5.7	41.9	8.5	60.7
Dairy	1.5	4.0	2.2	5.9	3.7	10.5	5.6	16.0
Forage feed & food crops	9.2	14.8	12.1	20.5	12.0	21.2	12.6	23.0
Cotton	10.4	15.4	18.7	28.7	26.1	40.8	32.7	51.7
Vegetables	5.0	27.9	8.4	48.4	10.0	63.5	12.3	86.8
Citrus	5.6	21.4	7.8	34.6	10.2	48.8	13.1	67.4
All other agriculture	3.6	7.7	6.1	13.6	10.4	23.9	16.6	39.5
Total ^{2/}	47.1	123.3	69.0	196.9	88.8	269.9	112.8	365.8
<u>L Colorado Subregion</u>								
Range livestock ^{1/}	7.1	12.2	8.0	14.2	10.1	18.7	12.5	23.2
Feeder livestock	0.08	0.3	0.06	0.3	0.05	0.2	0.04	0.2
Dairy	0.09	0.2	0.06	0.2	0.1	0.4	0.1	0.6
Forage feed & food crops	0.8	1.3	1.0	1.8	1.1	2.1	1.3	2.5
All other agriculture	0.3	0.7	0.5	1.2	1.0	2.2	1.3	3.6
Total ^{2/}	8.37	14.7	9.62	17.7	12.35	23.6	15.24	30.1
<u>Gila Subregion</u>								
Range livestock ^{1/}	29.9	57.3	29.7	58.7	31.0	61.5	32.3	64.3
Feeder livestock	16.3	118.4	87.1	271.5	122.4	362.1	167.1	475.2
Dairy	13.0	32.4	16.6	40.9	31.7	63.7	54.2	91.7
Forage feed & good crops	32.4	55.3	45.8	81.8	52.6	97.9	53.2	103.2
Cotton	54.1	113.7	64.3	145.6	77.6	185.0	91.5	230.2
Vegetables ^{3/}	20.1	46.7	32.5	71.2	52.5	117.9	71.1	163.4
Citrus	2.7	13.7	3.6	19.0	6.9	38.0	11.0	61.6
All other agriculture	7.9	20.8	14.6	37.3	25.3	65.5	38.3	100.2
Total ^{2/}	176.4	458.4	249.2	726.0	400.0	991.6	518.7	1,289.9

^{1/} Modified OBE-ERS projections are the same as the OBE-ERS projections.

^{2/} Items may not add to total due to rounding.

^{3/} Includes melons.

sector in 1980 and 2000 to reflect a more gradual increase in acreage over time. While reductions were involved in only two sectors, being major sectors in terms of value added and TGO, they had a major impact on totals for the subregion.

Cropland Harvested

Modified OBE-ERS projected harvested irrigated crop acres, consistent with the modified OBE-ERS total gross agricultural output figures given above, are summarized in table 3.7. The same crop yields and commodity prices were used in deriving the modified OBE-ERS agricultural output figures as were used in the OBE-ERS calculations. Hence, the crop acre total gross output relationship in the modified OBE-ERS projections is consistent with the OBE-ERS relationship.

The modified OBE-ERS regional harvested irrigated crop acreage is larger than the OBE-ERS acreage throughout the projection time frame, the increase being about 5 percent in 1980, and 9 percent in 2000 and 2020. The Lower Main Stem Subregion shows a 13 percent increase in 1980, but only a 6-7 percent increase in the other two target years. In contrast, the Gila Subregion shows only a 3 percent increase in 1980, but a 9 to 10 percent increase in the other two years. The Little Colorado Subregion shows an increase in all three target years, increasing from 12 percent in 1980 to 32 percent in 2020.

While the modified OBE-ERS aggregate harvested acreage exceeded the OBE-ERS acreage, this was not the case for all crops. As was indicated in the discussion of total gross output, some crops were increased in the modified OBE-ERS projections and others were reduced. Since the Region is especially well-suited to production of vegetables and citrus, the acreage of these crops was increased substantially, particularly in the latter part of the projection time frame. The acreage of pecans, a promising crop in the Region, also was increased substantially, particularly in the latter part of the time frame.

The modified OBE-ERS projections of feed grains, reflected in the acreage of grain sorghum and corn, were increased substantially in 1980 and 2000 compared with the OBE-ERS projections. However, the increase was made primarily to restore the large cut in acreage reflected in the OBE-ERS projections. Compared with the 1965 acreage, the modified OBE-ERS projected regional feed grain acreage is up slightly in 1980 but declines from there on, the 2020 acreage being less than 70 percent of the 1965 acreage.

The modified OBE-ERS projected regional acreage of alfalfa hay was reduced slightly compared with the OBE-ERS projection. Practically all the reduction was made in the Lower Main Stem Subregion, which has substantial exports of alfalfa hay, to "make room" for expansion of other crops. The alfalfa hay acreage in the other two subregions was increased

TABLE 3.7
HARVESTED IRRIGATED CROP ACRES FOR 1965 AND MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020
AND THEIR RELATIONSHIP TO OBE-ERS PROJECTIONS, LOWER COLORADO REGION, BY SUBREGION

Crop and Area	1965	Modified			Modified OBE-ERS as Percent		
		OBE-ERS Projections			of OBE-ERS Projections		
		1980	2000	2020	1980	2000	2020
		----- 1,000 Acres -----			----- Percent -----		
<u>Feed Crops</u>							
Barley and oats							
Region	160.5	161.9	143.7	112.5	100.0	100.0	100.0
LMS Subregion	17.5	17.7	15.7	12.2	100.0	100.0	100.0
L Colo Subregion	.3	.3	.3	.2	100.0	100.0	100.0
Gila Subregion	142.7	143.9	127.7	100.1	100.0	100.0	100.0
Sorghum & corn for grain							
Region	184.3	192.3	182.0	126.9	242.5	154.4	88.0
LMS Subregion	14.4	23.9	22.9	23.5	398.3	251.6	204.3
L Colo Subregion	2.3	5.5	5.4	5.9	323.5	385.7	590.0
Gila Subregion	167.6	162.9	153.7	97.5	227.5	143.0	74.0
Alfalfa hay							
Region	218.7	219.0	198.0	198.0	98.7	96.0	96.9
LMS Subregion	74.0	74.7	53.1	44.7	97.8	68.5	57.6
L Colo Subregion	6.2	6.7	7.9	8.3	100.0	109.7	113.7
Gila Subregion	138.5	137.6	137.0	145.0	99.2	112.8	121.4
Other feed crops ^{1/}							
Region	111.0	119.0	128.2	133.3	103.8	107.8	107.9
LMS Subregion	23.8	26.0	27.4	26.4	106.1	113.7	110.5
L Colo Subregion	8.4	8.2	9.0	9.7	98.8	103.4	105.4
Gila Subregion	78.8	84.8	91.8	97.2	103.8	106.7	107.5
<u>Food Crops</u>							
Wheat							
Region	26.6	78.6	79.1	81.2	100.0	100.0	100.0
LMS Subregion	5.8	17.8	17.8	18.1	100.0	100.0	100.0
L Colo Subregion	.6	2.0	2.0	2.0	100.0	100.0	100.0
Gila Subregion	20.2	58.8	59.3	61.1	100.0	100.0	100.0
Vegetables							
Region	90.1	128.0	178.0	225.0	122.7	142.9	153.8
LMS Subregion	36.7	60.0	75.0	85.0	129.6	130.9	131.4
L Colo Subregion	.5	.9	1.6	2.2	150.0	266.7	275.0
Gila Subregion	52.9	67.1	101.4	137.8	116.7	152.0	170.5
Citrus, total							
Region	39.0	56.0	78.0	100.0	112.0	130.0	153.8
LMS Subregion	22.9	35.0	42.0	50.0	116.7	110.5	119.0
Gila Subregion	16.1	21.0	36.0	50.0	105.0	163.6	217.4
Other food crops ^{2/}							
Region	24.4	74.7	90.8	108.2	103.9	119.0	132.4
LMS Subregion	5.1	8.0	12.3	17.6	114.3	148.2	183.3
L Colo Subregion	.5	.6	.8	1.1	100.0	133.3	183.3
Gila Subregion	18.8	66.1	77.7	89.5	102.8	115.3	125.2
<u>Oil and Fiber Crops</u>							
Cotton, all							
Region	345.8	375.0	400.0	420.0	83.5	93.8	100.2
LMS Subregion	30.5	46.0	52.0	58.0	99.6	99.4	99.3
Gila Subregion	315.3	329.0	348.0	362.0	81.6	93.0	100.3

See footnotes at end of table.

TABLE 3.7
HARVESTED IRRIGATED CROP ACRES FOR 1965 AND MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000 AND 2020
AND THEIR RELATIONSHIP TO OBE-ERS PROJECTIONS, LOWER COLORADO REGION, BY SUBREGION (CONTINUED)

Crop and Area	1965	Modified			Modified OBE-ERS as Percent		
		OBE-ERS Projections			of OBE-ERS Projections		
		1980	2000	2020	1980	2000	2020
		----- 1,000 Acres -----			----- Percent -----		
Safflower & flaxseed							
Region	12.4	30.2	50.2	60.2	100.0	100.0	100.0
LMS Subregion	.7	5.0	10.0	15.0	100.0	100.0	100.0
Gila Subregion	11.7	25.2	40.2	45.2	100.0	100.0	100.0
<u>Other Crops</u> ^{3/}							
Bermuda grass seed							
Region	12.8	14.5	16.4	18.2	120.8	136.7	151.7
LMS Subregion	10.6	11.0	12.0	13.0	110.0	120.0	130.0
L Colo Subregion	1.9	.5	.9	1.2	25.0	45.0	60.0
Gila Subregion	.3	3.0	3.5	4.0	-	-	-
<u>Total Irrigated</u>							
Region	1,225.6	1,449.2	1,544.4	1,583.5	105.5	109.1	109.2
LMS Subregion	241.9	325.1	340.2	368.5	113.3	106.3	107.4
L Colo Subregion	20.7	24.7	27.9	30.6	111.8	122.4	132.5
Gila Subregion	963.0	1,099.4	1,176.3	1,184.4	103.2	109.8	109.2

1/ Miscellaneous tame hay, irrigated wild hay, silage, and irrigated cropland pasture.

2/ Potatoes, dry beans, noncitrus fruit and nuts, and sugar beets. The sugar beet plant was built following 1965 and the projection was put at 40,000 acres, the sugar plant capacity. This accounts in part for the large acreage increase in the Region and Gila Subregion.

3/ Bermuda grass seed and other crops.

somewhat in 2000 and 2020 to meet increased feed requirements of livestock. The acreage of "other feed crops" was also increased somewhat for the same reason.

The modified OBE-ERS projected acreage of cotton in the Gila Subregion for 1980 and 2000 is somewhat lower than the OBE-ERS projections. The reduction was made to eliminate the sharp 1965-80 OBE-ERS projected increase. With the modified OBE-ERS projections the cotton acreage shows a gradual increase throughout the time frame, the 2020 acreage being the same as the OBE-ERS projection, except for rounding.

Livestock Numbers

Modified OBE-ERS projections for range cows and cattle, sheep and lambs, and broilers and turkeys marketed are the same as the OBE-ERS projections. Modified OBE-ERS projections for other types of livestock are given in table 3.8. These projections are consistent with the modified OBE-ERS total gross output projections given above. The same rates of production and livestock and livestock commodity prices were used in deriving the modified OBE-ERS total gross output figures as were used in the OBE-ERS calculations. Hence, the relationship between livestock or products produced and the corresponding total gross output is the same in the modified OBE-ERS and the OBE-ERS projections.

TABLE 3.8
 ESTIMATED NUMBER OF SELECTED TYPES OF LIVESTOCK IN 1965
 AND MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
 AND THEIR RELATIONSHIP WITH OBE-ERS PROJECTIONS, LOWER COLORADO REGION^{1/}

Area	: 1965 :	Modified			:Mod OBE-ERS Proj.			
	:(Normal-	OBE-ERS Projections			:as Pct of OBE-ERS			
	ized) :	1980 :	2000 :	2020 :	1980:	2000::	2020	
		----- 1,000 -----			---- Percent ----			
		<u>Cattle and Calves in Finishing Feedlots:</u>						
		<u>Number Marketed</u>						
<u>Region</u>	:	631.4	1,430.0	1,930.0	2,560.0	74.6	75.1	75.7
LMS Subregion	:	68.7	130.0	200.0	290.0	75.7	74.9	75.4
L Colo Subregion	:	1.4	1.3	1.2	1.2	100.0	100.0	100.0
Gila Subregion	:	561.3	1,298.7	1,728.8	2,268.8	74.5	75.1	75.7
		<u>Milk Cows (in production)</u>						
<u>Region</u>	:	58.7	61.1	88.1	119.8	133.4	168.8	190.5
LMS Subregion	:	7.0	8.3	13.9	18.6	156.6	231.7	258.3
L Colo Subregion	:	.8	.5	.7	.9	100.0	175.0	300.0
Gila Subregion	:	50.9	52.3	73.5	100.3	130.8	160.5	181.0
		<u>Hogs: Number Marketed</u>						
<u>Region</u>	:	51.0	53.6	57.3	62.2	382.9	314.8	264.7
LMS Subregion	:	8.3	8.7	9.3	10.1	378.3	310.0	265.8
L Colo Subregion	:	3.4	3.6	3.8	4.1	400.0	316.7	256.2
Gila Subregion	:	39.3	41.3	44.2	48.0	382.4	315.7	265.2
		<u>Laying Hens, Jan. 1</u>						
<u>Region</u>	:	1,080.0	1,202.0	1,342.0	1,452.0	143.8	136.4	125.7
LMS Subregion	:	75.0	83.0	93.0	100.0	143.1	136.8	125.0
L Colo Subregion	:	33.0	36.0	41.0	44.0	144.0	136.7	125.7
Gila Subregion	:	972.0	1,083.0	1,208.0	1,308.0	143.8	136.3	125.8
		<u>Horses and Mules, Including Colts</u>						
<u>Region</u>	:	78.0	86.9	134.2	178.1	104.3	106.5	102.7
LMS Subregion	:	12.4	17.4	29.4	34.0	125.2	134.9	112.2
L Colo Subregion	:	15.6	10.9	10.5	10.4	100.0	101.9	107.2
Gila Subregion	:	50.0	58.6	94.3	133.7	100.2	100.4	100.2

^{1/} Modified OBE-ERS projection for range cows and cattle, sheep and lambs, and broilers and turkeys marketed are the same as the OBE-ERS projections.

Modified OBE-ERS livestock projections reflect two major changes in the OBE-ERS projections: 1) the number of cattle and calves marketed from finishing feedlots was reduced substantially since it did not seem feasible to meet the OBE-ERS projections, and 2) the number of cows milked were increased substantially since the OBE-ERS projections were considerably below regional historical trends of cow numbers and milk production.

With the modified OBE-ERS projections the number of cattle and calves marketed from finishing feedlots in the Region will increase $2\frac{1}{2}$ times by 1980, more than 3 times by 2000, and more than 4 times by 2020. The 1980 projection is a major challenge. It represents approximately a linear projection of the increase from 1965 to 1970, which was somewhat steeper than the sharply upward 1950-65 trend. Following 1980 the upward trend is not quite so steep. The number in 2000 and 2020 is approximately a linear projection of the 1950-70 trend.

With the modified OBE-ERS projections the number of cows milked in 2020 is more than double the 1965 number and nearly double the OBE-ERS projection. Both milk cow numbers and total milk production in the Region have been increasing historically, the latter at roughly the same rate as population during the 1950-65 period. Hence, modified OBE-ERS regional milk production was projected to increase at the same rate as the modified OBE-ERS population. Due to the relatively large projected increase in production per cow, the increase in number of milk cows from 1965 to 1980 is relatively small. However, the projected increase thereafter is relatively sharp.

The modified OBE-ERS projections of hogs marketed and of laying hens were derived by applying the OBE-ERS projected rate of increase to the 1965 base. Since the 1965 base was higher than the 1959-61 base, used at the national level, the modified OBE-ERS projections are higher than the OBE-ERS projections, particularly for hogs.

Modified OBE-ERS projections of horse and mule numbers were increased somewhat compared with the OBE-ERS projections to account for the added number of "urban" horses associated with the increased modified OBE-ERS population.

Regional Share of National Production

The regional share of national production of selected agricultural commodities with the modified OBE-ERS projections is given in table 3.9. The share for the 1959-61 national base period also is shown for comparison. Changes in the regional share with the modified OBE-ERS projections compared with the OBE-ERS projections is, of course, related directly to changes in crop acres and livestock numbers. Since the modified OBE-ERS regional acreage of feed grains was increased in 1980 and 2000, and reduced in 2020, compared with the OBE-ERS projections the

TABLE 3.9
 LOWER COLORADO REGION PRODUCTION AS A PERCENT OF NATIONAL PRODUCTION
 OF SELECTED AGRICULTURAL COMMODITIES, 1959-61
 AND MODIFIED OBE-ERS PROJECTIONS^{1/} FOR 1980, 2000 AND 2020

Item	1959-61	Modified OBE-ERS Projections		
		1980	2000	2020
---- Percent LCR Production is of U. S. Production--				
Feed grains	0.282	0.432	0.385	0.259
Vegetables	3.760	4.095	4.864	5.220
Citrus	2.167	4.862	6.302	7.374
Cotton	5.178	5.771	6.450	6.860
Beef and veal	1.544	1.544	1.543	1.544
Pork	0.025	0.045	0.038	0.032
Milk	0.380	0.567	0.717	0.809
Eggs	0.297	0.402	0.382	0.351

^{1/} The regional projections are modified OBE-ERS projections, those for the United States are OBE-ERS projections.

regional share of national production reflects similar changes. Compared with the 1959-61 base period, the modified OBE-ERS regional share of feed grain production increases substantially in 1980 but declines subsequently so the 2020 share is lower than the 1959-61 share.

Since the vegetable and the citrus modified OBE-ERS projected acreages were increased substantially compared with the OBE-ERS acreages, the modified OBE-ERS projected shares of national production also increased substantially compared with the OBE-ERS shares. The modified OBE-ERS regional share of both crops increases throughout the projection time frame, the share for vegetables increasing nearly 40 percent while the citrus share more than tripled by 2020.

For cotton, the modified OBE-ERS share of national production is somewhat lower in 1980 and 2000 than with the OBE-ERS projections since the acreage was reduced. The 2020 projected share did not change and is about one-third higher than the base period share.

The modified OBE-ERS projected regional share of beef and veal production is the same as the base period share since this was the basis for the modified OBE-ERS projections of beef and veal production. The regional share with the modified OBE-ERS projections is a little lower than the share with the OBE-ERS projections since the number of cattle fed was reduced.

The regional share of national pork production is somewhat higher with the modified OBE-ERS projections than with the OBE-ERS projections, since the number of hogs marketed was increased. The situation with eggs is similar. However, in both cases, the modified OBE-ERS share of national production declines throughout the projection time frame, but the 2020 shares still are above the base period shares.

The modified OBE-ERS projected regional share of national milk production increases throughout the projection time frame, the 2020 share being more than double the base period share. This upward trend is in contrast with the OBE-ERS projected regional share which remained constant throughout the projection time frame at about the base period level.

Feed-Livestock Balance

Net exports or net imports of feed grain and hay with the modified OBE-ERS projections of crop and livestock production are shown in table 3.10. Feed required per pound of output given in table 2.21 was used in deriving the feed utilization part of the feed balance. Allowance also was made for utilization of feed grains for seed and food on a basis similar to the OBE-ERS projections. Wheat fed to livestock was estimated at 5 percent of production, the same as for the OBE-ERS projections. Silage production was budgeted to equal use, and the same was true of irrigated pasture.

TABLE 3.10
NET EXPORTS OR (IMPORTS) INDICATED BY FEED BALANCES
FOR 1965 AND WITH MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO REGION, BY SUBREGION

Area	1965	Modified OBE-ERS Projections		
	(Normalized)	1980	2000	2020
	----- 1,000 Tons -----			
<u>Feed grains</u>				
Region	47.6	(454.0)	(950.6)	(1,777.4)
LMS Subregion	(16.7) ^{1/}	(54.9)	(148.0)	(223.0)
L Colo Subregion	(8.3)	(3.8)	(5.6)	(6.6)
Gila Subregion	72.6	(395.3)	(797.0)	(1,547.8)
<u>Hay</u>				
Region	350.0	380.8	254.3	207.3
LMS Subregion	340.0	381.0	254.1	208.8
L Colo Subregion	0	0	0	0
Gila Subregion	10.0	(0.2)	0.2	(1.5)

^{1/} Net imports.

With the modified OBE-ERS projections, the feed grain picture for the Region changes from a small net export in the base year 1965 to substantial imports which increase sharply throughout the projection time frame, net import requirements in 2020 amounting to 1.8 million tons. However, net imports of feed grains with the modified OBE-ERS projections are considerably smaller than with the OBE-ERS projections, due primarily to the substantial reduction in the number of cattle fed and somewhat to the larger projected feed grain acreage for 1980 and 2000. Modified OBE-ERS projected net feed grain imports are 44 percent of OBE-ERS net imports in 1980, 65 percent in 2000, and 84 percent in 2020.

Hay exports with the modified OBE-ERS projections increase approximately 10 percent from 1965 to 1980, almost as much as with the OBE-ERS projections. However, in contrast to the OBE-ERS upward export trend thereafter, modified OBE-ERS projections indicate a reduction in 2000 and continuing to 2020. Modified OBE-ERS projected regional net exports of hay in 2020 are only 44 percent of OBE-ERS exports--and only 59 percent of those in 1965.

Forestry

No change was made in the OBE-ERS projections for the modified OBE-ERS projections. In other words, the modified OBE-ERS forestry projections are the same as the OBE-ERS projections.

Mineral Industry

The estimates of mineral industry output by sector for the modified OBE-ERS projections are shown in table 3.11. The projections, prepared by the Mineral Resources Work Group, were defined in the economic models by the same sectoral breakdown as for the OBE-ERS projections. Except for uranium, the mineral industry output changed very little from the OBE-ERS projections. Very large increases in uranium output, however, are expected in both the Lower Main Stem and Little Colorado Subregions, possibly because the swing to nuclear power seems apparent. For example, uranium output in the Little Colorado Subregion is ten times greater than for the OBE-ERS projections in 1980 and nine times greater in 2000 and 2020.

Moving from a relatively low uranium output of \$3.1 million during the period under OBE-ERS projections, the Lower Main Stem Subregion under modified OBE-ERS projections is projected to be \$61.0 million in 1980 with a slight decline to \$55.0 million in 2000 and 2020. Relatively small changes in output are expected in the "all other mining" sector of the Lower Main Stem Subregion; output in this sector is estimated to be \$115.7 million by 2020 under OBE-ERS projections compared with \$134.0 million under modified OBE-ERS projections.

Total value added for the mining industry in the Lower Colorado Region is projected to reach \$895.2 million by 2020 under the modified OBE-ERS

TABLE 3.11
 VALUE ADDED AND TOTAL GROSS OUTPUT OF MINING SECTORS
 IN THE THREE SUBREGIONS OF THE LOWER COLORADO REGION FOR 1965
 AND MODIFIED OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020^{1/}

Subregion and Sector	1965		Modified OBE-ERS Projections					
	VA	TGO	1980		2000		2020	
	VA	TGO	VA	TGO	VA	TGO	VA	TGO
----- Million 1960 dollars -----								
<u>LMS Subregion</u>								
Uranium	1.1	3.1	21.1	61.0	18.1	55.0	17.2	55.0
All other mining	14.9	29.0	33.1	65.3	47.9	98.2	62.9	134.0
Total	16.0	32.1	54.2	126.3	66.0	153.2	80.1	189.0
<u>L Colo Subregion</u>								
Coal	0.4	1.1	5.9	16.0	5.8	16.0	0.0	0.0
Oil and gas	0.2	0.7	16.4	50.0	21.9	70.0	11.9	40.0
Uranium	45.4	112.2	384.9	896.0	327.2	803.5	294.5	803.5
All other mining	3.0	5.1	3.3	5.5	4.8	8.2	5.3	9.3
Total	49.0	119.1	410.5	967.5	359.7	897.7	311.7	852.8
<u>Gila Subregion</u>								
Copper	224.3	388.5	290.3	549.0	391.8	808.0	468.4	1,071.0
All other mining	28.0	70.0	25.4	103.0	29.4	145.0	35.0	197.0
Total	252.3	458.3	315.7	652.0	421.2	953.0	503.4	1,268.0

^{1/} Based upon data provided by the Bureau of Mines, U. S. Department of Interior. Except for uranium, the figures reflect the actual value of the minerals at the mine, the processing costs being included in appropriate manufacturing sectors. The uranium figures include the cost of ore concentration.

projections, compared with \$604.2 million for the same year under OBE-ERS projections. Whereas the Gila Subregion accounted for about 83 percent of total regional value added in 2020 under OBE-ERS, the subregion declined to 56 percent under the modified projections. Copper production in the Gila Subregion, however, still accounts for 52 percent of total regional value added under the modified projections as compared to almost 78 percent under OBE-ERS projections. The Little Colorado Subregion picked up the largest share of the percentage decline in the Gila Subregion as a result of the increased uranium output described above.

Manufacturing

Total manufacturing output by sector in the three subregions of the Lower Colorado Region has been estimated in table 3.12 for the modified OBE-ERS projections. The manufacturing sectors under the modified OBE-ERS

TABLE 3.12
 VALUE ADDED AND TOTAL GROSS OUTPUT OF MANUFACTURING SECTORS IN THE THREE SUBREGIONS
 OF THE LOWER COLORADO REGION FOR 1965 AND MODIFIED OBE-ERS PROJECTIONS
 FOR 1980, 2000, AND 2020

Subregion and Sector	1965		Modified OBE-ERS Projections					
	VA	TGO	1980		2000		2020	
	VA	TGO	VA	TGO	VA	TGO	VA	TGO
----- Million 1960 dollars -----								
<u>LMS Subregion</u>								
Food & kindred products	11.4	31.4	61.1	138.9	160.6	389.1	296.9	770.0
Lumber & wood products	10.1	24.5	40.2	82.2	99.8	219.1	201.4	484.6
Chemicals	7.8	31.1	22.6	84.7	63.6	258.4	174.1	594.2
Printing & publishing	8.1	13.7	37.3	63.2	117.6	201.7	195.7	339.8
Fabricated metals	1.5	2.9	6.9	13.2	15.2	29.3	28.6	56.0
Stone clay & glass	7.2	21.5	22.9	63.0	63.7	166.2	157.7	396.5
All other manufacturing	20.6	72.0	103.6	321.1	312.8	904.6	586.7	1,916.3
Total	66.7	197.1	294.6	766.3	833.3	2,168.4	1,641.1	4,557.4
<u>L Colorado Subregion</u>								
Food & kindred products	0.3	0.9	8.2	13.0	16.9	27.4	37.4	61.7
Lumber & wood products	9.4	32.6	30.5	77.6	57.7	160.9	114.9	327.7
Paper & pulp	5.0	17.6	11.6	41.0	9.7	36.9	14.4	58.0
Printing & publishing	0.6	1.1	1.8	3.6	2.9	6.1	6.5	14.1
All other manufacturing	3.3	19.9	8.3	47.9	15.9	93.9	27.9	167.9
Total	18.6	72.1	60.4	183.1	103.1	325.2	201.1	629.4
<u>Gila Subregion</u>								
Food & kindred products	63.2	261.9	106.5	520.0	209.0	1,158.4	500.7	2,500.0
Lumber & wood products	7.9	23.7	27.1	71.0	72.2	195.0	170.6	485.0
Furniture & fixtures	4.7	13.9	12.3	35.0	33.2	98.7	78.7	244.0
Paper & pulp	4.1	15.5	18.9	60.0	39.4	120.0	78.3	230.0
Chemicals	15.5	50.6	63.9	190.0	278.1	880.0	758.9	2,680.0
Primary metals	46.5	490.7	64.4	750.0	193.7	1,400.0	415.9	2,540.0
Printing & publishing	54.1	87.4	144.8	260.0	380.6	722.8	928.0	1,804.3
Fabricated metals	19.5	57.3	51.7	170.0	155.3	545.7	305.7	1,184.6
Textiles & apparel	15.7	32.0	49.9	96.0	157.4	322.7	554.6	1,185.3
Leather & leather goods	0.3	0.6	0.5	1.0	1.5	3.0	3.8	8.0
Stone clay & glass	27.5	58.6	84.1	175.0	238.1	490.0	609.4	1,220.0
All other manufacturing	396.9	666.9	1,168.7	2,007.2	3,022.0	5,550.4	7,023.3	13,827.1
Total	655.9	1,759.1	1,792.8	4,335.2	4,780.5	11,486.7	11,427.9	27,908.3

projections show an increase in output of about 24 percent over the OBE-ERS projections in 2020 for the Lower Main Stem Subregion. The difference was greatest, however, in the year 2000 where output was about 42 percent greater. For the Little Colorado Subregion, the increase in output ranged from 17 percent in 1980 to 11 percent in 2000, and 30 percent by 2020. Changes in the Gila Subregion amounted to 1 percent or less over the projection period because population projections differed only slightly from OBE-ERS projections in this subregion.

Of the various manufacturing sectors in the Lower Main Stem Subregion, major differences occurred in chemicals and all other manufacturing; whereas in the Little Colorado Subregion major differences occur in

food and kindred products, lumber and wood products, and all other manufacturing. In part, this reflects the specialization of each subregional economy related to resource availability and utilization.

Total value added for manufacturing in the Lower Colorado Region amounts to \$13,270.1 million by 2020 under modified OBE-ERS projections as compared with \$12,791.8 million for the same year under OBE-ERS projections. This reflects an over-all increase in value added of nearly 10 percent from the OBE-ERS projections.

The Gila Subregion, accounting for about 89 percent of total regional value added by manufacturing in 2020 under OBE-ERS projections, dropped to approximately 86 percent, or \$11,341.0 million under the modified projections. Value added for the Lower Main Stem Subregion amounts to \$1,641.1 million or 12.4 percent of total value added, and the Little Colorado Subregion accounts for \$201.1 million, or 1.5 percent. Thus, the Lower Main Stem Subregion increased its share of total value by approximately 2 percentage points and the Little Colorado roughly 0.1 percentage point under the modified OBE-ERS projections.

Noncommodity Producing Industries

In general the noncommodity producing industries as defined for this study reflect moderate increases in total output when compared with the OBE-ERS projections. Other than for electric energy needs, greatest changes were recorded in the trade (particularly retail) and service sectors. These sectors, heavily dependent upon primary and secondary industrial activity, are increasingly influenced by recreation and tourism. The impact of recreation expenditures is largely in the retail trade and service sectors, i.e., gas and automobile services, eating and drinking places, lodging, and the like. In addition, population growth and anticipated higher income levels are expected to contribute to increasing demands for consumer goods and services from the noncommodity sectors. The electric energy sector shows a major increase. Regional power needs for the modified OBE-ERS projections were based on data developed by the Electric Power Work Group, whereas the lower estimates used in the OBE-ERS projections reflect power needs made consistent with the economic models based on OBE-ERS data.

Estimated total gross output for the noncommodity sectors are shown in table 3.13 for the three subregions of the Lower Colorado Region. Compared to OBE-ERS projections in the year 2020, output of the noncommodity sectors as a whole increased approximately 51 percent in the Little Colorado Subregion, 26 percent in the Lower Main Stem Subregion, and 13 percent in the Gila Subregion.

Total value added for the noncommodity sectors in the Lower Colorado Region amounted to \$36,100.6 million by 2020 under modified OBE-ERS projections. This value compares with \$30,247.6 million for the same year

TABLE 3.13
 VALUE ADDED AND TOTAL GROSS OUTPUT OF NONCOMMODITY PRODUCING SECTORS
 IN THE THREE SUBREGIONS OF THE LOWER COLORADO REGION FOR 1965 AND MODIFIED OBE-ERS PROJECTIONS
 FOR 1980, 2000, AND 2020

Subregion and Sector	1965		Modified OBE-ERS Projections					
	VA	TGO	1980		2000		2020	
			VA	TGO	VA	TGO	VA	TGO
----- Million 1960 dollars -----								
<u>LMS Subregion</u>								
Wholesale trade	31.1	83.5	108.9	289.1	277.4	745.3	494.5	1,344.9
Service stations	9.5	21.3	47.8	105.2	107.7	285.8	322.7	724.0
Eating & drinking	21.6	69.6	104.3	342.2	320.6	1,065.5	505.5	1,701.8
All other retail	80.0	162.3	395.7	730.0	1,229.2	2,252.8	2,022.3	3,773.4
Agricultural services	9.9	31.0	16.7	52.8	23.1	73.4	32.0	102.3
Lodging	118.8	183.9	570.1	882.1	1,873.5	2,887.5	4,279.5	6,626.6
All other services	106.6	205.8	440.0	821.9	1,414.0	2,655.9	3,006.5	5,679.1
Transportation	33.6	107.3	94.0	304.2	203.0	662.1	350.5	1,140.0
Electric energy	18.1	59.4	46.1	158.1	214.1	686.8	705.4	2,091.0
All other utilities	18.9	40.1	92.8	178.6	172.8	331.6	349.2	666.7
Contract construction	43.8	137.5	104.8	303.1	262.2	769.5	624.8	1,860.0
Rentals & finance	106.6	118.8	373.8	419.2	1,082.2	1,218.1	2,852.0	3,222.0
Total	598.5	1,220.5	2,395.0	4,586.5	7,179.8	13,634.3	15,544.9	28,931.8
<u>L Colorado Subregion</u>								
Wholesale trade	5.3	13.9	13.5	32.4	32.0	78.0	72.1	178.6
Service stations	3.0	4.8	6.1	9.7	12.6	20.2	24.2	39.1
Eating & drinking	2.7	10.5	5.6	22.7	11.3	47.3	21.6	93.9
All other retail	11.4	21.3	25.2	42.9	53.1	91.7	99.4	173.8
Lodging	2.8	5.8	5.6	11.7	14.0	29.5	28.6	61.2
All other services	5.9	13.9	11.4	26.7	23.3	55.3	52.2	125.0
Transportation	2.8	29.8	4.3	47.2	8.7	97.0	15.7	178.1
Electric energy	1.1	6.6	1.3	20.4	13.6	85.0	47.5	249.9
All other utilities	3.9	5.2	9.2	12.4	14.2	19.5	26.7	37.3
Contract construction	3.8	15.4	4.5	24.8	7.5	41.9	12.1	70.1
Rentals & finance	9.4	11.2	27.7	33.6	71.7	88.7	133.4	168.0
Total	52.1	138.4	114.4	284.5	262.0	654.1	533.5	1,375.0
<u>Gila Subregion</u>								
Wholesale trade	138.6	303.0	251.3	606.5	635.5	1,607.0	1,202.0	3,192.0
Service stations	21.7	41.0	47.4	82.4	110.0	194.2	240.8	421.5
Eating & drinking	60.4	168.2	117.0	337.0	273.7	802.7	597.2	1,769.3
All other retail	331.9	620.0	719.2	1,244.7	1,645.7	2,917.7	3,862.4	7,019.3
Agricultural services	13.8	32.1	17.3	40.8	23.6	56.0	30.5	73.1
Lodging	29.3	62.0	71.7	157.0	250.0	456.8	512.9	1,163.2
All other services	137.0	328.0	349.4	827.8	948.8	2,398.8	2,513.4	6,137.1
Transportation	80.5	214.3	157.8	428.0	399.7	1,104.0	735.6	2,070.0
Electric energy	90.6	153.6	287.3	482.8	1,261.1	2,074.0	3,848.2	6,290.0
All other utilities	71.1	157.8	147.2	335.0	312.9	718.0	679.4	1,562.8
Contract construction	137.1	417.5	257.9	804.0	517.7	1,832.7	956.7	3,927.7
Rentals & finance	409.8	480.2	923.4	1,096.5	2,178.0	2,611.8	4,843.1	5,865.7
Total	1,521.8	2,977.7	3,346.9	6,442.5	8,556.7	16,773.7	20,022.2	39,501.7

under OBE-ERS projections--an over-all increase in value added for the year 2020 of 19 percent. By 2020, at the subregional level, the Gila accounts for about 55 percent of total regional value added in the non-commodity sectors under the modified OBE-ERS projections compared with 57 percent under OBE-ERS projections for the same year.

Comparable data for the Lower Main Stem are 43 and 42 percent, and for the Little Colorado Subregion, 1.5 and 1.2 percent. As would be expected, changes in subregional shares of total value added for the non-commodity sectors essentially parallel those of the primary-secondary sectors.

ECONOMIC ANALYSIS

CHAPTER IV - ECONOMIC ANALYSIS

Considerable socio-economic analysis relative to the structure and interrelationships of the Region's economy, and its relationship to the national economy has been included in preceding chapters. The OBE-ERS and modified OBE-ERS projections have been compared extensively with the baseline projections. The objective in this chapter is to: 1) Present a summary analysis of the modified OBE-ERS projections compared with the OBE-ERS projections; 2) present an analysis to show relationships within the OBE-ERS projected economy, and illustrate how such information can be used to develop alternative projections and to study alternative uses of resources, together with the impact of the alternatives on people; 3) present a sensitivity analysis to show the effect of alternative assumptions regarding population growth rates and rates of increase in crop yields; 4) present an analysis regarding price and quantity effects of the projections; and 5) outline additional recommended socio-economic studies which are needed in river basin planning.

SUMMARY ANALYSIS OF MODIFIED OBE-ERS PROJECTIONS COMPARED WITH THE OBE-ERS PROJECTIONS

The modified OBE-ERS set of projections were developed from primary or structural projections--population, irrigated acreage, etc.--of the economy in a manner similar to that used in developing the OBE-ERS set of projections. Since some of the modified OBE-ERS primary or structural projections differed from the OBE-ERS primary or structural projections, some of the interrelationships in the modified OBE-ERS projected economy are different from those in the baseline economy. Most of these differences have been reflected in comparisons presented in Chapter III.

A summary comparison of the modified OBE-ERS projections related to the baseline projections is given in table 4.1. The comparison is in terms of water and related cropland requirements, and the effect of the projections on people as reflected by employment, value added and final demand.

Water utilization in the Lower Main Stem Subregion with the modified OBE-ERS projections was 10 percent greater than with the OBE-ERS projections in 1980, and 6 percent greater in 2000 and 2020. Cropland harvested increased by roughly the same proportion. The proportional increases in labor required, and in value added and final demand were considerably greater.

The comparison is substantially different in the other two subregions. In the Little Colorado Subregion the relative increases in water requirements with the modified OBE-ERS projections compared with the OBE-ERS projections are greater than the corresponding increases in employment, value added, and final demand, except in 2020 when the relative increases are roughly equal. In the Gila Subregion the 1980 modified

TABLE 4.1
SUMMARY COMPARISON OF ECONOMIC ACTIVITY
AND RELATED WATER REQUIREMENTS WITH THE OBE-ERS AND MODIFIED OBE-ERS PROJECTIONS, LOWER COLORADO SUBREGIONS^{1/}

Subregion & Item	1965	1980			2000			2020		
		OBE-ERS	Modified OBE-ERS	Per-cent ^{2/}	OBE-ERS	Modified OBE-ERS	Per-cent ^{2/}	OBE-ERS	Modified OBE-ERS	Per-cent ^{2/}
<u>LMS Subregion</u>										
Final demand (Mil.Do1.)	2,184.9	5,119.7	7,322.1	143.0	14,083.5	21,556.3	153.1	36,666.6	47,005.5	128.2
Value added (Mil. Do1.)	1,280.2	3,596.1	5,298.6	147.3	11,036.4	16,464.7	149.2	30,357.4	35,233.8	116.1
Water requirements (1,000AF ^{3/})	1,200.1	1,429.0	1,576.8	110.3	1,604.4	1,700.2	106.0	1,923.3	2,038.9	106.0
Labor, man years (1,000)	134.8	224.0	337.7	150.8	421.0	639.6	151.9	727.1	859.2	118.2
Cropland harvested (1,000Ac ^{4/})	245.5	286.8	325.1	113.4	320.0	340.2	106.3	343.1	368.5	107.4
Final demand/AF (\$1,000)	1.8	3.6	4.6	127.8	8.8	12.7	144.3	19.1	23.1	120.9
Value added/AF (\$1,000)	1.1	2.5	3.4	136.0	6.9	9.7	140.5	15.8	17.3	109.5
Labor/AF (man years)	.11	.16	.21	131.3	.26	.38	146.2	.38	.42	110.5
<u>L Colo Subregion</u>										
Final demand (Mil.Do1.)	379.3	1,109.7	1,219.2	109.9	2,468.2	2,704.3	109.6	5,397.2	6,410.3	118.8
Value added (Mil.Do1.)	221.2	703.4	812.8	115.6	1,655.6	1,890.9	114.2	3,771.8	4,779.1	126.7
Water requirements (1,000AF ^{3/})	114.8	114.2	140.1	122.7	128.3	157.3	122.6	143.3	180.1	125.6
Labor, man years (1,000)	33.7	54.9	60.5	110.2	75.3	85.3	113.3	91.1	119.8	131.5
Cropland harvested (1,000Ac ^{4/})	20.6	22.1	24.7	111.8	22.8	27.9	122.4	23.2	30.6	131.9
Final demand/AF (\$1,000)	3.3	9.7	8.7	89.7	19.2	17.1	89.1	37.7	35.6	94.4
Value added/AF (\$1,000)	1.9	6.2	5.8	93.5	12.9	12.0	93.0	26.3	26.5	100.8
Labor/AF (man years)	.29	.48	.43	89.6	.59	.54	91.5	.64	.67	104.7
<u>Gila Subregion</u>										
Final demand (Mil.Do1.)	7,015.6	14,380.3	14,406.9	100.2	36,542.3	36,767.0	100.6	89,102.2	89,747.6	100.7
Value added (Mil.Do1.)	4,524.8	10,316.3	10,341.2	100.2	28,414.4	28,669.1	100.9	72,846.3	73,376.2	100.7
Water requirements (1,000AF ^{3/})	3,822.5	4,300.9	4,284.0	99.6	4,366.8	4,610.1	105.5	4,887.6	5,386.5	110.2
Labor, man years (1,000)	507.2	732.6	735.1	100.3	1,178.0	1,207.1	102.5	1,820.9	1,853.7	101.8
Cropland harvested (1,000 Ac ^{4/})	972.6	1,064.6	1,099.4	103.3	1,072.8	1,176.3	109.6	1,084.5	1,184.4	109.2
Final demand/AF (\$1,000)	1.8	3.3	3.4	103.0	8.4	8.0	95.2	18.2	16.7	91.8
Value added/AF (\$1,000)	1.2	2.4	2.4	100.0	6.5	6.2	95.4	14.9	13.6	91.3
Labor/AF (man years)	.13	.17	.17	100.0	.27	.26	96.3	.37	.34	91.9

^{1/} All values are in 1960 dollars.

^{2/} Modified OBE-ERS as a percent of OBE-ERS.

^{3/} Source: Water depletion requirements for processing sectors, government, and households were derived from the input-output model and water coefficients consistent with total water depletion for the OBE-ERS level of development given in the Water Resources Appendix Nov. 1970. Details are in the supplement to Appendix IV. Water for recreation, fish and wildlife, and reservoir evaporation are from the Water Resources Appendix.

^{4/} Irrigated cropland.

OBE-ERS projections require slightly less water along with 3 percent more cropland harvested due to a change in the projected cropping pattern; i.e., the OBE-ERS acreage of cotton and forage and feed crops was reduced and the acreage of vegetables, fruit, and nuts, which require less water per harvested acre, was increased. In 2000 and 2020 the relative increases in water requirements, even though small, are several times larger than the percentage increases in employment, value added, and final demand.

The relationship of water utilization to people also is portrayed in the table in terms of employment, value added, and final demand per acre foot of water utilized. Comparing the modified OBE-ERS to the OBE-ERS projections on this basis, the Lower Main Stem Subregion again shows more difference than the other two subregions. In all three target years, the Lower Main Stem ratios of labor, value added, and final demand to water are greater for the modified OBE-ERS than for the OBE-ERS projections. In the other two subregions the modified OBE-ERS ratios are smaller in most instances than the OBE-ERS ratios.

It is interesting to compare the size of the ratios--labor, value added, and final demand per acre foot of water--among the three subregions, and also over time. The ratios in the Little Colorado Subregion are roughly double those in the other two subregions. Over time, the ratios increase very sharply.

RELATIONSHIPS WITHIN THE OBE-ERS PROJECTED ECONOMY

Alternative projections for use in framework study analyses can be developed on the basis of relationships in the baseline projected economy. The basic relationships required are shown for the base year and each of the target years, by subregion, in table 4.2^{1/}, located at the end of the appendix. The basic relationships shown include value added, and requirements for water, cropland harvested, and labor, related to final demand. Final demand represents sales to the final consumer and is defined as the sum of five major components: 1) Sales to households (personal consumption expenditures), 2) sales to Federal, state and local governments (government purchases of goods and services, 3) gross private capital investment, 4) exports of goods and services from the subregion, and 5) inventory accumulation. Value added includes: 1) personal income (wages, salaries, profits, and other income), 2) payments to government (property taxes, grazing fees, inspection fees, licenses, etc.), 3) depreciation allowances, and 4) inventory depletions. Labor includes all labor or employment, including supervision and management.

The output multiplier for each sector also is shown in the table. The output multiplier is the total output generated in the entire economy by a \$1.00 change in final demand for goods and/or services of the sector.

^{1/} For methodology see: Lofting, E. M. and P. H. McGauhey, Economic Evaluation of Water, Part III: An Interindustry Analysis of the California Water Economy, contribution No. 67, Water Resources Center, University of California, Berkeley, January 1963.

The relationships portrayed are based upon an input-output analysis of the baseline economy and related water, cropland, and labor coefficients. The coefficients reflect the amount of water, land, and labor required per dollar of total gross output of the sector. The water coefficients for crops were developed from data provided by the Irrigation and Drainage Work Group, those for mining sectors were provided by the Bureau of Mines, those for electric power were developed from data provided by the Power Work Group, and those for the remaining sectors were provided by the Municipal and Industrial Water Requirements Work Group. The cropland and labor coefficients were developed by the Economics Work Group and are consistent with the cropland and employment figures given in Chapter II.

The relationships portrayed reflect both direct and indirect effects related to final demand. Value added includes value added directly as a result of final demand for goods and/or services of the subject sector (the sector under consideration) and also the value added indirectly by sectors supplying goods and services to the subject sector. Similarly, the requirements for water, cropland, and labor include the direct requirements of the subject sector itself and also the indirect requirements of sectors supplying the subject sector. For example, the direct and indirect requirement for water by the food and kindred products sector in the Lower Main Stem for 1980 is, as shown in the table, 2.0812 acre feet per \$1,000 of products delivered or sold to final demand. This quantity is comprised of the following:

	<u>Acre Feet</u>
Direct use: Used directly by subject sector.	0.0094
Indirect use: Used directly and indirectly by sectors supplying the subject sector.	
Range livestock sector	0.0020
Feeder livestock sector	0.0014
Dairy sector	0.0049
Forage, feed & food sector	1.9575
Cotton sector	0.0024
All other agriculture sector	0.1015
All other sectors	<u>0.0021</u>
Total indirect use:	<u>2.0718</u>
Total direct and indirect use:	<u>2.0812</u>

Note that the indirect use by sectors supplying the subject sector includes both direct and indirect use. In other words, the indirect effects extend throughout the economy ad infinitum.

Relationships within the economy are complex and economic analyses which portray and analyze the relationships also are complex. Since a change

in one sector generally causes many changes in other sectors, it is important to consider both direct and indirect effects in analyses.

Since value added, and the direct and indirect requirements for water, cropland, and labor shown in the table all are related to final demand, they are comparable one with another. Several important relationships can be derived, therefore, from the data presented, including value added per acre foot of water, per man year of labor, and per acre of cropland.

The output multiplier shown by sector in table 4.2 reveals the direct and indirect output generated throughout the whole economy per collar of final demand change for that sector. The higher the multiplier, therefore, the greater is the contribution that an initial increase in final demand makes toward raising the subregion output. For example, in the Lower Main Stem Subregion the citrus and vegetable sectors have the highest multipliers, their multipliers exceeding 2.0 in the base period and in each of the target years. Hence, if the subregional final demand for vegetables, say, increased \$1,000,000, the output of the subregion would be increased by over \$2,000,000. On the other hand, the closer an output multiplier is to unity, the smaller the impact the industry registers on the subregion economy. For example, the textiles and apparel sector has a relatively low multiplier, the Gila Subregion multiplier being only 1.17 for 1980. Hence, a \$1,000,000 increase in final demand for textiles in the Gila Subregion in 1980 would increase the subregion output by only \$1,170,000. The output multiplier can be similarly related to requirements for water, cropland, and labor. For example, using the 2020 projections for the Lower Main Stem Subregion, the output multiplier for the vegetable sector divided by the acre feet of water required, gives an output of \$1,263 per acre foot. Similar values could be derived for other sectors to indicate the relative output multiplier effect of using water in different sectors.

ANALYSES BASED UPON RELATIONSHIPS IN THE OBE-ERS ECONOMY

The relationships or factors presented in the preceding section provide a basis for making several different types of economic analyses. Three types are presented or illustrated in this section: 1) an analysis of sectorial use of water and other resources related to final demand and the effect on people, 2) use of alternative projections in analysis of alternative uses of water, and 3) use of alternative projections in analysis of changes in the level of water availability.

Sectorial Use of Water Related to Final Demand

Using the factors presented in the preceding section, computations were made of the total amount of water required (direct and indirect) to meet the final demand of each of the sectors in each subregion. The figures for 1965, 1980, and 2020 are shown in cumulative form for the

Lower Main Stem Subregion in table 4.3, for the Little Colorado Subregion in table 4.4, and for the Gila Subregion in table 4.5, the sectors having been ranked in each of the tables according to value added to the economy by the sector per acre foot of water used. Note that, as explained in the preceding section, water required by each sector is a factor of the final demand of the sector; i.e., water required includes that used directly by the subject sector and indirectly by other sectors to meet the final demand of the subject sector. For example, in 1965, the final demand of the food and kindred products sector in the Gila Subregion was \$218 million. To meet this final demand the subject sector required 1.8 thousand acre feet of water and the sectors supplying the food and kindred products sector required 872.4 thousand acre feet. Hence, a total of 874.2 thousand acre feet of water were required by the food and kindred products sector to meet its final demand of \$218 million.

Also shown in each of the subregion tables are cumulative totals for value added, and direct and indirect requirements for labor and cropland, each related to final demand in the same manner as water. Hence, the value added, labor and cropland figures are directly comparable to the water figures and to each other.

With water use tabulated in terms of final product output, the large users of water generally include the food and kindred products and the eating and drinking places sectors, along with most of the agricultural sectors.

As is generally recognized, value added related to total water directly and indirectly used varies greatly from sector to sector. Since the sectors were ranked on this basis, the cumulative value added increases sharply relative to cumulative water use as one moves down the columns through most of the nonagricultural sectors. Thereafter the cumulative increase in value added is relatively small compared with the cumulative increase in water used. The situation is similar for final demand related to water use. A major part of the Region's water is used directly or indirectly by the food and kindred products, eating and drinking places, and agricultural sectors to produce a relatively small final product output and to add a relatively small amount of value to the Region's economy.

Comparing the direct and indirect requirements for labor with direct and indirect water use shows that labor requirements relative to water use are relatively large in most of the nonagricultural sectors. On the other hand, the converse is true for cropland.

Changes in Direct and Indirect Water Use Indicated by the OBE-ERS Projections

An analysis of direct and indirect use of water shown in tables 4.3, 4.4 and 4.5 indicates that significant changes are projected to take

TABLE 4.3
 CUMULATIVE VALUE ADDED, AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER
 LABOR, AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE
 LOWER MAIN STEM SUBREGION, 1965 AND OBE-FRS PROJECTIONS FOR 1980 AND 2020^{1/}

No.	Rank	Year and Sector	: Final : Demand	: Direct and Indirect		
				: Value : Added	: Water	: Labor : Crplnd : Hyst'd
			: Million : Dollars	Million Dollars	1,000 Ac.Ft.	1,000 Man Yrs Acres
<u>1965</u>			:	:	:	:
8	1	Forestry	: 0.0 ^{2/}	0.0	0.0	0.0
30	2	Rentals & finance	: 59.9	57.8	0.2	2.7
13	3	Lumber & wood products	: 81.2	72.8	0.3	4.1
16	4	Fabricated metals	: 82.9	73.9	0.3	4.3
28	5	All other utilities	: 99.0	83.8	0.3	5.9
			:	:	:	:
15	6	Printing & publishing	: 104.8	87.6	0.3	6.6
22	7	All other retail	: 253.5	186.9	1.6	23.0
25	8	All other services	: 419.7	289.9	3.0	50.6
19	9	Wholesale trade	: 479.6	321.4	3.6	55.1
20	10	Service stations	: 493.7	329.6	3.7	56.2
			:	:	:	:
24	11	Lodging	: 676.0	467.9	7.1	75.9
18	12	All other mfr	: 747.0	502.7	8.4	80.6
26	13	Transportation	: 814.8	530.2	9.5	84.2
10	14	Uranium	: 817.0	531.4	9.5	84.3
29	15	Contract construction	: 903.9	583.4	14.1	96.6
			:	:	:	:
11	16	All other mining	: 909.9	587.4	14.4	96.8
27	17	Electric energy	: 942.4	607.4	16.3	98.1
14	18	Chemicals	: 969.3	620.3	17.6	99.4
17	19	Stone, clay & glass	: 984.6	629.0	18.9	100.3
23	20	Agricultural services	: 984.6	629.0	18.9	100.3
			:	:	:	:
21	21	Eating & drinking	: 1,051.6	669.1	95.7	108.1
1	22	Range livestock	: 1,063.7	678.0	125.2	109.3
6	23	Vegetables	: 1,091.5	694.2	186.5	113.1
7	24	Citrus crops	: 1,112.9	708.2	287.4	115.5
12	25	Food & kindred products	: 1,126.9	716.9	356.1	116.6
			:	:	:	:
5	26	Cotton	: 1,140.1	727.4	462.5	117.3
2	27	Feeder livestock	: 1,153.6	733.8	573.6	118.1
3	28	Dairy	: 1,153.8	733.9	576.9	118.1
9	29	All other agriculture	: 1,159.5	737.5	650.1	118.5
4	30	Forage, feed & food	: 1,168.3	743.8	1,037.7	119.5

See footnotes at end of table, page 149.

TABLE 4.3

CUMULATIVE VALUE ADDED, AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER, LABOR, AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE LOWER MAIN STEM SUBREGION, 1965 AND OBE-ERS PROJECTIONS FOR 1980 AND 2020^{1/-CON}

No:	Rank:	Year and Sector	Final Demand	Direct & Indirect			
				Value Added	Water	Labor	Cropland Harvested
			Million Dollars	Million Dollars	1,000 Ac.Ft.	1,000 Man Yrs.	Acres
		<u>1980</u>					
8	1	Forestry	.0	.0	.0	0	0
30	2	Rentals & finance	199.9	192.5	0.6	6.3	25
28	3	All other utilities	228.6	210.6	0.7	8.1	26
16	4	Fabricated metals	232.6	213.2	0.7	8.3	26
15	5	Printing & publ'g	252.4	226.3	0.9	9.8	36
		:					
25	6	All other services	710.2	521.6	5.0	67.0	106
22	7	All other retail	1,077.5	790.6	9.3	96.3	136
19	8	Wholesale trade	1,221.4	869.4	10.8	102.7	183
24	9	Lodging	1,723.8	1,254.5	18.8	134.6	565
13	10	Lumber & wood prod	1,781.8	1,296.0	19.6	136.8	567
		:					
20	11	Service stations	1,817.2	1,317.2	20.1	138.6	578
26	12	Transportation	1,901.3	1,351.6	21.1	142.5	645
18	13	All other mfr	2,104.1	1,453.8	25.2	153.0	683
10	14	Uranium	2,106.3	1,455.1	25.3	153.1	683
29	15	Contract constr	2,269.2	1,563.1	33.8	169.8	717
		:					
17	16	Stone clay & glass	2,312.0	1,588.4	36.1	171.5	726
14	17	Chemicals	2,375.2	1,618.7	38.9	173.4	740
11	18	All other mining	2,381.2	1,622.9	39.3	173.5	741
27	19	Electric energy	2,444.1	1,662.4	48.6	175.3	787
23	20	Agric services	2,444.1	1,662.4	48.6	175.3	787
		:					
21	21	Eating & drinking	2,609.7	1,762.6	132.6	189.0	17,856
1	22	Range livestock	2,619.8	1,770.0	152.7	189.8	21,696
6	23	Vegetables & melons	2,657.3	1,792.2	225.9	192.3	72,331
12	24	Food & kindred prod	2,737.8	1,841.7	393.5	195.3	106,866
7	25	Citrus crops	2,767.4	1,860.8	525.4	197.9	139,002
		:					
5	26	Cotton	2,793.0	1,881.1	690.3	198.9	180,235
9	27	All other agric	2,802.0	1,886.8	743.6	199.4	193,407
3	28	Dairy	2,802.2	1,887.0	745.8	199.5	193,857
2	29	Feeder livestock	2,833.6	1,900.3	955.8	200.5	236,833
4	30	Forage feed & food	2,840.0	1,904.9	1,198.6	201.1	286,753
		:					

See footnotes at end of table, page 149.

TABLE 4.3

CUMULATIVE VALUE ADDED, AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER, LABOR, AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE LOWER MAIN STEM SUBREGION, 1965 AND OBE-ERS PROJECTIONS FOR 1980 AND 2020^{1/}-CON

No:	Rank:	Year and Sector	Final Demand	Direct & Indirect			
				Value Added	Water	Labor	Cropland Harvested
			Million dollars	Million dollars	1,000 Ac. ft.	1,000 Man Yrs.	Acres
2020							
8	1	Forestry	.0 ^{2/}	.0	.0	.0	0
30	2	Rentals & finance	2,128.3	2,046.3	5.2	32.5	114
28	3	All other utilities	2,199.2	2,090.9	5.4	34.3	115
16	4	Fabricated metals	2,222.1	2,105.9	5.4	34.8	115
15	5	Printing & publ'g	2,292.9	2,152.7	5.8	37.1	129
:							
25	6	All other services	6,542.2	4,892.7	31.0	300.8	412
22	7	All other retail	9,289.7	6,899.4	52.5	388.5	518
24	8	Lodging	13,847.1	10,384.8	96.2	472.7	2,233
19	9	Wholesale trade	14,570.1	10,781.5	101.4	491.1	2,335
20	10	Service stations	14,818.1	10,929.1	103.7	496.5	2,368
:							
26	11	Transportation	15,254.4	11,108.4	107.3	505.0	2,516
13	12	Lumber & wood prod	15,555.2	11,317.2	111.7	510.7	2,545
18	13	All other mfr	16,771.9	11,909.5	125.9	539.1	2,650
10	14	Uranium	16,774.0	11,910.8	126.0	539.2	2,650
17	15	Stone clay & glass	17,036.4	12,061.4	135.6	544.5	2,690
:							
14	16	Chemicals	17,450.0	12,250.3	148.8	550.2	2,727
29	17	Contract constr	18,431.7	12,900.0	197.8	596.6	2,820
11	18	All other mining	18,454.2	12,915.5	199.2	596.9	2,823
27	19	Electric energy	18,706.9	13,071.0	217.0	600.1	2,903
21	20	Eating & drinking	19,821.6	13,741.2	443.9	641.6	50,879
:							
23	21	Agric services	19,821.6	13,741.2	443.9	641.6	50,879
12	22	Food & kindred prod	20,132.4	13,925.9	699.6	647.6	106,590
1	23	Range livestock	20,135.7	13,927.6	703.7	647.8	107,400
6	24	Vegetables & melons	20,198.4	13,964.4	810.1	651.7	177,712
7	25	Citrus crops	20,251.9	13,998.6	977.7	654.3	220,289
:							
5	26	Cotton	20,297.9	14,034.7	1,177.3	655.3	272,199
9	27	All other agric	20,313.0	14,044.2	1,235.4	655.8	287,150
3	28	Dairy	20,313.1	14,044.3	1,235.8	655.8	287,247
2	29	Feeder livestock	20,334.1	14,052.4	1,324.7	656.2	306,585
4	30	Forage feed & food	20,340.7	14,057.1	1,490.7	656.5	343,058
:							

See footnotes at end of table, page 149.

TABLE 4.4

CUMULATIVE VALUE ADDED, AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER, LABOR, AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE LITTLE COLORADO SUBREGION, 1965 AND OBE-ERS PROJECTIONS TO 1980 AND 2020^{1/} --CONTINUED

No.:	Rank:	Year and Sector	Final Demand	Direct & Indirect			Cropland Harvested
				Value Added	Water	Labor	
			Million Dollars	Million Dollars	1,000 Ac.Ft.	1,000 Man Yrs	Acres
		<u>1965</u>					
5	1	Forestry	.1	.1	0 ^{2/}	.0	0
26	2	Rentals & finance	53.7	50.0	.2	5.5	3
24	3	All other utilities	56.1	52.0	.2	6.1	3
12	4	Lumber & wood prod	87.5	68.5	.3	9.4	3
14	5	Printing & publ'g	88.3	69.1	.3	9.6	3
17	6	Service stations	91.4	71.3	.3	10.0	3
16	7	Wholesale trade	103.9	76.8	.4	11.1	3
19	8	All other retail	123.0	89.2	.6	14.8	4
21	9	All other services	133.7	94.4	.6	20.3	4
13	10	Paper & pulp	151.2	101.6	.8	22.2	5
20	11	Lodging	157.0	104.7	.8	23.5	14
8	12	Oil & gas	157.0	104.7	.8	23.5	14
22	13	Transportation	171.9	107.3	1.0	25.3	16
9	14	Uranium	224.8	150.7	3.4	27.1	16
10	15	All other mining	229.6	154.0	3.6	27.3	16
25	16	Contract constr	242.8	158.1	4.0	30.6	17
15	17	All other mfr	258.6	161.4	4.5	31.8	17
18	18	Eating & drinking	268.8	165.2	5.4	33.7	376
7	19	Coal	268.9	165.3	5.4	33.7	376
23	20	Electric energy	271.3	166.0	5.7	33.9	376
1	21	Range livestock	283.4	174.6	41.1	37.0	10,693
11	22	Food & kindred prod	284.2	175.1	45.1	37.3	12,437
6	23	All other agric	284.6	175.4	48.3	37.4	15,115
2	24	Feeder livestock	284.9	175.6	51.4	37.5	16,066
3	25	Dairy	285.0	175.6	52.0	37.5	16,264
4	26	Forage feed & food	285.3	175.9	66.0	37.5	20,588

See footnotes at end of table, page 149.

TABLE 4.4
 CUMULATIVE VALUE ADDED AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER, LABOR,
 AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE LITTLE COLO-
RADO SUBREGION, 1965 AND OBE-ERS PROJECTIONS TO 1980 AND 2020^{1/}--CONTINUED

No.:	Rank:	Year and Sector	Final Demand	Value Added	Direct & Indirect		Cropland Harvested
					Water	Labor	
			Million Dollars	Million Dollars	1,000 Ac.Ft.	1,000 Man Yrs	Acres
<u>1980</u>							
5	1	Forestry	0 ^{2/}	0	0	0	0
26	2	Rentals & finance	15.7	14.6	.1	1.4	0
24	3	All other utilities	19.0	17.5	.1	2.3	0
16	4	Wholesale trade	44.2	29.5	.2	4.1	0
17	5	Service stations	50.9	34.3	.3	5.1	0
:							
14	6	Printing & publ'g	52.6	35.4	.3	5.6	0
19	7	All other retail	90.0	61.9	.7	12.1	0
21	8	All other services	107.3	70.5	.8	19.8	0
20	9	Lodging	118.2	76.4	.9	22.0	1
12	10	Lumber & wood prod	192.8	114.5	2.0	28.0	1
:							
13	11	Paper & pulp	217.3	124.8	2.2	30.1	1
18	12	Eating & drinking	237.6	132.8	2.5	33.6	52
22	13	Transportation	258.9	136.8	2.7	36.2	52
8	14	Oil & gas	294.9	156.8	3.9	37.6	52
10	15	All other mining	299.5	160.2	4.1	37.8	52
:							
9	16	Uranium	361.4	197.1	7.2	40.5	53
25	17	Contract constr	372.7	200.6	7.7	43.9	53
15	18	All other mfr	408.6	209.0	8.8	47.5	53
7	19	Coal	412.8	211.3	9.4	48.0	53
23	20	Electric energy	418.2	213.9	10.4	48.6	53
:							
11	21	Food & kindred prod	424.1	218.3	12.9	49.3	1,031
1	22	Range livestock	437.9	228.2	45.0	52.0	13,006
6	23	All other agric	438.9	228.8	50.2	52.1	47,818
2	24	Feeder livestock	439.1	229.0	52.9	52.1	48,891
3	25	Dairy	439.1	229.0	53.3	52.1	49,050
4	26	Forage feed & food	439.4	229.2	60.8	52.2	52,057
:							

See footnotes at end of table, page 149.

TABLE 4.4

CUMULATIVE VALUE ADDED AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER, LABOR, AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE LITTLE COLORADO SUBREGION, 1965 AND OBE-ERS PROJECTIONS TO 1980 AND 2020^{1/}--CONTINUED

No.:	Rank:	Year and Sector	Final Demand	Direct & Indirect			
				Value Added	Water	Labor	Cropland Harvested
			Million Dollars	Million Dollars	1,000 Ac.Ft.	1,000 Man Yrs	Acres
		2020					
5	1	Forestry	.0 ^{2/}	.0	.0	.0	0
23	2	Electric energy	14.2	3.4	.0	.3	0
26	3	Rentals & finance	103.1	85.4	.2	4.9	0
24	4	All other utilities	112.6	93.3	.2	6.1	0
19	5	All other retail	235.6	179.3	.8	16.9	0
							0
14	6	Printing & publ'g	240.8	182.4	.8	18.3	0
17	7	Service stations	262.3	196.3	.9	19.8	0
21	8	All other services	326.3	233.9	1.2	34.0	0
16	9	Wholesale trade	408.8	274.0	1.6	37.5	0
13	10	Paper & pulp	466.1	297.6	1.9	39.6	0
							0
20	11	Lodging	505.8	319.2	2.2	43.6	2
18	12	Eating & drinking	571.9	346.4	2.5	49.0	26
12	13	Lumber & wood prod	781.8	445.6	4.1	57.9	27
22	14	Transportation	877.0	464.0	4.9	64.1	27
8	15	Oil & gas	901.8	477.4	5.6	64.7	27
10	16	All other mining	908.2	482.0	5.9	64.9	27
11	17	Food & kindred prod	942.1	506.7	7.7	66.3	738
9	18	Uranium	1,004.0	542.8	10.6	68.0	738
15	19	All other mfr	1,104.1	566.5	12.8	74.2	738
25	20	Contract constr	1,142.5	579.0	14.4	80.6	738
7	21	Coal	1,142.5	579.0	14.4	80.6	738
1	22	Range livestock	1,165.1	595.1	48.4	82.8	14,157
6	23	All other agric	1,166.7	596.2	56.6	83.0	20,683
2	24	Feeder livestock	1,167.0	596.3	58.9	83.0	21,662
3	25	Dairy	1,167.0	596.4	59.3	83.0	21,850
4	26	Forage, feed & food	1,167.1	596.4	62.4	83.0	23,180

See footnotes at end of table, page 149.

TABLE 4.5

CUMULATIVE VALUE ADDED AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER, LABOR, AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE GILA SUBREGION, 1965 AND OBE-ERS PROJECTIONS FOR 1980 AND 2020^{1/}---CONTINUED

No:	Rank:	Year and Sector	Final Demand	Direct & Indirect			
				Value Added	Water	Labor	Cropland Harvested
			Million Dollars	Million Dollars	1,000 Ac. Ft.	1,000 Man Yrs.	Acres
		<u>1965</u>					
8	1	Forestry	.2	.1	.02/	.0	0
21	2	Textiles & apparel	32.2	17.6	.1	4.0	5
34	3	All other utilities	126.2	69.0	.3	13.4	37
36	4	Rentals & finance	470.6	387.1	2.2	37.3	208
24	5	All other mfr	1,023.6	793.5	6.9	76.5	948
		:					
15	6	Furniture & fixtrs	1,036.6	800.1	7.0	77.5	962
14	7	Lumber & wood prod	1,046.1	805.5	7.1	78.5	973
19	8	Printing & publ'g	1,102.4	846.2	7.6	84.3	1,016
28	9	All other retail	1,670.1	1,224.4	13.5	153.3	1,564
26	10	Service stations	1,694.0	1,241.2	13.8	157.0	1,598
		:					
20	11	Fabricated metals	1,726.2	1,254.8	14.1	161.6	1,610
29	12	Agric services	1,726.2	1,254.8	14.1	161.6	1,610
25	13	Wholesale trade	1,963.6	1,409.8	17.5	182.1	2,040
31	14	All other services	2,202.8	1,543.3	20.7	265.7	2,423
16	15	Paper & pulp	2,214.8	1,550.7	20.9	266.9	2,452
		:					
12	16	All other mining	2,236.8	1,564.6	21.8	268.3	2,491
17	17	Chemicals	2,270.0	1,580.1	22.7	270.0	2,511
33	18	Electric energy	2,336.2	1,631.9	26.1	272.3	2,586
23	19	Stone clay & glass	2,368.0	1,655.1	27.9	275.1	2,646
35	20	Contract constr	2,631.0	1,814.7	40.4	317.3	2,801
		:					
30	21	Lodging	2,688.4	1,852.4	45.0	336.4	3,845
32	22	Transportation	2,797.3	1,914.3	54.4	347.2	6,139
18	23	Primary metals	3,282.5	2,245.3	117.6	376.4	9,942
10	24	Uranium	3,282.5	2,245.3	117.6	376.4	9,942
11	25	Copper	3,285.3	2,247.2	118.0	376.6	9,967
		:					
27	26	Eating & drinking	3,445.0	2,337.4	193.4	397.2	29,585
22	27	Leather & lea gds	3,445.6	2,337.5	194.0	397.5	29,729
6	28	Vegetables	3,491.8	2,364.7	272.5	403.1	92,011
1	29	Range livestock	3,496.9	2,368.3	285.6	403.7	95,349
13	30	Food & kindred prod:	3,715.0	2,490.5	1,159.8	420.7	326,603
		:					
7	31	Citrus crops	3,728.1	2,498.6	1,224.4	422.4	343,066
9	32	All other agric	3,745.9	2,511.9	1,364.2	423.9	378,054
2	33	Feeder livestock	3,824.0	2,564.4	2,062.0	430.8	562,479
5	34	Cotton	3,926.1	2,635.3	3,117.0	439.1	845,746
3	35	Dairy	3,927.8	2,636.7	3,147.1	439.3	853,640
		:					
4	36	Forage feed & food	3,939.4	2,645.6	3,592.8	440.5	972,583

See footnotes at end of table, page 149.

TABLE 4.5

CUMULATIVE VALUE ADDED AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER, LABOR, AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE GILA SUBREGION, 1965 AND OBE-ERS PROJECTIONS FOR 1980 AND 2020^{1/}—CONTINUED

No:	Rank:	Year and Sector	Final Demand	Direct & Indirect			
				Value Added	Water	Labor	Cropland Harvested
			Million Dollars	Million Dollars	1,000 Ac. Ft.	1,000 Man Yrs.	Acres
		1980					
8	1	Forestry	.02/	3.6	.0	.0	0
36	2	Rentals & finance	723.0	924.9	4.6	36.9	362
34	3	All other utilities:	879.8	1,072.1	5.5	48.1	472
21	4	Textiles & apparel	975.1	1,122.0	6.2	55.9	558
15	5	Furniture & fixtrs	1,007.6	1,134.3	6.5	57.3	600
28	6	All other retail	2,119.0	1,824.5	21.8	163.7	1,934
14	7	Lumber & wood prod	2,154.7	1,851.5	22.3	165.6	1,984
19	8	Printing & publ'g	2,310.1	1,996.3	24.9	177.6	2,279
29	9	Agric services	2,310.1	2,015.6	24.9	177.6	2,279
26	10	Service stations	2,346.5	2,063.0	25.6	181.9	2,334
31	11	All other services	2,930.4	2,411.7	34.1	324.0	3,327
16	12	Paper & pulp	2,957.3	2,430.6	34.7	325.7	3,400
25	13	Wholesale trade	3,367.6	2,681.8	44.5	351.8	4,467
20	14	Fabricated metals	3,458.1	2,733.5	46.1	358.4	4,594
24	15	All other mfr	5,012.0	3,899.1	100.7	446.0	16,093
17	16	Chemicals	5,144.3	3,963.0	104.9	450.4	16,239
23	17	Stone clay & glass	5,225.8	4,047.1	108.9	454.8	16,394
12	18	All other mining	5,234.8	4,072.5	109.4	455.3	16,411
35	19	Contract constr	5,700.2	4,330.3	132.8	508.9	16,783
30	20	Lodging	5,834.8	4,402.0	141.8	531.1	18,775
32	21	Transportation	5,977.5	4,559.8	151.8	541.5	21,129
33	22	Electric energy	6,117.4	4,791.9	170.2	544.7	21,367
10	23	Uranium	6,117.4	4,791.9	170.2	544.7	21,367
18	24	Primary metals	6,826.5	4,856.4	263.5	579.7	27,394
11	25	Copper	6,829.0	5,146.7	263.9	579.8	27,418
27	26	Eating & drinking	7,137.9	5,263.7	383.6	608.9	58,892
22	27	Leather & lea gds	7,138.7	5,264.2	384.2	609.2	59,057
1	28	Range livestock	7,144.7	5,294.1	395.4	609.8	61,891
6	29	Vegetables	7,204.5	5,322.4	491.4	614.5	126,801
13	30	Food & kindred prod:	7,605.2	5,388.9	1,712.3	639.0	452,969
7	31	Citrus crops	7,622.2	5,392.3	1,787.0	640.7	472,715
9	32	All other agric	7,646.9	5,404.7	1,923.4	642.8	510,527
2	33	Feeder livestock	7,793.0	5,523.4	2,580.4	648.5	685,765
5	34	Cotton	7,953.1	5,602.1	3,942.9	658.1	1,050,426
3	35	Dairy	7,953.9	5,614.8	3,952.6	658.2	1,053,022
4	36	Forage feed & food	7,955.4	5,656.3	3,995.7	658.3	1,064,661

See footnotes at end of table, page 149.

TABLE 4.5

CUMULATIVE VALUE ADDED AND DIRECT AND INDIRECT REQUIREMENTS FOR WATER, LABOR, AND CROPLAND RELATED TO CUMULATIVE FINAL DEMAND OF SECTORS IN THE GILA SUBREGION, 1965 AND OBE-ERS PROJECTIONS FOR 1980 AND 2020^{1/}--CON

No:	Rank:	Year and Sector	Final Demand	Direct & Indirect			
				Value Added	Water	Labor	Cropland Harvested
			Million Dollars	Million Dollars	1,000 Ac. Ft.	1,000 Man Yrs.	Acres
		<u>2020</u>					
8	1	Forestry	.0 ^{2/}	.0	.0	.0	0
36	2	Rentals & finance	3,697.4	3,399.3	20.5	92.5	1,062
34	3	All other utilities	4,093.0	3,624.7	22.1	104.0	1,227
21	4	Textiles & apparel	5,253.5	4,346.6	30.6	135.8	2,269
28	5	All other retail	11,509.2	8,910.9	90.6	361.7	5,622
15	6	Furniture & fixtrs	11,735.5	9,042.8	92.4	366.7	5,786
31	7	All other services	16,207.2	11,694.6	133.0	838.4	8,898
29	8	Agric services	16,207.2	11,694.6	133.0	838.4	8,898
26	9	Service stations	16,318.1	11,780.1	134.4	843.6	8,975
14	10	Lumber & wood prod	16,689.6	12,015.1	139.2	853.9	9,273
19	11	Printing & publ'g	17,638.6	12,713.9	155.1	887.1	11,212
25	12	Wholesale trade	19,757.9	14,230.7	190.9	968.6	14,167
16	13	Paper & pulp	19,762.4	14,233.9	191.0	968.7	14,173
20	14	Fabricated metals	20,125.0	14,425.1	196.6	981.8	14,559
24	15	All other mfr	30,717.9	22,622.2	465.6	1,295.4	65,475
30	16	Lodging	31,690.7	23,270.9	494.8	1,342.1	71,061
32	17	Transportation	31,735.8	23,297.3	496.0	1,343.5	71,317
23	18	Stone clay & glass	32,010.0	23,511.4	506.9	1,349.0	71,513
17	19	Chemicals	33,930.1	24,528.1	562.0	1,375.4	72,929
12	20	All other mining	33,939.1	24,534.5	562.4	1,375.7	72,943
35	21	Contract constr	36,011.2	25,866.9	672.4	1,493.3	74,125
33	22	Electric energy	36,514.5	26,269.1	713.0	1,497.7	74,537
10	23	Uranium	36,514.5	26,269.1	713.0	1,497.7	74,537
18	24	Primary metals	38,210.6	27,476.5	864.7	1,538.2	82,113
11	25	Copper	38,213.9	27,478.7	865.2	1,538.3	82,134
27	26	Eating & drinking	39,745.1	28,375.7	1,067.5	1,600.1	137,671
22	27	Leather & lea gds	39,746.0	28,376.4	1,067.8	1,600.3	137,732
1	28	Range livestock	39,751.6	28,380.4	1,073.6	1,600.7	139,428
13	29	Food & kindred prod:	41,453.2	29,390.3	2,625.5	1,643.1	587,595
6	30	Vegetables	41,546.9	29,446.8	2,767.4	1,647.5	672,908
9	31	All other agric	41,568.7	29,463.6	2,837.0	1,648.4	693,383
2	32	Feeder livestock	41,628.1	29,500.0	2,999.6	1,649.7	740,473
3	33	Dairy	41,629.3	29,501.0	3,004.4	1,649.7	741,845
7	34	Citrus crops	41,651.5	29,515.0	3,073.1	1,651.0	760,573
5	35	Cotton	41,849.4	29,651.7	4,169.3	1,657.3	1,073,204
4	36	Forage feed & food	41,851.4	29,653.2	4,207.4	1,657.4	1,084,452

^{1/} All values are in 1960 dollars.

^{2/} Less than 0.05.

place. Direct and indirect water use by the nonagricultural sectors other than food and kindred products and eating and drinking places sectors, increases sharply throughout the projection time frame, their proportion of total water used by the processing sectors increasing from 5 percent in 1965 to 15 percent in 2020 in the Lower Main Stem Subregion; from 7 to 20 percent in the Little Colorado Subregion; and from 3 to 21 percent in the Gila Subregion. Large increases also are projected to occur in the eating and drinking places, and in the food and kindred product sectors in the Lower Main Stem and Gila Subregions. Direct and indirect water use in the eating and drinking places sector is projected to increase from 10 percent of the processing sector total in 1965 to 15 percent in 2020 in the Lower Main Stem Subregion, and from 2 to 5 percent in the Gila Subregion. Similarly, the proportion used by the food and kindred products sector is projected to increase from 9 to 17 percent in the Lower Main Stem Subregion, and from 24 to 37 percent in the Gila Subregion.

The proportion of total water used directly and indirectly by the processing sectors required by the agricultural sectors as a group is projected to decline from 1965 to 2020. However, the pattern among sectors is not uniform. In the Lower Main Stem Subregion the proportion of total water used directly and indirectly by citrus is projected to increase from less than 1 percent in 1965 to 11 percent in 2020. The projected increase for cotton is from 3 to 13 percent, and for the forage, feed and food sector, from 8 to 11 percent. Major decreases are projected for the range livestock, vegetable, and feeder livestock sectors. In the Little Colorado Subregion the proportion of total water required by the processing sectors used directly and indirectly by the all other agriculture sector is projected to increase from 5 percent in 1965 to 13 percent in 2020, while the proportion used directly and indirectly by the forage feed and food crop sector is projected to decline from 21 to 5 percent. In the Gila Subregion the proportion of total processing sector water used directly and indirectly by the vegetable sector is projected to increase from 2 percent in 1965 to 3 percent in 2020. On the other hand, the proportion used by the feeder livestock sector is projected to drop from 19 percent in 1965 to 4 percent in 2020. The corresponding projected decrease for the cotton sector is from 29 percent to 24 percent, and for the forage, feed and food sector, from 12 to less than 1 percent. Hence, it is evident that with growth and gradual maturity of the economy projected for the Region, the total amount of water will increase, and the proportion of the total used directly and indirectly by the nonagricultural sectors will increase sharply. Since further development and maturity of the economy of the Region undoubtedly will continue following 2020, direct and indirect water requirements of the nonagricultural sectors probably will continue to increase.

Increase Over Time in Value Added and Employment Per Unit of Water

The shift in water use associated with projections of economic activity in the Region, as outlined above, will have a beneficial effect in

terms of value added to the economy and employment. Value added to the economy per acre foot of water used by the processing sectors is projected to increase about tenfold from 1965 to 2020 in the Lower Main Stem and Gila Subregions, and about 3.6 times in the Little Colorado Subregion. The large increases are due primarily to an increase in the proportion of the total water used in those sectors of the economy where value added per unit of water is relatively high. However, a significant part of the increase is attributable to projected technological advances.

An increase also is projected for employment per unit of water used by the processing sectors. The increase per acre foot from 1965 to 2020 is projected to be about threefold in the Lower Main Stem and Gila Subregions, and nearly 2.5 times in the Little Colorado Subregion. The entire increase in this instance is due to the increase in the proportion of the total water being used in the labor intensive sectors. Practically all sectors show a decline in employment used per unit of water used due to increased efficiency in labor use.

Alternative Projections to Indicate Effects of Alternative Uses of Water

Alternative projections can be made using the factors given in table 4.2 to indicate benefits to be derived from alternative uses of water. Information provided by the alternative projections, coupled with that derived from the baseline projections, serves to broaden the base of information for use in framework planning. The objective in this section is to illustrate the procedure for developing alternative projections.

Analyses of alternative uses of water are made as of a given point in time and involve a given quantity of water. The objective is not to determine the benefits to be obtained from using additional water, but to indicate the benefits which can be derived from a different use or combination of uses of the amount of water available at the point in time being considered. The procedure is to shift water from one use to another and to compare the benefits with those before the shift was made. With benefits related to final demand as they are in table 4.2, it is convenient to make the shift in water use on a sector basis. As an example illustrating the procedure thus described, assume because of the large projected personal income or some other reason the demand for fresh vegetables produced in the Lower Colorado Region is projected to be substantially more than OBE-ERS projections. However, the OBE-ERS projections assume all available water has a projected use. What would be the effect on the economy of the Gila Subregion in 1980 if we shifted 1,000 acre feet of water from cotton to vegetables in order to supply this assumed larger demand? Referring to table 4.2, the final demand associated with 1,000 acre feet of water used in the cotton sector is \$117,553 ($1,000 \div 8,5068 = 117.553$ thousand per acre foot, or 117,553 per 1,000 acre feet. The factor 8.5068 is found under "Gila Subregion, 1980", in column 3). Similarly, the final demand associated with 1,000 acre feet

of water used in the vegetable sector is \$623,014. Applying the factors in table 4.2 to these final demands gives the following:

<u>Sector</u>	<u>Value Added</u>	<u>Labor</u>	<u>Cropland Harvested</u>
	<u>\$1,000</u>	<u>Man Years</u>	<u>Acres</u>
Cotton	82	7	268
Vegetables	374	49	676

Hence, with the relationships projected for the Gila Subregion in 1980, shifting 1,000 acre feet of water used directly and indirectly from the cotton sector to the vegetable sector would increase value added to the economy of the subregion by \$292,000, employment by 42 man years, and irrigated harvested cropland required by 408 acres. Making these adjustments in the OBE-ERS subregion projections for the processing sectors (shown in table 4.5) gives alternative projection totals for the processing sectors of the subregion as follows: Final demand, \$7,955.9 million; value added, \$5,656.6 million; and direct and indirect requirements for water, 3,995.7 thousand acre feet (the same as OBE-ERS projections, since the quantity of water was held constant); for labor, 658,342 man years; and for cropland harvested, 1,065.1 thousand acres.

Alternative Projections to Indicate Effects of Increasing
or Decreasing the Level of Water Available on the Economy

Alternative projections also can be made using the factors given in table 4.2 to indicate the effects of increasing or decreasing the level of water available on the economy. Comparing the alternative projections with the baseline projections would serve to improve the basis for framework planning. If the analysis were based upon a higher level of water availability, comparing the alternative projections with the baseline projections would provide an indication of whether costs of increasing the level of water availability would be worthwhile. If the analysis involved a lower level of water availability, comparison of the alternative projections with the baseline projections would provide an indication of the detriment caused by the reduction in water availability. The alternative projections, when completely structured, would also indicate the type of economy which would prevail with the lower level of water availability, together with stresses, problems, social pressures, etc., that likely would be experienced.

The methodology involved in analyses regarding an increased or decreased level of water availability compared with the baseline projections can be illustrated by consideration of the examples shown in table 4.6. In developing the alternative projections, it was assumed that the level of water available in the Lower Main Stem Subregion was

increased and decreased 500,000 acre feet compared with the OBE-ERS projected level in 2020. Similarly, it was assumed the level of water availability in the Gila Subregion was raised and lowered one million acre feet compared with the OBE-ERS projected 2020 level, a greater change in the level of water availability being assumed than in the Lower Main Stem Subregion since more water is used in the Gila Subregion. In both subregions two alternative projections were made at the higher and at the lower level of water availability. One alternative, designated as "2a" and "3a" in table 4.6, the assumption that water use of all sectors would be increased or decreased proportionally. The alternative, designated as "2b" and "3b" in the table was based upon the assumption that the increase or decrease in water use would be made in the sectors which add the smallest amount of value to the economy per unit of water used.

TABLE 4.6
ECONOMIC ACTIVITY OF THE PROCESSING SECTORS IN THE LOWER MAIN STEM AND GILA SUBREGIONS:
OBE-ERS PROJECTIONS FOR 2020 AND TWO ASSUMED ALTERNATIVE LEVELS

Subregion and Item	Water Requirement	Final Demand	Value Added	Labor Man Yrs.	Cropland Harvsted
	1,000 AF	Mil. Dol.	Mil. Dol.	1,000	1,000 Ac.
<u>LMS Subregion</u>					
1. OBE-ERS projections	1,490.7	20,340.7	14,057.1	657.0	343.1
2. Plus 500 thousand acre feet					
a. All sectors increased	1,990.7	27,163.2	18,772.0	877.4	458.2
b. Selected sectors increased	1,990.7	20,427.3	14,114.6	659.1	462.7
3. Minus 500 thousand acre feet					
a. All sectors reduced	990.7	13,518.2	9,324.2	436.6	228.0
b. Selected sectors reduced	990.7	20,254.1	13,999.6	654.9	223.5
<u>Gila Subregion</u>					
1. OBE-ERS projections	4.21	41,851.4	29,653.2	1,657.4	1,084.5
2. Plus 1 million acre feet					
a. All sectors increased	5.21	51,791.9	36,696.4	2,051.0	1,342.1
b. Selected sectors increased	5.21	42,026.8	29,774.4	1,663.1	1,370.0
3. Minus 1 million acre feet					
a. All sectors reduced	3.21	31,910.4	22,609.7	1,263.7	826.9
b. Selected sectors reduced	3.21	41,676.0	29,531.7	1,651.7	799.0

The procedure involved in deriving the alternative projections with all sectors increased or decreased proportionally needs no explanation. The increase or decrease in each sector was proportional to the change in water availability. The other alternatives, numbered "2a" and "3a", involved use of the factors given in table 4.2. The procedure can be explained by outlining how the alternative projection for the Lower Main Stem subregion designated "3b" in table 4.6 was developed.

The sectors with the lowest value added per acre foot of water utilized were first listed, as in the following tabulation:

<u>Sector</u>	<u>Change in Final Demand</u>	<u>Water Required</u>	<u>Value Added</u>	<u>Labor</u>	<u>Cropland Harvested</u>
	<u>\$1,000</u>	<u>Thou.AF</u>	<u>Mil.Dol.</u>	<u>Man Yrs.</u>	<u>Thou.Ac.</u>
Forage, feed & food	6,426	161.1	4.6	309	35.4
Feeder livestock	20,973	88.8	8.5	417	19.3
Dairy	0	0	0	0	0
All other agriculture	13,404	51.3	8.4	448	13.2
Cotton	45,822	198.9	36.0	949	51.7
Total	86,625	500.1	57.5	2,123	119.6

The final demand of each sector was then reduced, as shown in the tabulation, by an amount equal to exports of the sector; i.e., it was assumed exports of the sector would be eliminated. The water required was then calculated using factors in table 4.2. For example, the Lower Main Stem Subregion 2020 water requirement factor for the feeder livestock sector is 4,2340 acre feet per \$1,000 final demand. Multiplying the reduction in final demand for the feeder livestock sector, \$20,973 (in thousands), by 4,2340 = 88,800 acre feet reduction in water required. A similar procedure was followed in computing the other requirements and the value added shown in the tabulation. The sums given in the tabulation were deducted from the OBE-ERS projections in table 4.6 to give the alternative projection. For example, the OBE-ERS projected final demand of \$20,340.7 million less \$86,625 thousand gives \$20,254.1 million, as shown for the Lower Main Stem Subregion alternative projection designated as "3b".

The alternative projections reflecting an increase in the level of water availability are the converse of the projections reflecting a decrease in water availability.

Comparing alternative projections designated as "2a" and "3a" with the OBE-ERS projections, each measure of business activity shows a substantial change, each changing by the same proportion as the change in water. With the alternative projections designated "2b" and "3b" final demand and value added show small changes, while the changes in employment and cropland are large.

IMPACT OF ALTERNATIVE PROJECTIONS ON COMMODITY PRICES

A national-interregional set of baseline projections equates, as outlined in Chapter I, national demand with supply and provides a consistent set of interregional projections based upon historical trends in

interregional production relationships. The baseline projected demand-supply relationships were based upon price relationships approximately equivalent to those which existed in the base period. An increase in supply above the projected baseline supply would depress prices, and conversely. The amount of change in price of a given commodity would depend upon the elasticity of demand for the commodity. With a perfectly elastic demand a change in supply will have no effect on price of the commodity. With a perfectly inelastic demand a change in supply will cause a great change in price. The elasticity of demand for goods and services of individual farms and small businesses generally is perfectly elastic; i.e., the amount sold by an individual farmer or merchant has little or no effect on price since the quantity sold is relatively small. However, the situation is different for a Region since the quantity of a product produced may be large enough to have a significant influence on the price of the product. Hence, if an alternative projection includes a significant increase or decrease in production compared with the baseline projections, the price effect of the change in supply should be considered in framework planning.

The modified OBE-ERS projections indicated some significant changes in production compared with the OBE-ERS projections. Significant changes made in production of agricultural commodities include vegetables, citrus, red meat, and milk. Data are available to indicate the elasticities of demand for these commodities and the effect of the change in production on price is analysed in this section. Significant increases were made in the electric energy and uranium sectors, and in some manufacturing and noncommodity producing sectors as a result of the increased population, but data on elasticities of demand for these products are not available to use in estimating the effect on prices of the increased production.

The effects of the change in projected production on price of the agricultural commodities referred to in the preceding paragraph are indicated in table 4.7. As indicated in the table, the percent change in production reflects the proportional change in national baseline projected production caused by the increase in modified OBE-ERS production compared with OBE-ERS production. The percent change in price is derived by the equation

$$\text{Percent change in price} = \frac{\text{Percent change in quantity}}{\text{Elasticity Coefficient}}$$

For example, 0.73 divided by a negative 0.33 gives a negative 2.2. Keep in mind, however, that a negative 0.28 divided by a negative 0.70 gives a positive 0.4.

Small percentage changes in commodity prices probably will not significantly affect the level of production. However, it should be kept in mind that a change in price will cause an equal percentage change in gross income, and a substantially larger change in net income. Hence,

TABLE 4.7
CHANGE IN PRICE INDICATED BY THE CHANGE IN MODIFIED OBE-ERS
PROJECTED PRODUCTION COMPARED WITH OBE-ERS PROJECTED PRODUCTION,
LOWER COLORADO REGION

Commodity and Year (1)	Percent Change in Production ^{1/} (2)	Elasticity ^{2/} (3)	Pct. Change in Price (4)
<u>Vegetables</u>			
1980	.73	-.33	-2.2
2000	1.51	-.33	-4.6
2020	1.87	-.33	-5.7
<u>Citrus</u>			
1980	.51	-.67	- .8
2000	1.55	-.67	-2.3
2020	2.67	-.67	-4.0
<u>Cattle and calves</u>			
1980	-.28	-.70	.4
2000	-.28	-.70	.4
2020	-.28	-.70	.4
<u>Milk</u>			
1980	.14	-.35	- .4
2000	.29	-.35	- .8
2020	.38	-.35	-1.1

^{1/} Change in production in the Region divided by the National OBE-ERS projected production.

^{2/} They were obtained from or based upon the following sources: Elasticities for vegetables and citrus are from unpublished material prepared by Del Kimball, NRED, ERS, Berkeley, California, and are based upon an unpublished manuscript by Gerald Dean and Gordon King, Projections of California Agriculture to 1980 and 2020, University of California, Davis, California. Elasticities for cattle and calves, and for milk, were based upon A Handbook on the Elasticity of Demand for Agricultural Products in the United States, WEMC Publication No. 4, Extension Service, Colorado State University, July 1967.

even a small change in the price of a commodity may significantly affect production if the profit margin is small. A reduction of 4 or 5 percent in gross income may wipe out all profit and cause some producers to operate at a loss. Hence, lower prices for vegetables and citrus indicated

for the latter part of the projection time frame with the modified OBE-ERS level of production may reduce expansion of production below the projected level.

It should be kept in mind that the analysis of price-quantity effects presented consider only change in production within the Region. If alternative projections in other regions of the Nation increase production of, say, vegetables, the combined increase of production in all regions may substantially reduce the price of the commodity.

SENSITIVITY ANALYSIS OF PROJECTED YIELDS

The discussion of projections in Chapter I made the point that projections are of a point or line type and indicated the desirability of broadening the basis for judgement. As outlined in Chapter II, a definite effort was made to obtain the best possible projected yields. However, any projection is subject to error and, therefore, an analysis was made to determine what the effect would be on the acreage of cropland and irrigation water requirements if projected yields were increased, and decreased 10 percent.

The OBE-ERS projections in Chapter II set forth first the projected quantity of the various crops needed to meet the regional allocation of projected national requirements. The acreage of cropland was then obtained by dividing projected production by projected yields. With production held constant at the OBE-ERS level, a 10 percent increase in projected crop yields causes approximately a 9 percent reduction in the acreage of irrigated cropland harvested, and a 10 percent decrease in yields causes approximately an 11 percent increase in the acreage of irrigated cropland harvested. Table 4.8. The variation among subregions is due at least in part to rounding in making the calculations. Variation in the "mix" of crops in the subregions also may be a factor but it was not felt the differences warranted further investigation.

With production held constant at the OBE-ERS level and with water applied per acre unchanged, a 10 percent increase in crop yields reduces the amount of water required in the Region by roughly 450,000 acre feet, and a 10 percent decrease in crop yields increases the regional water requirement by approximately 550,000 acre feet. Table 4.9. The reduction resulting from a 10 percent increase in yields amounts to about 7 percent of total water required in 1980, and declines to about 6 percent in 2020. The increase associated with a 10 percent decrease in crop yields amounts to 8.6 percent of the total water requirements in 1980, and declines to about 7 percent in 2020. The Gila Subregion accounts for about 75 percent of the change in water requirements in the Region.

COMPARISON OF OBE JUNE 1969 PROJECTIONS WITH 1968 OBE-ERS PROJECTIONS

The economic projections for Water Resource Planning Areas issued by the Water Resources Council in June 1969, included revisions in the 1968

TABLE 4.8
CHANGE IN OBE-ERS PROJECTED CROPLAND HARVESTED WITH OBE-ERS CROP PRODUCTION HELD CONSTANT
AND YIELDS INCREASED AND DECREASED BY 10 PERCENT, LOWER COLORADO REGION BY SUBREGION

Area and change in cropland harvested	Projections			Projections		
	1980	2000	2020	1980	2000	2020
	Acres in 1,000's			Percent ^{1/}		
<u>Region</u>						
Reduction with yields increased 10%	124.8	128.6	132.3	9.1	9.1	9.1
Increase with yields decreased 10%	152.2	157.2	160.8	11.1	11.1	11.1
<u>LMS Subregion</u>						
Reduction with yields increased 10%	26.4	29.2	31.2	9.2	9.1	9.1
Increase with yields decreased 10%	31.8	35.6	38.2	11.1	11.1	11.1
<u>L Colorado Subregion</u>						
Reduction with yields increased 10%	1.8	1.9	2.0	8.1	8.3	8.6
Increase with yields decreased 10%	2.2	2.3	2.4	10.0	10.1	10.4
<u>Gila Subregion</u>						
Reduction with yields increased 10%	96.6	97.5	99.1	9.1	9.1	9.1
Increase with yields decreased 10%	118.2	119.3	120.2	11.1	11.1	11.1

^{1/} Percent of irrigated cropland harvested. On first thought one may think that with a 10 percent increase and decrease in yields, the increase and decrease in acreage would be the same. However, this is not the case as the following simple hypothetical example illustrates:

Initial situation

Total production, tons	100
Yield per acre, tons	10
Acres	10

Total production constant, yield increased 10%

Yield per acre, tons	11
Acres required	90.9
Decrease in acres	9.1

Total production constant, yield decreased 10%

Yield per acre, tons	9
Acres required	111.1
Increase in acres	11.1

TABLE 4.9
CHANGE IN PROJECTED IRRIGATION WATER REQUIREMENTS WITH OBE-ERS CROP PRODUCTION HELD CONSTANT
AND YIELDS INCREASED AND DECREASED BY 10 PERCENT, LOWER COLORADO REGION BY SUBREGION^{1/}

Area and change in water required	Projections			Projections		
	1980	2000	2020	1980	2000	2020
	Acres in 1,000's			Percent ^{3/}		
<u>Region</u>						
Reduction with yields increased 10% ^{2/}	454.5	437.2	444.5	7.0	7.0	5.8
Increase with yields decreased 10% ^{2/}	554.0	534.4	540.6	8.6	8.5	7.1
<u>LMS Subregion</u>						
Reduction with yields increased 10%	105.3	109.2	115.1	7.4	6.7	5.7
Increase with yields decreased 10%	126.9	133.1	141.0	8.9	8.1	6.9
<u>L Colorado Subregion</u>						
Reduction with yields increased 10%	4.3	4.3	4.4	3.8	3.3	3.0
Increase with yields decreased 10%	5.2	5.2	5.3	4.6	4.0	3.6
<u>Gila Subregion</u>						
Reduction with yields increased 10%	344.9	323.7	325.0	7.0	7.2	6.0
Increase with yields decreased 10%	422.0	396.1	394.3	8.6	8.8	7.2

^{1/} It was assumed that irrigation water applied per acre would remain constant; i.e., it would not change with the increase or decrease in yields.

^{2/} Total of subregion figures.

^{3/} Percent of total OBE-ERS water requirements. IV-158

OBE-ERS projections pertaining to population and employment. Differences in the revised projections--referred to as the OBE June 1969 Projections--compared with the 1968 OBE-ERS projections are portrayed in this section, together with the related effects on requirements for water and cropland harvested, and on final demand and value added to the economy. The OBE June 1969 projections can be considered as an alternative set of projections with the differences indicating the sensitivity of the OBE-ERS projections to changes in assumptions regarding rates of population and employment growth.

The OBE June 1969 projections of population and employment were substantially lower than the 1968 OBE-ERS projections, particularly in the Lower Main Stem Subregion. Table 4.10. The comparison for population is as follows:

	OBE 1969 Projections as Percent of 1968 OBE-ERS Projections		
	<u>1980</u>	<u>2000</u>	<u>2020</u>
LMS Subregion	86	74	58
L Colorado Subregion	100	97	91
Gila Subregion	96	92	83
Region	94	88	77

The relative reduction in projected total employment was similar to the reduction in projected population. However, there was considerable difference by industry. Projected employment in the mining industry was increased substantially, particularly in the Little Colorado Subregion where the 2020 OBE June 1969 projection was 73 percent higher than the 1968 OBE-ERS projection. Projected regional employment in agriculture and forestry was decreased 15 percent by 2020. OBE June 1969 projected employment in manufacturing was substantially below 1968 OBE-ERS projections throughout the projection time frame in all three subregions, the regional reduction in 2020 amounting to 47 percent. Projected employment in "other" industries also was reduced, particularly in the Lower Main Stem Subregion where the reduction in 2020 was 42 percent.

Using the differences in employment given in table 4.10, the associated change in final demand, value added, and requirements for water and cropland harvested were derived by use of relationships portrayed in table 4.2. Note that both direct and indirect value added by final demand of the industry is included and, similarly, that both direct and indirect requirements for water and cropland harvested to meet the final demand of the industry are included.

The regional final demand with the OBE June 1969 projections is 14 percent below the 1968 OBE-ERS projected level in 1980, 22 percent below in 2000, and 33 percent below in 2020. The greatest relative reduction is in the Lower Main Stem Subregion. By industry, large reductions

TABLE 4.10
COMPARISON OF THE OBE JUNE 1969 PROJECTIONS WITH THE 1968 OBE-ERS PROJECTIONS
LOWER COLORADO REGION BY SUBREGION

Area and Item	1968 OBE-ERS Projections			OBE June 1969 Projections			OBE June 1969 Projections as Percent of 1968 OBE-ERS Projections		
	1980	2000	2020	1980	2000	2020	1980	2000	2020
<u>Region</u>	----- 1,000 -----								
<u>Population</u>	2,644.1	4,263.2	6,639.2	2,495.6	3,749.9	5,084.3	94.4	88.0	76.6
<u>Employment</u>	----- Million 1960 dollars -----								
Agriculture & forestry	39.5	38.8	36.4	38.9	37.3	31.0	98.4	96.1	85.2
Mining	16.6	16.4	16.2	18.0	19.2	20.4	108.4	117.3	126.1
Manufacturing	163.4	284.6	459.5	111.0	175.8	242.0	67.9	61.8	52.7
Other	797.3	1,339.0	2,130.3	767.5	1,193.2	1,653.9	96.3	89.1	77.6
Total ^{1/}	1,016.8	1,678.8	2,642.4	935.4	1,425.5	1,947.3	92.0	84.9	73.7
<u>Final Demand</u>	----- Million 1960 dollars -----								
Agriculture & forestry	581.0	540.1	636.8	572.1	514.6	542.0	98.5	95.3	85.1
Mining	126.3	151.0	130.0	151.6	203.7	213.4	120.0	134.9	164.2
Manufacturing	3,928.3	9,656.9	22,987.4	2,693.0	6,012.8	12,097.9	68.6	62.3	52.6
Other	6,599.0	16,961.0	39,604.7	6,298.2	14,716.3	29,435.1	95.4	86.8	74.3
Total ^{1/}	11,234.7	27,308.9	63,359.2	9,714.9	21,447.4	42,288.6	86.5	78.5	66.7
<u>Value Added</u>	----- Million 1960 dollars -----								
Agriculture & forestry	379.1	352.1	415.7	373.6	336.2	354.1	98.5	95.5	85.2
Mining	76.0	91.4	79.6	91.0	123.1	129.6	119.7	134.7	162.8
Manufacturing	2,705.5	6,617.6	15,189.1	1,868.6	4,148.2	7,879.1	69.1	62.7	51.9
Other	4,629.5	12,151.4	28,622.2	4,411.6	10,564.0	21,362.4	95.3	86.9	74.6
Total ^{1/}	7,790.1	19,212.5	44,306.6	6,744.8	15,171.5	29,725.2	86.6	79.0	67.1
<u>Water required</u>	----- 1,000 AF -----								
Agriculture & forestry	3,336.9	2,495.9	2,427.0	3,285.0	2,380.7	2,066.6	98.4	95.4	85.6
Mining	6.5	6.8	6.3	7.8	9.0	10.1	120.0	132.4	160.3
Manufacturing	1,566.7	2,181.2	2,374.0	1,087.2	1,368.7	1,213.5	69.4	62.7	51.1
Other	345.0	589.2	948.3	328.6	512.5	710.2	95.2	87.0	74.9
Total ^{1/}	5,255.1	5,273.1	5,755.6	4,708.6	4,270.9	4,000.4	89.6	81.0	69.5
<u>Cropland harvested</u>	----- 1,000 Acres -----								
Agriculture & forestry	935.0	667.1	757.3	921.3	645.8	645.2	98.5	96.8	85.2
Mining	0.0 ^{2/}	0.0	0.0	0.0	0.0	0.0	102.0	104.3	105.2
Manufacturing	380.4	556.8	568.9	264.9	350.5	295.0	69.6	62.9	51.9
Other	58.2	96.5	124.3	55.8	85.0	93.5	95.9	88.1	75.2
Total ^{1/}	1,373.6	1,320.4	1,450.6	1,241.9	1,081.3	1,033.6	90.4	81.9	71.2

^{1/} Items may not add to total due to rounding.

^{2/} Less than 0.05.

TABLE 4.10
COMPARISON OF THE OBE JUNE 1969 PROJECTIONS WITH THE 1968 OBE-ERS PROJECTIONS
LOWER COLORADO REGION BY SUBREGION

Area and Item	1968 OBE-ERS Projections			OBE June 1969 Projections			OBE June 1969 Projections as Percent of 1968 OBE-ERS Projections		
	1980	2000	2020	1980	2000	2020	1980	2000	2020
----- 1,000 -----									
<u>LMS Subregion</u>									
<u>Population</u>	556.2	1,023.2	1,756.0	479.3	751.8	1,018.9	86.2	73.5	58.0
<u>Employment</u>									
Agriculture & forestry:	9.8	10.4	10.0	9.2	9.0	8.2	93.7	87.2	81.9
Mining	.7	.6	.6	.8	.8	.9	114.3	133.3	150.0
Manufacturing	18.4	31.5	50.8	11.3	17.5	22.4	61.4	55.6	44.1
Other	195.1	378.5	665.7	173.9	278.5	382.9	89.1	73.6	57.5
Total ^{1/}	224.0	421.0	727.1	195.2	305.8	414.4	87.1	72.6	57.0
----- Million 1960 dollars -----									
<u>Final Demand</u>									
Agriculture & forestry:	149.8	178.4	208.3	139.5	155.1	171.5	93.1	86.9	82.3
Mining	8.1	21.2	24.6	9.3	28.3	36.9	114.8	133.5	150.0
Manufacturing	471.1	1,126.3	3,321.0	289.3	625.7	1,464.4	61.4	55.6	44.1
Other	2,211.0	6,622.1	16,786.7	1,971.3	4,872.3	9,707.8	89.2	73.6	57.8
Total ^{1/}	2,840.0	7,948.0	20,340.7	2,409.4	5,681.4	11,380.7	84.8	71.5	56.0
<u>Value Added</u>									
Agriculture & forestry:	92.8	110.6	131.2	86.4	96.2	108.1	93.1	87.0	82.4
Mining	5.4	14.5	16.8	6.2	19.3	25.2	114.8	133.1	150.0
Manufacturing	264.2	619.2	1,386.8	162.2	344.0	395.7	61.4	55.6	28.5
Other	1,542.5	4,865.1	12,521.9	1,367.3	3,627.1	7,459.8	88.6	74.6	59.6
Total ^{1/}	1,904.9	5,609.4	14,056.7	1,622.1	4,086.6	7,988.8	86.8	67.0	56.8
----- 1,000 AF -----									
<u>Water required</u>									
Agriculture & forestry:	898.4	807.2	791.2	836.8	701.9	652.0	93.1	87.0	82.4
Mining	.5	1.3	1.5	.6	1.7	2.3	120.0	130.8	153.3
Manufacturing	177.8	272.9	297.5	109.2	151.6	84.9	61.4	55.6	28.5
Other	121.9	225.4	400.5	108.6	165.9	238.4	89.1	73.6	59.8
Total ^{1/}	1,198.6	1,306.8	1,490.7	1,055.2	1,021.1	977.6	88.0	78.1	65.6
----- 1,000 Acres -----									
<u>Cropland harvested</u>									
Agriculture & forestry:	234.4	138.4	236.5	218.3	120.3	194.9	93.1	86.9	82.4
Mining	0.0 ^{2/}	0.0	0.0	0.0	0.0	0.0	100.0	125.0	133.3
Manufacturing	34.6	54.7	55.9	21.3	30.4	16.0	61.6	55.6	28.6
Other	17.8	31.8	50.6	15.9	23.4	30.1	89.2	73.6	59.5
Total ^{1/}	286.8	224.9	343.0	255.4	174.1	240.9	89.1	77.4	70.2

^{1/} Items may not add to total due to rounding.

^{2/} Less than 0.05.

TABLE 4.10
COMPARISON OF THE OBE JUNE 1969 PROJECTIONS WITH THE 1968 OBE-ERS PROJECTIONS
LOWER COLORADO REGION BY SUBREGION

Area and Item	1968 OBE-ERS Projections			OBE June 1969 Projections			OBE June 1969 Projections as Percent of 1968 OBE-ERS Projections		
	1980	2000	2020	1980	2000	2020	1980	2000	2020
----- 1,000 -----									
<u>L Colorado Subregion</u>									
<u>Population</u>	180.0	219.6	261.7	180.5	212.9	238.7	100.3	96.9	91.2
<u>Employment</u>									
Agriculture & forestry	3.0	2.7	2.4	2.9	2.7	2.0	95.7	97.9	86.2
Mining	.7	.7	.6	.8	1.0	1.0	121.7	137.0	173.3
Manufacturing	10.8	14.4	17.3	5.1	5.9	6.7	46.9	41.0	38.7
Other	40.4	57.5	70.8	39.4	55.5	72.7	97.6	96.7	102.5
Total ^{1/}	54.9	75.3	91.1	48.2	65.1	82.4	87.8	86.4	90.5
----- Million 1960 dollars -----									
<u>Final Demand</u>									
Agriculture & forestry	15.2	19.9	24.6	14.5	19.5	21.2	95.4	98.0	86.2
Mining	106.6	118.2	93.1	129.8	161.9	161.2	121.8	137.0	173.1
Manufacturing	142.6	253.1	406.4	66.8	103.8	157.9	46.8	41.0	38.9
Other	174.9	367.4	642.9	170.5	354.2	659.4	97.5	95.1	102.6
Total ^{1/}	439.4	758.6	1,167.1	381.6	639.4	999.8	86.8	84.3	85.7
<u>Value Added</u>									
Agriculture & forestry	10.9	14.1	17.4	10.4	13.8	15.0	95.4	97.9	86.2
Mining	62.6	68.8	54.1	76.2	94.3	93.7	121.7	137.1	173.2
Manufacturing	62.2	107.1	174.4	29.1	43.9	67.8	46.8	41.0	38.9
Other	93.4	203.3	350.5	91.0	196.0	359.5	97.4	96.4	102.6
Total ^{1/}	229.1	393.3	596.4	206.7	348.0	536.0	90.2	88.5	89.9
----- 1,000 AF -----									
<u>Water required</u>									
Agriculture & forestry	47.9	47.6	48.0	45.7	46.6	41.4	95.4	97.9	86.2
Mining	5.1	4.7	3.9	6.2	6.4	6.7	121.6	136.2	171.8
Manufacturing	5.0	4.2	5.9	2.3	1.7	2.3	46.0	40.5	39.0
Other	2.8	3.3	4.7	2.7	3.2	4.8	96.5	97.0	102.1
Total ^{1/}	60.8	59.8	62.5	56.9	57.9	55.2	93.6	96.8	88.5
----- 1,000 Acres -----									
<u>Cropland harvested</u>									
Agriculture & forestry	21.2	22.0	22.4	20.2	21.5	19.3	95.5	97.7	86.2
Mining	0.0 ^{2/}	0.0	0.0	0.0	0.0	0.0	120.0	100.0	100.0
Manufacturing	1.0	.8	.7	.5	.2	.4	50.0	37.5	42.9
Other	.1	0.0	0.0	.1	0.0	0.0	98.1	97.1	107.7
Total ^{1/}	22.3	22.8	23.2	20.8	21.7	19.7	93.3	95.6	84.9

^{1/} Items may not add to total due to rounding.

^{2/} Less than 0.05.

TABLE 4.10
COMPARISON OF THE OBE JUNE 1969 PROJECTIONS WITH THE 1968 OBE-ERS PROJECTIONS
LOWER COLORADO REGION BY SUBREGION

Area and Item	1968 OBE-ERS Projections			OBE June 1969 Projections			OBE June 1969 Projections as Percent of 1968 OBE-ERS Projections		
	1980	2000	2020	1980	2000	2020	1980	2000	2020
----- 1,000 -----									
<u>Gila Subregion</u>									
<u>Population</u>	1,907.9	3,020.4	4,621.5	1,835.8	2,785.2	3,826.7	96.2	92.2	82.8
<u>Employment</u>									
Agriculture & forestry:	26.7	25.7	24.1	26.8	25.5	20.8	100.5	99.5	86.5
Mining	15.2	15.1	15.0	16.3	17.5	18.5	107.6	115.8	123.2
Manufacturing	134.2	238.7	391.4	94.6	152.4	212.9	70.5	63.8	54.4
Other	561.8	903.0	1,393.7	554.2	859.2	1,198.3	98.6	95.1	86.0
Total ^{1/}	737.9	1,182.5	1,824.2	692.0	1,054.6	1,450.5	94.2	89.2	79.5
----- Million 1960 dollars -----									
<u>Final Demand</u>									
Agriculture & forestry:	416.0	341.8	403.9	418.1	340.0	349.3	100.5	99.5	86.5
Mining	11.6	11.6	12.3	12.5	13.5	15.3	107.8	116.4	124.4
Manufacturing	3,314.6	8,277.5	19,260.0	2,336.9	5,283.3	10,475.6	70.5	63.8	54.4
Other	4,213.1	9,971.5	22,175.1	4,156.4	9,489.8	19,067.9	98.6	95.7	86.0
Total ^{1/}	7,955.3	18,602.3	41,851.4	6,923.9	15,126.5	29,908.1	87.0	81.3	71.5
<u>Value Added</u>									
Agriculture & forestry:	275.4	227.4	267.1	276.8	226.2	231.0	100.5	99.5	86.5
Mining	8.0	8.1	8.7	8.6	9.5	10.7	107.5	117.3	123.0
Manufacturing	2,379.1	5,891.3	13,627.9	1,677.3	3,760.3	7,415.6	70.5	63.8	54.4
Other	2,993.6	7,083.0	15,749.8	2,953.3	6,740.9	13,543.1	98.6	95.2	86.0
Total ^{1/}	5,656.1	13,209.8	29,653.5	4,916.0	10,736.9	21,200.4	86.9	81.3	71.5
----- 1,000 AF -----									
<u>Water required</u>									
Agriculture & forestry:	2,390.6	1,641.1	1,587.8	2,402.5	1,632.2	1,373.2	100.5	99.5	86.4
Mining	.9	.8	.9	1.0	.9	1.1	107.8	116.2	122.2
Manufacturing	1,383.9	1,904.1	2,070.6	975.7	1,215.4	1,126.3	70.5	63.8	54.4
Other	220.3	360.5	543.1	217.3	343.4	467.0	98.6	95.3	86.0
Total ^{1/}	3,995.7	3,906.5	4,202.4	3,596.5	3,191.9	2,967.6	90.0	81.7	70.6
----- 1,000 Acres -----									
<u>Cropland harvested</u>									
Agriculture & forestry:	679.4	506.7	498.4	682.8	504.0	431.0	100.5	99.5	86.4
Mining	0.0 ^{2/}	0.0	0.0	0.0	0.0	0.0	108.3	116.7	122.9
Manufacturing	344.8	501.3	512.3	243.1	319.9	278.6	70.5	63.8	54.4
Other	40.3	64.7	73.7	39.8	61.6	63.4	98.7	95.2	86.0
Total ^{1/}	1,064.5	1,072.7	1,084.4	965.7	885.5	773.0	90.7	82.5	71.3

^{1/} Items may not add to total due to rounding

^{2/} Less than 0.05.

were made in final demand of manufacturing industries in all three subregions, and in final demand of "other" industries in the Lower Main Stem Subregion. Final demand of the agriculture and forest industries with the OBE June 1969 projections is about 15 percent below the 1968 OBE-ERS projected level in the 2020 time frame. On the other hand, final demand of the mining industry with the OBE June 1969 projections is substantially above the 1968 OBE-ERS projected level throughout the projection time frame in all three subregions.

Relative changes in value added with the OBE June 1969 projections compared with the 1968 OBE-ERS projections are similar to those for final demand. The same also is true for direct and indirect requirements for water and cropland, although the relative reductions in water and cropland requirements generally are somewhat smaller than those for final demand.

ADDITIONAL SOCIO-ECONOMIC ANALYSES NEEDED IN RIVER BASIN PLANNING

Several additional socio-economic analyses to extend and supplement those included in this study would be beneficial in development of plans for the Region. A permanent Economics Work Group or Subcommittee of the Pacific Southwest Interagency Committee should be established in order to continue inter-agency cooperation in these studies, together with periodic review, assessment, and updating of completed studies. The suggested studies are briefly outlined in the following paragraphs:

1. The capability for examining a range of economic growth patterns has been developed for the Subregions of the Lower Colorado Region through the use of input-output analysis. These economic models provide the feasibility necessary to explore numerous alternative development levels and patterns of economic activity and to evaluate the economic effects of each alternative with respect to the quantity and quality of resource utilization, and the resulting effects in terms of population, employment, gross regional product, and the like. The impact upon water quality, for example, can be evaluated by integrating the economic and engineering (hydrologic, salt loading, etc.) models under various development proposals, thereby providing the decision maker with a choice for future growth.
2. Evaluation of impacts on the Region's economy of alternative patterns of water resources development would be enhanced if a dynamic interregional input-output programming model of the Lower Colorado Region's economy and other regional economies in the Western United States were developed. While input-output analysis is geared to analysis of the Region's economic structure, a programming model provides for optimizing techniques to be applied. A programming model ceases to

be determinate and the production levels may vary in each region in order to allocate scarce resources and establish efficient interregional trade patterns.

3. Research into methodology for improving historical industry sector projections implicit to the regional economy as characterized by economic variables, such as employment, income, output, and value added, should be initiated. The application of statistical inference and probability theory to parameter estimation would enhance accuracy of results.
4. Conventional "water requirements" methodology--matching of regional water demands and water supplies--is inadequate for water resources planning as it represents a "single-valued" solution to a complex investment decision process. Economic impacts of alternative regional framework plans should be included at all steps in the plan formulation process as they may concern study assumptions, alternative economic structures, alternative levels of water availability, technologies, single plan functions, or interregional shifts in agricultural production due to changes in government policies.
5. Additional analyses on how water resource development programs change employment participation rates, types of employment, income distribution patterns, educational levels, or other socio-economic factors should be initiated, particularly as related to low income, minority, and rural population sectors.
6. Studies should be initiated to assess the economic consequences of deteriorating water quality upon industrial and agricultural output in terms of how it affects the level and rate of regional economic growth and the well-being of the people.
7. Additional sensitivity analyses of alternatives and assumptions should be conducted, particularly as they pertain to efficiencies of water use, alternative cropping patterns, alternative crop yields, level of water availability predicated on 1965 conditions, and other agricultural production possibilities.
8. Further analyses of price-demand relationships for alternative regional agricultural production levels are needed; particularly for those levels implied by the OBE-ERS and modified OBE-ERS projections.
9. Studies exploring the relationships between economic activity and environmental characteristics of the region should be

initiated. Methods to measure environmental parameters in socio-economic terms are needed.

10. Studies should be initiated to assess the consequences of deteriorating quality of air upon the well-being of people, with resulting effects upon the level and rate of regional economic growth, and in turn, industrial and agricultural output.

GLOSSARY

GLOSSARY

Feed crops: Agricultural crops normally used to feed livestock.

Food crops: Agricultural crops normally used for human consumption.

Irrigated land (acres): Land receiving water by artificial means for production of agricultural crops.

Harvested acres (cropland harvested): Land from which an agricultural crop is harvested during the year reported.

Forestry: Forestry includes establishments engaged in the operation of commercial timberlands, such as gathering of tree seed, reforestation, timber stand improvement, timber measurement and appraisal, and the harvesting of commercial timber crops, including "yarding" in the forest. Does not include loading, or hauling, to the mill or other processing plants.

AUM (Animal Unit Month): A measure of the forage or feed required to maintain the equivalent of one 1,000 pound cow for one month.

Range carrying capacity: The capacity of range or forest lands in Animal Unit Months, to support domestic livestock grazing.

Primary industries: Primary industries are defined to include agriculture, forestry, and mining.

Secondary industries: Secondary industries are defined to include all manufacturing.

Tertiary industries: Tertiary industries are defined as noncommodity producing industries and include transportation; communications; utilities; wholesale and retail trade; services; and finance, insurance and real estate activities.

Personal income: Personal income includes income received by all individuals from whatever source. It is made up of wages, salaries, proprietors' income, rental income, dividends, interest, and the difference between government transfer payments and personal contributions for Social Security.

Input-Output table or interindustry transactions table: These tables depict the way industries of the Region's economy interact. The tables show, for each industry, the amount of its output that goes to each other industry as raw materials or semi-finished products, as well as the amount of finished goods and services that goes to the final markets of the economy. They also show for each industry its input (consumption) of the

products of other industries, as well as its contribution to value added (see definition) for the Region. In addition, these tables permit the tracing of industrial interdependency, direct plus indirect, of changes in consumer demand (households), demand for investment goods, exports, or government purchases.

Total Gross Output: Total gross output of each sector in the input-output table is defined as the total value to the producer of all goods and services produced within the Region. It measures the value of goods and services at each stage in the production process and is, therefore, an accumulation of value until the good or service reaches the final consumer.

Final Demand: Final demand represents the goods and services sold to final markets by each of the industries shown in the input-output table. It includes sales to all government agencies, ultimate consumers (households), capital investment, exports, and inventory accumulation during a given time period. The final demand sector is of special importance because changes in this sector can be traced throughout the rest of the input-output table.

Gross Regional Product: Gross Regional Product (GRP) is the market value of finished goods and services produced by the Region's economy within a specified period of time. GRP, a valuable measure of regional economic activity, is generally expressed at an annual rate.

Value added: Value added includes wages; salaries; profits; rents; interest; federal, state, and local taxes; and depreciation. It is measurable as the costs of producing the finished goods and services that go to the final markets described in gross regional product. Value added is not only a valuable measure of total regional economic activity, but also indicates the contribution of single industries to the economy.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/}

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
		Water (3)	Labor (4)	Cropland (5)	
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>LMS Subregion, 1965</u>					
1 Range livestock	739	2.4420	.0990	.4882	1,307
2 Feeder livestock	473	8.2815	.0552	1.7322	1,670
3 Dairy	762	14.1977	.1233	2.9639	1,746
4 Forage feed & food	719	44.1530	.1121	9.3571	1,227
5 Cotton	797	8.0370	.0542	1.9905	1,317
6 Vegetables & melons	582	2.1974	.1376	1.4621	2,032
7 Citrus crops	655	4.7173	.1111	1.1597	2,072
8 Forestry	875	.0011	.0810	.0001	1,192
9 All other agriculture	625	12.7428	.0650	2.0384	1,352
10 Uranium	594	.0290	.0231	.0001	1,559
11 All other mining	674	.0611	.0465	.0002	1,314
12 Food & kindred products	621	4.9095	.0799	.9918	1,544
13 Lumber & wood products	705	.0025	.0684	.0001	1,493
14 Chemicals	478	.0465	.0483	.0003	1,488
15 Printing & publishing	653	.0050	.1165	.0004	1,126
16 Fabricated metals	639	.0029	.0865	.0001	1,228
17 Stone clay & glass	568	.0830	.0577	.0007	1,508
18 All other manufacturing	492	.0182	.0665	.0003	1,403
19 Wholesale trade	527	.0094	.0745	.0007	1,311
20 Service stations	577	.0104	.0769	.0006	1,271
21 Eating & drinking	598	1.1478	.1162	.2307	1,634
22 All other retail	668	.0084	.1107	.0002	1,300
23 Agricultural services	562	.5862	.0290	.1430	1,571
24 Lodging	758	.0188	.1081	.0015	1,234
25 All other services	620	.0086	.1662	.0003	1,206
26 Transportation	404	.0152	.0537	.0017	1,200
27 Electric energy	616	.0584	.0399	.0011	1,484
28 All other utilities	617	.0030	.0990	.0001	1,272
29 Contract construction	598	.0521	.1423	.0004	1,737
30 Rentals & finance	964	.0034	.0447	.0003	1,106

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
		Water (3)	Labor (4)	Cropland (5)	
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>LMS Subregion, 1980</u>					
1 Range livestock	737	1.9975	.0767	.3823	1,341
2 Feeder livestock	424	6.6800	.0344	1.3674	1,579
3 Dairy	749	11.6829	.0699	2.3680	1,766
4 Forage feed & food	717	37.8677	.0826	7.7893	1,286
5 Cotton	793	6.4361	.0384	1.6103	1,349
6 Vegetables & melons	591	1.9515	.0680	1.3479	2,066
7 Citrus crops	647	4.4501	.0888	1.0844	2,146
8 Forestry	888	.0009	.0531	.0000	1,138
9 All other agriculture	630	5.9130	.0620	1.4597	1,371
10 Uranium	598	.0326	.0206	.0001	1,651
11 All other mining	696	.0656	.0259	.0002	1,368
12 Food & kindred products	614	2.0812	.0369	.4292	1,343
13 Lumber & wood products	715	.0151	.0382	.0000	1,410
14 Chemicals	480	.0449	.0299	.0002	1,462
15 Printing & publishing	663	.0070	.0739	.0005	1,140
16 Fabricated metals	654	.0043	.0506	.0000	1,251
17 Stone clay & glass	589	.0541	.0401	.0002	1,494
18 All other manufacturing	504	.0200	.0517	.0002	1,384
19 Wholesale trade	548	.0103	.0446	.0003	1,342
20 Service stations	598	.0127	.0504	.0003	1,287
21 Eating & drinking	605	.5075	.0825	.1031	1,610
22 All other retail	732	.0118	.0795	.0001	1,310
23 Agricultural services	567	.4741	.0229	.1162	1,586
24 Lodging	767	.0159	.0636	.0008	1,242
25 All other services	645	.0089	.1251	.0002	1,216
26 Transportation	410	.0124	.0462	.0008	1,214
27 Electric energy	629	.1469	.0286	.0007	1,501
28 All other utilities	628	.0028	.0611	.0000	1,200
29 Contract construction	664	.0523	.1026	.0002	1,787
30 Rentals & finance	963	.0032	.0317	.0001	1,114

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
		Water (3)	Labor (4)	Cropland (5)	
	<u>Dollars</u>	<u>Ac. Ft.</u>	<u>Man Yrs.</u>	<u>Acres</u>	<u>Dollars</u>
<u>LMS Subregion, 2000</u>					
1 Range livestock	736	1.5240	.0698	.3003	1,352
2 Feeder livestock	415	5.0893	.0263	1.0926	1,571
3 Dairy	749	8.9140	.0512	1.8944	1,809
4 Forage feed & food	711	29.4738	.0619	6.3721	1,337
5 Cotton	747	4.9251	.0282	1.2829	1,373
6 Vegetables & melons	588	1.7766	.0828	1.2751	2,116
7 Citrus crops	641	3.6157	.0665	.9193	2,179
8 Forestry	886	.0008	.0417	.0000	1,148
9 All other agriculture	629	4.5981	.0440	1.1866	1,413
10 Uranium	600	.0325	.0145	.0000	1,711
11 All other mining	694	.0637	.0174	.0002	1,409
12 Food & kindred products	601	1.3202	.0272	.2850	1,423
13 Lumber & wood products	715	.0138	.0278	.0001	1,497
14 Chemicals	476	.0415	.0221	.0002	1,550
15 Printing & publishing	664	.0057	.0476	.0003	1,156
16 Fabricated metals	654	.0034	.0331	.0000	1,268
17 Stone clay & glass	585	.0459	.0286	.0002	1,489
18 All other manufacturing	486	.0129	.0353	.0001	1,421
19 Wholesale trade	549	.0083	.0335	.0002	1,355
20 Service stations	598	.0102	.0311	.0002	1,299
21 Eating & drinking	602	.3235	.0539	.0684	1,641
22 All other retail	732	.0092	.0502	.0001	1,332
23 Agricultural services	564	.3675	.0155	.0934	1,594
24 Lodging	766	.0123	.0322	.0006	1,251
25 All other services	645	.0071	.0903	.0001	1,224
26 Transportation	412	.0102	.0296	.0005	1,224
27 Electric energy	630	.0944	.0215	.0005	1,518
28 All other utilities	628	.0023	.0428	.0000	1,199
29 Contract construction	661	.0508	.0685	.0001	1,804
30 Rentals & finance	962	.0027	.0218	.0001	1,119

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
	Water (3)	Labor (4)	Cropland (5)		
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>LMS Subregion, 2020</u>					
1 Range livestock	735	1.2590	.0602	.2479	1,364
2 Feeder livestock	406	4.2340	.0199	.9220	1,556
3 Dairy	742	7.4211	.0387	1.5985	1,844
4 Forage feed & food	704	25.0692	.0481	5.5069	1,359
5 Cotton	786	4.3403	.0207	1.1291	1,373
6 Vegetables & melons	587	1.6970	.0619	1.1215	2,144
7 Citrus crops	638	3.1298	.0496	.7954	2,198
8 Forestry	884	.0007	.0362	.0000	1,158
9 All other agriculture	628	3.8250	.0334	.9852	1,452
10 Uranium	601	.0326	.0102	.0000	1,768
11 All other mining	690	.0629	.0129	.0001	1,445
12 Food & kindred products	599	.8223	.0195	.1792	1,516
13 Lumber & wood products	694	.0145	.0189	.0001	1,610
14 Chemicals	457	.0319	.0318	.0001	1,369
15 Printing & publishing	661	.0049	.0320	.0002	1,169
16 Fabricated metals	654	.0030	.0242	.0000	1,282
17 Stone clay & glass	574	.0365	.0204	.0002	1,408
18 All other manufacturing	487	.0117	.0234	.0001	1,432
19 Wholesale trade	549	.0073	.0255	.0001	1,365
20 Service stations	595	.0090	.0214	.0001	1,307
21 Eating & drinking	602	.2036	.0372	.0430	1,672
22 All other retail	730	.0079	.0319	.0000	1,342
23 Agricultural services	566	.3272	.0106	.0829	1,597
24 Lodging	765	.0096	.0185	.0004	1,259
25 All other services	645	.0059	.0621	.0001	1,231
26 Transportation	411	.0084	.0195	.0003	1,220
27 Electric energy	615	.0702	.0127	.0003	1,459
28 All other utilities	628	.0020	.0247	.0000	1,194
29 Contract construction	662	.0499	.0473	.0001	1,816
30 Rentals & finance	962	.0025	.0153	.0001	1,123

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
	Water (3)	Labor (4)	Cropland (5)		
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>L Colo Subregion, 1965</u>					
1 Range livestock	715	2.9305	.2619	.8536	1,220
2 Feeder livestock	766	10.7469	.1612	3.3047	1,822
3 Dairy	706	18.1569	.2051	5.5457	1,662
4 Forage feed & food	702	43.8864	.1774	13.6382	1,327
5 Forestry	909	.0014	.0721	.0000	1,106
6 All other agriculture	637	6.7660	.1649	5.6224	1,391
7 Coal	539	.1367	.1170	.0000	1,567
8 Oil & gas	556	.0276	.0382	.0001	1,498
9 Uranium	821	.0451	.0337	.0000	1,614
10 All other mining	688	.0495	.0462	.0000	1,242
11 Food & kindred products	682	5.3088	.4358	2.3569	1,875
12 Lumber & wood products	626	.0046	.1064	.0000	1,379
13 Pulp & paper	410	.0083	.1112	.0001	1,296
14 Printing & publishing	621	.0060	.2130	.0000	1,251
15 All other manufacturing	210	.0288	.0739	.0000	1,120
16 Wholesale trade	447	.0049	.0873	.0000	1,223
17 Service stations	703	.0073	.1229	.0000	1,150
18 Eating & drinking	376	.0854	.1865	.0351	1,241
19 All other retail	646	.0080	.1975	.0000	1,201
20 Lodging	538	.0120	.2158	.0016	1,121
21 All other services	488	.0068	.5106	.0000	1,133
22 Transportation	176	.0091	.1244	.0001	1,286
23 Electric energy	284	.1360	.0751	.0000	1,410
24 All other utilities	854	.0033	.2297	.0000	1,202
25 Contract construction	304	.0328	.2473	.0000	1,200
26 Rentals & finance	930	.0031	.1026	.0001	1,180

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
	Water (3)	Labor (4)	Cropland (5)		
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>L Colo Subregion, 1980</u>					
1 Range livestock	720	2.3260	.1946	.8686	1,279
2 Feeder livestock	760	10.1328	.1445	4.0392	1,994
3 Dairy	709	16.1178	.1963	6.3759	1,912
4 Forage feed & food	720	31.5925	.1851	12.7261	1,478
5 Forestry	906	.0017	.0672	.0000	1,131
6 All other agriculture	648	5.5943	.1417	5.3828	1,508
7 Coal	562	.1397	.1210	.0000	1,667
8 Oil & gas	559	.0317	.0383	.0000	1,617
9 Uranium	595	.0504	.0437	.0000	1,815
10 All other mining	730	.0523	.0456	.0000	1,324
11 Food & kindred products	740	.4295	.1106	.1661	1,329
12 Lumber & wood products	511	.0140	.0809	.0000	1,275
13 Pulp & paper	421	.0117	.0872	.0000	1,349
14 Printing & publishing	639	.0078	.2659	.0000	1,367
15 All other manufacturing	232	.0315	.0992	.0000	1,194
16 Wholesale trade	479	.0052	.0741	.0000	1,228
17 Service stations	713	.0082	.1438	.0000	1,176
18 Eating & drinking	396	.0139	.1686	.0025	1,287
19 All other retail	709	.0106	.1760	.0000	1,254
20 Lodging	543	.0099	.1971	.0001	1,140
21 All other services	493	.0074	.4446	.0000	1,152
22 Transportation	184	.0098	.1246	.0000	1,314
23 Electric energy	479	.1753	.1238	.0002	2,324
24 All other utilities	883	.0046	.2250	.0000	1,242
25 Contract construction	316	.0422	.2972	.0000	1,560
26 Rentals & finance	928	.0038	.0918	.0000	1,208

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
L Colo Subregion, 2000					
1 Range livestock	716	2.1583	.1413	.8538	1,316
2 Feeder livestock	745	9.8312	.1108	4.1198	2,082
3 Dairy	696	13.8589	.1208	5.7672	1,943
4 Forage feed & food	707	26.9614	.1297	11.4109	1,467
5 Forestry	900	.0007	.0537	.0000	1,151
6 All other agriculture	635	1.6930	.0930	2.9208	1,365
7 Coal	579	.1378	.0900	.0000	1,690
8 Oil & gas	552	.0287	.0320	.0000	1,666
9 Uranium	591	.0481	.0362	.0000	1,857
10 All other mining	721	.0477	.0337	.0000	1,338
11 Food & kindred products	736	.1337	.0675	.0530	1,315
12 Lumber & wood products	483	.0116	.0567	.0000	1,379
13 Pulp & paper	424	.0094	.0572	.0000	1,423
14 Printing & publishing	612	.0055	.2665	.0000	1,397
15 All other manufacturing	238	.0071	.0805	.0000	1,211
16 Wholesale trade	482	.0016	.0571	.0000	1,249
17 Service stations	711	.0060	.0991	.0000	1,180
18 Eating & drinking	403	.0080	.1144	.0009	1,318
19 All other retail	704	.0069	.1266	.0000	1,258
20 Lodging	542	.0083	.1455	.0001	1,160
21 All other services	486	.0059	.3172	.0000	1,160
22 Transportation	191	.0066	.0923	.0000	1,337
23 Electric energy	398	.0673	.0683	.0000	1,964
24 All other utilities	845	.0026	.1813	.0000	1,263
25 Contract construction	382	.0419	.2206	.0000	1,597
26 Rentals & finance	921	.0029	.0687	.0000	1,226

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
	Water (3)	Labor (4)	Cropland (5)		
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>L Colo Subregion, 2020</u>					
1 Range livestock	712	1.5018	.0990	.5936	1,310
2 Feeder livestock	724	9.5140	.0924	4.0391	2,127
3 Dairy	674	12.3507	.0955	5.2151	1,932
4 Forage feed & food	682	23.8748	.1174	10.2293	1,398
5 Forestry	892	.0015	.0465	.0000	1,169
6 All other agriculture	637	5.0549	.0891	4.0422	1,582
7 Coal	0	.0000	.0000	.0000	0
8 Oil & gas	541	.0275	.0259	.0000	1,693
9 Uranium	583	.0472	.0274	.0000	1,880
10 All other mining	708	.0451	.0259	.0000	1,328
11 Food & kindred products	730	.0534	.0415	.0210	1,312
12 Lumber & wood products	473	.0075	.0421	.0000	1,383
13 Pulp & paper	412	.0048	.0357	.0000	1,412
14 Printing & publishing	606	.0041	.2557	.0000	1,410
15 All other manufacturing	237	.0221	.0618	.0000	1,212
16 Wholesale trade	486	.0044	.0432	.0000	1,266
17 Service stations	646	.0051	.0696	.0000	1,176
18 Eating & drinking	412	.0059	.0828	.0004	1,340
19 All other retail	699	.0044	.0881	.0000	1,243
20 Lodging	544	.0070	.1000	.0000	1,172
21 All other services	587	.0053	.2224	.0000	1,160
22 Transportation	193	.0081	.0652	.0000	1,355
23 Electric energy	240	.0005	.0189	.0000	1,176
24 All other utilities	839	.0022	.1264	.0000	1,274
25 Contract construction	326	.0421	.1670	.0000	1,629
26 Rentals & finance	921	.0022	.0519	.0000	1,238

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
		Water (3)	Labor (4)	Cropland (5)	
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>Gila Subregion, 1965</u>					
1 Range livestock	699	2.5475	.1145	.6499	1,271
2 Feeder livestock	672	8.9400	.0893	2.3631	1,999
3 Dairy	822	17.1005	.1196	4.5228	1,792
4 Forage feed & food	770	38.4626	.1094	10.2662	1,392
5 Cotton	695	10.3310	.0806	2.7741	1,426
6 Vegetables	588	1.6998	.1224	1.3484	1,340
7 Citrus crops	616	4.9198	.1271	1.2557	1,815
8 Forestry	900	.0005	.0629	.0000	1,062
9 All other agriculture	750	7.8367	.0832	1.9618	1,826
10 Uranium	124	.0249	.0180	.0002	1,249
11 Copper	675	.1526	.0542	.0091	1,217
12 All other mining	634	.0391	.0601	.0018	1,488
13 Food & kindred products	560	4.0082	.0780	1.0606	1,767
14 Lumber & wood products	566	.0072	.1013	.0011	1,384
15 Furniture & fixtures	506	.0063	.0753	.0011	1,376
16 Paper & pulp	617	.0179	.1007	.0024	1,860
17 Chemicals	465	.0298	.0528	.0006	1,333
18 Primary metals	682	.1300	.0603	.0078	2,084
19 Printing & publishing	724	.0093	.1045	.0008	1,206
20 Fabricated metals	423	.0083	.1426	.0004	1,180
21 Textiles & apparel	544	.0023	.1260	.0002	1,090
22 Leather & leather goods	689	.9672	.3816	.2537	1,502
23 Stone clay & glass	730	.0540	.0881	.0019	1,572
24 All other manufacturing	735	.0086	.0710	.0013	1,257
25 Wholesale trade	653	.0146	.0861	.0018	1,366
26 Service stations	702	.0137	.1571	.0014	1,324
27 Eating & drinking	563	.4724	.1295	.1228	1,478
28 All other retail	666	.0104	.1214	.0010	1,245
29 Agricultural services	592	.0129	.0272	.0017	1,302
30 Lodgings	657	.0801	.3318	.0182	1,375
31 All other services	558	.0131	.3498	.0016	1,268
32 Transportation	569	.0863	.0990	.0211	1,375
33 Electric energy	784	.0514	.0344	.0011	1,324
34 All other utilities	547	.0028	.0997	.0003	1,177
35 Contract construction	607	.0478	.1606	.0006	1,689
36 Rentals & finance	924	.0054	.0692	.0005	1,141

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 and OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	: Value : Added ^{2/} : (2)	: Direct & Indirect Requirements			: Output Mul- : tiplier ^{3/} : (6)
		: Water : (3)	: Labor : (4)	: Cropland : (5)	
	: Dollars	: Ac. Ft.	: Man Yrs.	: Acres	: Dollars
<u>Gila Subregion, 1980</u>					
1 Range livestock	: 704	1.8667	.0945	.4729	1,318
2 Feeder livestock	: 627	4.4960	.0393	1.1995	1,614
3 Dairy	: 826	12.1679	.0731	3.2428	1,825
4 Forage feed & food	: 768	28.3618	.0786	7.6589	1,437
5 Cotton	: 699	8.5068	.0600	2.2774	1,523
6 Vegetables	: 601	1.6051	.0780	1.0856	1,294
7 Citrus crops	: 626	4.3907	.0995	1.1607	1,863
8 Forestry	: 895	.0019	.0550	.0003	1,101
9 All other agriculture	: 774	5.5266	.0867	1.5330	1,922
10 Uranium	: 201	.0345	.0200	.0009	1,418
:	:	:	:	:	:
11 Copper	: 692	.1593	.0435	.0096	1,364
12 All other mining	: 696	.0522	.0579	.0027	1,880
13 Food & kindred products	: 616	3.0458	.0611	.8139	2,180
14 Lumber & wood products	: 632	.0143	.0526	.0014	1,456
15 Furniture & fixtures	: 568	.0104	.0427	.0013	1,474
16 Paper & pulp	: 688	.0230	.0628	.0027	1,848
17 Chemicals	: 520	.0321	.0335	.0011	1,405
18 Primary metals	: 702	.1316	.0494	.0085	2,240
19 Printing & publishing	: 739	.0169	.0770	.0019	1,380
20 Fabricated metals	: 501	.0178	.0734	.0014	1,451
:	:	:	:	:	:
21 Textiles & apparel	: 612	.0070	.0818	.0009	1,169
22 Leather & leather goods	: 739	.7721	.4275	.2037	1,703
23 Stone clay & glass	: 776	.0492	.0541	.0019	1,658
24 All other manufacturing	: 787	.0351	.0564	.0074	1,411
25 Wholesale trade	: 717	.0240	.0636	.0026	1,568
26 Service stations	: 773	.0183	.1171	.0015	1,380
27 Eating & drinking	: 586	.3875	.0942	.1019	1,593
28 All other retail	: 730	.0138	.0957	.0012	1,342
29 Agricultural services	: 600	.0138	.0208	.0016	1,326
30 Lodging	: 666	.0671	.1651	.0148	1,441
:	:	:	:	:	:
31 All other services	: 590	.0145	.2434	.0017	1,325
32 Transportation	: 582	.0698	.0728	.0165	1,426
33 Electric energy	: 800	.1317	.0230	.0017	1,353
34 All other utilities	: 569	.0055	.0716	.0007	1,246
35 Contract construction	: 630	.0502	.1152	.0008	1,774
36 Rentals & finance	: 924	.0064	.0511	.0005	1,166
:	:	:	:	:	:

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS^{1/} (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
	(2)	Water (3)	Labor (4)	Cropland (5)	(6)
	Dollars	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>Gila Subregion, 2000</u>					
1 Range livestock	701	1.3308	.0878	.3541	1,325
2 Feeder livestock	617	3.3763	.0289	.9754	1,580
3 Dairy	838	7.0475	.0474	2.0256	1,691
4 Forage feed & food	763	22.0335	.0592	6.4639	1,481
5 Cotton	695	6.6845	.0454	1.8932	1,576
6 Vegetables	601	1.5280	.0590	.9736	1,326
7 Citrus crops	626	3.6812	.0747	.9899	1,888
8 Forestry	894	.0015	.0409	.0003	1,115
9 All other agriculture	770	4.0532	.0616	1.1955	1,931
10 Uranium	243	.0336	.0159	.0008	1,517
11 Copper	689	.1559	.0334	.0094	1,469
12 All other mining	705	.0496	.0427	.0025	1,996
13 Food & kindred products	609	1.8265	.0408	.5268	2,134
14 Lumber & wood products	631	.0133	.0407	.0012	1,504
15 Furniture & fixtures	576	.0090	.0328	.0011	1,524
16 Paper & pulp	693	.0205	.0430	.0024	1,840
17 Chemicals	522	.0299	.0196	.0010	1,457
18 Primary metals	707	.1114	.0338	.0075	2,267
19 Printing & publishing	737	.0187	.0520	.0027	1,451
20 Fabricated metals	512	.0166	.0487	.0015	1,531
21 Textiles & apparel	617	.0077	.0470	.0012	1,236
22 Leather & leather goods	736	.4673	.2523	.1319	1,719
23 Stone clay & glass	778	.0440	.0324	.0014	1,646
24 All other manufacturing	781	.0326	.0414	.0072	1,504
25 Wholesale trade	716	.0195	.0511	.0022	1,626
26 Service stations	772	.0146	.0712	.0012	1,405
27 Eating & drinking	587	.2520	.0612	.0709	1,616
28 All other retail	729	.0112	.0591	.0009	1,357
29 Agricultural services	601	.0113	.0142	.0012	1,341
30 Lodging	667	.0471	.0792	.0105	1,471
31 All other services	591	.0114	.1600	.0012	1,351
32 Transportation	583	.0459	.0492	.0110	1,457
33 Electric energy	799	.0877	.0149	.0015	1,363
34 All other utilities	570	.0049	.0472	.0007	1,264
35 Contract construction	635	.0517	.0790	.0008	1,914
36 Rentals & finance	921	.0059	.0351	.0005	1,186

See footnotes at end of table, page 181.

TABLE 4.2
CHANGE IN VALUE ADDED, REQUIREMENTS FOR WATER, LABOR AND CROPLAND HARVESTED,
AND THE OUTPUT MULTIPLIER PER \$1,000 SALES TO FINAL DEMAND, BY SECTOR,
1965 AND OBE-ERS PROJECTIONS FOR 1980, 2000, AND 2020,
LOWER COLORADO SUBREGIONS (Continued)

Subregion, Year and Sector (1)	Value Added ^{2/} (2)	Direct & Indirect Requirements			Output Mul- tiplier ^{3/} (6)
	:	Water (3)	Labor (4)	Cropland (5)	
	:	Ac. Ft.	Man Yrs.	Acres	Dollars
<u>Gila Subregion, 2020</u>					
1 Range livestock	: 700	1.0376	.0782	.2675	1,331
2 Feeder livestock	: 612	2.7360	.0211	.7925	1,550
3 Dairy	: 851	4.0091	.0309	1.1427	1,547
4 Forage feed & food	: 753	19.0656	.0457	5.6230	1,534
5 Cotton	: 691	5.5382	.0322	1.5799	1,633
6 Vegetables	: 603	1.5131	.0469	.9103	1,362
7 Citrus crops	: 628	3.0873	.0552	.8422	1,915
8 Forestry	: 892	.0012	.0362	.0001	1,128
9 All other agriculture	: 774	3.1893	.0432	.9388	1,924
10 Uranium	: 285	.0345	.0125	.0005	1,618
11 Copper	: 686	.1470	.0266	.0064	1,583
12 All other mining	: 711	.0464	.0307	.0016	2,044
13 Food & kindred products	: 594	.9118	.0249	.2635	2,013
14 Lumber & wood products	: 632	.0128	.0277	.0008	1,567
15 Furniture & fixtures	: 583	.0081	.0221	.0007	1,572
16 Paper & pulp	: 699	.0181	.0278	.0015	1,827
17 Chemicals	: 530	.0287	.0138	.0007	1,568
18 Primary metals	: 712	.0894	.0239	.0045	2,361
19 Printing & publishing	: 736	.0168	.0350	.0020	1,476
20 Fabricated metals	: 528	.0156	.0362	.0011	1,653
21 Textiles & apparel	: 622	.0073	.0274	.0009	1,304
22 Leather & leather goods	: 730	.2388	.1375	.0660	1,715
23 Stone clay & glass	: 781	.0398	.0199	.0007	1,601
24 All other manufacturing	: 774	.0254	.0296	.0048	1,597
25 Wholesale trade	: 716	.0169	.0385	.0014	1,683
26 Service stations	: 771	.0129	.0465	.0007	1,429
27 Eating & drinking	: 586	.1321	.0404	.0363	1,620
28 All other retail	: 730	.0096	.0361	.0005	1,367
29 Agricultural Services	: 602	.0096	.0097	.0006	1,356
30 Lodging	: 667	.0300	.0480	.0057	1,498
31 All other services	: 593	.0091	.1055	.0007	1,378
32 Transportation	: 585	.0276	.0318	.0057	1,487
33 Electric energy	: 799	.0807	.0087	.0008	1,334
34 All other utilities	: 570	.0041	.0290	.0004	1,274
35 Contract construction	: 643	.0531	.0568	.0006	2,072
36 Rentals & finance	: 919	.0055	.0250	.0003	1,207

See footnotes at end of table, page 181.

- 1/ All values are in 1960 dollars.
- 2/ Value added: Includes both direct and indirect value added.
- 3/ Total output generated in the whole economy (direct and indirect output generated per \$1,000 change in final demand of the sector.