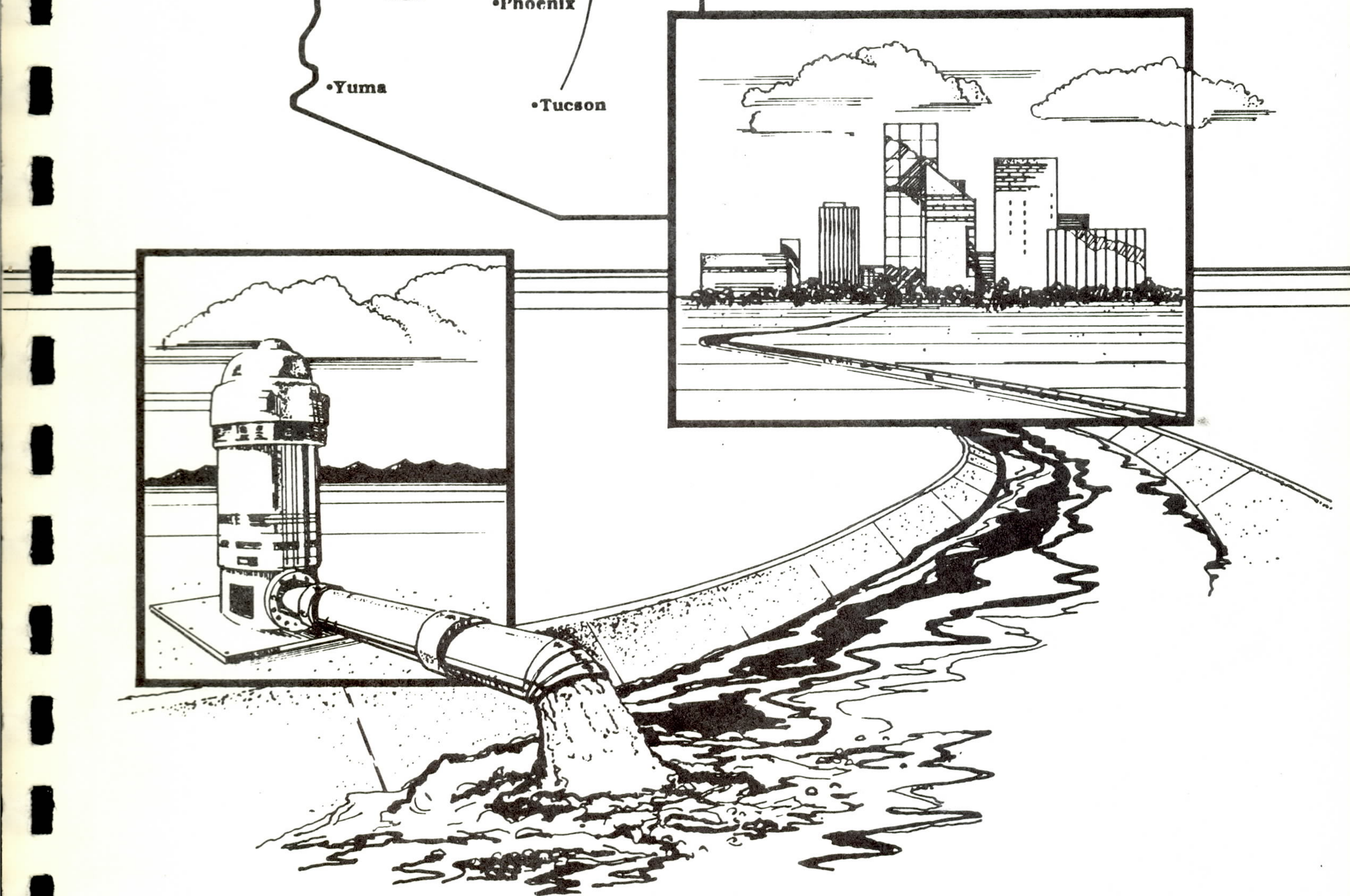
Water Transfer Study Final Report

Prepared for:
Joint Legislative Committee on Groundwater and Surface Water Exportation
and the
Arizona Department of Water Resources

November 1987



Prepared by:
Franzoy•Corey Engineers & Architects
in Association with:
Mountain West Research, Inc.
and **Econotrend, Inc.**
under Contract DWR-86/87-4500-010

TABLE OF CONTENTS

PAGE

PAGE

PAGE

TABLE	REFERENCED ON PAGE NUMBER

LIST OF TABLES

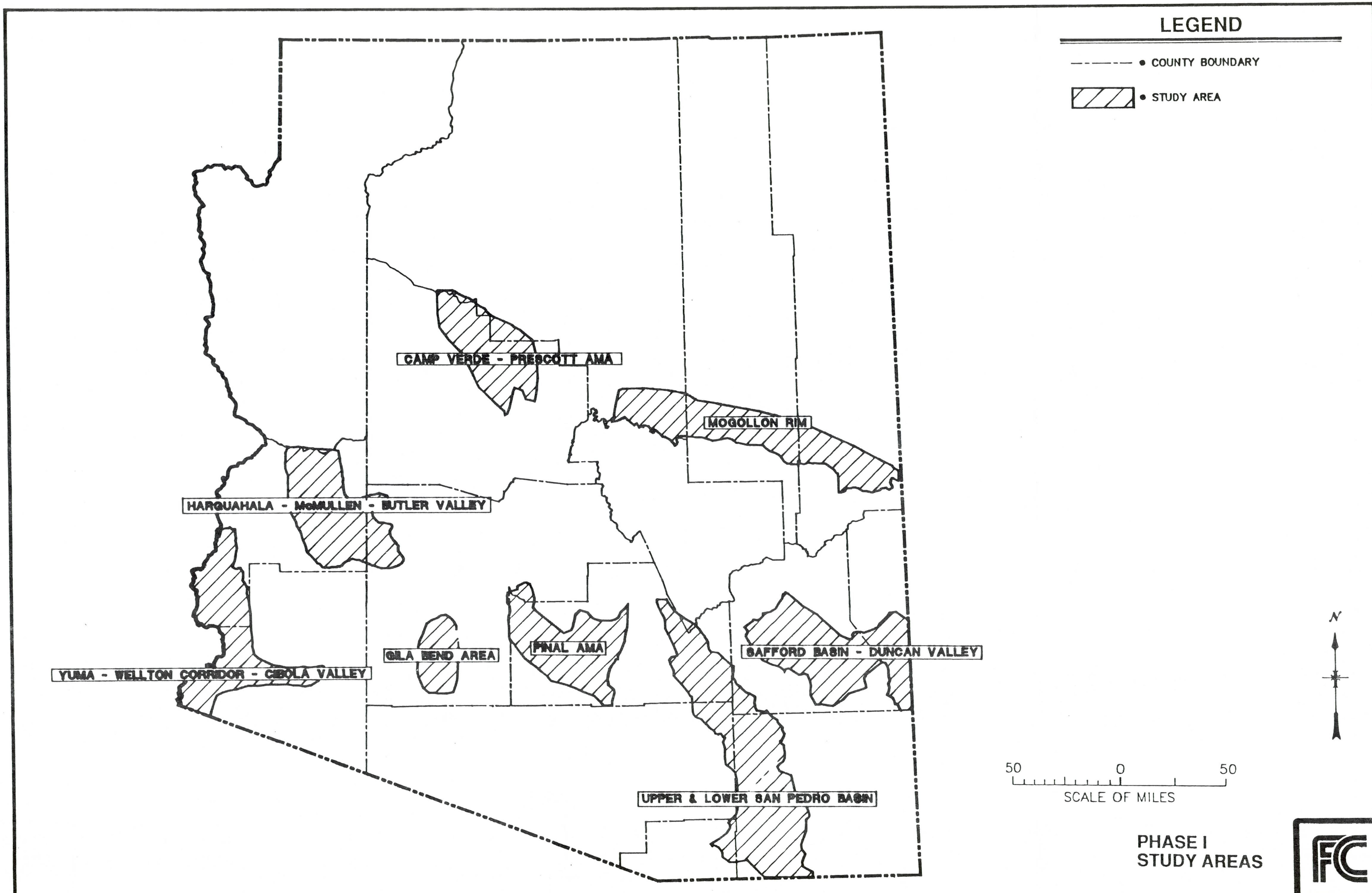
(All tables follow the chapter in which there are referenced)

TABLE		REFERENCED ON PAGE NUMBER

TABLE		REFERENCED ON PAGE NUMBER

FIGURE | FOLLOWING PAGE NUMBER

LIST OF FIGURES



PHASE I
STUDY AREAS

FIGURE 1.1

CHAPTER 1

INTRODUCTION

1.1 PURPOSE AND SCOPE OF STUDY

In recent years, cities such as Phoenix, Scottsdale, Mesa and Tucson have purchased agricultural lands with the intent of transferring agricultural water rights for municipal use. The impacts of this growing trend toward "water farming" in the state's rural areas are a major concern to the Arizona Legislature.

In 1986, the Thirty-seventh Legislature responded to the water-transfer concern with the passage of House Bill 2265 (bill). The bill mandates that a study be conducted of the hydrologic and economic effects of water transfers within Arizona. The bill is "An act relating to waters; providing for studies of the economic, fiscal and hydrologic impacts of groundwater and surface water exportation within this state; providing for a Joint Legislative Committee on Groundwater and Surface Water Exportation...." The Joint Legislative Committee developed the study guidelines.

The water transfer study (study) was designed to be used by legislators to evaluate the need for additional legislation governing the interbasin transfer of water within Arizona. The Arizona Department of Water Resources (ADWR) contracted with FRANZOY COREY in association with Econotrend and Mountain West Research (hereafter referred to as FRANZOY COREY) to conduct the study. The study was divided into three phases to facilitate the Joint Legislative Committee's review. Phase I was scoped to describe the current hydrologic and socioeconomic profiles and quantify potential volumes of water transfer. Specific areas within the state were to be recommended for further evaluation in phases II and III. Phase II was scoped to identify and quantify the hydrologic and socioeconomic impacts associated with water transfers. Phase III was scoped to identify potential legislative changes that could mitigate any negative impacts of water transfers. Draft reports were to be prepared for the first and second phases and presented to the legislative committee for their review, with the third phase culminating in a final report. The scope of work was specific in stating "No new hydrologic data will be developed." Field work for additional economic data was part of the scope, however, at the request of the ADWR this field work was not implemented by FRANZOY COREY subconsultants. Instead, ADWR personnel collected field data from irrigation districts via telephone and provided the data to the economic consultants. In summary, no new economic data were developed.

1.2 PHASE I

The phase I report described hydrologic and economic conditions within eight study areas (figure 1.1) selected by the ADWR in conjunction with the Joint Legislative Committee. The most current data in the literature, both published and unpublished were utilized. For each area, a brief hydrologic summary, water budget and short socioeconomic profiles of baseline conditions and projected years 2010 and 2025 were presented. Potential low, medium, and high estimates of water transfer volumes were selected by the ADWR. These volumes were 60,000 acre-feet, 90,000 acre-feet, and 120,000 acre-feet, respectively. Intrabasin water transfers were not evaluated. For each study area, the potential volume of transferable water was evaluated on the basis of water quality and the likelihood of acquiring the water rights needed for interbasin transfer. Five study areas were recommended for further study in phase II (figure 1.2).

1.3 PHASE II

In the period between phase I and phase II additional and/or more current data became available. In addition, more detailed hydrologic evaluations were made in phase II resulting in water budgets revised from those presented in the phase I draft report.

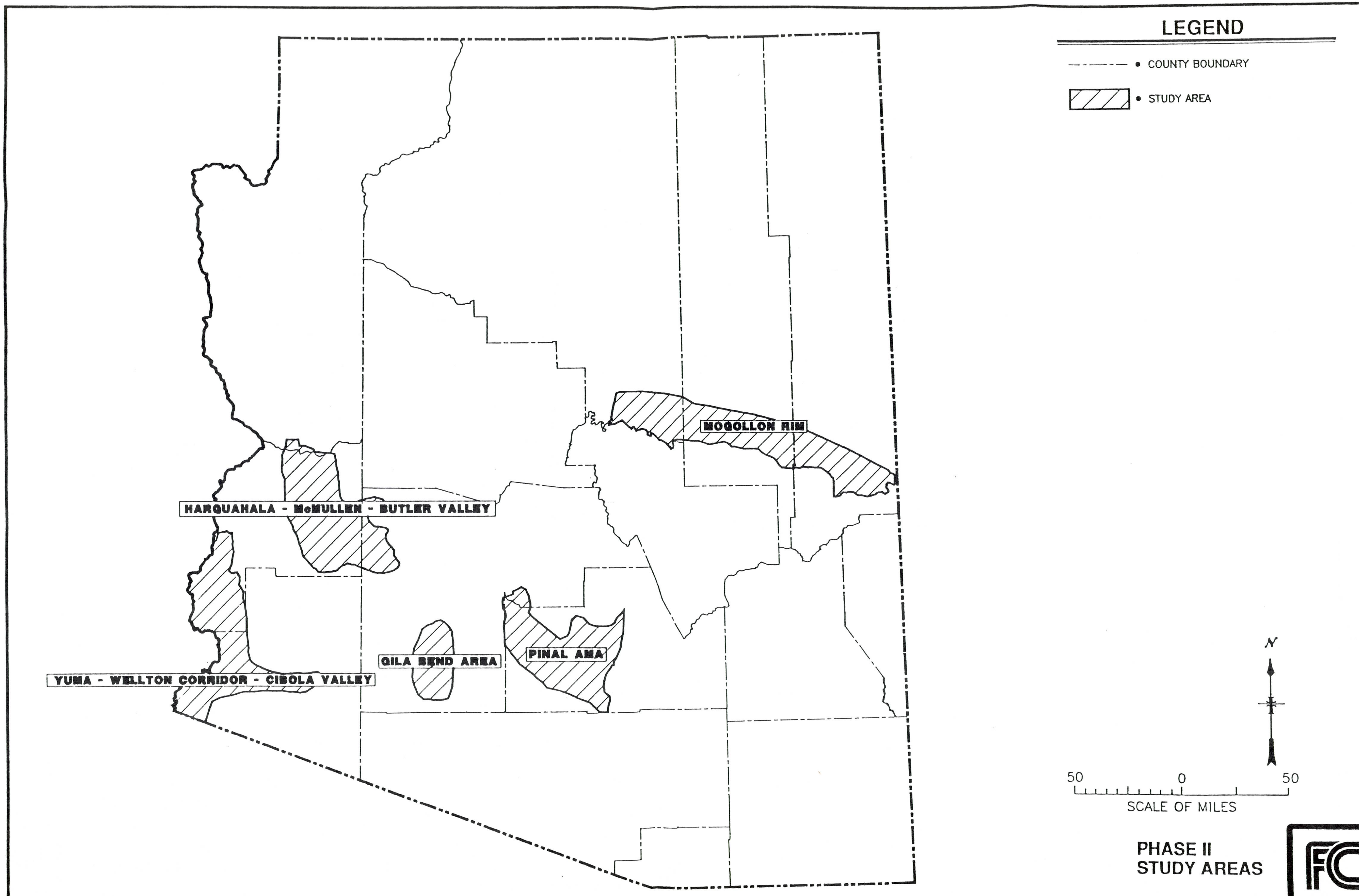
The phase II report identified and estimated the hydrologic and socioeconomic impacts of water transfers within the five study areas recommended for further study in phase I. The five study areas included: 1) Yuma-Wellton Corridor-Cibola Valley; 2) Harquahala-McMullen-Butler Valley (including Planet Ranch); 3) Mogollon Rim; 4) Pinal AMA; and 5) Gila Bend. Based on comments by members of the legislative committee and the ADWR, multiple impact analyses were conducted for the Yuma-Wellton Corridor-Cibola Valley and the Harquahala-McMullen-Butler Valley study areas. In the former, impact analyses were developed for water transfers from dispersed sources within the study area, and from a concentrated source of water. In the latter, impact analyses were developed for equal and shared water transfers from sources in La Paz and Maricopa Counties, and from one concentrated source of water within the study area. These five study areas were considered as representative areas and were not intended to be specific areas recommended for water transfers. In addition, prior to initiation of phase II the ADWR increased the low-medium-high transfer volumes from 60,000-90,000-120,000 acre-feet to 100,000-200,000-300,000 acre-feet to increase the effect of possible impacts.

During the presentation of the draft report to the legislative committee, it was apparent that the issue of water transfer had resulted in highly-polarized rural and urban factions. In addition, there were concerns about the briefness of that part of the report summarizing the socioeconomic impacts. Subsequent public hearings in Yuma, Parker, Flagstaff, Show Low, Casa Grande, and Phoenix further emphasized the sensitiveness of the water-transfer issue.

The testimony in the public hearings and follow-up letters by concerned citizens influenced the legislative committee to cancel the third phase of the study and request preparation of a final report that integrated the draft reports of phases I and II. The final report also responds to suggested revisions to those unavoidable errors in data that result from collection of only readily available data that is not verified in the field.

1.4 FINAL REPORT

This report integrates the phase I and phase II draft reports and revises those data that were indicated to be inaccurate or incorrect. Also, the phase II socioeconomic documentation that was the basis of the socioeconomic summary presented in the phase II draft report is largely inserted into this report to respond to the concerns about briefness by the committee and by citizens in the public hearings. To assure the completeness and responsiveness of the final report, Mr. C.E. Franzoy, one of the principals of FRANZOY COREY, met with concerned citizens in Yuma and Parker. Their comments and concerns have been addressed as much as possible in this report.



PHASE II
STUDY AREAS

B34003.00/81987

FIGURE 1.2

CHAPTER 2

STUDY APPROACH

2.1 PHASE I EVALUATION CRITERIA

For the phase I analysis, the ADWR and FRANZOY COREY defined specific hydrologic criteria to be used in deciding whether a phase I study area should be studied further in phase II. The phase I analysis concentrated on quantifying potential volumes of transferable water and evaluating the engineering and legal opportunities for transporting the water to high-demand areas.

Three critical hydrologic conditions were identified. Study areas not meeting any one of the following three conditions were not recommended for further analysis in phase II:

1. Sufficient water supplies will be retained in each study area to meet the area's estimated municipal and industrial water demand for 100 years. The high-volume estimate of potentially transferable water must accommodate this criterion.

2. The volume of transferable water does not include surface water unless the water rights have been completely adjudicated.

3. Practical engineering and legal solutions exist to transport the transferable water to the point of use.

Two additional guidelines were added as "soft" evaluation criteria:

4. Water with total dissolved solids (TDS) of more than 1,500 mg/L was considered unsuitable water.

5. A potential volume of transferable water that was less than 120,000 acre-feet annually was considered inadequate to supply interbasin demands.

The socioeconomic data were not considered in the selection of areas for further study.

2.2 STUDY RATIONALE AND ASSUMPTIONS

2.2.1 Hydrology

The intent of the water transfer study is to identify and estimate potential impacts of the transfer of given quantities of water from any study area to other points of use. The hydrologic data developed for the study are necessarily general and are intended to apply to each study area as a whole. These data should not be applied to local areas within any study area because of extreme variations that may occur in water quantity and quality.

The water budgets assumed that all net agricultural acreage would be irrigated and average annual water conditions would prevail for water supply and water use throughout the study period.

The intense level of land-development activity in several study areas was recognized early in the study. However, the final developments and their associated water demands were not considered in the water budgets or impact analyses because these developments are subject to change and their future water needs cannot be accurately projected.

Nonstructural alternatives (such as water exchanges), coupled with existing water transportation facilities such as the CAP system were assumed to be part of the region's physical infrastructure available to convey water from the study areas to the points of use. Costs for additional conveyance facilities were not considered. The prevailing political environment was likewise not considered.

The water transfers were assumed to begin in the year 2000 with the maximum volume being attained in the year 2025. The associated hydrologic impacts were developed for the years 2010 and 2025. Water transfers in the year 2010 were derived from an assumed straight-line increase between the years 2000 and 2025.

Several cities have purchased agricultural lands as of August 1987 in several study areas for potential water transfers. These cities, the acreage purchased for water rights and the contemplated volume of water that will be transferred from each affected study area are shown below.

City	Purchased Acreage (acres)	Water Transfer (acre-feet)	Study Area
Scottsdale	2,200	12,500	Harquahala, etc.
Phoenix	14,000	30,000	Harquahala, etc.
Mesa	11,606	30,000	Pinal AMA

For the calculations required in the water budgets the total potential volume indicated above was rounded to 72,000 acre-feet. To reflect the implemented or expressed actions of the above cities, pumpage in the appropriate study area was assumed to be significantly reduced until transfer pumpage was initiated in the year 2000. This reduction of pumpage was assumed to result in rising water levels or at least significant reductions in the rates of decline in the Harquahala and Pinal AMA study areas.

The current potential water transfers of 72,000 acre-feet were subtracted from the future transfers of 100,000, 200,000 and 300,000 acre-feet, as appropriate, in each study area. For example, in the Gila Bend area proportions of, and a total of, 72,000 acre-feet were subtracted from all transfer volumes to recognize total transfers from other study areas. Since hydrologic and economic impacts were being evaluated for the years 2010 and 2025, and transfers were being initiated in year 2000, the volumes shown in all water budgets were one-point volumes for those specific years projected as a straight-line increase from initiation of transfer until the maximum transfer is achieved.

If a water transfer involves purchase of existing rights in use within an AMA the volume transferred cannot exceed 3 acre-feet per acre. For transfers outside of an AMA, it was assumed that the transfers would be equivalent to the average farm delivery demand of the crops grown in the study area. Any additional pumpage required to provide the necessary transfer volumes was assumed to come from unidentified nonagricultural sources in the study area.

Allocations of CAP water within a study area greatly affect the impacts of water transfers. The CAP January 1985 Water Supply Study was used to generate assumed average annual water volumes for the allottees of CAP water in the years 2010 and 2025 in the appropriate study areas.

2.2.2 Socioeconomics

All socioeconomic impacts were induced by the purchase and retirement of agricultural lands to provide for specified volumes of water for transfer from any specific study area. The quantification of impacts began with retiring agricultural lands from production and continued by following the spin-off effects through the local economy.

When lands are purchased and retired from production in a given study area, there is a direct effect on agricultural output and employment. Agricultural output and employment influence other economic activities and employment through the level of purchases made in the local and regional economies. Changes in local and regional purchases affect output and employment in other sectors of the economy which are both directly and indirectly related to agriculture. For example, direct impacts would be lower purchases from suppliers of agricultural inputs such as fertilizers, pesticides and seeds. An example of indirect impacts is declining population which results in decreased school enrollment and lower employment associated with operation of the school.

The impacts on farm employment involving migrant workers were not evaluated. In addition, population estimates and projections do not include migrant workers or winter residents.

Retirement of agricultural land also has direct fiscal impacts due to the tax-exempt status of municipal-owned lands in Arizona. Consequently, retired lands reduce the tax base and decrease tax revenues. Indirect fiscal impacts can also be expected to occur over the longer-term as employment and population growth decrease, growth in assessed valuation and tax revenues will also change at a slower rate.

Impacts are divided into two general categories: 1) socioeconomic, and 2) fiscal. Socioeconomic impacts were further categorized into changes in agricultural output, employment, population, school enrollment and land ownership. Fiscal impacts included primary and secondary assessment valuations and tax revenues as well as revenue sharing between state and county governments.

Additional areas of potential impacts from water transfers were analyzed: 1) control of noxious weeds and dust, and 2) irrigation districts. The approach to investigating the problem of noxious weeds and dust resulting from retired agricultural lands was to estimate the costs of control rather than potential impacts. It was assumed that proper controls would be implemented to avoid potential damage claims and poor relations with neighbors.

A major concern was the impact water transfers would have on the fixed debt obligations and annual operating revenues of irrigation districts. Since irrigation districts have taxing authority, fixed debt obligations can be met by taxing property owners regardless of whether it is public or private ownership. The amount of annual district revenues generated may be affected by water transfers depending upon the disposition of district water not delivered to municipal lands. Reduced water sales would result in lower total revenues, although impacts on net revenues will be minimized due to lower annual operating costs.

As described in section 2.2.1, the cities of Scottsdale, Phoenix, and Mesa have already purchased agricultural lands for potential water transfers in the Harquahala-McMullen-Butler and Pinal AMA study areas. Although the impacts of these purchases are already being felt in some study areas, the baseline projections against which impacts are measured were assumed as if these purchases had not yet taken place. This convention allows existing as well as potential future purchases to be examined within a single analytical framework.

2.3 HYDROLOGIC METHODOLOGY

Estimates of surface water supply were based on average annual flows from U.S. Geological Survey gaging station data and/or from ADWR reports. Estimates of groundwater supply were based on data obtained from the U.S. Geological Survey, the U.S. Bureau of Reclamation, and the ADWR. Estimates of baseline groundwater in storage to a depth of 1,200 feet were derived from the Arizona Water Commission. Where the hydrological study areas cut across groundwater basins, the volume of groundwater in storage was estimated by using a percentage based on surface area. Recoverable groundwater was defined by the ADWR and FRANZOY COREY to be 50 percent of groundwater in storage (see appendix A).

Water quality data were obtained from U.S. Geological Survey, U.S. Bureau of Reclamation, and the ADWR. Water quality was evaluated on the basis of three measurements, where available: (a) the amount of Total Dissolved Solids (TDS), measured in mg/L; (b) the specific conductance values of the water, measured in micromhos/cm; and (c) fluoride concentrations, measured in mg/L.

Agricultural water demand was calculated from estimates of each area's net agricultural acreage and water application rate per acre. Net agricultural acreage was derived from gross irrigated acreage, and adjusted by a factor of 0.875 to account for roads, homesteads, and other nonagricultural acreage. A representative cropping pattern was derived from data for each study area, and a water application rate (expressed in acre-feet per acre) was estimated for each crop. The water application rate considered soil and water quality, climate, and local farming practices. The cropping pattern and application rates formed the basis for estimating the weighted water application rate per acre for each study area.

Municipal water demand was estimated on the basis of the total population per study area and a 1987 per capita water usage figure that was considered typical of the area. For urban areas within AMAs, water usage was adjusted to account for the effects of water conservation plans. Industrial water demand was derived from specific sources (i.e. powerplants, sawmills, etc.).

Hydrologic impacts of water transfers were evaluated on the basis of water budgets prepared from the supply and demand data (tables 2.1 through 6.1) and how those budgets reflected apparent changes in groundwater overdraft. Overdraft is defined in the budgets as total water demand minus total incidental recharge, surface water supply and natural recharge. The overdraft, in turn, affects changes in pumping volumes and potential water levels, degradation of water quality, and potential areas of land subsidence and fissures.

The water in storage shown in the water budgets includes gross and recoverable storage. Gross storage for the year 1987 is the storage reported by the Arizona Water Commission as of 1975, adjusted for the estimated baseline overdraft between the years of 1975 and 1987. The recoverable storage for the year 1987 was also adjusted for the period 1975-87 overdrafts.

2.4 SOCIOECONOMIC METHODOLOGY

The socioeconomic consequences of water transfers on rural economies depend on the extent to which each local economy relies on direct agricultural employment and agriculture-related purchases. The significance of the fiscal effects will depend on the extent to which the jurisdictions rely on property tax revenues generated by affected lands.

Socioeconomic profiles and baseline projections of key variables were developed for each study area. This information was used to describe each area and to evaluate the potential socioeconomic and fiscal effects of water transfers in phase II of the study. The baseline projections describe anticipated socioeconomic trends and changes in the absence of water transfers. Water transfer impacts were assessed by comparing baseline projections with transfer projections of impacts for each study area.

The socioeconomic profiles for each study area were developed using the best available secondary data sources. These sources included, among other information, reports from the 1980 census, and when available, the 1985 special census, County Business Patterns of 1984, and the most recent annual reports from the Arizona Department of Education, Arizona Department of Revenue, and Arizona Tax Research Foundation. For this reason, data contained within some of the tables were referenced by date. The reader is cautioned that the data from each referenced source may vary within a specific area.

The socioeconomic profiles were projected to represent a 1987 baseline from which baseline population and employment projections were made to the years 2010 and 2025. Baseline population and employment projections were made using Department of Economic Security assumptions about county economic growth and output from the Planning and Assessment System (PAS) model. Where necessary, projections were extended to the year 2025 on the basis of trends evident in the data between the years 2005 and 2010.

Baseline property values, property tax revenues, and selected nonproperty tax revenues were projected as functions of sector-specific employment and population growth. Tax rates were assumed to remain unchanged over the projection horizon and are expressed in constant 1986 dollars.

The distinction between the primary and the secondary property valuation was maintained throughout the study. Since 1980, Arizona has operated under two distinct valuation bases for levying ad valorem property tax, the primary or limited valuation, and the secondary or full cash valuation. Taxes levied on the primary valuation are used for the maintenance and operation of counties, cities and towns, school districts, and community college districts within each county. Taxes levied on the secondary valuation are used for debt retirement, voter-approved budget overrides, and the maintenance and operation of special service districts such as sanitary, fire, and road improvement districts.

The value of agricultural production was estimated using representative gross agricultural revenues in 1986 dollars, cropping characteristics, number of acres in production, and total gross revenues over the past three years (1984-86).

It was recognized early in the impact analysis that the levels of proposed nonagricultural land development in several study areas were possibly over and above the projections provided by the Arizona Department of Economic Security (DES). However, due to the scope of work these proposed developments in the private sector and their associated water demands are not considered in the impact assessment.

Potential agricultural, socioeconomic, and fiscal impacts were evaluated by comparing projected water transfer scenarios to baseline conditions. Agricultural impacts were based upon the amount of land involved in each water transfer scenario. Socioeconomic projections were developed using an impact model, the Planning and Assessment System (PAS), and DES assumptions about county-level employment and population growth. Fiscal impact projections were developed using agricultural land values and socioeconomic projections specific to each study area.

Three scenarios were developed which incorporate low, medium, and high water transfer volumes. These scenarios were compared to baseline conditions where no water transfers occurred and the difference or impact was evaluated. All monetary values are expressed in 1986 normalized prices.

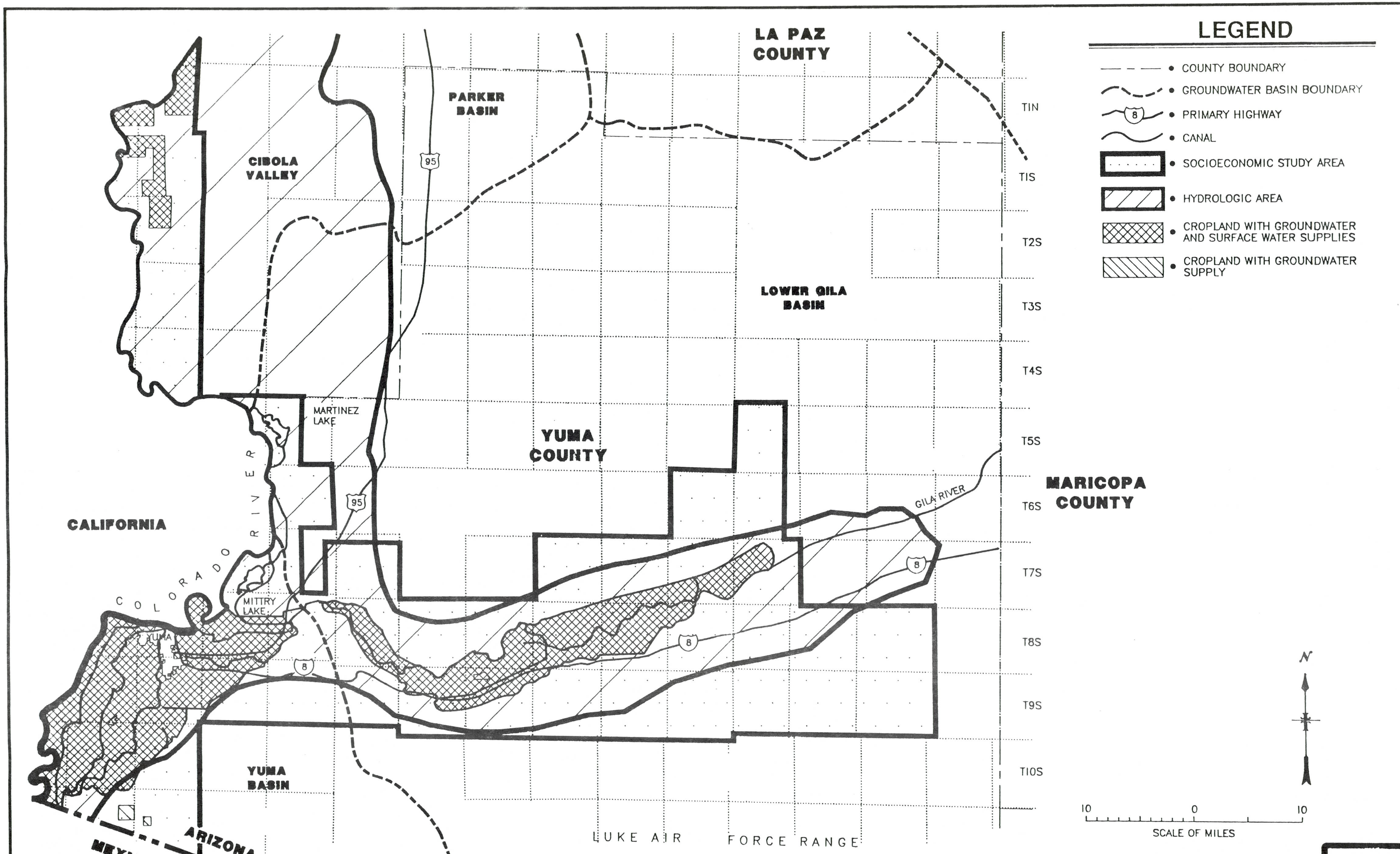
Key additional assumptions to those made in the hydrologic portion of the study are that:

(1) All agricultural land purchased for water transfers is acquired in 1987;

(2) All land acquired is retired from agricultural production at the time of purchase; and

(3) All land purchased by municipalities becomes tax exempt at the time of purchase.

In general, as a consequence of these conditions, the agricultural, socioeconomic, and fiscal impacts associated with agricultural land purchases occur near the time of purchase and tend to diminish towards the end of the study period. This is contrasted to the hydrologic impacts which build up throughout the study period and, in most cases, reach a peak near the last year of the analysis, year 2025.



YUMA - WELLTON CORRIDOR - CIBOLA VALLEY

FIGURE 3.1

B34003.00/81987

CHAPTER 3

YUMA-WELLTON CORRIDOR-CIBOLA VALLEY

3.1 GENERAL DESCRIPTION

The Yuma-Wellton Corridor-Cibola Valley study area (figure 3.1) is a low-lying desert plain that includes the lower reaches of the Gila and Colorado Rivers, Martinez and Mittry Lakes, city of Yuma, and the towns of Wellton, San Luis, and Somerton. The climate is exceptionally dry with a mean annual precipitation of slightly more than 2.5 inches. Rainfall is heaviest in the summer, associated with tropical disturbances. Winter temperatures range from the low 40s to the high 60s. Summer morning temperatures average in the high 70s, afternoon temperatures average in the low 100s.

3.2 CURRENT HYDROLOGIC PROFILES

The hydrologic study area includes the Gila River drainage from Texas Hill to Dome, and the Colorado River drainage from Cibola Valley to the south boundary with Mexico. The entire area is in the Basin and Range Lowlands Water Province.

3.2.1 Wellton-Mohawk Area Groundwater

In the Wellton-Mohawk area, the main source of groundwater is alluvial deposits where the upper sandy and lower gravel aquifers are from 30-150 feet in aggregate thickness. Groundwater in the area occurs under unconfined conditions. Depths to groundwater in the Wellton-Mohawk area range from less than 5 feet to more than 200 feet. Most wells in the hydrologic study area are capable of producing 1,000 gal/min or more.

The quality of groundwater in the Wellton-Mohawk area is unsuitable for most uses. A minor quantity is used for irrigation. Specific conductance values of more than 12,000 micromhos/cm are common, and fluoride concentrations generally range from 1-10 mg/L.

3.2.2 Cibola Valley-Yuma Area Groundwater

In the Cibola Valley-Yuma area, the principal source of groundwater is gravel zones contained in the alluvium deposited by both the Gila and Colorado Rivers. The groundwater occurs under mainly unconfined conditions. Depths to groundwater in the Cibola Valley-Yuma area range from less than 50 feet to more than 150 feet. Most wells in the hydrologic study area are capable of producing 1,000 gal/min or more.

Total dissolved solids (TDS) in the Cibola Valley-Yuma area range from less than 500 mg/L to more than 3,000 mg/L. Fluoride values generally range from 0.2-0.9 mg/L, which is acceptable for municipal use.

3.2.3 Groundwater Storage

Estimated groundwater in storage to a depth of 1,200 feet was about 195 million acre-feet in 1975 (Arizona Water Commission). About 146 million acre-feet of this storage is contained in the Gila River portion of the hydrologic study area where the quality is mostly unsuitable for potable and irrigation uses.

3.2.4 Groundwater Conditions

Pumping by Mexico along the United States-Mexico border increased the gradient which caused more groundwater to flow from the United States into Mexico. The existing treaty between the United States and Mexico addresses surface water flows but does not address groundwater flows. The Minute 242 well field, constructed and operated by the U.S. Bureau of Reclamation, intercepts groundwater that would flow into Mexico and delivers the intercepted groundwater on the surface so that the United States can claim credit for water delivered in accordance with treaty obligations.

Areas along the Colorado and Gila Rivers experience problems with high groundwater levels and require pumping to control (or lower) the groundwater levels. Local changes in groundwater levels reflect changes in the amount of applied irrigation water, drainage pumping, and water levels in the Colorado River. The study area is essentially in balance.

3.2.5 Surface Water Resources

Surface water in the study area is generated outside the hydrologic study area. The area's two major rivers are the Colorado and the Gila. Flow in the normally dry Gila River is controlled by flood releases from Painted Rock Dam, operated by the U.S. Army Corps of Engineers. Colorado River flows are generally based on water demands and are controlled upstream by releases from Hoover Dam, operated by the U.S. Bureau of Reclamation.

Surface water from the Colorado River is the source of nearly all irrigation water in the hydrologic study area. The surface water is obtained through contracts with the Secretary of the Interior. Water rights are senior to those in central Arizona except Cibola. These water rights were assigned to the irrigation districts by individual land owners.

3.2.6 Irrigation Districts

The eight irrigation districts within the study area are Cibola Valley Irrigation and Drainage District, Hillander "C" Irrigation District, North Gila Valley Irrigation District, Unit "B" Irrigation and Drainage District, Wellton-Mohawk Irrigation and Drainage District, Yuma Irrigation District, Yuma Mesa Irrigation and Drainage District, and Yuma County Water Users' Association.

3.3 HYDROLOGIC IMPACTS

Hydrologic impacts were developed from two water transfer scenarios: dispersed sources of transfer water throughout the study area; and from a representative concentrated source assumed to be the Wellton-Mohawk area. In both cases the water was derived from Colorado River diversions. Tables 3.1 and 3.2 illustrate the water budgets for the dispersed and concentrated sources, respectively. The water transfers are reduced by proportions of, and a total of 72,000 acre-feet to reflect transfers from other study areas in years 2010 and 2025.

3.3.1 Dispersed Sources

Water transfers from dispersed sources in this study area will result in nominal hydrologic impacts. The water budget (table 3.1) assumed that any increase in water demand would be met by Colorado River diversions until the contracted diversion volumes are reached. As the volume of water transfers increased the irrigation acreage was reduced to provide the necessary volumes. No demand was placed on the groundwater resource, except to continue that pumpage necessary to meet drainage or salinity control requirements, or Mexico-United States water-delivery agreements. If required, the groundwater resource from local areas could contribute significant quantities of water.

If the water transfer was accomplished upstream via Central Arizona Project facilities, minor changes in water quality may result in the Colorado River water because of downstream return flows with with less water available for dilution.

3.3.2 Concentrated Source

Similar to the dispersed sources discussed above, water transfers from the Wellton-Mohawk subarea will result in nominal hydrologic impacts. The water budget (table 3.2) indicates that a major beneficial impact would be reduced pumpage for drainage and salinity control.

The Wellton-Mohawk subarea was chosen as the concentrated source for convenience only, to study the potential impacts of transferring water from one location rather than from a large area. The reader should not imply that water will necessarily be transferred from the Wellton-Mohawk subarea.

3.4 SOCIOECONOMIC AND FISCAL PROFILES

The socioeconomic study area includes the communities of Yuma, Wellton, San Luis, and Somerton and their associated census divisions. The area contains three high schools, six elementary schools, and Arizona Western College.

3.4.1 Population and School Enrollment

There were 79,087 persons living in the study area according to the 1980 census (see table 3.3). This census figure does not take into account the population fluctuations associated with winter tourism. The population is young relative to the state as a whole. In 1980, the median age was 27.8 years, compared with a median age of 29.2 years for Arizona. About 76 percent of the 19,164 study area children under the age of 18 were enrolled in schools in 1980. The study area population is projected to grow at a moderate rate during the projection horizon (table 3.4). Between 1987 and 2025, population is projected to increase at an annual compound growth rate of 1.9 percent, growing from about 88,700 persons in 1987 to above 181,300 by 2025. School enrollment is projected to increase from about 20,300 students in 1987 to about 40,700 by 2025.

3.4.2 Household Income

Income in the area is low relative to the state. The median income for study area households in 1980 was $14,900, compared with $16,448 for Arizona.

3.4.3 Labor Force

Unemployment in the area is higher than the state average. According to the 1980 census, 8.2 percent of the 29,588 residents in the area's civilian labor force were unemployed, compared to 6.7 percent unemployed for Arizona (In September 1987 the unemployment rate was 21.4 percent).

3.4.4 Employment

Primary industries in the area are agriculture, tourism, and defense (military facilities). Tourism was a $200 million industry for Yuma in 1985. Two military facilities operate in the area, the U.S. Army Yuma Proving Ground and the U.S. Marine Corps Air Station. The city of Yuma is a regional tourist and trading center. The economies of Wellton and Somerton are based primarily on agriculture. Area employment in 1980 by sector was about 16.0 percent in agriculture, about 23.0 percent in trade, and about 25.3 percent in service (table 3.3).

Employment is projected to grow at a moderate rate, increasing from about 34,300 jobs in 1987 to about 70,900 by 2025 (table 3.4). The largest employment increases are expected to occur in the trade and service industries as tourism increases in importance. Manufacturing is projected to grow slowly, and agricultural employment is expected to gradually decline through 2025.

3.4.5 Land Ownership

The study area encompasses about 1.01 million acres, most of which is publicly owned. About 15.0 percent of the land is state owned, about 58.3 percent is owned as other forms of public land such as military reserves and wildlife refuges, about 26.5 percent is privately owned and 0.2 percent is Indian.

3.4.6 Property Tax Base

The area's 1986 primary net assessed value totaled about $256 million (table 3.5). The tax rate of $10.17 per $100 of the primary assessment generated more than $26 million in revenue. The secondary net assessed value was about $267 million. Property was taxed at a rate of $1.80 per $100 of the secondary assessment and generated a total of about $4.8 million in tax revenue.

Agricultural and vacant land had a primary net assessed value of over $33 million, and accounted for 12.9 percent of the total primary assessment. Residential property had the greatest aggregate value totalling over $74 million, or about 29 percent of the total primary assessment.

Primary net assessed value is projected to increase from about $256 million to about $532 million by 2025 (table 3.6). Property values in residential, commercial, and industrial use classes are projected to grow along with the economic expansion, but the net assessed value of agricultural and vacant lands is projected to decline over the course of the projection horizon from about $33 million to about $22 million.

3.4.7 Property Tax Revenues

Schools are the jurisdictions most dependent on property tax revenues. Of the $26 million in revenues generated from 1986 primary assessments (table 3.5), schools received over $13 million, counties about $6.2 million, and towns and cities, approximately $2 million.

Total property tax revenues are projected to more than double by 2025. Tax revenues based on the primary assessment are projected to increase from about $26 million to about $54 million, and tax revenues based on the secondary assessment are projected to increase from about $4.8 million to about $9.8 million (table 3.6).

3.4.8 Nonproperty Tax Revenues

Three key nonproperty tax revenue sources that could be affected by economic changes were identified: county state-shared revenues; city state-shared revenues; and city sales tax collections. The following increases are projected to occur by 2025; county state-shared revenues increase from about $3.3 million to about $6.9 million; state-shared revenues for cities and towns increase from about $12.2 million to about $28.2 million; and city sales tax collections increase from about $5.3 million to about $14.2 million. Table 3.6 shows these projections as percentages of the key nonproperty tax revenues. The relatively large increase in projected city sales tax collections is due to the projected growth of tourism in the area economy.

3.5 SOCIOECONOMIC AND FISCAL IMPACTS

3.5.1 Dispersed Sources

This socioeconomic and fiscal impacts analysis is for the water transfer scenario that derives water from sources throughout the study area.

3.5.1.1 Land Ownership. In the Yuma-Wellton Corridor-Cibola Valley area, total land area is estimated to be about 1,010,800 acres. The baseline ownership distribution is as follows: 230,660 (22.8 percent) in BLM; 151,500 acres (15.0 percent) in state; 358,570 acres (35.5 percent) in other public; and 267,990 acres (26.5 percent) in private. There are 2,080 acres owned by Indian tribes. It is estimated that 6,666 acres will be purchased for the low transfer volume, which increases the other public category to 36.1 percent and decreases the private category to 25.9 percent of the total, respectively. Under the medium transfer volume, there are 30,477 acres involved which increases the other public category to 38.5 percent and decreases the private category to 23.5 percent. The high transfer volume involves 54,286 acres and results in 40.8 percent of the land falling into the other public category and 21.1 percent remaining in the private category.

Although land areas exceeding 50,000 acres are involved with water transfers, shifts in land ownership are moderate even under the high transfer volume where the other public category increases from 358,570 acres to 412,856 acres and the private category decreases from 267,990 acres to 213,704 acres. Table 3.7 summarizes the land ownerships and impacts.

<u>3.5.1.2 Impacts on Gross Agricultural Output</u>. Acreage for each crop was estimated by applying percentages from the representative cropping pattern to net irrigated acres. Yields and prices were multiplied to estimate a value of gross output per acre for each crop. The number of acres and gross output per acre were then multiplied to obtain the value of gross output by crop, which was summed for all crops resulting in the total value of gross agricultural output for baseline conditions. Baseline gross agricultural output was estimated to be $244.5 million based upon 1984-86 average prices and 1984-86 average cropping patterns.

Impacts resulting from water transfers were estimated based on the amount of land remaining in production for each water transfer volume. In this analysis, it was assumed that the amount of water transferred on a per acre basis is equal to the farm delivery demand. The weighted farm delivery demand per acre for the dispersed sources is 4.8 acre-feet per acre.

The total transfer volume divided by farm delivery demand results in the number of acres to be retired from agricultural production. It is further assumed that each acre retired from production is a composite of the area cropping pattern. The composite or weighted gross output per acre for this area is estimated to be $1,300.30.

Table 3.8 summarizes the direct impacts on agriculture in the year 2025. Under the low water transfer volume where 28,000 acre-feet are assumed to be transferred, 5,833 acres of agricultural land will be retired from production. The remaining acres in production are calculated by subtracting 5,833 acres from the total net irrigated acres of 156,721 and multiplying the result by 1.2 to account for double cropping. It is estimated that 181,066 acres would remain in production under the low water transfer volume. The total gross output can be calculated by multiplying the weighted value per acre of $1,300.30 by the remaining acres (181,066) in production. The result is $235.4 million of estimated gross agricultural output.

The impacts for the low water transfer volume are estimated to be $9.1 million which is the difference between the baseline gross output value of $244.5 million and $235.4 million. Impacts for medium and high transfer volumes have been estimated using the same procedure. The results for these volumes also are summarized in table 3.8.

These impacts are based upon the assumption that all subareas within this study area will be affected equally.

3.5.1.3 Direct Agricultural Employment Impacts. The potential impacts of water transfers on agricultural employment are also shown in table 3.8. Employment impacts range from 141 to 1,150 jobs lost, or from 3.7 to 30.3 percent, of all agricultural employment, depending on the amount of agricultural land withdrawn from production.

3.5.1.4 Regional Socioeconomic Impacts. The regional socioeconomic impacts of a decline in agricultural activity result from the direct loss of agricultural jobs (the income generated by those jobs spent in the local economy) as well as the loss of direct business purchases in the local economy by the agricultural sector. Projections of the potential regional employment and population impacts of a decline in agricultural activity associated with the different water transfer volumes were developed using estimates of the decline in agricultural employment and gross agricultural output as inputs to the PAS model. It was assumed that 33 percent of total farm output was spent on local purchases in the study area economy.

Employment Impacts. Projected employment impacts by economic sector are shown in table 3.9. By the year 2010, from 242 to 1,971 total jobs, or from 0.5 to 3.7 percent of all employment in the study area would be lost depending on the level of water transfers.

Employment impacts are lower in the year 2025. In 2025, the decline in employment ranges from 203 to 1,654 jobs, and from 0.3 to 2.3 percent, depending on the level of water transfers. The severity of the impact declines because agriculture is projected to have a less substantial role in the Yuma economy by the year 2025.

Population by Age and School Enrollment Impacts. Projected regional population and school enrollment impacts are shown in table 3.10. In 2010, the potential impact of water transfers ranges from 626 to 5,107 people, or from 0.5 to 3.7 percent of the population, depending on the level of water transfers. In 2025, the impact ranges from a decline of 526 to 4,286 people, depending on the water transfer volumes. Impacts on school enrollment parallel those on population. In 2010, school enrollment impacts range from 173 to 1,415 students, from 0.6 to 4.5 percent of the baseline projection. In 2025, the impact ranges from 0.4 to 3.9 percent of the total school enrollment.

3.5.1.5 Direct Fiscal Impacts. Direct fiscal impacts are those that result from a decline in the amount of taxable agricultural land. In 1986, irrigated land in the Yuma study area had an average full cash value of approximately $606 per acre, and a limited cash value of approximately $527 per acre. The assessment ratio on agricultural land is 0.16. Thus, irrigated agricultural land would have an estimated secondary net assessed value of $96.90 per acre and an estimated primary net assessed value of $84.30 per acre. The potential direct impacts of water transfers in

2025 on assessed valuation in the study area are shown in table 3.11.

Direct Net Assessed Value Impacts. The direct impact of water transfers on assessed valuation ranges from $562,000 to $4,576,000 or from 0.2 to 1.8 percent of total assessed value, depending on the level of water transfers. The relatively low impact on assessed value of even the high water transfer volume reflects the relatively limited contribution of irrigated agricultural acreage to total assessed value in this study area.

Property Tax Revenue Impacts. Direct property tax revenue impacts are those that come solely from the loss of taxable agricultural lands. Property in the study area is taxed at a cumulative rate of $9.39 per $100 of primary net assessed value. Local schools account for the largest proportion of the tax with a rate of $5.14 per $100 of assessed value followed by Yuma County, which taxes at a rate of $2.42 per $100 with the remainder distributed among the State of Arizona and Arizona Western Community College. The direct primary property tax revenue impacts by the three water transfer volumes in 2025 for the Yuma study area are shown in table 3.11.

Overall, the study area in 1986 generated a total of about $24.1 million in taxes based on the primary assessed valuation. Of this, schools collected $13.2 million and Yuma County $6.2 million. Impacts on tax revenues based on the primary valuation would range from $53,000 to $429,000 annually, depending on the amount of land retired.

The cumulative tax rate in the study area is $1.88 per $100 of secondary net assessed value. Schools with a tax rate of $1.39 per $100 and Yuma County with a rate of $0.41 per $100 account for most of the secondary property taxes levied.

Tax revenue impacts based on the secondary valuation in 2025 are shown in table 3.12.

In 1986, there were $5.01 million in property tax revenues paid based on the secondary valuation. Schools collected approximately $3.7 million, or nearly 74 percent of the total, while Yuma County collected $1.1 million. Secondary property tax revenue impacts would range from $13,000 to $99,000, depending on the amount of agricultural land retired.

<u>3.5.1.6 Indirect Fiscal Impacts</u>. A decline in agricultural activity in the study area can also be expected to impact the growth of assessed value, and thus tax revenues, through its impacts on regional socioeconomic activity. The potential indirect impacts of water transfers on the growth of primary and secondary net assessed values in the study area are shown in tables 3.13 and 3.14. For purposes of comparison, the valuation of agricultural lands has been held constant at its 1986 level while increases in the valuation of commercial/industrial, residential, and rail/utilities and other classes were projected as functions of changes in study area population and employment levels. The valuation of vacant land was decreased to account for growth of population employment in the area.

<u>Indirect Net Assessed Value Impacts</u>. The impact on future primary assessed value of the decline in residual economic activity would range from $2.9 million to $23.3 million in the year 2010, and from $2.5 to $20.3 million in the year 2025. The impacts on future secondary assessed value would range from $2.9 to $24.3 million in the year 2010, and from $2.5 to $20.3 million in the year 2025. Once again, the impacts are lower in 2025 because of the lower level of significance that agriculture is projected to have in the study area's economy. The impacts on the property tax rates also are shown on tables 3.13 and 3.14.

Indirect Property Tax Revenue Impacts. The projected indirect property tax revenue impacts of the decline in primary and secondary assessed values also are shown in tables 3.13 and 3.14. The baseline tax rates of the area are assumed to remain constant for each category throughout the projection horizon. In the baseline projection total tax revenues based on the primary valuation were projected to reach $40.3 million by the year 2010, and $54.2 million by the year 2025. In the baseline projection for secondary valuation the total tax revenues were projected to reach $13.3 million in the year 2010, and $17.8 million by the year 2025.

Total primary property tax revenue impacts are projected to range from $291,000 to $2.4 million in the year 2010, and from $252,000 to $2.1 million in the year 2025. Impacts on secondary tax revenues are projected to range from $96,000 to $782,000 in the year 2010, and from $83,000 to $681,000 in the year 2025.

3.5.1.7 Conclusions. Overall, the socioeconomic impacts of water transfers on the Yuma study area would be quite modest. The economy of the Yuma study area is relatively diverse, and the amount of agricultural land retired under the high impact scenario is relatively limited compared to the county land base.

3.5.2 Concentrated Source

3.5.2.1 Land Ownership. The Wellton-Mohawk subarea has the most significant water transfer impacts on land ownership. Baseline land ownership is as follows: BLM, 77,720 (21.6 percent); state, 34,920 (9.7 percent); other public, 122,050 acres (33.9 percent); and private, 125,240 acres (34.8 percent).

Table 3.15 shows the maximum ownership differences between baseline conditions and the high water transfer volume to be over 15 percent. Other public lands increases to 49.0 percent of the total area from 33.9 percent, while private land ownership decreases from 34.8 to 19.7 percent. This shift is significant and is especially identifiable in an area highly dependent on agriculture as the basis of its economy.

<u>3.5.2.2 Impacts on Gross Agricultural Output</u>. The impacts assume that water will be transferred from a concentrated area, assumed to be the Wellton-Mohawk Irrigation District, where land will be retired from production.

Under baseline conditions, the total gross output is estimated to be $72.3 million which includes a historic cropping intensity of 1.22 percent (table 3.16).

Acres remaining in production under the low water transfer volume are estimated to be 69,392 (net irrigated acres of 62,711 less 5,833 multiplied by 1.22). Gross output was estimated to be $65.5 million and the difference from baseline conditions is $6.8 million.

Under the medium water transfer volume, 26,667 acres (128,000 acre-feet/4.8 acre-feet per acre) will be retired from production. Gross agricultural output for the remaining acres (43,974) in production is estimated to be $41.5 million. The difference from baseline conditions is $30.7 million

The transfer volume for the high volume will retire 47,500 acres from production. Gross agricultural output would be reduced to $17.5 million and estimated impacts are $54.7 million. The results are summarized in table 3.16.

3.5.2.3 Direct Agricultural Employment Impacts. The potential impacts of water transfers on agricultural employment are shown in table 3.16. Agricultural employment impacts would range from 61 to 494 jobs lost, or from 9 to 24 percent, of all agricultural employment in the study area, depending on the amount of agricultural land withdrawn from production in year 2025. The agricultural employment and impacts on agricultural employment do not include seasonal labor.

3.5.2.4 Regional Socioeconomic Impacts. The regional socioeconomic impacts of a decline in agricultural activity result from the direct loss of agricultural jobs (the income generated by those jobs spent in the local economy) as well as the loss of direct business purchases in the local economy by the agricultural sector. These impacts are measured in this alternative against the baseline projections for the area. Projections of the potential regional employment and population impacts of a decline in agricultural activity associated with the different water transfer volumes were developed using estimates of the decline in agricultural employment and gross agricultural output as inputs to the PAS model. It was assumed that 33 percent of total farm output was spent on local purchases in the study area economy.

Employment Impacts. Projected employment impacts by economic sector are shown in table 3.17. By the year 2010, from 103 to 840 total jobs, or from 3.9 to 31.6 percent of all employment in the study area would be lost depending on the level of water transfers.

Employment impacts are lower in the year 2025. In 2025, the decline in employment ranges from 84 to 713 jobs depending on the level of water transfers. These declines represent

3.0 to 24.5 percent of the employment projected to be in the study area.

Population by Age and School Enrollment Impacts. Projected regional population and school enrollment impacts are shown in table 3.18. In 2010, the potential impact of water transfers ranges from 269 to 2,176 people, or from 3.9 to 31.2 percent of the population, depending on the level of water transfers. In 2025, the impact ranges from a decline of 227 to 1,846 people, depending on the water transfer volume. Impacts on school enrollment parallel those on population. In 2010, school enrollment impacts range from 74 to 603 students. In 2025, the impact ranges from 63 to 511 students.

3.5.2.5 Direct Fiscal Impacts. Direct fiscal impacts are those that result from a decline in the amount of taxable agricultural land. In 1986, irrigated land in the study area had an average full cash value of approximately $590 per acre, and a limited cash value of $513 per acre. The assessment ratio on agricultural land is 0.16. Thus, irrigated agricultural land would have an estimated secondary net assessed value of $94.40 per acre and an estimated primary net assessed value of $82.10 per acre. The potential direct impacts of water transfers in 2025 on primary and secondary assessed valuations in the study area are shown in tables 3.19 and 3.20.

Direct Net Assessed Value Impacts. The direct impact of water transfers on primary assessed valuation ranges from $547,000 to $4,458,000, or from 2.2 to 17.7 percent of total assessed value, depending on the level of water transfers. The direct impact on secondary assessed valuation ranges from $629,000 to $5,125,000.

Property Tax Revenue Impacts. Direct property tax revenue impacts are those that come solely from the loss of taxable agricultural lands. Property in the study area is taxed at a cumulative rate of $9.39 per $100 of primary net assessed value. Local schools account for the largest proportion of the tax with a rate of $5.14 per $100 of assessed value followed by Yuma County, which taxes at a rate of $2.42 per $100 with the remainder distributed among the State of Arizona and Arizona Western Community College. The direct primary property tax revenue impacts by level of water transfer in 2025 are shown in table 3.19. The valuation of vacant land was decreased to account for growth of population employment in the area.

Overall, the study area in 1986 generated a total of $2.4 million in taxes based on the primary assessed valuation. Of this, schools collected $1.3 million and Yuma County $0.6 million. Declines in tax revenues based on the primary valuation would range from $51,000 to $419,000 annually, depending on the amount of land retired.

Tax revenue impacts based on the secondary valuation are shown in table 3.20. Agricultural land in the study area is taxed at a cumulative rate of $1.88 per $100 of secondary net assessed value. Schools with a tax rate of $1.39 per $100 and Yuma County districts with a rate of $.41 per $100 account for most of the secondary property taxes levied.

Currently, there are $492,000 in property tax revenues paid based on the secondary valuation. Schools collect approximately $364,000, or about 74 percent of the total, while Yuma County collects approximately $107,000. Secondary property tax revenue declines would range from $13,000 to $96,000, depending on the amount of agricultural land retired.

3.5.2.6 Indirect Fiscal Impacts. A decline in agricultural activity in the study area can also be expected to impact the growth of assessed value and property tax revenues, which impacts on regional socioeconomic activity. The potential indirect impacts of water transfers on the growth of primary and secondary net assessed values in the study area are shown in tables 3.21 and 3.22. For purposes of comparison, the valuation of agricultural lands has been held constant at its baseline level while increases in the valuation of commercial/industrial, residential, and railroad/utility classes were projected as functions of changes in study area population and employment levels.

Indirect Net Assessed Value Impacts. The impact on future primary assessed value of the decline in residual economic activity would range from $1.3 to $10.9 million in the year 2010, and from $1.2 to $9.9 million in the year 2025. The impact on secondary assessed value would range from $1.4 to $11.3 million in the year 2010, and from $1.3 to $10.3 million in the year 2025. Once again, the impacts are lower in 2025 because of the lower level of significance that agriculture is projected to have in the study area's economy by this time period.

Indirect Property Tax Revenue Impacts. The projected indirect primary and secondary property tax revenue impacts of the decline in assessed value also are shown in tables 3.21 and 3.22. The current tax rates of the area are assumed to remain constant throughout the projection horizon. In the baseline projection, total tax revenues based on the primary valuation were projected to reach $1.8 million by the year 2010, and $2.0 million by the year 2025. Total tax revenues based on the secondary valuation were projected to reach $547,000 in the year 2010 and $600,00 in the year 2025.

Total primary property tax revenue impacts are projected to range from $86,000 to $705,000 in the year 2010, and from $79,000 to $641,000 in the year 2025. Total secondary property tax revenue impacts are projected to range from $26,000 to $213,000 in the year 2010, and from $24,000 to $193,000 in the year 2025. The impacts on primary and secondary property tax rates also are shown on tables 3.21 and 3.22.

3.5.2.7 Conclusions. The declines in agricultural output, agricultural acreage and agricultural employment are severe in the local area. However, the study area-wide socioeconomic impacts of water transfers from a concentrated source differ only slightly from the impacts from a dispersed source. In this case, agricultural land in the Wellton-Mohawk Corridor tends to be more oriented to field crops than to vegetable and citrus crops. As a result, it supports somewhat lower levels of agricultural labor, has a lower lease value, and thus lower assessed value than the study area as a whole. Although socioeconomic impacts on the study area are just slightly lower than the dispersed source alternative, impacts are more concentrated and would require substantially more adjustment than impacts on the complete study area.

TABLE 3.1
Water Transfer Study
Water Budget
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

Description	1987	2010			2025		
Water Demand (1,000 AF)							
Water Transfer	0	11	51	91	28	128	228
Municipal & Industrial	19	28	28	28	39	39	39
Agricultural	752	741	701	661	724	624	524
Drainage Pumping	186	189	181	170	191	169	146
Total Demand	957	969	961	950	982	960	937
Incidental Recharge (1,000 AF)							
Municipal & Industrial	9	14	14	14	20	20	20
Agricultural	150	148	140	131	145	125	105
Conveyance Seepage	22	22	22	20	21	19	16
Total Incidental Recharge	181	184	176	165	186	164	141
Water Supplies (1,000 AF)							
Surface Water	771	780	780	780	791	791	791
Groundwater	0	0	0	0	0	0	0
Drainage Pumping	186	189	181	170	191	169	146
Total Supplies	957	969	961	950	982	960	937
Natural Recharge (1,000 AF)	5	5	5	5	5	5	5
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	0	0	0	0	0	0	0
Variables							
Irrigated Acreage (1,000)	157	154	146	138	151	130	109
Per Capita Muni Use (GPCD)	190		190			190	
Avg Crop Consump Use (ft/yr)	3.6		3.6			3.6	
Avg Irrigation Efficiency	75%		75%			75%	
Irrigation Recharge Factor	20%		20%			20%	
Municipal Recharge Factor	50%		50%			50%	
Industrial Recharge Factor	50%		50%			50%	
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)							
Gross Storage	195,000		195,000			195,000	
Recoverable Storage	97,500		97,500			97,500	

Data compiled by FRANZOY COREY

TABLE 3.2
Water Transfer Study
Water Budget
Yuma-Wellton-Mohawk Subarea (Concentrated Source)

Description	1987	2010			2025		
Water Demand (1,000 AF)							
Water Transfer	0	11	51	91	28	128	228
Municipal & Industrial	–	–	–	–	–	–	–
Agricultural	301	290	250	210	273	173	73
Drainage Pumping	200	198	190	182	195	175	155
Total Demand	501	499	491	483	496	476	456
Incidental Recharge (1,000 AF)							
Municipal & Industrial	–	–	–	–	–	–	–
Agricultural	60	58	50	42	55	35	15
Conveyance Seepage	40	40	40	40	40	40	40
Total Incidental Recharge	100	98	90	82	95	75	55
Water Supplies (1,000 AF)							
Surface Water	401	401	401	401	401	401	401
Groundwater	–	–	–	–	–	–	–
Drainage Pumping	100	98	90	82	95	75	55
Total Supplies	501	499	491	483	496	476	456
Natural Recharge (1,000 AF)	0	0	0	0	0	0	0
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	0	0	0	0	0	0	0
Variables							
Irrigated Acreage (1,000)	63	60	52	44	57	36	15
Per Capita Muni Use (GPCD)	190		190			190	
Avg Crop Consump Use (ft/yr)	3.6		3.6			3.6	
Avg Irrigation Efficiency	75%		75%			75%	
Irrigation Recharge Factor	20%		20%			20%	
Municipal Recharge Factor	50%		50%			50%	
Industrial Recharge Factor	50%		50%			50%	
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)							
Gross Storage	146,000		146,000			146,000	
Recoverable Storage	73,000		73,000			73,000	

Data compiled by FRANZOY COREY

TABLE 3.3
Socioeconomic Profile
Yuma-Wellton Corridor-Cibola Valley

Economic Component	Study Area	Arizona
Population (1980)	79,087	2,718,215
Age 0 - 17 (%)	32.0	29.2
Age 18 - 64 (%)	58.0	59.5
Age 65+ (%)	10.0	11.3
Median age	27.8	29.2
School Enrollment (1980)	19,164	652,174
Median household income (1980)	$14,900	$16,448
Less than $5,000 (%)	12.2	12.1
$ 5,000 - $14,999 (%)	40.4	33.3
$15,000 - $29,999 (%)	34.0	36.4
$30,000 - $39,999 (%)	8.2	10.2
$40,000 + (%)	5.2	8.0
Civilian labor force (1980)	29,588	1,238,000
Unemployed (%)	8.2	6.7
Employment (1980)	27,170	1,113,270
Agriculture (%)	16.0	3.0
Construction (%)	7.4	8.3
Manufacturing (%)	6.2	14.8
Trade (%)	23.0	22.6
Services (%)	25.3	30.6
Government (%)	11.5	6.7
Other (%)	10.6	14.0
Land Ownership (000's of acres)	1,011	
Private (%)	26.5	
Indian (%)	0.2	
Public - State (%)	15.0	
Public - Other (%)	58.3	

Data compiled by Mountain West and Econotrend

TABLE 3.4
Baseline Socioeconomic Projections
Yuma-Wellton Corridor-Cibola Valley

	1987	2010	2025
Population	88,700	138,500	181,300
Age 0 - 17 (%)	32.2	30.4	30.4
Age 18 - 64 (%)	54.1	52.1	52.1
Age 65 + (%)	13.7	17.5	17.5
School Enrollment	20,300	31,100	40,700
Employment (no. of employees)	34,300	52,800	70,900
Agriculture (%)	11.1	5.6	3.5
Const. and Mfg. (%)	9.9	9.5	8.9
Trade (%)	21.1	24.2	25.3
Services (%)	23.8	29.1	32.7
Government (%)	24.5	21.6	19.1
Other (%)	9.6	10.0	10.5

Source: Mountain West Research

TABLE 3.5
Property Tax Profile (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley

	Primary Assessment			Secondary Assessment		
	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)
Study area total	256,352	10.17	26,071	266,636	1.80	4,799
Legal classes						
2 Utilities	45,863	10.17	4,664	45,863	1.80	826
3 Commercial and industrial	72,988	10.17	7,423	75,914	1.80	1,366
4 Agricultural and vacant land	33,104	10.17	3,367	36,778	1.80	662
5 Residential	74,832	10.17	7,610	76,900	1.80	1,384
6 Rental residential	27,863	10.17	2,834	28,788	1.80	518
7 Railroads	1,698	10.17	173	2,388	1.80	43
8 Historic property	4	10.17	0	5	1.80	0
Jurisdictions						
State	256,352	0.38	974	266,636	0.00	0
Counties	256,352	2.42	6,207	266,636	0.41	1,093
Towns and Cities	142,398	1.40	1,994	142,398	0.00	0
Schools	256,352	5.14	13,179	266,636	1.39	3,706
Community College	256,352	1.45	3,717	266,636	0.08	213

Data compiled by Mountain West

TABLE 3.6
Baseline Net Assessed Value and Tax Revenue Projections (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley

	Primary			Secondary		
	1987	2010	2025	1987	2010	2025
Net Assessed Value ($000's)	256,352	396,386	532,404	266,636	410,217	549,407
Ag. and Vacant (%)	12.9	6.5	4.1	13.8	6.9	4.4
Comm. and Indus. (%)	28.5	32.1	34.2	28.5	32.3	34.4
Residential (%)	40.0	40.5	39.4	39.6	40.3	39.3
Other (%)	18.6	20.9	22.3	18.1	20.5	21.9
Cities and Towns Total (%)	55.5	67.3	72.0	53.4	65.9	71.1
Property Tax Revenue ($000's)	26,076	40,321	54,157	4,789	7,343	9,834
State (%)	3.7	3.7	3.7	0.0	0.0	0.0
Counties (%)	23.8	23.4	23.3	22.3	22.3	22.3
Cities and Towns (%)	7.6	9.1	9.7	0.0	0.0	0.0
Schools (%)	50.6	49.8	49.4	77.7	77.7	77.7
Community College (%)	14.3	14.0	13.9	0.0	0.0	0.0
	Local Government Revenues					
Key Nonproperty Tax Revenue ($000's)	20,877	35,711	49,317			
County State Shared (%)	16.0	14.4	14.0			
City State Shared (%)	58.6	58.4	57.2			
City Sales (%)	25.4	27.2	28.8			

Source: Mountain West Research

TABLE 3.7
Land Ownership Impacts
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

Category	1987 Baseline		2025 Water Transfer Volumes: Low 28,000 AF		Medium 128,000 AF		High 228,000 AF	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
BLM	230,660	22.8	230,660	22.8	230,660	22.8	230,660	22.8
Forest Service	0	–	0	–	0	–	0	–
Indian	2,080	0.2	2,080	0.2	2,080	0.2	2,080	0.2
State	151,500	15.0	151,500	15.0	151,500	15.0	151,500	15.0
Other Public	358,570	35.5	365,236	36.1	389,047	38.5	412,856	40.9
Private	267,990	26.5	261,324	25.9	237,513	23.5	213,704	21.1
TOTAL	1,010,800	100.0	1,010,800	100.0	1,010,800	100.0	1,010,800	100.0

Source: Econotrend

TABLE 3.8
Direct Impacts on Agricultural Lands, Output, and Employment
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

Variable	Baseline	2025 Water Transfer Volumes Low 28,000 AF	Medium 128,000 AF	High 228,000 AF
Loss of Net Irrigated Acres	0	5,833	26,667	47,500
Net Irrigated Acres	156,721	150,888	130,054	109,221
Loss of Gross Irrigated Acres	0	6,666	30,477	54,286
Gross Irrigated Acres	179,110	172,444	148,633	124,824
Loss of Cropped Acres	0	7,000	32,000	57,000
Acres of Crops in Production	188,066	181,066	156,066	131,066
Loss of Agricultural Output (in 1986 dollars)	0	9,102,100	41,609,600	74,117,100
Agricultural Output (in 1986 dollars)	244,542,100	235,440,000	202,932,500	170,425,000
Loss of Agricultural Employment	0	141	646	1,150
Agricultural Employment	3,795	3,654	3,149	2,645
Percent Direct Impact on Agricultural Output	0	-3.7%	-17.0%	-30.3%

Source: Mountain West Research and Econotrend

TABLE 3.9
Employment Impacts
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		11,000 AF			51,000 AF			91,000 AF		
Employment (no. of employees)	52,801	52,558	-242	-0.5	51,693	-1,108	-2.1	50,829	-1,970	-3.7
Agriculture	2,957	2,847	-110	-3.7	2,453	-503	-17.0	2,061	-896	-30.3
Const./Manuf.	4,963	4,938	-25	-0.5	4,850	-114	-2.3	4,761	-202	-4.1
Trade	12,778	12,759	-19	-0.1	12,692	-86	-0.7	12,625	-152	-1.2
Services	15,418	15,391	-27	-0.2	15,295	-123	-0.8	15,199	-218	-1.4
Government	11,405	11,383	-21	-0.2	11,307	-98	-0.9	11,231	-174	-1.5
Other	5,280	5,240	-40	-0.8	5,096	-184	-3.5	4,952	-328	-6.2
Water Transfer Volumes - 2025		28,000 AF			128,000 AF			228,000 AF		
Employment (no. of employees)	70,901	70,697	-203	-0.3	69,971	-929	-1.3	69,246	-1,654	-2.3
Agriculture	2,482	2,389	-92	-3.7	2,059	-422	-17.0	1,730	-752	-30.3
Const./Manuf.	6,310	6,289	-21	-0.3	6,215	-95	-1.5	6,140	-170	-2.7
Trade	17,938	17,922	-16	-0.1	17,866	-72	-0.4	17,810	-128	-0.7
Services	23,184	23,162	-22	-0.1	23,081	-103	-0.4	23,001	-183	-0.8
Government	13,542	13,524	-18	-0.1	13,460	-82	-0.6	13,396	-146	-1.1
Other	7,445	7,411	-34	-0.5	7,290	-155	-2.1	7,169	-275	-3.7

Source: Mountain West Research

TABLE 3.10
Population Impacts
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		11,000 AF			51,000 AF			91,000 AF		
Population	138,501	137,873	-626	-0.5	135,631	-2,869	-2.1	133,393	-5,107	-3.7
Age 0-17	42,104	41,869	-235	-0.6	41,028	-1,076	-2.6	40,189	-1,915	-4.5
Age 18-64	72,159	71,792	-366	-0.5	70,480	-1,678	-2.3	69,171	-2,988	-4.1
Age 65+	24,238	24,212	-25	-0.1	24,123	-115	-0.5	24,033	-204	-0.8
School Enrollment	31,100	30,927	-173	-0.6	30,305	-795	-2.6	29,685	-1,415	-4.5
Water Transfer Volumes - 2025		28,000 AF			128,000 AF			228,000 AF		
Population	181,300	180,774	-525	-0.3	178,892	-2,408	-1.3	177,014	-4,285	-2.4
Age 0-17	55,115	54,918	-197	-0.4	54,212	-903	-1.6	53,508	-1,607	-2.9
Age 18-64	94,457	94,150	-307	-0.3	93,049	-1,409	-1.5	91,950	-2,507	-2.7
Age 65+	31,728	31,706	-21	-0.1	31,631	-96	-0.3	31,556	-171	-0.5
School Enrollment	40,700	40,554	-146	-0.4	40,033	-667	-1.6	39,513	-1,187	-2.9

Source: Mountain West Research

TABLE 3.11
Direct Impacts on Primary Assessed Valuation and Property Tax Revenues (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

		2025 Water Transfer Volumes					
	Baseline	28,000 AF	Change	128,000 AF	Change	228,000 AF	Change
Primary Assessed Value ($000's)	256,352	255,790	-562	253,783	-2,569	251,776	-4,576
Property Tax Revenues ($000's)							
State	974		-2		-10		-17
County	6,204		-14		-62		-111
Schools	13,176		-29		-132		-235
Community College	3,717		-8		-37		-66
TOTAL	24,071		-53		-241		-429

Source: Mountain West Research

TABLE 3.12
Direct Impacts on Secondary Assessed Value and Property Tax Revenues (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

		2025 Water Transfer Volumes					
	Baseline	28,000 AF	Change	128,000 AF	Change	228,000 AF	Change
Secondary Assessed Value ($000's)	266,636	265,996	-640	263,683	-2,953	261,377	-5,259
Property Tax Revenues ($000's)							
State	0	0	0	0	0	0	0
County	1,093	1,090	-3	1,081	-12	1,071	-22
Schools	3,706	3,697	-9	3,665	-41	3,633	-73
Community College	213	212	-1	211	-2	209	-4
TOTAL	5,012	4,999	-13	4,957	-55	4,913	-99

Source: Mountain West Research

TABLE 3.13
Primary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	11,000	51,000	91,000	Baseline	28,000	128,000	228,000
Primary Net Assessed ($000's)	396,386	-2,866	-13,108	-23,344	532,403	-2,486	-11,406	-20,325
Agricultural and Vacant	25,765	-562	-2,569	-4,576	21,807	-562	-2,569	-4,576
Commercial/Industrial	127,240	-1,055	-4,828	-8,597	181,900	-881	-4,047	-7,214
Residential	160,536	-726	-3,321	-5,915	210,089	-607	-2,786	-4,964
Railroad/Utilities/Other	82,845	-523	-2,390	-4,256	118,607	-436	-2,004	-3,571
Property Tax Revenue ($000's)	40,322	-291	-1,333	-2,375	54,157	-252	-1,160	-2,068
State	1,506	-11	-50	-89	2,023	-9	-43	-77
County	9,605	-69	-318	-566	12,901	-60	-276	-493
Yuma	3,093	-22	-102	-182	4,154	-19	-89	-159
Schools	20,361	-147	-673	-1,199	27,347	-128	-586	-1,044
Community College	5,757	-42	-190	-339	7,732	-36	-166	-295
Property Tax Rate	10.17	0.07	0.34	0.60	10.17	0.05	0.22	0.39
State	0.38	0.00	0.01	0.02	0.38	0.00	0.01	0.01
County	2.42	0.02	0.08	0.14	2.42	0.01	0.05	0.09
Yuma	0.78	0.01	0.03	0.05	0.78	0.00	0.02	0.03
Schools	5.14	0.04	0.17	0.30	5.14	0.02	0.11	0.20
Community College	1.45	0.01	0.05	0.09	1.45	0.01	0.03	0.06

Source: Mountain West Research

TABLE 3.14
Secondary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley (Dispersed Sources)

	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	11,000	51,000	91,000	Baseline	28,000	128,000	228,000
Secondary Net Assessed ($000's)	412,288	-2,981	-13,634	-24,280	553,762	-2,586	-11,863	-21,141
Agricultural and Vacant	26,799	-585	-2,672	-4,760	22,682	-585	-2,672	-4,760
Commercial/Industrial	132,344	-1,098	-5,022	-8,941	189,197	-916	-4,210	-7,503
Residential	166,977	-755	-3,454	-6,152	218,518	-631	-2,897	-5,163
Railroad/Utilities/Other	86,168	-543	-2,486	-4,426	123,366	-454	-2,084	-3,715
Property Tax Revenue ($000's)	11,379	-81	-377	-670	15,283	-72	-325	-584
State	0	0	0	0	0	0	0	0
County	1,690	-12	-56	-100	2,270	-11	-49	-87
Yuma	3,628	-26	-120	-214	4,873	-23	-104	-186
Schools	5,731	-41	-190	-337	7,697	-36	-163	-294
Community College	330	-2	-11	-19	443	-2	-9	-17
Property Tax Rate	2.76	0.01	0.07	0.12	2.76	0.01	0.04	0.08
State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
County	0.41	0.00	0.01	0.01	0.41	0.00	0.00	0.01
Yuma	0.88	0.01	0.03	0.05	0.88	0.00	0.02	0.03
Schools	1.39	0.00	0.00	0.00	1.39	0.00	0.00	0.00
Community College	0.08	0.01	0.03	0.05	0.08	0.00	0.02	0.03

Source: Mountain West Research

TABLE 3.15
Land Ownership Impacts
Yuma-Wellton Corridor-Cibola Valley (Concentrated Source)

	1987 Baseline		2025 Water Transfer Volumes					
			Low 28,000 AF		Medium 128,000 AF		High 228,000 AF	
Category	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
BLM	77,720	21.6	77,720	21.6	77,720	21.6	77,720	21.6
Forest Service	0	-	0	-	0	-	0	-
Indian	0	-	0	-	0	-	0	-
State	34,920	9.7	34,920	9.7	34,920	9.7	34,920	9.7
Other Public	122,050	33.9	128,716	35.8	152,527	42.4	176,336	49.0
Private	125,240	34.8	118,574	32.9	94,763	26.3	70,954	19.7
TOTAL	359,930	100.0	359,930	100.0	359,930	100.0	359,930	100.0

Source: Econotrend

TABLE 3.16
Direct Impacts on Agricultural Lands, Output, and Employment
Yuma-Wellton Corridor-Cibola Valley (Concentrated Source)

Variable	Baseline	2025 Water Transfer Volumes: Low 28,000 AF	Medium 128,000 AF	High 228,000 AF
Loss of Net Irrigated Acres	0	5,833	26,667	47,500
Net Irrigated Acres	62,711	56,878	36,044	15,211
Loss of Gross Irrigated Acres	0	6,666	30,477	54,286
Gross Irrigated Acres	71,670	65,004	41,193	17,384
Loss of Cropped Acres	0	7,116	32,534	57,950
Acres of Crops in Production	76,508	69,392	43,974	18,558
Loss of Agricultural Output (in 1986 dollars)	0	6,722,100	30,732,900	54,741,900
Agricultural Output (in 1986 dollars)	72,272,400	65,550,300	41,539,500	17,530,500
Loss of Agricultural Employment	0	61	276	494
Agricultural Employment	653	592	377	159
Percent Direct Impact on Agricultural Output	0	-9.3%	-42.5%	-75.7%

Source: Mountain West Research and Econotrend

TABLE 3.17
Employment Impacts
Yuma-Wellton Corridor-Cibola Valley (Concentrated Source)

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		11,000 AF			51,000 AF			91,000 AF		
Employment (no. of employees)	2,658	2,553	-103	-3.9	2,187	-468	-17.7	1,817	-840	-31.6
Agriculture	505	458	-47	-9.3	291	-213	-42.3	123	-382	-75.7
Const./Manuf.	213	202	-11	-5.0	164	-48	-22.6	126	-86	-40.5
Trade	505	497	-8	-1.6	468	-36	-7.2	440	-65	-12.9
Services	784	772	-11	-1.5	732	-52	-6.6	691	-93	-11.9
Government	215	206	-9	-4.3	174	-41	-19.3	141	-74	-34.5
Other	436	418	-17	-4.0	358	-78	-17.9	296	-140	-32.1
Water Transfer Volumes - 2025		28,000 AF			128,000 AF			228,000 AF		
Employment (no. of employees)	2,913	2,824	-89	-3.0	2,514	-398	-13.7	2,199	-713	-24.5
Agriculture	428	388	-40	-9.3	247	-181	-42.3	104	-324	-75.7
Const./Manuf.	230	221	-9	-3.9	189	-41	-17.7	157	-73	-31.8
Trade	641	634	-7	-1.1	610	-31	-4.8	585	-55	-8.6
Services	1,069	1,059	-10	-0.9	1,025	-44	-4.1	990	-79	-7.4
Government	233	225	-8	-3.3	198	-35	-15.1	170	-63	-27.0
Other	312	297	-15	-4.7	245	-66	-21.3	193	-119	-38.0

Source: Mountain West Research

TABLE 3.18
Population Impacts
Yuma-Wellton Corridor-Cibola Valley (Concentrated Source)

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		11,000 AF			51,000 AF			91,000 AF		
Population	6,975	6,707	-269	-3.9	5,758	-1,216	-17.4	4,799	-2,176	-31.2
Age 0-17	2,120	2,020	-101	-4.8	1,664	-456	-21.5	1,304	-816	-38.5
Age 18-64	3,634	3,477	-157	-4.3	2,922	-711	-19.6	2,361	-1,273	-35.0
Age 65+	1,221	1,210	-11	-0.9	1,172	-49	-4.0	1,134	-87	-7.1
School Enrollment	1,566	1,492	-74	-4.8	1,229	-337	-21.5	963	-603	-38.5
Water Transfer Volumes - 2025		28,000 AF			128,000 AF			228,000 AF		
Population	7,444	7,214	-227	-3.1	6,412	-1,031	-13.9	5,597	-1,846	-24.8
Age 0-17	2,263	2,177	-85	-3.8	1,876	-387	-17.1	1,570	-692	-30.6
Age 18-64	3,878	3,744	-133	-3.4	3,275	-603	-15.6	2,798	-1,080	-27.8
Age 65+	1,303	1,293	-9	-0.7	1,261	-41	-3.2	1,229	-74	-5.7
School Enrollment	1,671	1,608	-63	-3.8	1,385	-286	-17.1	1,160	-511	-30.6

Source: Mountain West Research

TABLE 3.19
Direct Impacts on Primary Assessed Valuation and Property Tax Revenues (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley (Concentrated Source)

		2025 Water Transfer Volumes					
	Baseline	28,000 AF	Change	128,000 AF	Change	228,000 AF	Change
Primary Assessed Value ($000's)	25,183	24,636	-547	22,680	-2,503	20,725	-4,458
Property Tax Revenues ($000's)							
State	95.7	93.7	-2	85.7	-10	78.7	-17
County	609.4	596.4	-13	548.4	-61	501.4	-108
Schools	1,294.4	1,266.4	-28	1,165.4	-129	1,065.4	-229
Community College	365.1	364.3	-8	329.1	-36	300.1	-65
TOTAL	2,364.6	2,320.8	-51	2,128.6	-236	1,945.6	-419

Source: Mountain West Research

TABLE 3.20
Direct Impacts on Secondary Assessed Valuation and Property Tax Revenues (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley (Concentrated Source)

		2025 Water Transfer Volumes					
	Baseline	28,000 AF	Change	128,000 AF	Change	228,000 AF	Change
Secondary Assessed Value ($000's)	26,193	25,564	-629	23,316	-2,877	21,068	-5,125
Property Tax Revenues ($000's)							
State	0	0	0	0	0	0	0
County	107	104	-3	95	-12	86	-21
Schools	364	355	-9	324	-40	293	-71
Community College	21	20	-1	19	-2	17	-4
TOTAL	492	479	-13	438	-54	396	-96

Source: Mountain West Research

TABLE 3.21
Primary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley (Concentrated Source)

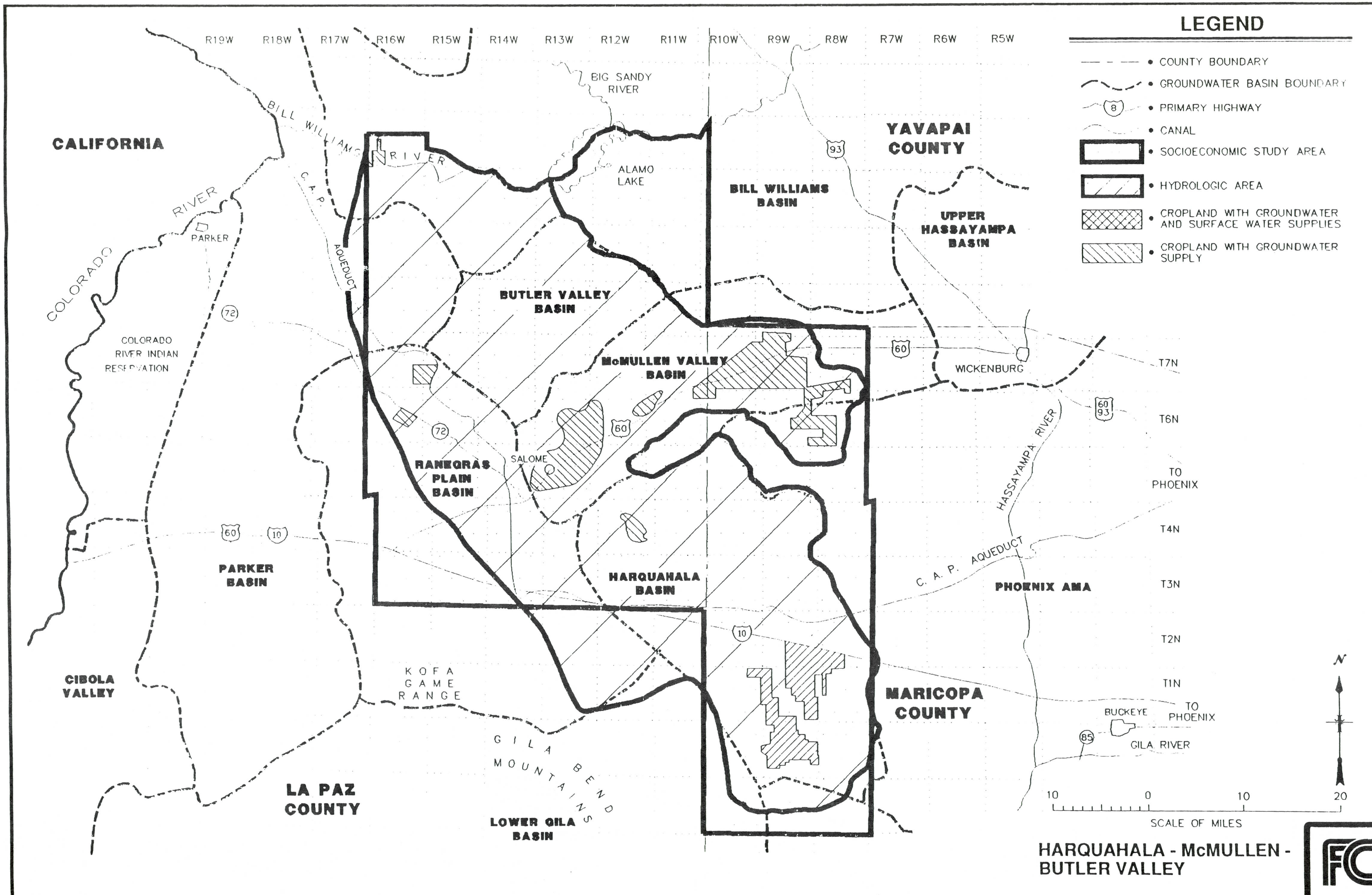
	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	11,000	51,000	91,000	Baseline	28,000	128,000	228,000
Primary Net Assessed ($000's)	27,987	-1,336	-6,083	-10,868	30,701	-1,217	-5,533	-9,879
Agricultural and Vacant	5,884	-547	-2,503	-4,458	5,884	-547	-2,503	-4,458
Commercial/Industrial	9,380	-309	-1,400	-2,507	10,833	-262	-1,185	-2,120
Residential	8,078	-327	-1,487	-2,662	8,620	-278	-1,258	-2,252
Railroad/Utilities/Other	4,645	-153	-693	-1,241	5,364	-130	-587	-1,049
Property Tax Revenue ($000's)	2,628	-125	-571	-1,021	2,883	-115	-519	-928
State	106	-5	-23	-41	117	-5	-21	-38
County	677	-32	-147	-263	743	-29	-134	-239
Schools	1,439	-69	-313	-599	1,578	-63	-284	-508
Community College	406	-19	-88	-158	446	-18	-80	-143
Property Tax Rate	9.39	0.45	2.04	3.65	9.39	0.37	1.69	3.02
State	0.38	0.02	0.08	0.15	0.38	0.02	0.07	0.12
County	2.42	0.12	0.53	0.94	2.42	0.10	0.44	0.78
Schools	5.14	0.25	1.12	1.99	5.14	0.20	0.93	1.65
Community College	1.45	0.07	0.32	0.56	1.45	0.06	0.26	0.47

Source: Mountain West Research

TABLE 3.22
Secondary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Yuma-Wellton Corridor-Cibola Valley (Concentrated Source)

	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	11,000	51,000	91,000	Baseline	28,000	128,000	228,000
Secondary Net Assessed ($000's)	29,109	-1,389	-6,327	-11,304	31,932	-1,265	-5,755	-10,275
Agricultural and Vacant	6,120	-569	-2,603	-4,637	6,120	-569	-2,603	-4,637
Commercial/Industrial	9,756	-321	-1,456	-2,608	11,267	-272	-1,233	-2,205
Residential	8,402	-340	-1,547	-2,768	8,966	-289	-1,308	-2,342
Railroad/Utilities/Other	4,831	-159	-721	-1,291	5,579	-135	-610	-1,091
Property Tax Revenue ($000's)	547	-26	-119	-213	600	-24	-108	-193
State	0	0	0	0	0	0	0	0
County	119	-6	-26	-46	131	-5	-24	-42
Schools	405	-19	-88	-157	444	-18	-80	-143
Community College	23	-1	-5	-9	26	-1	-5	-8
Property Tax Rate	1.88	0.09	0.41	0.73	1.88	0.07	0.34	0.60
State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
County	0.41	0.02	0.09	0.16	0.41	0.02	0.07	0.13
Schools	1.39	0.07	0.30	0.54	1.39	0.06	0.25	0.45
Community College	0.08	0.00	0.02	0.03	0.08	0.00	0.01	0.03

Source: Mountain West Research



HARQUAHALA - McMULLEN - BUTLER VALLEY

FIGURE 4.1

B34003.00/82637

CHAPTER 4

HARQUAHALA-MCMULLEN-BUTLER VALLEY

4.1 GENERAL DESCRIPTION

The Harquahala-McMullen-Butler Valley study area (figure 4.1) combines four basins and watersheds north of the Gila Bend Mountains centered near the City of Salome. Yearly precipitation is about 7 inches. Winter rains are light and sporadic, summer rains usually occur during convective thunderstorms. January low temperatures are in the low 30s, afternoon temperatures are in the mid-60s. July temperatures range from the low 70s to the low 100s.

4.2 CURRENT HYDROLOGIC PROFILES

The hydrologic study area includes the Harquahala Plains, Butler Valley and major portions of Ranegras Plains, McMullen Valley, and the Clara Peak area (along and south of the Bill Williams River). The entire area is between the Gila River drainage on the south and Bill Williams River drainage on the north. The hydrologic study area is in the Basin and Range Lowlands Water Province.

4.2.1 Area Groundwater

The sources of groundwater are primarily alluvial basin-fill deposits in all areas, and channel deposits related to the Bill Williams River in the Clara Peak area. These deposits range in thickness from about 1,000 feet in the Clara Peak and Ranegras Plains areas to greater than 4,000 feet in McMullen Valley. In most areas the groundwater occurs under unconfined conditions; however, confined and perched conditions occur locally. Depths to groundwater range from less than 10 feet to more than 100 feet in the Clara Peak area, less than 40 feet to more than 400 feet in the Ranegras Plains and Butler Valley areas, less than 100 feet to more than 600 feet in the McMullen Valley area, and about 150 feet to more than 650 feet in the Harquahala Plains area. Most wells in the hydrologic study area are capable of producing 1,000 gal/min or more.

4.2.2 Water Level Declines

Water level declines have occurred in all areas, ranging from minimal in the Clara Peak area, to more than 250 feet and 300 feet in the McMullen Valley and Harquahala Plains areas, respectively. The Harquahala area is the only area that will receive water from the Central Arizona Project's Granite Reef Aqueduct.

4.2.3 Water Quality

The quality of water is highly variable throughout the various areas, with the exception of fluoride values which are consistently higher than the maximum allowable contaminant levels. The Ranegras area has TDS values ranging from about 460-3,700 mg/L. The Harquahala area has TDS values ranging from about 400-2,000 mg/L in the main aquifer, to about 1,400-3,500 mg/L in the perched water body. The McMullen area TDS values range from about 210-1,400 mg/L. The Clara Peak area has TDS values that range from about 360-1,400 mg/L. Fluoride concentrations range from about 0.3-8.3 mg/L in the McMullen area, to about 4.1-8.9 mg/L in the Ranegras area, to about 3.2-17.6 mg/L in the perched water of the Harquahala area.

4.2.4 Groundwater Storage

The estimated groundwater in storage to a depth of 1,200 feet was about 76 million acre-feet in 1975 (Arizona Water Commission). The individual areas ranged from an estimated 2.5 million acre-feet in the Clara Peak area to about 26 million acre-feet in the Harquahala area.

4.2.5 Surface Water Resources

Surface water within the hydrologic study occurs only during storm events. The streams are ephemeral.

4.2.6 Irrigation Districts

The two irrigation districts within the study area are the Harquahala Valley Irrigation District and Wenden Pecan Irrigation District.

4.3 HYDROLOGIC IMPACTS

The hydrologic impacts are evaluated for two scenarios: water transfer volumes equally shared by La Paz and Maricopa Counties, and water transfer volumes from one concentrated source assumed to be Butler Valley. Since 30,000 acre-feet of water transfer will occur from Pinal AMA, the total transfer volumes from La Paz and Maricopa Counties are reduced by that amount or a proportion thereof, then divided equally. Similar deductions are made from the total transfer volumes in the Butler Valley concentrated source.

4.3.1 La Paz County

The areas considered within the La Paz County study area include Planet Ranch and Lincoln Ranch along the Bill Williams River, Butler Valley, Ranegras Plain, the Salome agricultural area of McMullen Valley, and the extreme upper end of Harquahala Valley (figure 4.1).

The Cibola Valley, located in the southwest corner of La Paz County contains approximately 5,200 acres with a surface water supply of approximately 22,500 acre-feet pumped from the Colorado River under contract with the Secretary of the Interior. This land base and water supply was included in the Yuma-Wellton Corridor-Cibola Valley area at the direction of ADWR. Although the surface water supply is a La Paz County resource, it is geographically and hydrologically separated from the areas studied and reported in this chapter. As a result none of the data reported in this chapter reflects either the land base or the water supply of the Cibola Valley.

The baseline (1987) water demand of about 88,000 acre-feet is mainly for agricultural purposes, with groundwater supplying about 76,000 acre-feet and surface water from the Bill Williams River supplying about 12,000 acre-feet. Baseline overdraft is estimated to be about 65,000 acre-feet (table 4.1).

The significant hydrologic impact occurs between the year 2010 and 2025 when the maximum volume transfers exceed about 88,000 acre-feet. Within that time frame the groundwater overdraft increases from about 70,000 acre-feet annually to over 120,000 acre-feet annually in year 2025 and agricultural activity ceases. For purposes of this study, when the water demand for transfer exceeded that volume of water derived from agricultural lands the remainder is assumed to be pumped from unidentified acreage in Butler Valley. This "make up" water is about 50,000 acre-feet in year 2025. The hydrologic impact resulting from this assumption is solely in Butler Valley where water levels will decline at the estimated rate of about 2.5 ft/yr at the

50,000 acre-feet annual pumpage rate. The groundwater levels in areas which had agricultural lands will continue to decline at the pretransfer rates, except for McMullen Valley where the City of Phoenix will be pumping 30,000 acre-feet for transfer. The City of Phoenix pumpage in McMullen Valley will cause water level declines of 8-10 ft/yr which is similar to recent rates.

There should be no degradation of water quality in Butler or McMullen Valleys. Land subsidence and associated fissures are a long-term potential in McMullen Valley.

In the year 2025 there would be an adequate water supply in both areas because of the large volume of recoverable groundwater in storage, about 18 million acre-feet.

4.3.2 Maricopa County

The areas considered within the Maricopa County study area include the Aguila agricultural area of McMullen Valley and the main agricultural area of Harquahala Valley (figure 4.1).

The baseline (1987) water demand of about 214,000 acre-feet is mainly for agricultural purposes, with groundwater supplying about 144,000 acre-feet and CAP water supplying about 70,000 acre-feet to Harquahala Valley. Baseline overdraft is estimated to be about 121,000 acre-feet (table 4.2).

Hydrologic impacts are minimal in this study area because of the positive effects of CAP water in Harquahala Valley. With the maximum potential water transfer of 78,000 acre-feet in 2025, groundwater overdraft would increase nominally by about 7,000 acre-feet per year.

In the year 2025 there would be an adequate water supply because of the large volume of recoverable groundwater in storage, about 10 million acre-feet.

4.3.3 Butler Valley

Butler Valley is a relatively undeveloped area in La Paz County comprising primarily federal and state public lands. The area has been studied as a water source by various public agencies, including the USBR, USGS, and the DWR. The studies have indicated water-table and confined aquifers, nominal natural recharge, and a significant volume of groundwater in storage. To estimate the hydrologic impacts, natural recharge was assumed to be zero and gross baseline groundwater storage was estimated at 20 million acre-feet. The aquifer boundaries used in storage calculations result in approximate volumes of 20,000 acre-feet for each one foot of saturated thickness. The water budget for Butler Valley is shown on table 4.3.

The hydrologic impacts of water transfers from Butler Valley range from nominal to severe. Through the range of overdrafts shown on table 4.3 associated water level declines would probably range from less than 1 ft/yr to about 5 ft/yr in the year 2010 and from about 2 ft/yr to about 11 ft/yr in year 2025. By the year 2025 the total maximum water level decline would approximate 125 feet. The recoverable groundwater in storage could support the year 2025 overdraft rate for about an additional 31 years. The potential for land subsidence and earth fissures increases when total water level declines exceed 100 feet. Under sustained overdraft beyond year 2025, the potential of land subsidence and fissures in Butler Valley is great.

4.4 SOCIOECONOMIC AND FISCAL PROFILES

The socioeconomic study area is located in the eastern portion of La Paz County and the adjoining western portion of Maricopa County. It includes parts of the Parker and Buckeye census divisions. Salome and Wenden are the principal communities in the largely agricultural area. The Maricopa Community College, three high schools (Bicentennial, Parker, and Buckeye), and six elementary schools serve the area.

4.4.1 Population and School Enrollment

There were 3,641 persons living in the area according to the 1980 census (see table 4.4). The median age of the population was 29.0 years, approximately the same as that for Arizona as a whole. About 73 percent of the study area children under the age of 18 were enrolled in schools.

The population of the socioeconomic study area is projected to grow at a very moderate rate over the course of the projection horizon (see table 4.5). Between 1987 and 2025, the population is projected to increase at an annual compound growth rate of approximately 1.4 percent per year, growing from about 3,900 persons in 1987 to about 6,500 by 2025. School enrollment is projected to increase from about 900 students in 1987 to about 1,400 by 2025.

4.4.2 Household Income

Income in the socioeconomic study area is low relative to the state. The median household income in 1980 was $13,600, almost $3,000 lower than that for Arizona (table 4.4).

4.4.3 Labor Force

According to the 1980 census, 6.8 percent of the 1,658 residents in the area's civilian labor force were unemployed, compared with 6.7 percent unemployed for Arizona (table 4.4). In 1987 the unemployment rate was 9.5 percent.

4.4.4 Employment

Agriculture and its support services are the mainstays of the area economy, with some income generated by winter visitors and recreational users of Alamo Lake State Park. Area employment by economic sector in 1980 was about 31.9 percent in agriculture, about 23.1 percent in construction and manufacturing, and 17.6 percent in services, primarily health and educational services.

Employment is projected to increase from about 1,500 jobs in 1987 to about 2,600 by the year 2025 (table 4.5). The largest employment increases are projected to be in the trade and service industries. Agricultural employment is projected to decrease during this period.

4.4.5 Land Ownership

The study area encompasses about 1.8 million acres, most of which, about 71.0 percent, is publicly owned by the U.S. Bureau of Land Management. About 14.1 percent of the land is privately owned, and about 13.1 percent is state owned (table 4.4).

4.4.6 Property Tax Base

In 1986, agricultural and vacant lands were the second largest single source of property tax revenue in the area (table 4.6). Utilities, with a primary assessment of about $13.6 million, were the largest. The area's primary net assessed value totaled about $34 million in 1986. Property was taxed at an aggregate rate of $7.31 per $100 of the primary assessment and generated about $2.5 million in revenue. The secondary net assessed value was about $37.4 million. Property was taxed at a rate of $1.92 per $100 of the secondary assessment and generated about $0.7 million in tax revenue.

4.4.7 Property Tax Revenues

Schools in the socioeconomic study area received about $1.1 million in tax revenues based on the primary assessment. The county received about $0.8 million and the community colleges received about $0.4 million (table 4.6).

4.4.8 Nonproperty Tax Revenues

County state-shared revenues are about $0.4 million.

4.5 SOCIOECONOMIC AND FISCAL IMPACTS

4.5.1 Introduction

The Harquahala-McMullen-Butler Valley study area is one of the smallest and most agriculturally dependent of those under consideration. Over time, the economy and population of the area are projected to grow slowly in the absence of water transfers.

For this area, impacts on La Paz County have been analyzed separately from those in Maricopa County. In addition, an analysis has been performed in which it was assumed that Butler Valley would be a concentrated source of additional water transfers above those that have already been purchased by Phoenix in the McMullen Valley and Scottsdale on the Bill Williams River. Impacts for the La Paz and Maricopa County alternatives are measured in terms of the declines that would take place within the specified portion of the study area only. Thus, impacts are measured against what would have occurred within the study area, not the county as a whole.

4.5.2 La Paz County Source

4.5.2.1 Land Ownership. Land ownership for baseline conditions in the La Paz County portion of this area is distributed as follows: BLM, 876,980 acres (74.3 percent); state, 139,255 acres (11.8 percent); private, 132,455 acres (11.2 percent); and public, 31,720 acres (2.7 percent). Under the high volume transfer, other public land increased from 2.7 to 4.4 percent of the total area and the private category decreased from 11.2 to 9.5 percent. Changes in land ownership are presented in table 4.7.

4.5.2.2 Impacts on Gross Agricultural Output. This analysis assumed that half of the total amount of water transfers for the Harquahala-McMullen-Butler Valley would come from La Paz County. Since 30,000 acre-feet will be transferred from the Pinal AMA, the required low, medium, and high transfer volumes for La Paz County are reduced to 35,000, 85,000, and 135,000 acre-feet, respectively.

Baseline gross agricultural output was estimated to be about $12.4 million based upon 1984-86 average prices and cropping patterns. Table 4.8 indicates that under the low transfer volume 6,863 acres (35,000 acre-feet divided by 5.1 acre-feet per acre) would be retired from agricultural production. The remaining agricultural land would total 10,479 acres which includes a small amount of double cropping. The agricultural output is estimated to be about $7.5 million and the resulting impact is a loss of $4.9 million.

The medium volume transfer retires all but 675 net acres of irrigation land in the study area. Total agricultural output declines by $11.9 million.

The high volume transfer will retire all available acreage. The impact is equal to the total baseline output which is $12.4 million.

4.5.2.3 Direct Agricultural Employment Impacts. The potential impacts of water transfers on agricultural employment in the year 2025 are also shown in table 4.8. Agricultural employment impacts would range from 50 to 126 jobs lost or from 40 to 100 percent.

4.5.2.4 Regional Socioeconomic Impacts. The regional socioeconomic impacts of a decline in agricultural activity result from the direct loss of agricultural jobs, the income generated by those jobs spent in the local economy, and the loss of direct business purchases in the local economy by the agricultural sector. Projections of the potential regional employment and population impacts of a decline in agricultural activity associated with the different scenarios were developed using estimates of the decline in agricultural employment and gross agricultural output as inputs to the PAS model. It was assumed that 33 percent of total farm output was spent on local purchases in the study area economy.

Employment Impacts. Projected employment impacts by economic sector are shown in table 4.9. By the year 2010, from 68 to 306 total jobs, or from about 11 to 51 percent of all employment in the study area would be lost depending on the level of water transfers.

Employment impacts in terms of number of employees are somewhat greater in the year 2025. In 2025, the decline in employment ranges from 75 to 336 jobs, and from about 9 to 42 percent, depending on the level of water transfers. The strength of the impact declines in percentage terms because agriculture is projected to grow only slightly while employment in services grows substantially by the year 2025.

Population by Age and School Enrollment Impacts. Projected regional population and school enrollment impacts are shown in table 4.10. In 2010, the potential impact of water transfers on the population ranges from 178 to 793 people, or from about 11 to 47 percent of the population, depending on the level of water transfers. In 2025, the impact ranges from a decline of 196 to 874 people, depending on the water transfer volumes. Impacts on school enrollment parallel those of population. In 2010, school enrollment impacts range from 51 to 226 students, from about 14 to 62 percent of the baseline projection. In 2025, the impact ranges from about 12 to 55 percent of the total school enrollment.

4.5.2.5 Direct Fiscal Impacts. Direct fiscal impacts are those that result from a decline in the amount of taxable agricultural land. In 1986, irrigated land in the study area had an average full cash value of approximately $250 per acre, and a limited cash value of approximately $218 per acre. The assessment ratio on agricultural land is 0.16. Thus, irrigated agricultural land would have an estimated secondary net assessed value of $40.00 per acre and an estimated primary net assessed value of $34.88 per acre. The potential direct impacts of water transfers in 2025 on primary assessed valuation in the study area are shown in table 4.11.

Direct Net Assessed Value Impacts. The direct impact of water transfers on primary assessed valuation ranges from $273,000 to $690,000, or from about 1 to 3 percent of total assessed value, depending on the level of water transfers (table 4.11). The relatively low impact on assessed value of even the high volume transfer reflects the relatively limited contribution of irrigated agricultural acreage to total assessed value in this study area. The direct impacts on secondary assessed valuation ranges from $314,000 to $793,000, depending on the level of water transfers (table 4.12).

Property Tax Revenue Impacts. Direct property tax revenue impacts are those that come solely from the loss of taxable agricultural lands. Property in the study area is taxed at a cumulative rate of $7.57 per $100 of primary net assessed value. Local schools account for the largest proportion of the tax with a rate of $3.24 per $100 of assessed value followed by La Paz County, which taxes at a rate of $2.50 per $100 with the remainder distributed between the State of Arizona and community colleges. The direct primary property tax revenue impacts in 2025 are shown in table 4.11.

Overall, the study area generated a total of about $1.7 million in taxes in 1986 based on the primary assessed valuation. Of this, schools collected $709,000 and La Paz County $547,000. Impacts on tax revenues based on the primary valuation would range from $20,000 to $52,000 annually, depending on the amount of land retired.

Agricultural land in the study area is taxed at a cumulative rate of $1.98 per $100 of secondary net assessed value. Schools with a tax rate of $1.57 per $100 and La Paz County with a rate of $0.41 per $100 account for most of the secondary property taxes levied. Tax revenue impacts based on the secondary valuation in 2025 are shown in table 4.12.

In 1986, there were $460,000 in property tax revenues paid based on the secondary valuation. Schools collected approximately $365,000, or 79 percent of the total, while La Paz County collected approximately $95,000 from the study area. Secondary property tax revenue impacts would range from $6,000 to $15,000, depending on the amount of agricultural land retired.

4.5.2.6 Indirect Fiscal Impacts. A decline in agricultural activity in the study area can also be expected to impact the growth of assessed value, and thus tax revenues, through its impacts on regional socioeconomic activity. The potential indirect impacts of water transfers on the growth of primary and secondary net assessed valuations in the study area are shown in tables 4.13 and 4.14. For purposes of comparison, the valuation of agricultural lands has been held constant at its 1986 level while increases in the valuation of commercial/industrial, residential, and railroad/utilities and other classes were projected as functions of changes in study area population and employment levels. The valuation of vacant land was decreased to account for growth of population employment in the area.

Indirect Net Assessed Value Impacts. The impact on future primary assessed value of the decline in residual economic activity would range from $870,000 to $3,362,000 in the year 2010, and from $930,000 to $3,626,000 in the year 2025. The impacts on future secondary assessed value would range from $925,000 to $3,574,000 in the year 2010, and from

$988,000 to $3,853,000 in the year 2025. The impacts are somewhat higher in 2025 because of the lower level of significance that agriculture is projected to have in the study area's economy by this time period.

<u>**Indirect Property Tax Revenue Impacts**</u>. The projected indirect property tax revenue impacts of the decline in primary and secondary assessed values are also shown in tables 4.13 and 4.14. The baseline tax rates of the area are assumed to remain constant for each category throughout the projection horizon. In the baseline projection total tax revenues based on the primary valuation were projected to reach $1.8 million by the year 2010, and $1.9 million by the year 2025. Tax revenues based on secondary valuation were projected to reach $455,000 by the year 2010 and $481,000 by the year 2025.

Total property tax revenue impacts from primary valuations are projected to range from $66,000 to $255,000 in the year 2010, and from $70,000 to $275,000 in the year 2025. Tax revenue impacts from secondary valuations are projected to range from $16,000 to $63,000 in the year 2010, and from $17,000 to $68,000 in the year 2025.

Impacts on property tax rates also are shown on tables 4.13 and 4.14.

<u>**4.5.2.7 Conclusions**</u>. The La Paz County portion of the study area is predominantly agricultural. As a result, the socioeconomic and fiscal impacts associated with water transfers from this area are substantial.

4.5.3 Maricopa County

4.5.3.1 Land Ownership. The Maricopa County portion of this area has a baseline land distribution as follows: BLM, 409,970 acres (64.8 percent); state, 99,240 acres (15.7 percent); other public, 0 acres (0.0 percent); and private, 123,750 acres (19.5 percent). Table 4.15 shows that the public category increases from no land to about 1 percent under the low volume transfer and to about 5 percent for the high volume transfer. The private category decreases from 19.5 to 14.3 percent under the high volume transfer.

4.5.3.2 Impacts on Gross Agricultural Output. The Maricopa County portion of the Harquahala-McMullen-Butler Valley area started with the same initial water transfer volumes as La Paz County. With this assumption, the low volume transfer is 35,000 acre-feet. As table 4.16 shows, this transfer results in a loss of 8,510 gross acres and a loss of agricultural production of $6.8 million.

For the medium volume transfer, 85,000 acre-feet will be required from the Maricopa County subarea. The farm-gate demand is estimated to be 4.7 acre-feet per acre, taking into account double cropping, and 18,085 acres will be retired from production. After accounting for double cropping, there are 29,124 acres remaining in production which generate $24.7 million in gross output. The loss in production totals $16.4 million.

The high volume transfer would require 135,000 acre-feet and retire 28,723 acres. The remaining acreage of 17,798 would produce $15.1 million in gross output resulting in impacts of $26.0 million.

4.5.3.3 Direct Agricultural Employment Impacts. The potential impacts of water transfers on agricultural employment are also shown in table 4.16, along with the impacts on agricultural land use and productive output. Agricultural employment impacts for the high volume transfer result in the loss of 215 jobs, or about 63 percent of the baseline agricultural employment.

4.5.3.4 Regional Socioeconomic Impacts. The regional socioeconomic impacts of a decline in agricultural activity result from the direct loss of agricultural jobs, the income generated by those jobs spent in the local economy, and the loss of direct business purchases in the local economy by the agricultural sector. Projections of the potential regional employment and population impacts of a decline in agricultural activity associated with the different scenarios were developed using estimates of the decline in agricultural employment and gross agricultural output as inputs to the PAS model. It was assumed that 33 percent of total farm output was spent on local purchases in the study area economy.

Employment Impacts. Projected employment impacts by economic sector are shown in table 4.17. By the year 2010, from about 17 to 65 percent of all employment in the study area would be lost depending on the level of water transfers.

In 2025, the decline in employment ranges from 123 to 472 jobs, and from about 14 to 55 percent, depending on the level of water transfers. The strength of the impact declines because agriculture is projected to have a less substantial role in the Harquahala-McMullen-Butler Valley economy by the year 2025.

Population by Age and School Enrollment Impacts. Projected regional population and school enrollment impacts are shown in table 4.18. In 2010, the potential impact of water transfers ranges from 309 to 1,183 people, or from about 21 to 82 percent of the population, depending on the level of water transfers. In 2025, the impacts on population are similar. Impacts on school enrollment parallel those on population. In 2010, school enrollment impacts range from 70 to 269 students, from about 22 to 86 percent of the baseline projection. In 2025, the impact ranges from about 20 to 76 percent of the total school enrollment.

4.5.3.5 Direct Fiscal Impacts. Direct fiscal impacts are those that result from a decline in the amount of taxable agricultural land. In 1986, irrigated land in the study area had an average full cash value of approximately $330 per acre, and a limited cash value of $287 per acre. The assessment ratio on agricultural land is 0.16. Thus, irrigated agricultural land would have an estimated secondary net assessed value of $52.80 per acre and an estimated primary net assessed value of $45.92 per acre. The potential direct impacts of water transfers in 2025 on primary and secondary assessed valuations in the study area are shown in tables 4.19 and 4.20.

Direct Net Assessed Value Impacts. The direct impact of water transfers on primary assessed valuation ranges from $391,000 to $1,508,000 or from about 5 to 18 percent of total assessed value, depending on the level of water transfers. The direct impact on secondary assessed valuation ranges from $449,000 to $1,733,000, depending on the level of water transfers. The moderate impact on assessed value of the high volume transfer reflects the importance of irrigated agricultural acreage to total assessed value in this study area.

Property Tax Revenue Impacts. Direct property tax revenue impacts are those that come solely from the loss of taxable agricultural lands. Property in the study area is taxed at a cumulative rate of $7.31 per $100 of primary net assessed value. Local schools account for the largest proportion of the tax with a rate of $3.29 per $100 of assessed value followed by Maricopa County, which taxes at a rate of $2.32 per $100 with the remainder distributed among the State of Arizona and Maricopa Community Colleges. The direct primary property tax revenue impacts in 2025 are shown in table 4.19.

Overall, the study area in 1986 generated a total of $631,000 million in taxes based on the primary assessed valuation. Of this, schools collected $284,000 million and Maricopa County $200,000. Impacts on tax revenues based on the primary valuation would range from $28,000 to $111,000 annually, depending on the amount of land retired.

Agricultural land in the study area is taxed at a cumulative rate of $1.77 per $100 of secondary net assessed value. Schools with a tax rate of $1.36 per $100 and county with a rate of $0.41 per $100 account for most of the secondary property taxes levied. Tax revenue impacts based on the secondary valuation in 2025 are shown in table 4.20.

In 1986, there were $172,000 in property tax revenues paid based on the secondary valuation. Schools collected approximately $132,000 while the county collected approximately $40,000 from the study area. Secondary property tax revenue impacts would range from $8,000 to $31,000 depending on the amount of agricultural land retired.

4.5.3.6 Indirect Fiscal Impacts. A decline in agricultural activity in the study area can also be expected to impact the growth of assessed value, and thus tax revenues, through its impacts on regional socioeconomic activity. The potential indirect impacts of water transfers on the growth of primary and secondary net assessed values in the study area are shown in tables 4.21 and 4.22. For purposes of comparison the valuation of agricultural lands has been held constant at its 1986 level while increases in the valuation of commercial/industrial, residential, and railroad/utility/other classes were projected as functions of changes in study area population and employment levels. The valuation of vacant land was decreased to account for growth of population employment in the area.

Indirect Net Assessed Value Impacts. The impact on future total primary assessed value of the decline in residual economic activity would range from $868,000 to $3.3 million in the year 2010, and $870,000 to $3.3 million in the year 2025. The impact on future total secondary assessed value would range from $979,000 to $3.8 million in the year 2010, and from $981,000 to $3.8 million in the year 2025. Once again, the impacts as a percentage of total assessed value are lower in 2025 because of the lower level of significance that agriculture is projected to have in the study area's economy by this time period.

Indirect Property Tax Revenue Impacts. The projected indirect property tax revenue impacts of the decline in primary and secondary assessed values are shown in tables 4.21 and 4.22. The baseline tax rates of the area are assumed to remain constant throughout the projection horizon. In the baseline projection total tax revenues based on the primary valuation were projected to reach $963,000 by the year 2010, and $1.1 million by the year 2025. Tax revenues based on the secondary valuation were projected to reach $263,000 by the year 2010 and $288,000 by the year 2025.

Total primary property tax revenue impacts are projected to range from $63,000 to $244,000 in the year 2010 and from $64,000 to $245,000 in the year 2025.

The impacts on property tax rates also are shown on tables 4.21 and 4.22.

4.5.3.7 Summary. As in the La Paz portion of the study area, the Maricopa County subarea is predominantly agricultural, and the levels of land to be retired under each level of water transfer are large. As a result, the relative socioeconomic and fiscal impacts of water transfers on the study area will be significant.

4.5.4 Butler Valley

Since Butler Valley is primarily federal and state lands and essentially no permanent population or business activities exist, no socioeconomic and fiscal impact analyses were conducted.

TABLE 4.1
Water Transfer Study
Water Budget
Harquahala-McMullen-Butler Valley (La Paz County Source)

Description	1987	2010			2025		
Water Demand (1,000 AF)							
Water Transfer	0	14	34	54	35	85	135
Municipal & Industrial	–	–	–	–	–	–	–
Agricultural	88	74	54	34	53	3	0
Total Demand	88	88	88	88	88	88	135
Incidental Recharge (1,000 AF)							
Municipal & Industrial	–	–	–	–	–	–	–
Agricultural	9	7	5	3	5	0	0
Total Incidental Recharge	9	7	5	3	5	0	0
Water Supplies (1,000 AF)							
Surface Water	12	12	12	12	12	12	12
Groundwater	76	76	76	76	76	76	123
Total Supplies	88	88	88	88	88	88	135
Natural Recharge (1,000 AF)	2	2	2	2	2	2	2
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	65	67	69	71	69	74	121
Variables							
Irrigated Acreage (1,000)	17	15	11	7	11	1	0
Per Capita Muni Use (GPCD)	190		190			190	
Avg Crop Consump Use (ft/yr)	3.2		3.2			3.2	
Avg Irrigation Efficiency	65%		65%			65%	
Irrigation Recharge Factor	10%		10%			10%	
Municipal Recharge Factor	50%		50%			50%	
Industrial Recharge Factor	50%		50%			50%	
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)							
Gross Storage	41,700	40,200	40,200	40,100	39,200	39,100	38,700
Recoverable Storage	20,500	19,000	19,000	18,900	18,000	17,900	17,500

Data compiled by FRANZOY COREY

TABLE 4.2
Water Transfer Study
Water Budget
Harquahala-McMullen-Butler Valley (Maricopa County Source)

Description	1987	2010			2025		
Water Demand (1,000 AF)							
Water Transfer	0	14	34	54	35	85	135
Municipal & Industrial	1	1	1	1	1	1	1
Agricultural	213	199	179	159	178	128	78
Total Demand	214	214	214	214	214	214	214
Incidental Recharge (1,000 AF)							
Municipal & Industrial	1	1	1	1	1	1	1
Agricultural	21	20	18	16	18	13	8
Total Incidental Recharge	22	21	19	17	19	14	9
Water Supplies (1,000 AF)							
Surface Water	70	70	70	70	70	70	70
Groundwater	144	144	144	144	144	144	144
Total Supplies	214	214	214	214	214	214	214
Natural Recharge (1,000 AF)	1	1	1	1	1	1	1
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	121	122	124	126	124	129	134
Variables							
Irrigated Acreage (1,000)	45	45	41	36	40	29	18
Per Capita Muni Use (GPCD)	190		170			150	
Avg Crop Consump Use (ft/yr)	3.3		3.3			3.3	
Avg Irrigation Efficiency	70%		75%			75%	
Irrigation Recharge Factor	10%		10%			10%	
Municipal Recharge Factor	50%		50%			50%	
Industrial Recharge Factor	50%		50%			50%	
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)							
Gross Storage	31,500		28,700		26,900	26,800	26,700
Recoverable Storage	15,000		12,200		10,400	10,300	10,200

Data compiled by FRANZOY COREY

TABLE 4.3
Water Transfer Study
Water Budget
Harquahala-McMullen-Butler Valley (Concentrated Source)

Description	1987	2010			2025		
Water Demand (1,000 AF)							
Water Transfer	-	11	51	91	28	128	228
Municipal & Industrial	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-
Total Demand	-	11	51	91	28	128	228
Incidental Recharge (1,000 AF)							
Municipal & Industrial	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-
Total Incidental Recharge	-	-	-	-	-	-	-
Water Supplies (1,000 AF)							
Surface Water	-	-	-	-	-	-	-
Groundwater	-	11	51	91	28	128	228
Total Supplies	-	11	51	91	28	128	228
Natural Recharge (0,000 AF)	0	0	0	0	0	0	0
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	0	11	51	91	28	128	228
Variables							
Irrigated Acreage (1,000)	-		-			-	
Per Capita Muni Use (GPCD)	-		-			-	
Avg Crop Consump Use (ft/yr)	-		-			-	
Avg Irrigation Efficiency	-		-			-	
Irrigation Recharge Factor	-		-			-	
Municipal Recharge Factor	-		-			-	
Industrial Recharge Factor	-		-			-	
Water in Storage (1,000 AF)							
Gross Storage	20,000	19,900	19,700	19,500	19,600	18,400	17,100
Recoverable Storage	10,000	9,900	9,700	9,500	9,600	8,400	7,100

Data compiled by FRANZOY COREY

TABLE 4.4
Socioeconomic Profile
Harquahala-McMullen-Butler Valley

Economic Component	Study Area	Arizona
Population (1980)	3,641	2,718,215
Age 0 - 17 (%)	28.4	29.2
Age 18 - 64 (%)	61.9	59.6
Age 65+ (%)	9.7	11.3
Median Age	29.0	29.2
School Enrollment	750	652,174
Median Household Income (1980)	$13,600	$16,448
Less Than $5,000 (%)	17.7	12.1
$5,000 - $14,999 (%)	37.3	33.3
$15,000 - $29,999 (%)	33.1	36.4
$30,000 - $39,999 (%)	6.4	10.2
$40,000 + (%)	5.5	8.0
Civilian Labor Force (1980)	1,658	1,238,000
Unemployed (%)	6.8	6.7
Employment (1980)	1,468	1,113,270
Agriculture (%)	31.9	3.0
Construction (%)	18.0	8.3
Manufacturing (%)	5.1	14.8
Trade (%)	12.2	22.6
Services (%)	17.6	30.6
Government (%)	3.7	6.7
Other (%)	11.5	14.0
Land Ownership (000's of acres)	1,813	
Private (%)	14.1	
Indian (%)	0.0	
Public - State (%)	13.1	
Public - Other (%)	72.8	

Data compiled by Mountain West and Econotrend

TABLE 4.5
Baseline Socioeconomic Projections
Harquahala-McMullen-Butler Valley

	1987	2010	2025
Population	3,900	5,300	6,500
Age 0 - 17 (%)	29.7	28.4	28.4
Age 18 - 64 (%)	52.4	53.7	53.7
Age 65 + (%)	17.9	17.9	17.9
School Enrollment	900	1,100	1,400
Employment (no. of employees)	1,500	2,100	2,600
Agriculture (%)	30.6	21.4	17.8
Const. and Mfg. (%)	24.7	23.3	23.9
Trade (%)	13.0	12.7	13.3
Services (%)	15.0	24.2	25.3
Government (%)	4.7	3.8	3.6
Other (%)	12.0	14.6	16.1

Source: Mountain West Research

TABLE 4.6
Property Tax Profile (in 1986 dollars)
Harquahala-McMullen-Butler Valley

	Primary Assessment			Secondary Assessment		
	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)
Study area total	34,138	7.31	2,495	37,417	1.92	718
Legal classes						
2 Utilities	13,574	7.31	992	13,574	1.92	260
3 Commercial and industrial	4,366	7.31	319	4,684	1.92	90
4 Agricultural and vacant land	9,729	7.31	711	11,975	1.92	230
5 Residential	3,537	7.31	259	3,740	1.92	72
6 Rental residential	1,219	7.31	89	1,277	1.92	24
7 Railroads	1,713	7.31	125	2,167	1.92	42
Jurisdictions						
State	34,138	0.38	130	37,417	0.00	0
Counties	34,138	2.32	793	37,417	0.41	140
Schools	34,138	3.29	1,123	37,417	1.37	512
Jr./Community Colleges	34,138	1.32	449	7,242	0.08	6
Special Districts	5,173	0.00	0	11,808	0.51	60

Local Government Revenues	
Key Nonproperty Tax Revenue ($000's)	444
County State Shared (%)	100.0
City State Shared (%)	0.0
City Sales (%)	0.0

Data compiled by Mountain West

TABLE 4.7
Land Ownership Impacts
Harquahala-McMullen-Butler Valley (La Paz County Source)

	1987 Baseline		2025 Water Transfer Volumes: Low 35,000 AF		Medium 85,000 AF		High 185,000 AF	
Category	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
BLM	876,980	74.3	876,980	74.3	876,980	74.3	876,980	74.3
Forest Service	0	–	0	–	0	–	0	–
Indian	0	–	0	–	0	–	0	–
State	139,255	11.8	139,255	11.8	139,255	11.8	139,255	11.8
Other Public	31,720	2.7	39,563	3.3	50,768	4.3	51,540	4.4
Private	132,455	11.2	124,612	10.6	113,407	9.6	112,635	9.5
TOTAL	1,180,410	100.0	1,180,410	100.0	1,180,410	100.0	1,180,410	100.0

Source: Econotrend

TABLE 4.8
Direct Impacts on Agricultural Lands, Output, and Employment
Harquahala-McMullen-Butler Valley (La Paz County Source)

		2025 Water Transfer Volumes		
Variable	Baseline	Low 35,000 AF	Medium 85,000 AF	High 135,000 AF
Loss of Net Irrigated Acres	0	6,863	16,667	17,342
Net Irrigated Acres	17,342	10,479	675	0
Loss of Gross Irrigated Acres	0	7,843	19,048	19,820
Gross Irrigated Acres	19,820	11,977	772	0
Loss of Cropped Acres	0	6,942	16,858	17,541
Acres of Crops in Production	17,541	10,599	683	0
Loss of Agricultural Output (in 1986 dollars)	0	4,900,000	11,900,000	12,400,000
Agricultural Output (in 1986 dollars)	12,400,000	7,500,000	500,000	0
Loss of Agricultural Employment	0	50	121	126
Agricultural Employment	126	76	5	0
Percent Direct Impact on Agricultural Output	0	-39.6%	-96.1%	-100.0%

Source: Mountain West Research and Econotrend

TABLE 4.9
Employment Impacts
Harquahala-McMullen-Butler Valley (La Paz County Source)

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		14,000 AF			34,000 AF			54,000 AF		
Employment (no. of employees)	599	531	-68	-11.4	356	-243	-40.6	293	-306	-51.1
Agriculture	113	88	-25	-22.1	23	-90	-79.6	0	-113	-100.0
Const./Manuf.	81	68	-13	-16.0	34	-47	-58.0	22	-59	-72.8
Trade	102	91	-11	-10.8	64	-38	-37.3	54	-48	-47.1
Services	251	240	-11	-4.4	212	-39	-15.5	202	-50	-19.9
Government	23	20	-3	-13.0	10	-13	-56.5	7	-16	-69.6
Other	29	24	-5	-17.2	13	-16	-55.2	8	-20	-69.0
Water Transfer Volumes - 2025		35,000 AF			85,000 AF			135,000 AF		
Employment (no. of employees)	800	725	-75	-9.4	533	-267	-33.4	464	-336	-42.0
Agriculture	125	97	-28	-22.4	26	-99	-79.2	0	-125	-100.0
Const./Manuf.	110	95	-15	-13.6	58	-51	-46.4	45	-65	-59.1
Trade	142	131	-11	-7.7	101	-42	-29.6	90	-52	-36.6
Services	350	338	-12	-3.4	307	-43	-12.3	296	-54	-15.4
Government	29	25	-4	-13.8	15	-14	-48.3	11	-18	-62.1
Other	44	39	-5	-11.4	26	-18	-40.9	22	-22	-50.0

Source: Mountain West Research

TABLE 4.10
Population Impacts
Harquahala-McMullen-Butler Valley (La Paz County Source)

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		14,000 AF			34,000 AF			54,000 AF		
Population	1,700	1,522	-178	-10.5	1,071	-629	-37.0	907	-793	-46.6
Age 0-17	483	416	-67	-13.9	247	-236	-48.9	185	-298	-61.7
Age 18-64	913	809	-104	-11.4	545	-368	-40.3	449	-464	-50.8
Age 65+	304	297	-7	-2.3	279	-25	-8.2	273	-31	-10.2
School Enrollment	367	316	-51	-13.9	187	-179	-48.8	141	-226	-61.6
Water Transfer Volumes - 2025		35,000 AF			85,000 AF			135,000 AF		
Population	2,000	1,804	-196	-9.8	1,307	-693	-34.7	1,126	-874	-43.7
Age 0-17	598	525	-73	-12.2	338	-260	-43.5	270	-328	-54.8
Age 18-64	1,098	983	-115	-10.5	693	-405	-36.9	587	-511	-46.5
Age 65+	304	296	-8	-2.6	276	-28	-9.2	269	-35	-11.5
School Enrollment	454	398	-56	-12.3	257	-197	-43.4	205	-249	-54.8

Source: Mountain West Research

TABLE 4.11
Direct Impacts on Primary Assessed Value and Property Tax Revenues (in 1986 dollars)
Harquahala-McMullen-Butler Valley (La Paz County Source)

	Baseline	2025 Water Transfer Volumes: 35,000 AF	Change	85,000 AF	Change	135,000 AF	Change
Primary Assessed Value ($000's)	21,885	21,612	-273	21,222	-663	21,195	-690
Property Tax Revenues ($000's)							
State	83	82	-1	80	-3	80	-3
County	547	540	-7	530	-17	530	-17
Schools	709	700	-9	688	-21	687	-22
Community College	317	314	-3	307	-10	307	-10
TOTAL	1,656	1,636	-20	1,605	-51	1,604	-52

Source: Mountain West Research

TABLE 4.12
Direct Impacts on Secondary Assessed Value and Property Tax Revenues (in 1986 dollars)
Harquahala-McMullen-Butler Valley (La Paz County Source)

		2025 Water Transfer Volumes					
		35,000 AF		85,000 AF		135,000 AF	
	Baseline		Change		Change		Change
Secondary Assessed Value ($000's)	23,261	22,947	-314	22,499	-762	22,468	-793
Property Tax Revenues ($000's)							
State	0	0	0	0	0	0	0
County	95	94	-1	92	-3	92	-3
Schools	365	360	-5	353	-12	353	-12
Community College	0	0	0	0	0	0	0
TOTAL	460	454	-6	445	-15	445	-15

Source: Mountain West Research

TABLE 4.13
Primary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Harquahala-McMullen-Butler Valley (La Paz County Source)

	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	14,000	34,000	54,000	Baseline	35,000	85,000	135,000
Primary Net Assessed ($000's)	24,203	-870	-2,781	-3,362	25,592	-930	-2,992	-3,626
Agricultural and Vacant	7,309	-273	-663	-690	7,307	-273	-663	-690
Commercial/Industrial	2,845	-255	-907	-1,144	3,599	-281	-997	-1,256
Residential	1,660	-151	-533	-672	2,042	-166	-586	-740
Railroad/Utilities/Other	12,389	-191	-678	-856	12,644	-210	-746	-940
Property Tax Revenue ($000's)	1,833	-66	-211	-255	1,939	-70	-226	-275
State	92	-3	-11	-13	97	-4	-11	-14
County	606	-22	-70	-84	641	-23	-75	-91
Schools	784	-28	-90	-109	829	-30	-97	-117
Community College	351	-13	-40	-49	372	-13	-43	-53
Property Tax Rate	7.57	0.27	0.87	1.05	7.57	0.28	0.89	1.07
State	0.38	0.01	0.04	0.05	0.38	0.01	0.04	0.05
County	2.50	0.09	0.29	0.35	2.50	0.09	0.29	0.35
Schools	3.24	0.12	0.37	0.45	3.24	0.12	0.38	0.46
Community College	1.45	0.05	0.17	0.20	1.45	0.05	0.17	0.21

Source: Mountain West Research

TABLE 4.14
Secondary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Harquahala-McMullen-Butler Valley (La Paz County Source)

	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	14,000	34,000	54,000	Baseline	35,000	85,000	135,000
Secondary Net Assessed ($000's)	25,724	-925	-2,956	-3,574	27,202	-988	-3,180	-3,853
Agricultural and Vacant	7,768	-290	-705	-733	7,766	-290	-705	-733
Commercial/Industrial	3,024	-272	-964	-1,216	3,826	-298	-1,059	-1,335
Residential	1,765	-160	-567	-714	2,171	-176	-623	-786
Railroad/Utilities/Other	13,168	-203	-721	-910	13,439	-223	-793	-999
Property Tax Revenue ($000's)	455	-16	-52	-63	481	-17	-56	-68
State	0	0	0	0	0	0	0	0
County	105	-4	-12	-15	112	-4	-13	-16
Schools	350	-13	-40	-49	370	-13	-43	-52
Community College	0	0	0	0	0	0	0	0
Property Tax Rate	1.98	0.07	0.23	0.28	1.98	0.07	0.23	0.28
State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
County	0.41	0.01	0.05	0.06	0.41	0.01	0.05	0.06
Schools	1.57	0.06	0.18	0.22	1.57	0.06	0.18	0.22
Community College	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Mountain West Research

TABLE 4.15
Land Ownership Impacts
Harquahala-McMullen-Butler Valley (Maricopa County Source)

	1987 Baseline		2025 Water Transfer Volumes: Low 35,000 AF		Medium 88,000 AF		High 135,000 AF	
Category	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
BLM	409,970	64.8	409,970	64.8	409,970	64.8	409,970	64.8
Forest Service	0	–	0	–	0	–	0	–
Indian	0	–	0	–	0	–	0	–
State	99,240	15.7	99,240	15.7	99,240	15.7	99,240	15.7
Other Public	0	–	8,510	1.3	20,669	3.2	32,826	5.2
Private	123,750	19.5	115,240	18.2	103,081	16.3	90,924	14.3
TOTAL	632,960	100.0	632,960	100.0	632,960	100.0	632,960	100.0

Source: Econotrend

TABLE 4.16
Direct Impacts on Agricultural Lands, Output, and Employment
Harquahala-McMullen-Butler Valley (Maricopa County Source)

Variable	Baseline	2025 Water Transfer Volumes Low 35,000 AF	Medium 85,000 AF	High 135,000 AF
Loss of Net Irrigated Acres	0	7,447	18,085	28,723
Net Irrigated Acres	45,439	37,992	27,354	16,716
Loss of Gross Irrigated Acres	0	8,510	20,669	32,826
Gross Irrigated Acres	51,930	43,420	31,261	19,104
Loss of Cropped Acres	0	7,929	19,255	30,581
Acres of Crops in Production	48,379	40,450	29,124	17,798
Loss of Agricultural Output (in 1986 dollars)	0	6,800,000	16,400,000	26,000,000
Agricultural Output (in 1986 dollars)	41,100,000	34,300,000	24,700,000	15,100,000
Loss of Agricultural Employment	0	56	135	215
Agricultural Employment	340	284	205	125
Percent Direct Impact on Agricultural Output	0	-16.4%	-39.8%	-63.2%

Source: Mountain West Research and Econotrend

TABLE 4.17
Employment Impacts
Harquahala-McMullen-Butler Valley (Maricopa County Source)

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		14,000 AF			34,000 AF			54,000 AF		
Employment (no. of employees)	724	601	-123	-17.0	428	-296	-40.8	252	-472	-65.2
Agriculture	340	284	-56	-16.5	205	-135	-39.7	125	-215	-63.2
Const./Manuf.	79	65	-14	-17.7	46	-33	-41.8	26	-53	-67.1
Trade	100	83	-17	-17.0	58	-42	-42.0	33	-67	-67.0
Services	38	32	-7	-18.4	22	-16	-42.1	13	-25	-65.8
Government	71	58	-12	-16.9	41	-30	-42.3	23	-48	-67.6
Other	96	79	-17	-17.7	56	-40	-41.7	32	-64	-66.7
Water Transfer Volumes - 2025		35,000 AF			85,000 AF			135,000 AF		
Employment (no. of employees)	856	733	-123	-14.4	560	-296	-34.6	384	-472	-55.1
Agriculture	340	284	-56	-16.5	205	-135	-39.7	125	-215	-63.2
Const./Manuf.	93	81	-12	-12.9	64	-29	-31.1	47	-46	-49.5
Trade	122	106	-16	-13.1	84	-38	-31.1	61	-61	-50.0
Services	77	67	-10	-13.0	53	-24	-31.1	39	-38	-49.4
Government	64	56	-8	-12.5	44	-20	-31.3	32	-32	-50.0
Other	160	139	-21	-13.1	110	-50	-31.3	80	-80	-50.0

Source: Mountain West Research

TABLE 4.18
Population Impacts
Harquahala-McMullen-Butler Valley (Maricopa County Source)

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		14,000 AF			34,000 AF			54,000 AF		
Population	1,451	1,142	-309	-21.3	707	-744	-51.3	268	-1,183	-81.5
Age 0-17	412	319	-93	-22.6	189	-223	-54.1	57	-355	-86.2
Age 18-64	779	588	-191	-24.5	318	-461	-59.1	46	-733	-94.1
Age 65+	260	235	-25	-9.6	200	-60	-23.0	165	-95	-36.5
School Enrollment	313	243	-70	-22.4	144	-169	-54.0	43	-269	-85.9
Water Transfer Volumes - 2025		35,000 AF			85,000 AF			135,000 AF		
Population	1,599	1,286	-313	-19.6	845	-754	-47.2	396	-1,203	-75.2
Age 0-17	478	384	-94	-19.7	252	-227	-47.5	117	-361	-75.5
Age 18-64	878	684	-194	-22.1	410	-469	-53.4	132	-746	-85.0
Age 65+	243	218	-25	-10.3	183	-60	-24.7	147	-96	-39.5
School Enrollment	363	292	-71	-19.6	191	-172	-47.4	89	-274	-75.5

Source: Mountain West Research

TABLE 4.19
Direct Impacts on Primary Assessed Valuation and Property Tax Revenues (in 1986 dollars)
Harquahala-McMullen-Butler Valley (Maricopa County Source)

		2025 Water Transfer Volumes					
		35,000 AF		85,000 AF		135,000 AF	
	Baseline		Change		Change		Change
Primary Assessed Value ($000's)	8,626	8,235	-391	7,677	-949	7,118	-1,508
Property Tax Revenues ($000's)							
State	33	32	-1	29	-4	27	-6
County	200	191	-9	178	-22	165	-35
Schools	284	271	-13	153	-31	234	-50
Community College	114	109	-5	101	-13	94	-20
TOTAL	631	603	-28	561	-70	520	-111

Source: Mountain West Research

TABLE 4.20
Direct Impacts on Secondary Assessed Valuation and Property Tax Revenues (in 1986 dollars)
Harquahala-McMullen-Butler Valley (Maricopa County Source)

		2025 Water Transfer Volumes					
	Baseline	35,000 AF	Change	85,000 AF	Change	135,000 AF	Change
Secondary Assessed Value ($000's)	9,728	9,279	-449	8,637	-1,091	7,995	-1,733
Property Tax Revenues ($000's)							
State	0	0	0	0	0	0	0
County	40	38	-2	36	-4	33	-7
Schools	132	126	-6	117	-15	108	-24
Community College	0	0	0	0	0	0	0
TOTAL	172	164	-8	153	-19	141	-31

Source: Mountain West Research

TABLE 4.21
Primary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Harquahala-McMullen-Butler Valley (Maricopa County Source)

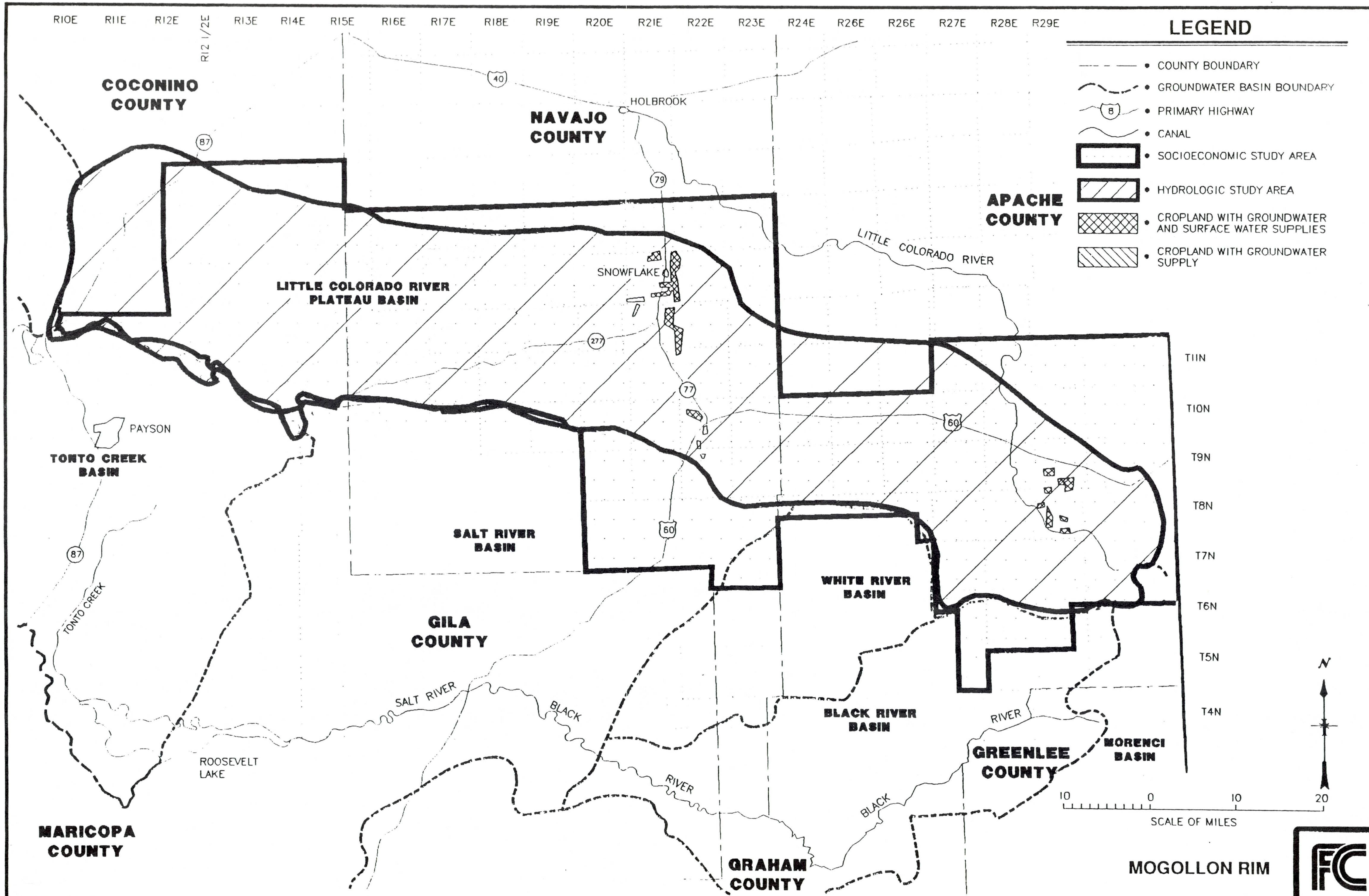
	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	14,000	34,000	54,000	Baseline	35,000	85,000	135,000
Primary Net Assessed ($000's)	13,167	-868	-2,100	-3,341	14,418	-870	-2,105	-3,348
Agricultural and Vacant	8,626	-391	-949	-1,508	8,626	-391	-949	-1,508
Commercial/Industrial	337	-49	-119	-189	435	-49	-119	-189
Residential	804	-108	-260	-414	894	-110	-265	-421
Railroad/Utilities/Other	3,400	-320	-772	-1,230	4,462	-320	-772	-1,230
Property Tax Revenue ($000's)	963	-63	-154	-244	1,054	-64	-154	-245
State	50	-3	-8	-13	55	-3	-8	-13
County	305	-20	-49	-78	334	-20	-49	-78
Schools	433	-29	-69	-110	474	-29	-69	-110
Community College	174	-11	-28	-44	190	-11	-28	-44
Property Tax Rate	7.31	0.48	1.17	1.85	7.31	0.44	1.07	1.70
State	0.38	0.03	0.06	0.10	0.38	0.02	0.06	0.09
County	2.32	0.15	0.37	0.59	2.32	0.14	0.34	0.54
Schools	3.29	0.22	0.52	0.83	3.29	0.20	0.48	0.76
Community College	1.32	0.09	0.21	0.33	1.32	0.08	0.19	0.31

Source: Mountain West Research

TABLE 4.22
Secondary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Harquahala-McMullen-Butler Valley (Maricopa County Source)

	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	14,000	34,000	54,000	Baseline	35,000	85,000	135,000
Secondary Net Assessed ($000's)	14,849	-979	-2,368	-3,768	16,260	-981	-2,373	-3,776
Agricultural and Vacant	9,728	-441	-1,070	-1,701	9,728	-441	-1,070	-1,701
Commercial/Industrial	380	-55	-134	-213	491	-55	-134	-213
Residential	907	-122	-293	-467	1,008	-124	-298	-475
Railroad/Utilities/Other	3,835	-361	-871	-1,387	5,032	-361	-871	-1,387
Property Tax Revenue ($000's)	263	-17	-42	-67	288	-17	-42	-67
State	0	0	0	0	0	0	0	0
County	61	-4	-10	-15	67	-4	-10	-15
Schools	202	-13	-32	-51	221	-13	-32	-51
Community College	0	0	0	0	0	0	0	0
Property Tax Rate	1.77	0.12	0.28	0.45	1.77	0.11	0.26	0.41
State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
County	0.41	0.03	0.07	0.10	0.41	0.02	0.06	0.10
Schools	1.36	0.09	0.22	0.35	1.36	0.08	0.20	0.32
Community College	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Mountain West Research



MOGOLLON RIM

B34003.00/81287

FIGURE 5.1

CHAPTER 5

MOGOLLON RIM

5.1 GENERAL DESCRIPTION

The Mogollon Rim study area (figure 5.1) is located north of the Mogollon Rim in northeast Arizona. The area includes ponderosa pine forest near Show Low and flat, high-desert mesas that drain into the Little Colorado River north of Snowflake. In Show Low, winter temperatures range from the upper teens to the mid-40s. Summer temperatures range from the mid-50s to the mid-80s. Precipitation averages 15.5 inches annually. More than half of the winter precipitation occurs as snow, which averages 40 inches annually.

5.2 CURRENT HYDROLOGIC PROFILES

The hydrologic study area includes the Concho, St. Johns and White Mountain areas in Apache County and the Chevelon, Holbrook, Snowflake, and Canyon Diablo areas of southern Navajo and Coconino Counties. All of the area is above the Mogollon Rim in the mountainous areas of northeast Arizona. The Little Colorado River and its major tributaries, Silver, Chevelon, and Clear Creeks drain the area.

5.2.1 Area Groundwater

The major source of groundwater is the Coconino aquifer, which includes the lower portions of the Kaibab Limestone, the Coconino Sandstone and the upper portions of the Supai Formation. To a lesser extent on an area-wide basis, river alluvium, volcanic rocks and sedimentary rocks above and below the Coconino aquifer provide groundwater to local areas. The Coconino aquifer attains a maximum thickness ranging from about 730 feet in southern Apache County to about 900 feet in southern Navajo and Coconino Counties. Groundwater in the Coconino is mostly unconfined to semi-confined, but is perched or confined locally. Water levels range from several feet above land surface (artesian wells) to more than 2,500 feet below land surface northwest of the study area. Wells that penetrate underlying limestone aquifers can have water levels more than 2,500 feet to 3,000 feet below land surface. Wells that are located in alluvial deposits near-surface or in volcanics have relatively shallow water levels. Most wells in the Coconino aquifer are capable of producing 1,000 gal/min or more.

5.2.2 Water Level Declines

Water level declines in the Coconino aquifer are directly related to areas of concentrated pumping. The Holbrook-Joseph City and Snowflake-Shumway areas in southern Navajo County have experienced long-term declines of more than 50 feet. In southern Apache County, many areas show seasonal water level fluctuations in response to pumping but negligible long-term changes. Pumping in southern Coconino County has not resulted in significant declines in water levels.

5.2.3 Water Quality

TDS values vary considerably within the study area and depend on the source of water. In southern Apache County, TDS values from the Coconino aquifer generally range from less than 125 mg/L to about 1,000 mg/L. TDS concentrations increase in a northerly direction to more than 64,000 mg/L. In southern Navajo County, water from the Coconino aquifer has TDS values ranging from less than 350 mg/L in the southern part of the area to as much as 68,000 mg/L in the northern part of the area. In southern Coconino County, TDS values from the Coconino aquifer generally are less than 500 mg/L. The only portion of the hydrologic study area that has fluoride values exceeding the EPA maximum contaminant level is the area surrounding St. Johns.

5.2.4 Groundwater Storage

Groundwater in storage in the Coconino aquifer underlying the study area is estimated at about 86 million acre-feet. This value was calculated assuming an average saturated thickness ranging from about 320 feet to 400 feet, an average specific yield of five percent, and a surface area of roughly 7,600 square miles.

5.2.5 Surface Water Resources

The Little Colorado River flows at Woodruff range from 0-25,000 cfs, with a mean of 43 cfs. The Little Colorado River water originates from surfacing groundwater, snow melt, and to a very minor extent, summer storms.

5.2.6 Irrigation Districts

The two irrigation districts within the study area are Show Low Water Conservation District and Show Low Irrigation Company.

5.3 HYDROLOGIC IMPACTS

The Mogollon Rim study area is an area of minor agricultural development, with municipal and industrial water demands surpassing agricultural water demands (table 5.1). Power-generation facilities pump in excess of 25,000 acre-feet of groundwater under baseline (1987) conditions. Pumping for power plants near St. Johns and Springerville will result in significant increases by the year 2010.

The baseline demand for water is about 51,000 acre-feet with groundwater satisfying all of the demand. Upon implementation of water transfers, agricultural uses would gradually be reduced until complete retirement in year 2010 for the high volume transfer. For purposes of this study it was assumed that new well fields would be located on U.S. Forest Service lands in favorable areas of the Coconino aquifer to supply the additional transfer volumes. From presently available data these favorable areas are generally recognized.

Since other study areas are supplying water transfers of 72,000 acre-feet annually, the maximum transfer volume of 228,000 acre-feet would occur in year 2025. Based upon an estimated natural recharge of 200,000 acre-feet annually, an overdraft rate of about 50,000 acre-feet would be initiated. It must be emphasized that the hydrogeologic data to document the recharge volume are not available. In addition, the gross storage indicated on table 5.1 has been estimated from sparse data. This study area, more than any other study area, would require hydrologic and geologic investigations to substantiate a water budget that would be necessary for any potential water transfer since it is generally known that brackish and saline groundwater underlies portions of the Colorado Plateau area north of the study area. The fresh-water underflow coming from the Mogollon Rim helps to control the interface between the brackish-saline water and fresh water supply.

5.4 SOCIOECONOMIC AND FISCAL PROFILES

The socioeconomic study area is comprised of portions of Navajo and Apache Counties on the northern side of the Mogollon Rim, and a small adjacent portion of Coconino County. It includes the Snowflake and Eager-Springerville census divisions, and the towns of Show Low, Lakeside, Pinetop, Snowflake, Taylor, Eager, and Springerville. The area is served by Northland Junior College. There are nine school districts and eight fire and flood control districts.

5.4.1 Population and School Enrollment

There were 25,901 persons living in the area according to the 1980 census (table 5.2). The population is relatively young; in 1980, the median age was 22.2 years, as compared with 29.2 for Arizona. About 9,100 children were enrolled in area schools in 1980. The socioeconomic study area is projected to grow at a relatively moderate rate during the projection period (table 5.3). The population is projected to grow at an annual compound growth rate of 1.7 percent per year, increasing from about 28,100 in 1987 to about 52,600 by 2025. School enrollment is projected to grow from about 9,300 to approximately 16,000 over the projection horizon.

5.4.2 Household Income

Study area median household income in 1980 was $16,900, compared with $16,448 for Arizona.

5.4.3 Labor Force

Unemployment in the socioeconomic study area is relatively high. According to the 1980 census, 9.6 percent of the 9,916 area residents in the civilian labor force were unemployed.

5.4.4 Employment

Tourism, recreation, forest products, mining, and ranching are the principal economic industries in the study area. Show Low and Pinetop-Lakeside also serve as the regional trade and services centers for the southern portion of Navajo County and portions of southern Apache County. Area employment by economic sector in 1980 was 27.5 percent in manufacturing and construction, 24.3 percent in services, and 21.5 percent in trade. Agriculture accounts for 7.9 percent of employment. Employment is projected to approximately double by 2025 (table 5.3). The largest increase is projected for the trade and service sectors. Construction and agricultural employment are projected to decline over the projection horizon.

5.4.5 Land Ownership

The study area encompasses about 2.3 million acres, much of which is managed by the U.S. Forest Service. About 22.5 percent of the land is privately owned; 7.4 percent is Indian land; 16.6 percent is state owned; and 22.5 percent is privately owned.

5.4.6 Property Tax Base

In 1986, the largest source of property tax revenue in the area was utilities (table 5.4). The 1986 total net primary assessment was about $455 million. Property was taxed at a rate of $5.77 per $100 of the primary assessment and generated about $26.3 million in revenue. The secondary net assessed value totaled about $498 million, was taxed at a rate of $1.64 per $100 of the secondary assessment, and generated about $8.2 million in revenue. Utilities account for more than $280 million in primary net assessed value due largely to the Springerville Generating Station. Residential properties account for $63.2 million, and commercial and industrial property $57.8 million in primary net assessed value. Net primary assessed value is projected to grow from approximately $455 million in 1987 to about $685 million by the year 2025 (table 5.5). Residential, commercial, and industrial classes are projected to grow during the economic expansion. The net assessed value of agricultural and vacant lands is projected to decline.

5.4.7 Property Tax Revenues

Schools in the socioeconomic study area received $12.8 million in revenue from property tax on the primary net assessment, and the counties received $10.8 million. Property tax revenues are projected to increase from about $26.3 million to about $42.1 million by the year 2025.

5.4.8 Nonproperty Tax Revenues

County state-shared revenues, city state-shared revenues, and city sales tax collection are also projected to grow over the projection horizon. County state-shared revenues are projected to increase from $5.5 to $8.2 million, city state-shared revenues are projected to increase from $4.0 to $8.4 million, and city sales tax collections are projected to increase from $3.6 to $8.4 million, as calculated from table 5.5. The relatively large size of the growth in city sales tax collections is due to the projected growth in tourist and recreational activities in the socioeconomic study area.

5.5 SOCIOECONOMIC AND FISCAL IMPACTS

5.5.1 Land Ownership

Under the worst-case condition for this area which is in 2025 under the high volume transfer, only 0.3 percent of the total land area would shift from the private category to public ownership. Prior to this potential shift, no public category ownership of land existed in the area. Nevertheless, the amount is quite small (1.4 percent) when compared to the total land area in the private category. The impact is projected to be nominal.

5.5.2 Impacts on Gross Agricultural Output

Water transfers from the Mogollon Rim area would most likely not require the retirement of agricultural lands. Probable locations for transfer facilities would be on forest service or other nonagricultural lands and, therefore, agricultural output would not be affected.

Where agricultural lands are involved in transfers, it is estimated that less than 5,500 net irrigated acres would go out of production. Baseline gross output, estimated to total $1.3 million, would be lost.

5.5.3 Conclusions

Given the size of the study area and the small number of irrigated acres that exist in the area, it can be assumed that the impacts associated with the retirement of agricultural land on agricultural employment and other socioeconomic characteristics of the area would be nominal.

TABLE 5.1
Water Transfer Study
Water Budget
Mogollon Rim

Description	Year						
	1987	2010			2025		
Water Demand (1,000 AF)							
Water Transfer	0	11	51	91	28	128	228
Municipal & Industrial	26	45	45	45	45	45	45
Agricultural	25	14	0	0	0	0	0
Total Demand	51	70	96	136	73	173	273
Incidental Recharge (1,000 AF)							
Municipal & Industrial	13	23	23	23	23	23	23
Agricultural	5	3	0	0	0	0	0
Total Incidental Recharge	18	26	23	23	23	23	23
Water Supplies (1,000 AF)							
Surface Water	0	0	0	0	0	0	0
Groundwater	51	70	96	136	73	173	273
Total Supplies	51	70	96	136	73	173	273
Natural Recharge (1,000 AF)	200	200	200	200	200	200	200
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	0	0	0	0	0	0	50
Variables							
Irrigated Acreage (1,000)	6	3	0	0		0	
Per Capita Muni Use (GPCD)	150		150			150	
Avg Crop Consump Use (ft/yr)	3.2		3.2			3.2	
Avg Irrigation Efficiency	70%		70%			70%	
Irrigation Recharge Factor	20%		20%			20%	
Municipal Recharge Factor	50%		50%			50%	
Industrial Recharge Factor	50%		50%			50%	
Water in Storage (1,000 AF)							
Gross Storage	86,000		86,000		86,000	86,000	85,600
Recoverable Storage	43,000		43,000		43,000	43,000	42,600

Data compiled by FRANZOY COREY

TABLE 5.2
Socioeconomic Profile
Mogollon Rim

Economic Component	Study Area	Arizona
Population (1980)	25,901	2,718,215
Age 0 - 17 (%)	39.1	29.2
Age 18 - 64 (%)	54.1	59.5
Age 65+ (%)	6.8	11.3
Median Age	22.2	29.2
School Enrollment (1980)	9,126	652,174
Median Household Income (1980)	$16,900	$16,448
Less than $5,000 (%)	11.3	12.1
$ 5,000 - $14,999 (%)	14.5	33.3
$15,000 - $29,999 (%)	40.6	36.4
$30,000 - $39,999 (%)	10.3	10.2
$40,000 + (%)	6.3	8.0
Civilian Labor Force (1980)	9,916	1,238,000
Unemployed (%)	9.6	6.7
Employment (1980)	8,960	1,113,270
Agriculture (%)	7.9	3.0
Construction (%)	14.7	8.3
Manufacturing (%)	12.8	14.8
Trade (%)	21.5	22.6
Services (%)	24.3	30.6
Government (%)	4.2	6.7
Other (%)	14.6	14.0
Land Ownership (000's of acres)	2,270	
Private (%)	22.5	
Indian (%)	7.4	
Public - State (%)	16.6	
Public - Other (%)	53.5	

Data compiled by Mountain West and Econotrend

TABLE 5.3
Baseline Socioeconomic Projections
Mogollon Rim

	1987	2010	2025
Population	28,100	43,100	52,600
Age 0 - 17 (%)	35.9	33.2	33.2
Age 18 - 64 (%)	54.5	55.1	55.1
Age 65 + (%)	9.6	11.7	11.7
School Enrollment	9,300	13,100	16,000
Employment (no. of employees)	11,300	16,700	22,800
Agriculture (%)	6.4	4.3	3.2
Const. and Mfg. (%)	32.5	29.0	30.2
Trade (%)	20.3	23.4	23.6
Services (%)	23.9	26.6	27.6
Government (%)	3.7	3.6	3.2
Other (%)	13.2	13.1	12.2

Source: Mountain West Research

TABLE 5.4
Property Tax Profile (in 1986 dollars)
Mogollon Rim

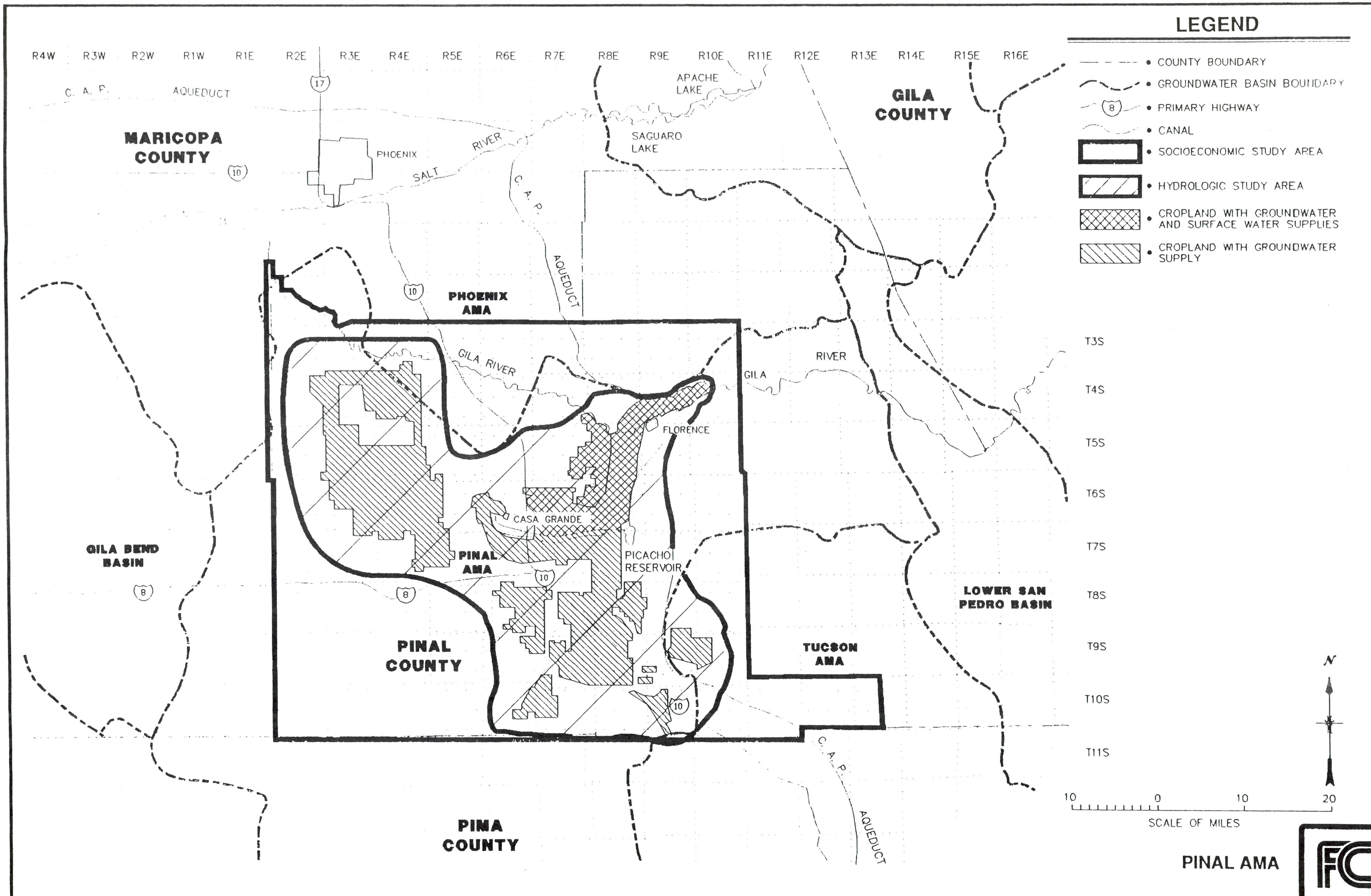
	Primary Assessment			Secondary Assessment		
	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)
Study area total	455,302	5.77	26,286	497,511	1.64	8,181
Legal classes						
2 Utilities	280,083	5.77	16,170	280,083	1.64	4,606
3 Commercial and industrial	57,801	5.77	3,337	64,377	1.64	1,059
4 Agricultural and vacant land	43,143	5.77	2,491	66,360	1.64	1,091
5 Residential	63,191	5.77	3,648	74,143	1.64	1,219
6 Rental residential	9,148	5.77	528	10,532	1.64	173
7 Railroads	1,933	5.77	112	2,013	1.64	33
8 Historic Property	3	5.77	0	3	1.64	0
Jurisdictions						
State	455,302	0.38	1,730	497,511	0.00	0
Counties	455,302	2.37	10,788	497,511	0.34	1,671
Towns and Cities	71,922	0.00	0	88,282	0.00	0
Schools	455,302	2.82	12,819	497,512	1.12	5,550
Jr./Community Colleges	161,450	0.59	949	197,297	0.00	0
Special Districts	0	0.00	0	148,904	0.64	960

Data compiled by Mountain West

TABLE 5.5
Baseline Net Assessed Value and Tax Revenue Projections (in 1986 dollars)
Mogollon Rim

	Primary			Secondary		
	1987	2010	2025	1987	2010	2025
Net Assessed Value ($000's)	455,302	608,240	684,638	497,512	660,439	744,843
Ag. and Vacant (%)	9.5	7.1	6.3	13.3	10.0	8.9
Comm. and Indus. (%)	12.7	14.4	17.7	12.9	14.8	18.1
Residential (%)	15.9	18.2	19.8	17.0	19.7	21.3
Other (%)	61.9	60.3	56.2	56.8	55.5	51.7
Cities and Towns Total (%)	15.8	29.5	35.6	17.7	33.1	48.8
Property Tax Revenue ($000's)	26,286	37,422	42,122	8,182	11,855	15,629
State (%)	6.6	6.2	6.2	0.0	0.0	0.0
Counties (%)	41.0	38.5	38.5	20.5	20.4	20.4
Cities and Towns (%)	0.0	0.0	0.0	0.0	0.0	0.0
Schools (%)	48.8	45.8	45.8	67.8	67.9	67.9
Comm. Colleges (%)	3.6	9.5	9.5	0.0	0.0	0.0
Special Districts (%)	0.0	0.0	0.0	11.7	11.7	11.7
	Local Government Revenues					
Key Nonproperty Tax Revenue ($000's)	13,098	20,042	25,046			
County State Shared (%)	41.7	36.4	32.8			
City State Shared (%)	30.6	33.4	33.5			
City Sales (%)	27.7	30.2	33.7			

Source: Mountain West Research



B34003.00/22637

PINAL AMA

FIGURE 6.1

CHAPTER 6

PINAL AMA

6.1 GENERAL DESCRIPTION

The Pinal AMA study area (figure 6.1) is a flat desert valley located between the Casa Grande and Sacaton Mountains. Annual precipitation is about 8 inches. Winter temperatures range from the low 40s to the mid-60s. Summer temperatures range from the high 60s to above 110 degrees.

6.2 CURRENT HYDROLOGIC PROFILES

The hydrologic study area includes the major agricultural areas of the Pinal Active Management Area (AMA). The area is located within the Basin and Range Lowlands Water Province, characterized by northwest-southeast and east-west trending alluviated basins largely encompassed by similarly trending mountain ranges.

6.2.1 Area Groundwater

The major source of groundwater is from thick basin-fill deposits. An upper unit of about 1,200-foot maximum thickness is underlain by a thick, fine-grained unit at least 2,300 feet thick locally. This fine-grained unit contains interbedded primary and secondary accumulations of evaporites. The fine-grained unit is underlain by a conglomeritic unit. The entire basin-fill sequence varies in thickness from 0 feet along the basin peripheries to more than an estimated 9,000 feet south of Eloy. Groundwater in the upper unit is generally unconfined; however, perched or semi-perched conditions also occur. The fine-grained unit is considered an aquiclude, but thin sandy subunits yield minor quantities of water. Groundwater in the lower conglomerate is generally confined, but is also unconfined where the fine-grained unit does not directly overlie it.

Depths to groundwater range from about 100 feet to more than 500 feet within the hydrologic study area. Most wells in the hydrologic study area are capable of producing 1,000 gal/min or more.

6.2.2 Water Level Declines

Since 1923, water levels along the eastern portion of the hydrologic study area have declined from about 50 feet to more than 300 feet. Within the same time frame, water levels along the western portion of the hydrologic study area have declined from about 50 feet to nearly 500 feet.

6.2.3 Water Quality

Specific conductance, a direct function of total dissolved solids (TDS), apparently increases from south to north along the eastern portion of the hydrologic study area. This increase may be attributable to penetration of evaporites and improper construction of the wells, or from the degraded quality of the perched water. In any event, the range of available specific conductance data is about 400-3,500 micromhos/cm. In the western portion, the range of available specific conductance data is about 400-5,400 micromhos/cm, with a similar apparent increase from south to north. Fluoride concentrations range from 0.2-4 mg/L. In the hydrologic study area much of the groundwater exceeds the 1.4 mg/L EPA maximum contaminant level for public water supplies.

6.2.4 Groundwater Storage

Estimated groundwater in storage to a depth of 1,200 feet in the Lower Santa Cruz Basin which is mostly the Pinal AMA was about 91 million acre-feet in 1975 (Arizona Water Commission).

6.2.5 Surface Water Resources

The Gila and Santa Cruz Rivers and Santa Rosa Wash are main sources of surface water to the area. The Santa Cruz River and Santa Rosa Wash are ephemeral and flow only during large storms. The majority of the source waters for the Gila River originate in east-central Arizona and west-central New Mexico. The Gila River is controlled by Coolidge Dam and almost all releases from the dam have been for downstream users. Except during rare flood events, the entire Gila River is diverted for beneficial uses at Ashurst-Hayden Dam. Downstream of Ashurst-Hayden Dam, the Gila River is ephemeral.

6.2.6 Irrigation Districts

The four irrigation districts within the study area are Central Arizona Irrigation and Drainage District, HoHoKam Irrigation and Drainage District, San Carlos Irrigation and Drainage District, and Maricopa-Stanfield Irrigation and Drainage District.

6.3 HYDROLOGIC IMPACTS

Similar to the other study areas, potential water transfers will be implemented from other areas and the water transfers from the Pinal AMA are reduced by 42,000 acre-feet.

The Groundwater Code mandates the goal of safe yield by the year 2025 for the Tucson, Phoenix, and Prescott AMAs. In the Pinal AMA, the goal is to extend the life of the agricultural economy as long as possible, while preserving groundwater supplies for future nonagricultural uses. In this respect the Pinal AMA fills a special role in this study.

The introduction of CAP surface water supplies into the Pinal AMA and their effect on the hydrology of the study area cannot be overemphasized. Those irrigation districts and Indian irrigation projects receiving partial allocations of CAP water in 1987 reduced pumpage accordingly. Water level rises have been reported in local areas. Based upon the water demand - water supply relationship in 1987, overdraft is estimated at about 890,000 acre-feet (table 6.1). With full deliveries of CAP water the overdraft is reduced to several hundred thousand acre-feet annually in a short period of time. Even with reduced CAP deliveries by year 2010, the annual overdraft is estimated at about 280,000 acre-feet.

The immediate impact of CAP water is assumed to be a period of dynamic change as pumpage is sharply reduced and the long-term overdraft stresses imposed upon the primary aquifers are gradually relieved. The historic, steep decline in water levels will flatten during this period, with some areas probably showing water level rises.

This predicted impact is supported by the influence of flood events and higher than normal surface water availability in the San Carlos Project on the groundwater levels in the Pinal AMA during the past six years. The increased surface flows into the area with reduced water demands have resulted in measured changes in the rate of groundwater declines and, in some isolated cases, water level rises.

Groundwater storage during this favorable hydrologic period continues to diminish, although, at a rate much reduced from the last several decades. In the year 2010 it is estimated that water levels will have adjusted to the new hydrologic conditions and experience declines at annual rates between 1-3 feet. There will be some areas which will experience no declines. The only significant negative hydrologic impact to the year 2025 caused by water transfers is a reduced quantity of incidental recharge from agricultural uses.

The special role the Pinal AMA plays in this study - preserving groundwater supplies for future nonagricultural uses - has been illustrated in the water budget. The water transfers, in effect, would be the future nonagricultural uses. More than 50 percent of all non-Indian CAP agricultural water surface supplies are allocated within the study area. About 90 percent of Indian allocations for agriculture are within the study area. The marked reductions in overdraft, rates of water level decline (rises in some areas) and groundwater storage all will be manifestations of a changed hydrologic regime in the Pinal AMA.

Assured water supplies are available in local areas of the Pinal AMA because of the large volume of recoverable groundwater in storage.

6.4 SOCIOECONOMIC AND FISCAL PROFILES

The socioeconomic study area is comprised of a large portion of Pinal County. It includes the Casa Grande, Coolidge, Eloy, Florence, and parts of the Maricopa-Stanfield census divisions. The area contains Central Arizona College, 11 school districts, and 5 fire and flood control districts.

6.4.1 Population and School Enrollment

There were 48,460 persons living in the socioeconomic study area according to the 1980 census (table 6.2). The median age of the area population is 26.7 years, which is younger than that of Arizona. About 13,850 children (nearly 82 percent of the area population under the age of 18 years) were enrolled in school in 1980. Significant growth is projected for the study area (table 6.3). The population is projected to grow at an annual compound rate of 2.6 percent between 1987 and 2025, increasing from about 59,000 persons to about 151,000 by 2025. School enrollment is projected to grow from about 14,200 students in 1987 to about 34,000 by 2025.

6.4.2 Household Income

Income in the socioeconomic study area is relatively low. The median household income in 1980 was about $12,900, compared with about $16,450 for Arizona.

6.4.3 Labor Force

Unemployment in the socioeconomic study area is relatively high. According to the 1980 census, about 8.6 percent of the 18,335 area residents in the civilian labor force were unemployed (in September 1987, the unemployment rate was 10.0 percent).

6.4.4 Employment

Agriculture is the principal economic activity in the area. Casa Grande, the largest city in Pinal County, serves as a regional center for surrounding agricultural communities. Casa Grande is pursuing an aggressive economic recruitment and diversification program to take advantage of its location in the state's "central corridor". Area employment by economic sector in 1980 was about 17.5 percent in agriculture, about 17.2 percent in trade and about 29.7 percent in services (table 6.2). The area economy is projected to almost triple in size, and shift its orientation from agriculture to manufacturing. Total employment is projected to increase from approximately 19,900 jobs to 58,500 by 2025. Agricultural employment is projected to decline from 14.8 percent to 3.5 percent while construction and manufacturing employment is projected to increase from 24.5 percent to 39.9 percent (table 6.3).

6.4.5 Land Ownership

The study area encompasses about 1.66 million acres. About 38 percent of the land is privately owned, about 27 percent is state-owned, and about 26 percent is Indian land (table 6.2).

6.4.6 Property Tax Base

Under baseline conditions (1986 data), the primary net assessed value in the socioeconomic study area totaled almost $205 million with agricultural lands the largest source of property tax revenue (table 6.4). Property was taxed at a rate of $9.41 per $100 of the primary assessment and generated approximately $19.3 million in revenue. The secondary net assessed value was about $220 million. Property was taxed at a rate of $1.78 per $100 of the secondary assessment and generated about $3.9 million in tax revenue. Agricultural and vacant lands had the largest primary net assessed valuation, followed by utilities, commercial and industrial, and residential uses. Primary net assessed value in the socioeconomic study area is projected to increase from about $205 million in 1987 to about $519 million by the year 2025 (table 6.5).

Commercial, industrial, and residential property values are projected to grow along with the economic expansion. The net assessed value of agricultural and vacant land is projected to decline during the projection period.

6.4.7 Property Tax Revenues

Schools in the area received about $8.2 million in revenue from property taxes based on the primary assessment. The county received about $5.6 million and towns and cities received about $0.9 million (table 6.4). Total property tax revenues are projected to more than double by 2025 (table 6.5). Tax collections based on the primary assessment are projected to increase from about $19.3 million to about $50 million. Tax revenues based on the secondary assessment are projected to increase from about $3.9 to about $9.8 million from 1987 to 2025.

6.4.8 Nonproperty Tax Revenues

County state-shared revenues, city state-shared revenues, and city sales tax collections are also projected to grow. County state-shared revenues are projected to increase from $2.5 to $6.2 million, city state-shared revenues are projected to increase from $8.4 to $24.9 million, and city sales tax collections are projected to increase from $4.1 to $13.4 million (calculated from table 6.5).

6.5 SOCIOECONOMIC AND FISCAL IMPACTS

6.5.1 Land Ownership

Land ownership in the Pinal AMA under baseline conditions is distributed as follows: BLM, 145,510 acres (8.3 percent); Indian, 495,130 acres (28.3 percent); state, 438,430 acres (25.0 percent); other public, 6,730 acres (0.4 percent); and private, 664,760 acres (38.0 percent). With the high transfer volume, the other public category would increase from 0.4 percent of the total area to 6.0 percent while the private category decreases to 32.4 percent from 38.0 percent. Table 6.6 shows the land ownership distribution and related changes under all three water transfer volumes.

6.5.2 Impacts on Gross Agricultural Output

Net irrigated acreage is 284,533 in the Pinal AMA, and it is estimated that 15 percent of the land is doubled cropped. The weighted gross returns per acre is $639.76 and the total gross output for baseline conditions is estimated to be $209.3 million, based upon 1984-86 average prices and 1984-86 average cropping patterns.

Table 6.7 summarizes the direct agricultural impacts. Water transfer volumes are based on 42,000 acre-feet coming from sources outside of this study area and result in 58,000-158,000-258,000 acre-feet for the low-medium-high water transfer volumes, respectively.

In the low-volume transfer, 304,979 acres would remain in production (284,533 less 19,333 multiplied by 1.15) resulting in an estimated gross output of $195.1 million. The loss of agricultural output for this low-volume transfer is estimated to be $14.2 million.

The medium-volume transfer retires 52,667 acres, leaving 266,645 acres in production. Total gross output is $170.6 million and the resulting loss is $38.7 million.

Eighty-six thousand acres are retired under the high-volume transfer with 228,312 acres remaining in production. The total gross output is $146.1 million and the loss is estimated to be $63.2 million.

6.5.3 Direct Agricultural Employment Impacts

The potential impacts of water transfers on agricultural employment are shown in table 6.7, along with the impacts on agricultural employees in the study area. Agricultural employment impacts would range from 200 to 886 jobs lost, or 7 to 30 percent of all agricultural employment, depending on the amount of agricultural land withdrawn from production.

6.5.4 Regional Socioeconomic Impacts

The regional socioeconomic impacts of a decline in agricultural activity result from the direct loss of agricultural jobs, the income generated by those jobs spent in the local economy, and the loss of direct business purchases in the local economy by the agricultural sector. Projections of the potential regional employment and population impacts of a decline in agricultural activity associated with the different transfer volumes were developed using estimates of the decline in agricultural employment and gross agricultural output as inputs to the PAS model. It was assumed that 33 percent of total farm output was spent on local purchases in the study area economy.

6.5.4.1 Employment Impacts. Projected employment impacts by economic sector are shown in table 6.8. By the year 2010, from 448 to 1,987 total jobs, or from 1.2 to 5.1 percent of all employment in the study area would be lost depending on the level of water transfers.

Employment impacts are lower in the year 2025. In 2025, the decline in employment ranges from 392 to 1,738 jobs, or from 0.7 to 3.0 percent, depending on the level of water transfers. The strength of the impact declines because agriculture is projected to have a less substantial role in the Pinal AMA economy by the year 2025.

6.5.4.2 Population by Age and School Enrollment Impacts. Projected regional population and school enrollment impacts are shown in table 6.9. In 2010, the potential impact of water transfers ranges from 1,040 to 4,605 people, or 0.9 to 3.8 percent of the population, depending on the level of water transfers. In 2025, the impact ranges from a decline of 907 to 4,019 people, depending on the water transfer volume. Impacts on school enrollment parallel those on population. In 2010, school enrollment impacts range from 296 to 1,311 students, or 1.1 to 4.8 percent of the baseline projection. In 2025, the impact ranges from 0.8 to 3.4 percent of the total school enrollment.

6.5.5 Direct Fiscal Impacts

Direct fiscal impacts are those that result from a decline in the amount of taxable agricultural land. In 1986, irrigated land in the Pinal study area had an average full cash value of approximately $310 per acre, and a limited cash value of approximately $270 per acre. The assessment ratio on agricultural land is 0.16. Thus, irrigated agricultural land would have an estimated secondary net assessed value of $49.60 per acre and an estimated primary net assessed value of $43.20 per acre. The potential direct impacts of water transfers in 2025 on primary and secondary assessed valuations in the study area are shown in tables 6.10 and 6.11.

6.5.5.1 Direct Net Assessed Value Impacts. The direct impact of water transfers on primary assessed valuation ranges from about $953,000 to about $4.2 million, or 0.5 to 2.1 percent of total assessed value, depending on the level of water transfers. The direct impact on secondary assessed valuation ranges from about $1.1 million to about $4.9 million. The relatively low impacts on assessed values of even the high volume transfer reflects the relatively limited contribution of irrigated agricultural acreage to total assessed values in this study area.

<u>6.5.5.2 Property Tax Revenue Impacts</u>. Direct property tax revenue impacts are those that come solely from the loss of taxable agricultural lands. Property in the study area is taxed at a cumulative rate of $8.71 per $100 of primary net assessed value. Local schools account for the largest proportion of the tax with a rate of $4.03 per $100 of assessed value followed by Pinal County, which taxes at a rate of $2.73 per $100 with the remainder distributed among the State of Arizona and Pinal Junior College. The direct primary and secondary property tax revenue impacts in 2025 by transfer volume are shown in tables 6.10 and 6.11.

Overall, the study area in 1986 generated a total of about $17.8 million in taxes based on the primary assessed valuation. Of this, schools collected about $8.2 million and Pinal County about $5.6 million. Impacts on tax revenues based on the primary valuation would range from $83,000 to $370,000 annually, depending on the amount of land retired.

Agricultural land in the study area is taxed at a cumulative rate of $1.62 per $100 of secondary net assessed value. Schools with a tax rate of $1.14 per $100 and Pinal with a rate of $0.41 per $100 account for most of the secondary property taxes levied. Tax revenue impacts based on the secondary valuation are shown in table 6.11.

In 1986, there were $3,568,000 in property tax revenues based on the secondary valuation. Schools collected approximately $2,511,000, or over 70 percent of the total.

Secondary property tax revenue impacts would range from $17,000 to $79,000, depending on the amount of agricultural land retired.

6.5.6 Indirect Fiscal Impacts

A decline in agricultural activity in the study area can also be expected to impact the growth of assessed values, and thus tax revenues, through its impact on regional socioeconomic activity. The potential indirect impacts of water transfers on the growth of primary and secondary net assessed values in the study area are shown in tables 6.12 and 6.13. For purposes of comparison the valuation of agricultural lands has been held constant at its 1987 level while increases in the valuation of commercial/industrial, residential, and other classes were projected as functions of changes in study area population and employment levels. The valuation of vacant land was decreased to account for growth of population employment in the area.

6.5.6.1 Indirect Net Assessed Value Impacts. The impact on future primary assessed value of the decline in residual economic activity would range from about $3.6 to about $13.7 million in the year 2010, and from about $3.2 to about $12.5 million in the year 2025. The impact on secondary assessed value would range from about $3.9 to about $14.7 million in the year 2010, and from about $3.4 to about $13.4 million in the year 2025. Once again, the impacts are lower in 2025 because of the lower level of significance that agriculture is projected to have in the study area's economy by this time period.

6.5.6.2 Indirect Property Tax Revenue Impacts. The projected indirect property tax revenue impacts of the decline in primary and secondary assessed values also are shown in tables 6.12 and 6.13. The tax rates characteristic of the area in 1987 are assumed to remain constant for each category throughout the projection horizon. In the baseline projection total tax revenues based on the primary valuation were projected to reach about $33.1 million by the year 2010, and about $46.5 million by the year 2025. Total tax revenues based on the secondary valuation were projected to reach about $12.9 million by the year 2010, and about $18.1 million by the year 2025.

Total primary property tax revenue impacts are projected to range from $322,000 to $1,225,000 in the year 2010, and from $274,000 to $1,096,000 in the year 2025. Total secondary property tax revenue impacts are projected to range from $126,000 to $477,000 in the year 2010, and from $112,000 to $435,000 in the year 2025. Impacts on property tax rates also are shown on tables 6.12 and 6.13.

6.5.7 Conclusions

Overall, the socioeconomic impacts of water transfers on the Pinal study area would be relatively modest. The economy of the Pinal study area is relatively diverse, and the amount of agricultural land to be retired under even the high volume transfer is relatively limited.

TABLE 6.1
Water Transfer Study
Water Budget
Pinal AMA

Description	1987	2010			2025		
Water Demand (1,000 AF)							
Water Transfer	0	23	63	103	58	158	258
Municipal & Industrial	13	23	23	23	25	25	25
Agricultural	1365	1239	1199	1159	1217	1117	1017
Total Demand	1378	1285	1285	1285	1300	1300	1300
Incidental Recharge (1,000 AF)							
Municipal & Industrial	7	12	12	12	12	12	12
Agricultural	205	151	147	142	122	112	102
Total Incidental Recharge	212	163	159	154	134	124	114
Water Supplies (1,000 AF)							
Surface Water	277	815	815	815	706	706	706
Groundwater	1101	470	470	470	594	594	594
Total Supplies	1378	1285	1285	1285	1300	1300	1300
Natural Recharge (1,000 AF)	26	26	26	26	26	26	26
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	889	281	285	290	434	444	454
Variables							
Irrigated Acreage (1,000)	303	316	302	289	319	286	253
Per Capita Muni Use (GPCD)	186		140			140	
Avg Crop Consump Use (ft/yr)	3.2		3.2			3.2	
Avg Irrigation Efficiency	70%		82%			85%	
Irrigation Recharge Factor	15%		12%			10%	
Municipal Recharge Factor	50%		50%			50%	
Industrial Recharge Factor	50%		50%			50%	
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)							
Gross Storage	80,300	73,800	73,800	73,700	68,400	68,300	68,100
Recoverable Storage	34,800	28,300	28,200	28,100	22,900	22,700	22,500

Data compiled by FRANZOY COREY

TABLE 6.2
Socioeconomic Profile
Pinal AMA

Economic Component	Study Area	Arizona
Population (1980)	48,460	2,718,215
Age 0 - 17 (%)	35.2	29.2
Age 18 - 64 (%)	55.7	59.5
Age 65+ (%)	9.1	11.3
Median age	26.7	29.2
School Enrollment (1980)	13,846	652,174
Median household income (1980)	$12,900	$16,448
Less than $5,000 (%)	18.8	12.1
$ 5,000 - $14,999 (%)	39.0	33.3
$15,000 - $29,999 (%)	32.8	36.4
$30,000 - $39,999 (%)	5.4	10.2
$40,000 + (%)	4.0	8.0
Civilian labor force (1980)	18,335	1,238,000
Unemployed (%)	8.6	6.7
Employment (1980)	16,725	1,113,270
Agriculture (%)	17.5	3.0
Construction (%)	5.3	8.3
Manufacturing (%)	10.0	14.8
Trade (%)	17.2	22.6
Services (%)	29.7	30.6
Government (%)	12.1	6.7
Other (%)	8.2	14.0
Land Ownership (000's of acres)	1,659	
Private (%)	38.2	
Indian (%)	25.5	
Public - State (%)	27.1	
Public - Other (%)	9.2	

Data compiled by Mountain West and Econotrend

TABLE 6.3
Baseline Socioeconomic Projections
Pinal AMA

	1987	2010	2025
Population	59,000	120,800	151,100
Age 0 - 17 (%)	31.7	30.9	28.9
Age 18 - 64 (%)	55.6	55.9	55.9
Age 65 + (%)	12.7	15.2	15.2
School Enrollment	14,200	27,200	34,000
Employment (no. of employees)	19,900	39,100	58,500
Agriculture (%)	14.8	6.0	3.5
Const. and Mfg. (%)	24.5	35.1	39.9
Trade (%)	20.0	17.7	17.3
Services (%)	20.8	26.9	27.5
Government (%)	11.4	7.6	6.1
Other (%)	8.5	6.7	5.7

Source: Mountain West Research

TABLE 6.4
Property Tax Profile (in 1986 dollars)
Pinal AMA

	Primary Assessment			Secondary Assessment		
	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)
Study area total	204,621	9.41	19,251	220,222	1.78	3,925
Legal classes						
1 Mines/Timber	1,750	9.41	165	1,750	1.78	31
2 Utilities	53,685	9.41	5,051	53,685	1.78	957
3 Commercial and industrial	47,122	9.41	4,433	50,212	1.78	895
4 Agricultural and vacant land	60,579	9.41	5,699	70,720	1.78	1,260
5 Residential	39,201	9.41	3,688	41,062	1.78	732
6 Rental residential	832	9.41	78	959	1.78	17
7 Railroads	1,446	9.41	136	1,827	1.78	33
8 Historic property	6	9.41	1	7	1.78	0
Jurisdictions						
State	204,621	0.38	778	220,220	0.00	0
County	204,621	2.73	5,591	220,220	0.41	905
Towns and Cities	88,993	1.02	912	94,695	0.07	66
Schools	204,621	4.03	8,243	220,220	1.14	2,515
Pinal Co. Jr. College	204,621	1.57	3,215	220,220	0.07	158
Special Districts	204,621	0.25	512	25,830	1.07	277

Data compiled by Mountain West

TABLE 6.5
Baseline Net Assessed Value and Tax Revenue Projections (in 1986 dollars)
Pinal AMA

	Primary			Secondary		
	1987	2010	2025	1987	2010	2025
Net Assessed Value ($000's)	204,621	369,568	518,924	220,222	389,761	543,569
Ag. and Vacant (%)	29.6	13.2	8.1	32.1	14.6	9.1
Comm. and Indus. (%)	23.0	29.3	32.7	22.8	29.6	33.2
Residential (%)	19.6	22.2	19.8	19.1	22.1	19.8
Other (%)	27.8	35.3	39.4	26.0	33.7	37.9
Cities and Towns Total (%)	43.5	60.6	65.2	43.0	59.0	64.3
Property Tax Revenue ($000's)	19,251	35,416	49,978	3,925	6,987	9,764
State (%)	4.0	4.0	3.9	0.0	0.0	0.0
Counties (%)	29.0	28.5	28.4	23.1	23.0	22.9
Cities and Towns (%)	4.7	6.4	6.9	1.7	2.3	2.5
Schools (%)	42.8	42.1	41.9	64.2	63.7	63.6
Comm. Colleges (%)	16.7	16.4	16.3	4.0	4.0	4.0
Special Districts (%)	2.8	2.6	2.6	7.0	7.0	7.0
	Local Government Revenues					
Key Nonproperty Tax Revenue ($000's)	15,018	32,803	44,470			
County State Shared (%)	16.3	13.5	14.0			
City State Shared (%)	56.1	59.3	55.9			
City Sales (%)	27.6	27.2	30.1			

Source: Mountain West Research

TABLE 6.6
Land Ownership Impacts
Pinal AMA

	1987 Baseline		2025 Water Transfer Volumes: Low 58,000 AF		Medium 158,000 AF		High 258,000 AF	
Category	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
BLM	145,510	8.3	145,510	8.3	145,510	8.3	145,510	8.3
Forest Service	0	-	0	-	0	-	0	-
Indian	495,130	28.3	495,130	28.3	495,130	28.3	495,130	28.3
State	438,430	25.0	438,430	25.0	438,430	25.0	438,430	25.0
Other Public	6,730	0.4	28,825	1.6	66,921	3.8	105,016	6.0
Private	664,760	38.0	642,665	36.7	604,569	34.5	566,474	32.4
TOTAL	1,750,560	100.0	1,750,560	100.0	1,750,560	100.0	1,750,560	100.0

Source: Econotrend

TABLE 6.7
Direct Impacts on Agricultural Lands, Output, and Employment
Pinal AMA

Variable	Baseline	2025 Water Transfer Volumes Low 58,000 AF	Medium 158,000 AF	High 258,000 AF
Loss of Net Irrigated Acres	0	19,333	52,667	86,000
Net Irrigated Acres	284,533	265,200	231,866	198,533
Loss of Gross Irrigated Acres	0	22,095	60,191	98,286
Gross Irrigated Acres	325,180	303,085	264,989	226,894
Loss of Cropped Acres	0	22,233	60,567	98,900
Acres of Crops in Production	327,212	304,979	266,645	228,312
Loss of Agricultural Output (in 1986 dollars)	0	$14,200,000	$38,700,000	$63,200,000
Agricultural Output (in 1986 dollars)	209,300,000	$195,100,000	$170,600,000	$146,100,000
Loss of Agricultural Employment	0	200	543	886
Agricultural Employment	2,934	2,734	2,391	2,048
Percent Direct Impact on Agricultural Output	0	6.8%	18.5	30.2

Source: Mountain West Research and Econotrend

TABLE 6.8
Employment Impacts
Pinal AMA

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010			23,000 AF			63,000 AF			103,000 AF	
Employment (no. of employees)	39,101	38,652	-449	-1.1	37,883	-1,218	-3.1	37,114	-1,987	-5.1
Agriculture	2,346	2,186	-160	-6.8	1,912	-434	-18.5	1,638	-708	-30.2
Const./Manuf.	13,685	13,602	-83	-0.1	13,459	-226	-1.7	13,316	-369	-2.7
Trade	6,921	6,853	-68	-1.0	6,737	-184	-2.7	6,621	-300	-4.3
Services	10,518	10,448	-70	-0.7	10,327	-191	-1.8	10,207	-311	-3.0
Government	2,972	2,933	-39	-1.3	2,867	-105	-3.5	2,801	-171	-5.8
Other	2,659	2,630	-29	-1.1	2,581	-78	-2.9	2,531	-128	-4.8
Water Transfer Volumes - 2025			58,000 AF			158,000 AF			258,000 AF	
Employment (no. of employees)	58,500	58,108	-392	-0.7	57,438	-1,062	-1.8	56,769	-1,738	-3.0
Agriculture	2,048	1,908	-140	-6.8	1,669	-379	-18.5	1,428	-620	-30.3
Const./Manuf.	23,400	23,327	-73	-0.3	23,203	-197	-0.8	23,078	-322	-1.4
Trade	10,120	10,061	-59	-0.6	9,960	-160	-1.6	9,858	-262	-2.6
Services	16,087	16,026	-61	-0.4	15,921	-166	-1.0	15,815	-272	-1.7
Government	3,569	3,535	-34	-1.0	3,477	-92	-2.6	3,418	-151	-4.2
Other	3,276	3,251	-25	-0.8	3,208	-68	-2.1	3,165	-111	-3.4

Source: Mountain West Research

TABLE 6.9
Population Impacts
Pinal AMA

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		23,000 AF			63,000 AF			103,000 AF		
Population	120,800	119,760	-1,040	-0.9	117,978	-2,822	-2.3	116,194	-4,606	-3.8
Age 0-17	36,119	35,729	-390	-1.1	35,061	-1,058	-2.9	34,392	-1,727	-4.8
Age 18-64	66,319	65,711	-608	-0.9	64,668	-1,651	-2.5	63,625	-2,694	-4.1
Age 65+	18,362	18,320	-42	-0.2	18,249	-113	-0.6	18,177	-185	-1.0
School Enrollment	27,200	26,904	-296	-1.1	26,396	-804	-3.0	25,889	-1,311	-4.8
Water Transfer Volumes - 2025		58,000 AF			158,000 AF			258,000 AF		
Population	151,100	150,193	-907	-0.6	148,637	-2,463	-1.6	147,081	-4,019	-2.7
Age 0-17	43,668	43,328	-340	-0.8	42,744	-924	-2.1	42,161	-1,507	-3.5
Age 18-64	84,465	83,934	-531	-0.6	83,024	-1,441	-1.7	82,114	-2,351	-2.8
Age 65+	22,967	22,931	-36	-0.2	22,869	-98	-0.4	22,806	-161	-0.7
School Enrollment	34,000	33,472	-258	-0.8	33,299	-701	-2.1	32,856	-1,144	-3.4

Source: Mountain West Research

TABLE 6.10
Direct Impacts on Primary Assessed Valuation and Property Tax Revenues (in 1986 dollars)
Pinal AMA

		2025 Water Transfer Volumes					
	Baseline	58,000 AF	Change	158,000 AF	Change	258,000 AF	Change
Primary Assessed Value ($000's)	204,621	203,668	-953	202,024	-2,597	200,380	-4,241
Property Tax Revenues ($000's)							
State	778	774	-4	768	-10	762	-16
County	5,586	5,560	-26	5,515	-71	5,470	-116
Schools	8,246	8,208	-38	8,141	-105	8,075	-171
Community College	3,213	3,198	-15	3,172	-41	3,146	-67
TOTAL	17,823	17,740	-83	17,596	-227	17,453	370

Source: Mountain West Research

TABLE 6.11
Direct Impacts on Secondary Assessed Value and Property Tax Revenues (in 1986 dollars)
Pinal AMA

		2025 Water Transfer Volumes					
	Baseline	58,000 AF	Change	158,000 AF	Change	258,000 AF	Change
Secondary Assessed Value ($000's)	220,220	219,124	-1,096	217,235	-2,985	215,345	-4,875
Property Tax Revenues ($000's)							
State	0	0	0	0	0	0	0
County	903	899	-4	891	-12	883	-20
Schools	2,511	2,499	-12	2,477	-34	2,455	-56
Community College	154	153	-1	152	-2	151	-3
TOTAL	3,568	3,551	-17	3,520	-48	3,489	-79

Source: Mountain West Research

TABLE 6.12
Primary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Pinal AMA

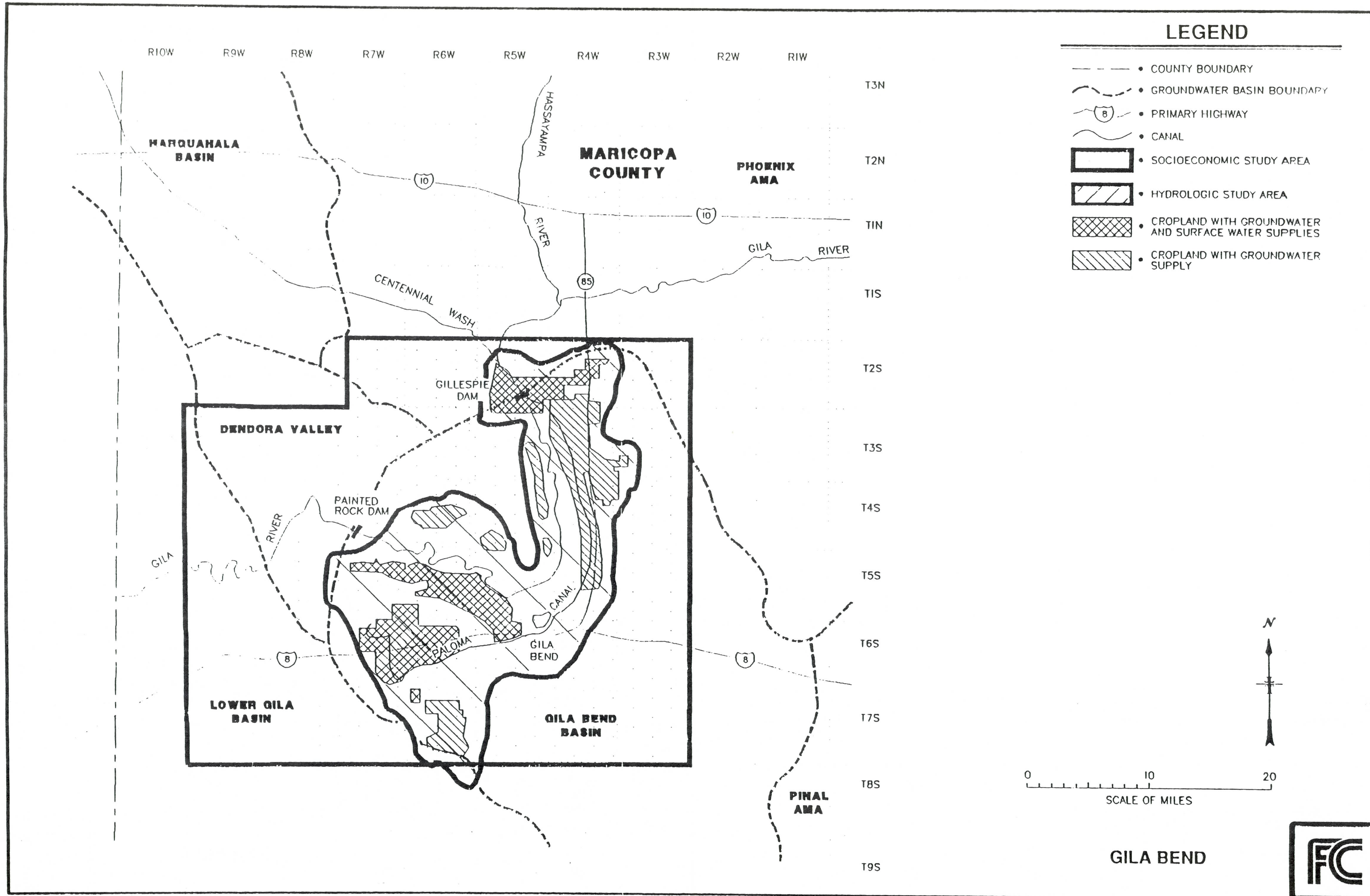
	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	23,000	63,000	103,000	Baseline	58,000	158,000	258,000
Primary Net Assessed ($000's)	369,937	-3,596	-8,508	-13,663	518,924	-3,195	-7,755	-12,460
Agricultural and Vacant	48,783	-953	-2,597	-4,241	42,033	-953	-2,597	-4,241
Commercial/Industrial	108,283	-879	-1,938	-3,086	169,688	-738	-1,691	-2,691
Residential	82,044	-703	-1,634	-2,611	102,747	-613	-1,426	-2,279
Railroad/Utilities/Other	130,827	-1,061	-2,339	-3,725	204,456	-891	-2,041	-3,249
Property Tax Revenue ($000's)	33,146	-322	-762	-1,225	46,496	-274	-665	-1,069
State	1,406	-14	-32	-52	1,972	-87	-212	-340
County	10,099	-98	-232	-373	14,167	-129	-312	-502
Schools	14,908	-145	-343	-551	20,913	-50	-122	-196
Community College	5,808	-56	-134	-215	8,147	-8	-19	-31
Special District	925	-9	-21	-34	1,297	0	0	0
Property Tax Rate	8.96	0.09	0.21	0.33	8.96	0.05	0.13	0.21
State	0.38	0.00	0.01	0.01	0.38	0.02	0.04	0.07
County	2.73	0.03	0.06	0.10	2.73	0.02	0.06	0.10
Schools	4.03	0.04	0.09	0.15	4.03	0.01	0.02	0.04
Community College	1.57	0.02	0.04	0.06	1.57	0.00	0.00	0.01
Special District	0.25	0.00	0.01	0.01	0.25	0.00	0.00	0.00

Source: Mountain West Research

TABLE 6.13
Secondary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Pinal AMA

	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	23,000	63,000	103,000	Baseline	58,000	158,000	258,000
Secondary Net Assessed ($000's)	398,637	-3,875	-9,168	-14,723	559,182	-3,443	-8,356	-13,427
Agricultural and Vacant	52,568	-1,027	-2,798	-4,570	45,294	-1,027	-2,798	-4,570
Commercial/Industrial	116,684	-947	-2,088	-3,325	182,852	-795	-1,822	-2,900
Residential	88,409	-758	-1,761	-2,813	110,718	-661	-1,536	-2,456
Railroad/Utilities/Other	140,977	-1,143	-2,521	-4,014	220,318	-960	-2,199	-3,501
Property Tax Revenue ($000's)	12,916	-126	-297	-477	18,117	-112	-271	-435
State	0	0	0	0	0	0	0	0
County	1,634	-16	-38	-60	2,293	-14	-34	-55
Schools	4,544	-44	-105	-168	6,375	-39	-95	-153
Community College	279	-3	-6	-10	391	-2	-6	-9
Special District	6,458	-63	-149	-239	9,059	-56	-135	-218
Property Tax Rate	1.62	0.02	0.04	0.06	1.18	0.01	0.02	0.03
State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
County	0.41	0.00	0.01	0.02	0.22	0.00	0.00	0.01
Schools	1.14	0.01	0.03	0.04	0.88	0.01	0.01	0.02
Community College	0.07	0.00	0.00	0.00	0.08	0.00	0.00	0.00
Special District	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Mountain West Research



B34003.00/81287

FIGURE 7.1

CHAPTER 7

GILA BEND

7.1 GENERAL DESCRIPTION

The Gila Bend study area (figure 7.1) is in central-southwest Arizona. High terrain is limited to the Gila Bend Mountains and the Sand Tank Mountains. Annual precipitation averages 5.5 inches. Winter temperatures range from the low 40s to the high 60s or low 70s. Summer temperatures range from the high 60s to above 110 degrees.

7.2 CURRENT HYDROLOGIC PROFILES

The hydrologic study area is concentrated along the Gila River floodplain and contains the largely agricultural towns of Gila Bend, Cotton Center, and Theba. The Gila River basin is a wide desert plain in the Basin and Range Lowlands Water Province. The Gila River enters the area at Gillespie Dam, flows south, and then flows west to the basin outlet at Painted Rock Dam.

7.2.1 Area Groundwater

The main source of groundwater is alluvial deposits consisting primarily of unconsolidated to moderately consolidated clay, silt, sand, and gravel. This unit is more than 2,000 feet thick in the central part of the basin. Near Theba, upper and lower water-bearing units are separated by a fine-grained unit that ranges in thickness from a few feet to about 900 feet. In most places, the water in the main water-bearing unit occurs under unconfined conditions. Near Theba, the middle fine-grained unit causes general confined conditions in the lower water-bearing units. Apparent perched water conditions occur northwest of Gila Bend because of local fine-grained interbeds within the main water-bearing unit. Depths to groundwater range from about 20 feet to more than 500 feet. Most wells in the hydrologic study area are capable of producing 1,000 gal/min or more.

7.2.2 Water Level Declines

In the period 1952-64, the area from Gila Bend to Gillespie Dam showed declines of about 20 to 80 feet, while the area around Theba showed levels unchanged to an increase of 20 feet. In the period 1966-73, the area downstream of Gillespie Dam showed increases of up to 60 feet, and around Gila Bend and Theba declines of 10 to 20 feet. In the period 1973-79, the area upstream of Gila Bend showed increases ranging up to 60 feet, with the area east and south of Gila Bend and around Theba showing declines of up to about 15 feet and increases of about 20 feet, respectively. Any change in water levels in the hydrologic study area is very responsive to wet-and-dry cycles and availability of Gila River surface water.

7.2.3 Water Quality

The specific conductance values occurring in the Gila River floodplain, extending from Gillespie Dam to west of Gila Bend and Theba, ranged from about 1,800-8,200 micromhos/cm. High values of specific conductance (to 8,500 micromhos/cm) occurring east and north of Theba probably represent water from the perched zone. Fluoride concentrations in the hydrologic study area generally exceed the maximum contaminant level of 1.4 mg/L, ranging from 0.5 mg/L at Cotton Center to values over 6.0 mg/L near Gila Bend and northwest of Theba. Generally, the values ranged from 1.5-6.2 mg/L, averaging about 4.0 mg/L.

7.2.4 Groundwater Storage

Estimated groundwater in storage to a depth of 1,200 feet in the entire Gila Bend Basin was about 60 million acre-feet in 1975 (Arizona Water Commission). Estimated groundwater in storage to a depth of 1,000 feet in an area including the Gila River floodplain, Gila Bend, Theba, and Citrus Valley was about 22 million acre-feet in 1964 (Bureau of Reclamation, 1976).

7.2.5 Surface Water Resources

The Gila River at Gillespie Dam flows nearly year-round. Source waters for the Gila River at Gillespie Dam are irrigation return flows and effluent. The Gila River below Gillespie is ephemeral. Also located within the hydrologic study area is Painted Rock Dam. Painted Rock Dam, operated by the U.S. Corps of Engineers, is a large flood control reservoir with about 2.5 million acre-feet of storage. The dam controls a 50,910 square mile drainage area.

7.2.6 Irrigation Districts

There are no irrigation districts within the Gila Bend area.

7.3 HYDROLOGIC IMPACTS

Table 7.1 illustrates the water budgets for the Gila Bend study area. The water transfers are reduced by 72,000 acre-feet, or a proportion thereof, to reflect transfers from other study areas.

The baseline (1987) conditions indicate a total demand of 183,000 acre-feet, of which about 160,000 acre-feet is supplied by groundwater. The remaining demand is satisfied by surface water diversions from the Gila River into the Gila and Enterprise Canal systems. Overdraft is estimated at about 43,000 acre-feet. Water level declines within the last several decades are indicative of an overdraft condition.

By the year 2010 as water transfers are implemented, the impacts are indicated to be nominal. At a maximum rate of transfer, overdraft increases to about 70,000 acre-feet. This increased rate of overdraft, spread throughout the study area, would intensify water level declines in local areas. In the year 2025, at the medium and high rates of transfer, the overdraft increases significantly to a maximum rate in excess of 150,000 acre-feet. At this rate of overdraft water level declines would be prevalent throughout the study area in the range of about 7-8 ft/yr. There would be no degradation of water quality and there would be no evidence of land subsidence until aggregate water level declines total more than 100 feet. The Theba area, overlying fine-grained materials within the groundwater reservoir, may have more potential for land subsidence and earth fissures.

In the year 2025 there would be an adequate water supply because of the large volume of recoverable groundwater in storage, about 27 million acre-feet.

7.4 SOCIOECONOMIC AND FISCAL PROFILES

The socioeconomic study area is comprised of the Town of Gila Bend and the remainder of the Gila Bend census division. Six school districts levy taxes in the area.

7.4.1 Population and School Enrollment

There were 4,884 persons living in the area according to the 1980 census (table 7.2). The population was relatively young with a median age of 24.2 years old. About 1,200 children (nearly 70 percent of the area population under the age of 18) were enrolled in school in 1980. Growth in the socioeconomic study area is projected to be moderate during the projection period (table 7.3). The population is projected to grow at an annual compound rate of 1.5 percent per year increasing from about 5,000 persons in 1987 to 8,800 by 2025. School enrollment is projected to grow from 1,100 students in 1987 to 1,900 by 2025.

7.4.2 Household Income

Income in the socioeconomic study area is relatively low. The median household income in 1980 was $13,100, as compared to $16,448 for Arizona.

7.4.3 Labor Force

Unemployment in the socioeconomic study area is about average for the state. According to the 1980 census, about 6.0 percent of the 1,763 residents in the civilian labor force were unemployed (in September 1987, the unemployment rate was 5.2 percent).

7.4.4 Employment

Agriculture is the principal economic activity in the socioeconomic study area. The Gila Bend area is the second largest producer of cattle in Arizona. Area employment by economic sector in 1980 was 26.3 percent in agriculture, about 15.0 percent in trade, and 21.7 percent in services. Directly south of Gila Bend is the Gila Bend Air Force

Auxiliary Range which employs about 225 military and 108 civilian personnel. The economy of the socioeconomic study area is projected to expand slightly with employment declines in agriculture offset by moderate growth in the construction, manufacturing, trade, and service sectors. Overall, employment is projected to grow from 1,600 jobs in 1987 to 3,000 by the year 2025 (table 7.3).

7.4.5 Land Ownership

The study area encompasses about 919,520 acres, most of which is public land. About 73 percent of the land is "other public" land, primarily managed by the U.S. Bureau of Land Management. Private land represented about 16 percent of all study area land.

7.4.6 Property Tax Base

Agricultural lands were the second largest source of property tax revenue in the socioeconomic study area (table 7.4). The 1986 primary net assessed value totaled about $37.7 million. Property was taxed at a rate of $6.21 per $100 of the primary assessment and generated approximately $2.3 million in revenue. The secondary net assessed value totaled about $40.7 million which was taxed at a rate of $1.19 per $100 of the secondary assessment. Tax revenues generated about $0.5 million. Utilities account for $14.3 million and agriculture $13.1 million in primary net assessed value. Primary net assessed value in the socioeconomic study area is projected to increase from approximately $37.7 million in 1987 to about $65 million by the year 2025 (table 7.5). The assessed value of agricultural and vacant land is projected to decline. Residential, commercial, and industrial property are projected to increase moderately during the projection period.

7.4.7 Property Tax Revenues

Schools in the area received about $1.2 million in tax revenues based on the 1986 primary assessments. Total property tax revenues for the socioeconomic study area are projected to increase from about $2.3 million in 1987 to about $4.2 million by the year 2025. Table 7.5 shows these projections as percentages of revenue.

7.4.8 Nonproperty Tax Revenues

County state-shared revenues, city state-shared revenues, and city sales tax collections are also projected to increase modestly. County state-shared revenues are projected to increase from about $0.5 million to about $0.8 million, city state-shared revenues are projected to increase from about $0.7 million to about $1.4 million, and city sales tax collections are projected to increase from about $0.3 million to about $0.7 million, as calculated from table 7.5.

7.5 SOCIOECONOMIC AND FISCAL IMPACTS

7.5.1 Land Ownership

Land ownership in Gila Bend under baseline conditions is distributed as follows: BLM, 515,590 acres (56.1 percent); Indian, 5,940 acres (0.6 percent); state, 92,910 acres (10.1 percent); other public, 158,720 acres (17.3 percent); and private, 146,360 acres (15.9 percent). Under the high volume transfer in 2025, the other public category would increase from 17.3 percent of the total area to 22.2 percent while the private category decreases to 11.0 percent from 15.9 percent. Table 7.6 shows the land ownership distribution and related changes with all three water transfer volumes.

7.5.2 Impacts on Gross Agricultural Output

It is estimated that 39,830 net irrigated acres are in this area and that 15 percent of the land is double cropped. A farm-gate demand of 4.5 acre-feet per acre has been computed based upon the cropping pattern. The weighted gross returns per acre are $703.25 and the estimated total gross output for baseline conditions is $32.2 million based upon 1984-86 average prices and 1984-86 average cropping patterns.

As table 7.7 indicates the low volume transfer would leave 38,650 acres in production with a gross agricultural output of about $27.2 million. The resulting impact of this scenario is a $5.0 million reduction in output.

Under the medium volume transfer, 13,094 acres would remain in production and yield a gross output of $9.2 million. An estimated $23.0 million of impacts are associated with the medium volume transfer.

No acreage would remain in production under the high volume transfer and the impacts equal the baseline gross output of $32.2 million.

7.5.3 Direct Agricultural Employment Impacts

The potential impacts of water transfers on agricultural employment also are shown in table 7.7. Agricultural employment impacts would range from 59 to 380 jobs lost, or about 16 to 100 percent of all agricultural employment, depending on the amount of agricultural land withdrawn from production.

7.5.4 Regional Socioeconomic Impacts

The regional socioeconomic impacts of a decline in agricultural activity result from the direct loss of agricultural jobs, the income generated by those jobs spent in the local economy, as well as the loss of direct business purchases in the local economy by the agricultural sector. Projections of the potential regional employment and population impacts of a decline in agricultural activity associated with the different scenarios were developed using estimates of the decline in agricultural employment and gross agricultural output as inputs to the PAS model. It was assumed that 33 percent of total farm output was spent on local purchases in the study area economy.

7.5.4.1 Employment Impacts. Projected employment impacts by economic sector are shown in table 7.8. By the year 2010, from 101 to 647 total jobs, or 4.4 to 28.1 percent of all employment in the study area, would be lost depending on the level of water transfers.

Employment impacts are lower in the year 2025. In 2025, the decline in employment ranges from 86 to 547 jobs, or 2.8 to 18.1 percent, depending on the level of water transfers. The strength of the impact declines because agriculture is projected to have a less substantial role in the Gila Bend economy by the year 2025.

7.5.4.2 Population by Age and School Enrollment Impacts. Projected regional population and school enrollment impacts are shown in table 7.9. In 2010, the potential impact of water transfers ranges from 260 to 1,675 people, or 3.7 to 23.9 percent of the population, depending on the level of water transfers. In 2025, the impact ranges from a decline of 220 to 1,419 people. Impacts on school enrollment parallel those on population. In 2010, school enrollment impacts range from 69 to 443 students, or 4.6 to 29.5 percent of the baseline projection. In 2025, the impact ranges from 3.1 to 19.9 percent of the total school enrollment.

7.5.5 Direct Fiscal Impacts

Direct fiscal impacts are those that result from a decline in the amount of taxable agricultural land. In 1986, irrigated land in the Gila Bend study area had an average full cash value of approximately $330 per acre, and a limited cash value of approximately $306 per acre. The assessment ratio on agricultural land is 0.16. Thus, irrigated agricultural land would have an estimated secondary net assessed value of $52.80 per acre and an estimated primary net assessed value of $49.00 per acre. The potential direct impacts of water transfers in 2025 on primary and secondary assessed valuations in the study area are shown in tables 7.10 and 7.11.

7.5.5.1 Direct Net Assessed Value Impacts. The direct impact of water transfers on primary assessed valuation ranges from about $490,000 to $2.2 million, or 0.9 to 5.9 percent of total assessed value, depending on the level of water transfers. The impact on secondary assessed valuation ranges from about $375,000 to $2.4 million, depending on the level of water transfers. The relatively low impact on assessed value of even the high volume transfer reflects the relatively limited contribution of irrigated agricultural acreage to total assessed value in this study area.

7.5.5.2 Property Tax Revenue Impacts. Direct property tax revenue impacts are those that come solely from the loss of taxable agricultural lands. Property in the study area is taxed at a cumulative rate of $6.05 per $100 of primary net assessed value. Local schools account for the largest proportion of the tax with a rate of $3.06 per $100 of assessed value followed by Maricopa County, which taxes at a rate of $1.45 per $100 with the remainder distributed among the State of Arizona, special districts, and community colleges. The direct primary property tax revenues impacts by level of water transfer in 2025 for the Gila Bend study area are shown in table 7.10.

Overall, the study area in 1986 generated a total of about $2.3 million in taxes based on the primary assessed valuation. Of this, schools collect about $1.2 million and Maricopa County about $0.5 million. Impacts on tax revenues based on the primary valuation would range from $21,000 to $133,000 annually, depending on the amount of land retired.

Agricultural land in the study area is taxed at a cumulative rate of $2.04 per $100 of secondary net assessed value. Schools with a tax rate of $.88 per $100 and special districts with a rate of $0.86 per $100 account for most of the secondary property taxes levied. Tax revenue impacts based on the secondary valuation in 2025 are shown in table 7.11.

In 1986, there were $830,000 in property tax revenues based on the secondary valuation. Schools collected approximately $358,000, or slightly under half the total, while special districts collected approximately $350,000 from the study area. Secondary property tax revenue impacts would range from $7,000 to $49,000, depending on the amount of agricultural land retired.

7.5.6 Indirect Fiscal Impacts

A decline in agricultural activity in the study area can also be expected to impact the growth of assessed value, and thus tax revenues, through its impacts on regional socioeconomic activity. The potential indirect impacts of water transfers on the growth of primary and secondary net assessed values in the study area are shown in tables 7.12 and 7.13. For purposes of comparison the valuation of agricultural lands has been held constant at its 1987 level while increases in the valuation of commercial/industrial, residential, and railroad/utility classes were projected as functions of changes in study area population and employment levels. The valuation of vacant land was decreased to account for growth of population employment in the area.

7.5.6.1 Indirect Net Assessed Value Impacts. The impact on future primary assessed value of the decline in residual economic activity would range from about $1.5 to about $9.0 million in the year 2010, and from about $1.4 to about $7.9 million in the year 2025. The impact on secondary assessed value would range from about $1.6 to about $9.7 million in the year 2010, and from about $1.5 to about $8.5 million in the year 2025. Once again, the impacts are lower in 2025 because of the lower level of significance that agriculture is projected to have in the study area's economy by this time period.

7.5.6.2 Indirect Property Tax Revenue Impacts. The projected indirect primary and secondary property tax revenue impacts of the decline in assessed values also are shown in tables 7.12 and 7.13. The tax rates characteristic of the area in 1987 are assumed to remain constant for each category throughout the projection horizon. In the baseline projection total tax revenues based on the primary valuation were projected to reach about $3.1 million by the year 2010, and about $3.9 million by the year 2025. Total tax revenues based on the secondary evaluation were projected to reach about $1.8 million in the year 2010 and about $2.3 million in the year 2025.

Total primary property tax revenue impacts are projected to range from $93,000 to $542,000 in the year 2010, and from $83,000 to $480,000 in the year 2025. Secondary property tax revenues are projected to range from $53,000 to $311,000 in the year 2010, and from $48,000 to $275,000 in the year 2025. Impacts on property tax rates also are shown on table 7.12 and 7.13.

7.5.7 Conclusions

The Gila Bend study area currently is a predominantly agricultural-based economy. In addition, the levels of water transfer and the amount of irrigated land needed to support those transfers considered in this study are very high relative to the amount of available water and land in the study area. As a consequence, the socioeconomic and fiscal impacts of water transfers can be expected to range from moderate at low levels to very substantial at high levels of water transfer. For example, at high levels of water transfer, the employment and population impacts in 2010 would approach or exceed 25 percent of existing levels while the impact on assessed valuation would exceed 18 percent. Thus, overall, high levels of water transfer can be expected to produce substantial impacts in the Gila Bend study area.

TABLE 7.1
Water Transfer Study
Water Budget
Gila Bend

Description	1987	2010			2025		
Water Demand (1,000 AF)							
Water Transfer	0	11	51	91	28	128	228
Municipal & Industrial	1	1	1	1	1	1	1
Agricultural	182	159	127	88	151	51	0
Total Demand	183	171	179	180	180	180	228
Incidental Recharge (1,000 AF)							
Municipal & Industrial	0	0	0	0	0	0	0
Agricultural	36	32	25	18	30	10	0
Conveyance Seepage	30	25	26	20	23	8	0
Total Incidental Recharge	66	57	51	38	53	18	0
Water Supplies (1,000 AF)							
Surface Water	23	23	23	23	23	23	23
Groundwater	160	148	156	157	157	157	205
Total Supplies	183	171	179	180	180	180	228
Natural Recharge (1,000 AF)	51	51	51	51	51	51	51
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	43	40	54	68	53	88	154
Variables							
Irrigated Acreage (1,000)	40	37	30	21	35	12	0
Per Capita Muni Use (GPCD)	150		150			150	
Avg Crop Consump Use (ft/yr)	3.2		3.2			3.2	
Avg Irrigation Efficiency	70%		75%			75%	
Irrigation Recharge Factor	20%		20%			20%	
Municipal Recharge Factor	50%		50%			50%	
Industrial Recharge Factor	50%		50%			50%	
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)							
Gross Storage	59,500	58,500	58,400	58,300	57,800	57,400	56,700
Recoverable Storage	29,500	28,500	28,400	28,300	27,800	27,400	26,700

Data compiled by FRANZOY COREY

TABLE 7.2
Socioeconomic Profile
Gila Bend

Economic Component	Study Area	Arizona
Population (1980)	4,884	2,718,215
Age 0 - 17 (%)	35.0	29.2
Age 18 - 64 (%)	59.0	59.5
Age 65+ (%)	6.0	11.3
Median age	24.2	29.2
School Enrollment (1980)	1,200	652,174
Median household income (1980)	$13,100	$16,448
Less than $5,000 (%)	16.3	12.1
$ 5,000 - $14,999 (%)	40.9	33.3
$15,000 - $29,999 (%)	28.8	36.4
$30,000 - $39,999 (%)	7.6	10.2
$40,000 + (%)	6.4	8.0
Civilian labor force (1980)	1,763	1,238,000
Unemployed (%)	6.0	6.7
Employment (1980)	1,657	1,113,270
Agriculture (%)	26.3	3.0
Construction (%)	10.4	8.3
Manufacturing (%)	10.6	14.8
Trade (%)	15.0	22.6
Services (%)	21.7	30.6
Government (%)	11.0	6.7
Other (%)	5.0	14.0
Land Ownership (000's of acres)	919	
Private (%)	15.9	
Indian (%)	0.6	
Public - State (%)	10.1	
Public - Other (%)	73.4	

Data compiled by Mountain West and Econotrend

TABLE 7.3
Baseline Socioeconomic Projections
Gila Bend

	1987	2010	2025
Population	5,000	7,000	8,800
Age 0 - 17 (%)	32.2	30.4	30.4
Age 18 - 64 (%)	54.1	52.1	52.1
Age 65 + (%)	13.7	17.5	17.5
School Enrollment	1,100	1,500	1,900
Employment (no. of employees)	1,600	2,300	3,000
Agriculture (%)	23.8	12.7	8.2
Const. and Mfg. (%)	20.4	21.1	20.3
Trade (%)	18.0	22.1	23.7
Services (%)	20.4	26.7	30.8
Government (%)	11.8	11.1	10.1
Other (%)	5.6	6.3	6.9

Source: Mountain West Research

TABLE 7.4
Property Tax Profile (in 1986 dollars)
Gila Bend

	Primary Assessment			Secondary Assessment		
	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)
Study area total	37,730	6.21	2,341	40,656	1.19	483
Legal classes						
1 Mines/timber	0	6.21	0	0	1.19	0
2 Utilities	14,271	6.21	886	14,271	1.19	170
3 Commercial and industrial	5,726	6.21	355	6,034	1.19	72
4 Agricultural and vacant land	13,102	6.21	813	15,077	1.19	178
5 Residential	2,424	6.21	150	2,675	1.19	32
6 Rental residential	1,572	6.21	98	1,749	1.19	21
7 Railroads	635	6.21	39	850	1.19	10
Jurisdictions						
State	37,729	0.38	143	40,656	0.00	0
Counties	37,729	1.45	547	40,656	0.22	89
Towns and Cities	5,085	1.15	58	5,479	0.00	0
Schools	37,729	3.06	1,155	40,656	0.88	359
Community Colleges	37,729	0.66	249	40,656	0.08	33
Special Districts	37,729	0.50	189	272	0.86	2

Data compiled by Mountain West

TABLE 7.5
Baseline Net Assessed Value and Tax Revenue Projections (in 1986 dollars)
Gila Bend

	Primary			Secondary		
	1987	2010	2025	1987	2010	2025
Net Assessed Value ($000's)	37,730	50,841	64,977	40,656	53,851	68,275
Ag. and Vacant (%)	34.7	19.9	13.2	37.1	21.7	14.5
Comm. and Indus. (%)	15.2	19.2	21.1	14.8	19.1	21.2
Residential (%)	10.6	10.8	10.8	10.9	11.3	11.3
Other (%)	39.5	50.1	54.9	37.2	47.9	53.0
Cities and Towns Total (%)	13.5	30.7	39.9	13.5	29.8	39.2
Property Tax Revenue ($000's)	2,341	3,257	4,230	483	638	809
State (%)	6.1	5.9	5.8	0.0	0.0	0.0
Counties (%)	23.3	22.7	22.3	18.6	18.6	18.5
Cities and Towns (%)	2.5	5.5	7.1	0.0	0.0	0.0
Schools (%)	49.3	47.8	47.0	74.5	74.6	74.7
Community Colleges (%)	10.7	10.3	10.1	6.9	6.8	6.8
Special Districts (%)	8.1	7.8	7.7	0.0	0.0	0.0
	Local Government Revenues					
Key Nonproperty Tax Revenue ($000's)	1,437	2,151	2,882			
County State Shared (%)	31.5	28.4	27.1			
City State Shared (%)	50.1	49.0	48.3			
City Sales (%)	18.4	22.6	24.6			

Source: Mountain West Research

TABLE 7.6
Land Ownership Impacts
Gila Bend

	1987 Baseline		2025 Water Transfer Volumes: Low 28,000 AF		2025 Water Transfer Volumes: Medium 128,000 AF		2025 Water Transfer Volumes: High 228,000 AF	
Category	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
BLM	515,590	56.1	515,590	56.1	515,590	56.1	515,590	56.1
Forest Service	0	-	0	-	0	-	0	-
Indian	5,940	0.6	5,940	0.6	5,940	0.6	5,940	0.6
State	92,910	10.1	92,910	10.1	92,910	10.1	92,910	10.1
Other Public	158,720	17.3	165,831	18.1	191,227	20.8	204,240	22.2
Private	146,360	15.9	139,249	15.1	113,853	12.4	100,840	11.0
TOTAL	919,520	100.0	919,520	100.0	919,520	100.0	919,520	100.0

Source: Econotrend

TABLE 7.7
Direct Impacts on Agricultural Lands, Output, and Employment
Gila Bend

		2025 Water Transfer Volumes		
Variable	Baseline	Low 28,000 AF	Medium 128,000 AF	High 228,000 AF
Loss of Net Irrigated Acres	0	6,222	28,444	39,830
Net Irrigated Acres	39,830	33,608	11,386	0
Loss of Gross Irrigated Acres	0	7,111	32,507	45,520
Gross Irrigated Acres	45,520	38,409	13,013	0
Loss of Cropped Acres	0	7,155	32,711	45,805
Acres of Crops in Production	45,805	38,650	13,094	0
Loss of Agricultural Output (in 1986 dollars)	0	5,030,000	23,000,000	32,200,000
Agricultural Output (in 1986 dollars)	32,200,000	27,200,000	9,200,000	0
Loss of Agricultural Employment	0	59	271	380
Agricultural Employment	380	321	109	0
Percent Direct Impact on Agricultural Output	0	-15.6%	-71.4%	-100.0%

Source: Mountain West Research and Econotrend

TABLE 7.8
Employment Impacts
Gila Bend

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010		11,000 AF			51,000 AF			91,000 AF		
Employment (no. of employees)	2,306	2,205	-101	-4.4	1,844	-462	-20.0	1,659	-647	-28.1
Agriculture	294	248	-46	-15.6	84	-210	-71.4	0	-294	-100.0
Const./Manuf.	487	477	-10	-2.1	440	-47	-9.7	421	-66	-13.6
Trade	509	501	-8	-1.6	473	-36	-7.1	459	-50	-9.8
Services	616	605	-11	-1.8	565	-51	-8.3	544	-72	-11.7
Government	255	246	-9	-3.5	214	-41	-16.1	198	-57	-22.4
Other	145	128	-17	-11.7	68	-77	-53.1	37	-108	-74.5
Water Transfer Volumes - 2025		28,000 AF			128,000 AF			228,000 AF		
Employment (no. of employees)	3,019	2,933	-86	-2.8	2,628	-391	-13.0	2,472	-547	-18.1
Agriculture	249	210	-39	-15.7	71	-178	-71.5	0	-249	-100.0
Const./Manuf.	615	606	-9	-1.5	575	-40	-6.5	559	-56	-9.1
Trade	714	707	-7	-1.0	684	-30	-4.2	672	-42	-5.9
Services	928	919	-9	-1.0	885	-43	-4.6	867	-61	-6.6
Government	304	296	-8	-2.6	269	-35	-11.5	256	-48	-15.8
Other	209	195	-14	-6.7	144	-65	-31.1	118	-91	-43.5

Source: Mountain West Research

TABLE 7.9
Population Impacts
Gila Bend

	Baseline		Change	%Change		Change	%Change		Change	%Change
Water Transfer Volumes - 2010			11,000 AF			51,000 AF			91,000 AF	
Population	7,000	6,740	-260	-3.7	5,805	-1,195	-17.1	5,325	-1,675	-23.9
Age 0-17	2,128	2,030	-98	-4.6	1,680	-448	-21.1	1,500	-628	-29.5
Age 18-64	3,647	3,495	-152	-4.2	2,948	-699	-19.2	2,667	-980	-26.9
Age 65+	1,225	1,215	-10	-0.8	1,177	-48	-3.9	1,158	-67	-5.5
School Enrollment	1,500	1,431	-69	-4.6	1,184	-316	-21.1	1,057	-443	-29.5
Water Transfer Volumes - 2025			28,000 AF			128,000 AF			228,000 AF	
Population	8,800	8,580	-220	-2.5	7,789	-1,011	-11.5	7,381	-1,419	-16.1
Age 0-17	2,675	2,593	-82	-3.1	2,296	-379	-14.2	2,143	-532	-19.9
Age 18-64	4,585	4,456	-129	-2.8	3,993	-592	-12.9	3,755	-830	-18.1
Age 65+	1,540	1,531	-9	-0.6	1,500	-40	-2.6	1,483	-57	-3.7
School Enrollment	1,900	1,841	-59	-3.1	1,630	-270	-14.2	1,522	-378	-19.9

Source: Mountain West Research

TABLE 7.10
Direct Impacts on Primary Assessed Valuation and Property Tax Revenues (in 1986 dollars)
Gila Bend

		2025 Water Transfer Volumes					
	Baseline	28,000 AF	Change	128,000 AF	Change	228,000 AF	Change
Primary Assessed Value ($000's)	37,730	37,239	-489	36,136	-1,592	35,499	-2,229
Property Tax Revenues ($000's)							
State	143	142	-1	137	-6	135	-8
County	547	542	-5	524	-23	515	-32
Schools	1,155	1,144	-11	1,106	-49	1,087	-68
Community College	249	247	-2	238	-11	235	-14
Special Districts	189	187	-2	181	-8	178	-11
TOTAL	2,283	2,262	-21	2,186	-97	2,150	-133

Source: Mountain West Research

TABLE 7.11
Direct Impacts on Secondary Assessed Valuation and Property Tax Revenues (in 1986 dollars)
Gila Bend

	Baseline	2025 Water Transfer Volumes: 28,000 AF	Change	128,000 AF	Change	228,000 AF	Change
Secondary Assessed Value ($000's)	40,656	40,281	-375	38,940	-1,716	38,253	-2,403
Property Tax Revenues ($000's)							
State	0	0	0	0	0	0	0
County	89	88	-1	85	-4	84	-5
Schools	359	355	-3	343	-15	337	-21
Community College	33	33	0	32	-1	31	-2
Special Districts	350	347	-3	335	-15	329	-21
TOTAL	830	823	-7	795	-35	-781	-49

Source: Mountain West Research

TABLE 7.12
Primary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Gila Bend

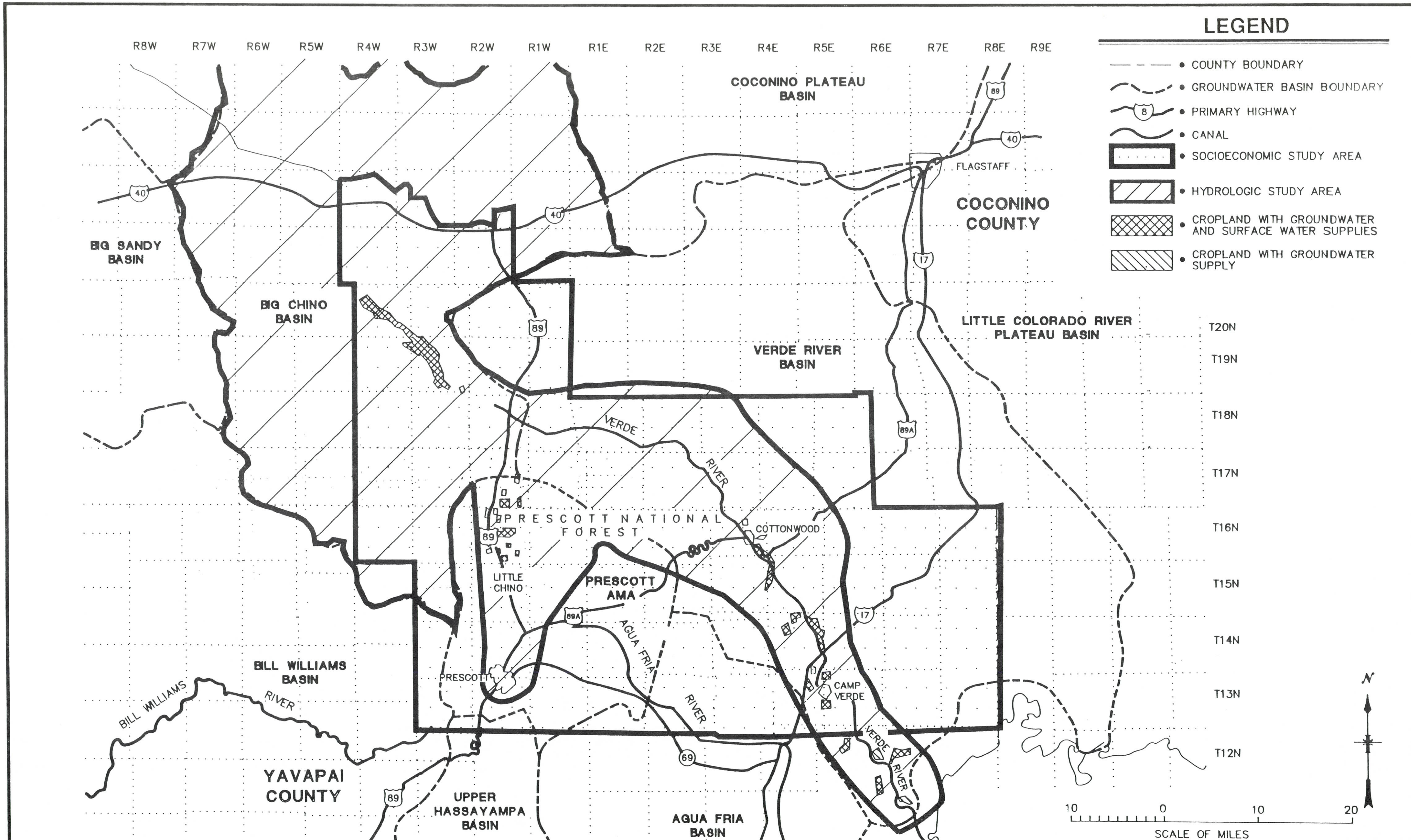
	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	11,000	51,000	91,000	Baseline	28,000	128,000	228,000
Primary Net Assessed ($000's)	50,841	-1,530	-6,387	-8,958	64,977	-1,374	-5,658	-7,928
Agricultural and Vacant	10,117	-490	-1,593	-2,230	8,577	-490	-1,593	-2,230
Commercial/Industrial	9,812	-278	-1,282	-1,799	13,710	-236	-1,087	-1,524
Residential	5,491	-206	-948	-1,330	7,018	-175	-803	-1,126
Railroad/Utilities/Other	25,421	-556	-2,564	-3,599	35,672	-473	-2,175	-3,048
Property Tax Revenue ($000's)	3,076	-93	-386	-542	3,931	-83	-342	-480
State	193	-6	-24	-34	247	-5	-22	-30
County	737	-22	-93	-130	942	-20	-82	-115
Schools	1,556	-47	-195	-274	1,988	-42	-173	-243
Community College	336	-10	-42	-59	429	-9	-37	-52
Special Districts	254	-8	-32	-45	325	-7	-28	-40
Property Tax Rate	6.05	0.18	0.76	1.07	6.05	0.13	0.53	0.74
State	0.38	0.01	0.05	0.07	0.38	0.01	0.03	0.05
County	1.45	0.04	0.18	0.26	1.45	0.03	0.13	0.18
Schools	3.06	0.09	0.38	0.54	3.06	0.06	0.27	0.37
Community College	0.66	0.02	0.08	0.12	0.66	0.01	0.06	0.08
Special District	0.50	0.02	0.06	0.09	0.50	0.01	0.04	0.06

Source: Mountain West Research

TABLE 7.13
Secondary Assessed Valuation, Property Tax Revenue and Rate Impacts (in 1986 dollars)
Gila Bend

	Year							
	2010				2025			
Water Transfer Volumes (AF)	Baseline	11,000	51,000	91,000	Baseline	28,000	128,000	228,000
Secondary Net Assessed ($000's)	54,785	-1,649	-6,883	-9,653	70,018	-1,480	-6,097	-8,543
Agricultural and Vacant	10,902	-528	-1,717	-2,403	9,242	-528	-1,717	-2,403
Commercial/Industrial	10,574	-300	-1,382	-1,939	14,774	-255	-1,172	-1,642
Residential	5,917	-222	-1,022	-1,433	7,562	-188	-865	-1,213
Railroad/Utilities/Other	27,393	-599	-2,763	-3,878	38,440	-509	-2,344	-3,285
Property Tax Revenue ($000's)	1,118	-34	-141	-197	1,428	-30	-124	-174
State	0	0	0	0	0	0	0	0
County	121	-4	-15	-21	154	-3	-13	-19
Schools	482	-15	-61	-85	616	-13	-54	-75
Community College	44	-1	-6	-8	56	-1	-5	-7
Special Districts	411	-14	-59	-83	602	-13	-52	-73
Property Tax Rate	2.04	0.06	0.26	0.36	2.04	0.04	0.18	0.25
State	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
County	0.22	0.01	0.03	0.04	0.22	0.00	0.02	0.03
Schools	0.88	0.03	0.11	0.16	0.88	0.02	0.08	0.11
Community College	0.08	0.00	0.01	0.01	0.08	0.00	0.01	0.01
Special District	0.86	0.03	0.11	0.15	0.86	0.02	0.07	0.10

Source: Mountain West Research



VERDE RIVER - PRESCOTT AMA

FIGURE 8.1

CHAPTER 8

VERDE RIVER-PRESCOTT AMA

8.1 GENERAL DESCRIPTION

The Verde River-Prescott AMA study area (figure 8.1) contains two main watersheds, the Chino Valley and the Verde River Valley. Washes and creeks originating in the surrounding mountains carry flows to the valley floors and eventually to the Verde River. The range of elevations in the watershed is reflected in the vegetation, ponderosa pine on the plateau, juniper and chaparral at intermediate elevations, and cacti in the low-lying river valleys. Winter temperatures range from the teens to the high 40s or 50s. Sub-zero morning temperatures occur about twice a year. Summer temperatures fluctuate from the mid-50s to the high 80s. Rainfall averages 12 inches annually, with about 6 inches occurring during summer thunderstorms. The driest months are May and June.

8.2 CURRENT HYDROLOGIC PROFILES

The hydrologic study area includes major portions of the upper Verde River area, the Little Chino Valley portion of the Prescott AMA, and the Lower Big Chino Valley area. The entire hydrologic study area is in the Central Highlands Water Province, a transition zone between the Basin and Range and Plateau Uplands Provinces. Little and Big Chino Creeks and Granite Creek are the headwaters of the Verde River. The headwaters of the Agua Fria River occur in Prescott Valley, outside of the hydrologic study area and to the south of the Little Chino Valley.

8.2.1 Upper Verde River Area Groundwater

The regional aquifer in the upper Verde River area is the Verde Formation and overlying alluvial deposits and basalt flows. Very deep wells penetrate aquifers in the Supai Formation and Redwall Limestone.

Water levels in the upper Verde River area regional aquifer range from flowing at the surface to almost 1,300 feet below land surface. In most of the area, groundwater is under unconfined conditions. Confined conditions occur mainly in the Verde Formation but also may occur in the other rock units and/or alluvium. In most places, the alluvium in and along the Verde River is separated from the regional aquifer by several tens to several hundred feet of unsaturated rock. All groundwater in the area moves toward and parallel to the Verde River.

In the upper Verde River area, wells in the regional aquifer yield from about 10 to more than 1,000 gal/min. Many wells that penetrate the Verde Formation have yields of 200-300 gal/min and yields of more than 1,000 gal/min have been reported. Springs issuing from the regional aquifer that sustain the base flow of the Verde River in channel or floodplain deposits generally yield less than 50 gal/min.

8.2.2 Little Chino Area Groundwater

The regional aquifer in the Little Chino Valley consists of alluvial deposits and interbedded basalt flows.

Depths to water in Little Chino Valley range from flowing at the surface (at and near Del Rio Springs) to more than 500 feet below land surface. Confined conditions occur primarily in the northern part of the area where a clay layer (and massive basalts) overlie the primary basalt aquifer. This clay layer also supports a perched aquifer. In addition, a barrier near Del Rio Springs forces groundwater flow upward in that area. The unconfined zone in most of the valley is the mainly alluvial aquifer with local interbedded basalts. Movement of groundwater is mainly toward and parallel to Granite Creek and Little Chino Creek.

In Little Chino Valley, wells that penetrate the artesian zone of the primary basalt aquifer yield from 500 to more than 1,000 gal/min.

8.2.3 Lower Big Chino Valley Area Groundwater

The regional aquifer in the Lower Big Chino Valley consists of alluvial deposits and interbedded basalt flows.

Water levels in the Lower Big Chino Valley range from near land surface to more than 200 feet below land surface. Groundwater occurs under both confined and unconfined conditions. Movement of groundwater in the Lower Big Chino Valley is mainly southeasterly towards the headwaters of the Verde River, south and east of Paulden.

The lower Big Chino Valley appears to have wells capable of yielding in excess of 1,000 gal/min.

8.2.4 Water Level Declines

Data on water levels since the early 1950s throughout the area indicate no appreciable changes except in areas of concentrated pumping. Near the town of Chino Valley, water levels declined as much as 75 feet from 1940-82. These general conditions are expected to continue to the year 2025.

8.2.5 Water Quality

The regional aquifer in the Verde River area generally contains excellent quality water with median values of TDS ranging from the lower 200s to lower 400s mg/L in the rock units and 1,450 mg/L in the alluvium. Fluoride values are generally below EPA maximum contaminant levels, ranging from 0.1-0.7 mg/L for all aquifers.

8.2.6 Surface Water Resources

The Agua Fria River and the Verde River are the two major surface water sources in the hydrologic study area. The Agua Fria (at Mayer) flows from 0-617 cfs with a mean of 3-5 cfs. The Verde River below Tangle Creek flows from 61-94,800 cfs with a mean of 384 cfs. The Verde River usually flows year-round, while the Agua Fria River flows are more intermittent. Peak flow volumes are generated from snow melt in both watersheds. Flash floods occur during the summer months, however, the floods contribute only minor volumes of water.

8.2.7 Groundwater Storage

Estimated groundwater in storage to a depth of 1,200 feet was about 47 million acre-feet in 1975 (Arizona Water Commission).

Table 8.1 shows the water budget for the hydrologic study area.

8.2.8 Irrigation Districts

The Chino Valley Irrigation District is the only irrigation district within the study area.

8.3 SOCIOECONOMIC AND FISCAL PROFILES

The socioeconomic study area is comprised of a large portion of Yavapai County, one of the fastest growing counties in Arizona. It includes the Mingus Mountain, Prescott, and Verde Valley census divisions, and the cities and towns of Camp Verde, Chino Valley, Clarksdale, Cottonwood, Jerome, Prescott, Prescott Valley, and Sedona. The area is served by Yavapai Community College, ten school districts, and nine fire and flood control districts.

8.3.1 Population and School Enrollment

There were 57,511 persons living in the area according to the 1980 census (table 8.2). The population was considerably older than that of Arizona as a whole, a reflection of the number of retirees now living in the area. The median age of the population was 39.0 years, compared with 29.2 years for Arizona. There were 11,855 children enrolled in area schools in 1980, about 83 percent of the population under the age of 18. The socioeconomic study area is projected to grow at a fairly high rate over the course of the projection horizon (table 8.3). Between 1987 and 2025 the population is projected to increase at a compound annual growth rate of approximately 2.5 percent, growing from 82,200 persons in 1987 to approximately 209,000 by 2025. School enrollment is projected to increase from 15,800 students in 1987 to approximately 37,600 by 2025.

8.3.2 Household Income

Income in the socioeconomic study area is relatively low compared with that of the state. The median household income in 1980 was $13,300, more than $3,000 lower than that for Arizona.

8.3.3 Labor Force

Unemployment in the area is higher than the State average. According to the 1980 census, 8.1 percent of the 21,187 area residents in the civilian labor force were unemployed.

8.3.4 Employment

Ranching and copper mining were once the mainstays of the area's economy. However, as the area has grown its economy has diversified. Now tourism, recreation, manufacturing, services, and government are the area's principal industries. Area employment by sector in 1980 was about 4.6 percent in agriculture, 11.9 percent in construction, 22.0 percent in trade, and 34.1 percent in services. The distribution of employment by sector in the area closely reflects that of the state as a whole. Employment in the study area is projected to more than triple, growing from an estimated 24,400 jobs in 1987 to approximately 90,000 in 2025 (table 8.3).

8.3.5 Land Ownership

Much of the 1.6 million acres of land in the study area, about 57 percent, is publicly owned and managed by the U.S. Forest Service. About 32 percent is privately owned and about 11 percent is owned by the state.

8.3.6 Property Tax Base

Residential property is the largest source of property tax revenue in the socioeconomic study area (see table 8.4). In 1986, the total primary net assessed valuation in the socioeconomic study area was about $337 million. Property was taxed at an overall rate of $10.06 per $100 of the primary assessment and generated approximately $33.9 million in revenue. The secondary net assessed value totaled about $373 million. Property was taxed at a rate of $2.11 per $100 of the secondary assessment and generated about $7.9 million in tax revenue. Residential and rental residential properties accounted for about 46 percent of the net primary assessment. Agricultural and vacant lands accounted for about $70.1 million, and commercial and industrial uses accounted for about $68 million in the primary assessment. Primary net assessed value in the study area is projected to increase from approximately $337 million in 1987 to about $887 million by year 2025 (table 8.5). Residential, commercial, and industrial properties are projected to grow during the economic expansion. The assessed values of agricultural and vacant lands are not projected to increase over the course of the projection horizon.

8.3.7 Property Tax Revenues

Schools in the socioeconomic study area received approximately $18.2 million in revenue generated from the primary assessment, and Yavapai County received about $9.2 million. Total property tax revenues for the area are projected to almost triple by 2025. Tax revenues based on the primary assessment are projected to increase from about $33.9 million to about $90.2 million, and taxes based on the secondary assessment are projected to increase from about $7.9 million to about $21.3 million.

8.3.8 Nonproperty Tax Revenues

County state-shared revenues, city state-shared revenues, and city sales tax collections are also projected to grow over the projection horizon. City sales-tax collections are projected to experience the largest proportionate increase as tourism and recreation activities become increasingly important elements in the area economy.

8.4 CONCLUSIONS

The estimated potential volume of water which could be transferred out of the Verde River-Prescott AMA is small (a maximum of 15,000 acre-feet per year). Because of the current litigation surrounding water rights on the Verde River, this area was not recommended for further study in Phase II.

TABLE 8.1
Water Transfer Study
Water Budget
Verde River-Prescott AMA

Description	Year 1987	2010	2025
Water Demand (1,000 AF)			
Municipal & Industrial	14	27	35
Agricultural	48	48	48
Total Demand	62	75	83
Incidental Recharge (1,000 AF)			
Municipal & Industrial	7	13	18
Agricultural	12	12	12
Total Incidental Recharge	19	25	30
Water Supplies (1,000 AF)			
Surface Water	36	36	36
Groundwater	26	39	47
Total Supplies	62	75	83
Natural Recharge (1,000 AF)	5	5	5
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	0	9	12
Variables			
Irrigated Acreage (1,000)	9.0	9.0	9.0
Per Capita Muni Use (GPCD)	150	150	150
Avg Crop Consump Use (ft/yr)	4.0	4.0	4.0
Avg Irrigation Efficiency	75%	75%	75%
Irrigation Recharge Factor	25%	25%	25%
Municipal Recharge Factor	50%	50%	50%
Industrial Recharge Factor	50%	50%	50%
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)			
Gross Storage	46,800	46,700	46,600
Recoverable Storage	15,000	14,900	14,800

Data compiled by FRANZOY COREY

TABLE 8.2
Socioeconomic Profile
Verde River-Prescott AMA

Economic Component	Study Area	Arizona
Population (1980)	57,511	2,718,215
Age 0 - 17 (%)	24.8	29.2
Age 18 - 64 (%)	56.4	59.5
Age 65+ (%)	18.8	11.3
Median age	39.0	29.2
School Enrollment (1980)	11,855	652,174
Median household income (1980)	$13,300	$16,448
Less than $5,000 (%)	15.0	12.1
$ 5,000 - $14,999 (%)	41.2	33.3
$15,000 - $29,999 (%)	31.9	36.4
$30,000 - $39,999 (%)	7.0	10.2
$40,000 + (%)	4.9	8.0
Civilian labor force (1980)	21,187	1,238,000
Unemployed (%)	8.1	6.7
Employment (1980)	19,461	1,113,270
Agriculture (%)	4.6	3.0
Construction (%)	11.9	8.3
Manufacturing (%)	8.1	14.8
Trade (%)	22.0	22.6
Services (%)	34.1	30.6
Government (%)	6.6	6.7
Other (%)	12.7	14.0
Land Ownership (000's of acres)	1,609	
Private (%)	31.9	
Indian (%)	0.0	
Public - State (%)	10.9	
Public - Other (%)	57.2	

Data compiled by Mountain West and Econotrend

TABLE 8.3
Baseline Socioeconomic Projections
Verde River-Prescott AMA

	1987	2010	2025
Population	82,200	160,500	209,000
Age 0 - 17 (%)	24.1	22.3	22.3
Age 18 - 64 (%)	54.6	57.1	57.1
Age 65 + (%)	21.3	20.6	20.6
School Enrollment	15,800	28,900	37,600
Employment (no. of employees)	24,400	54,000	90,000
Agriculture (%)	4.2	1.9	1.1
Const. and Mfg. (%)	24.1	18.7	16.2
Trade (%)	23.3	27.9	31.9
Services (%)	30.0	35.3	35.6
Government (%)	6.6	7.0	7.2
Other (%)	11.8	9.2	8.0

Source: Mountain West Research

TABLE 8.4
Property Tax Profile (in 1986 dollars)
Verde River-Prescott AMA

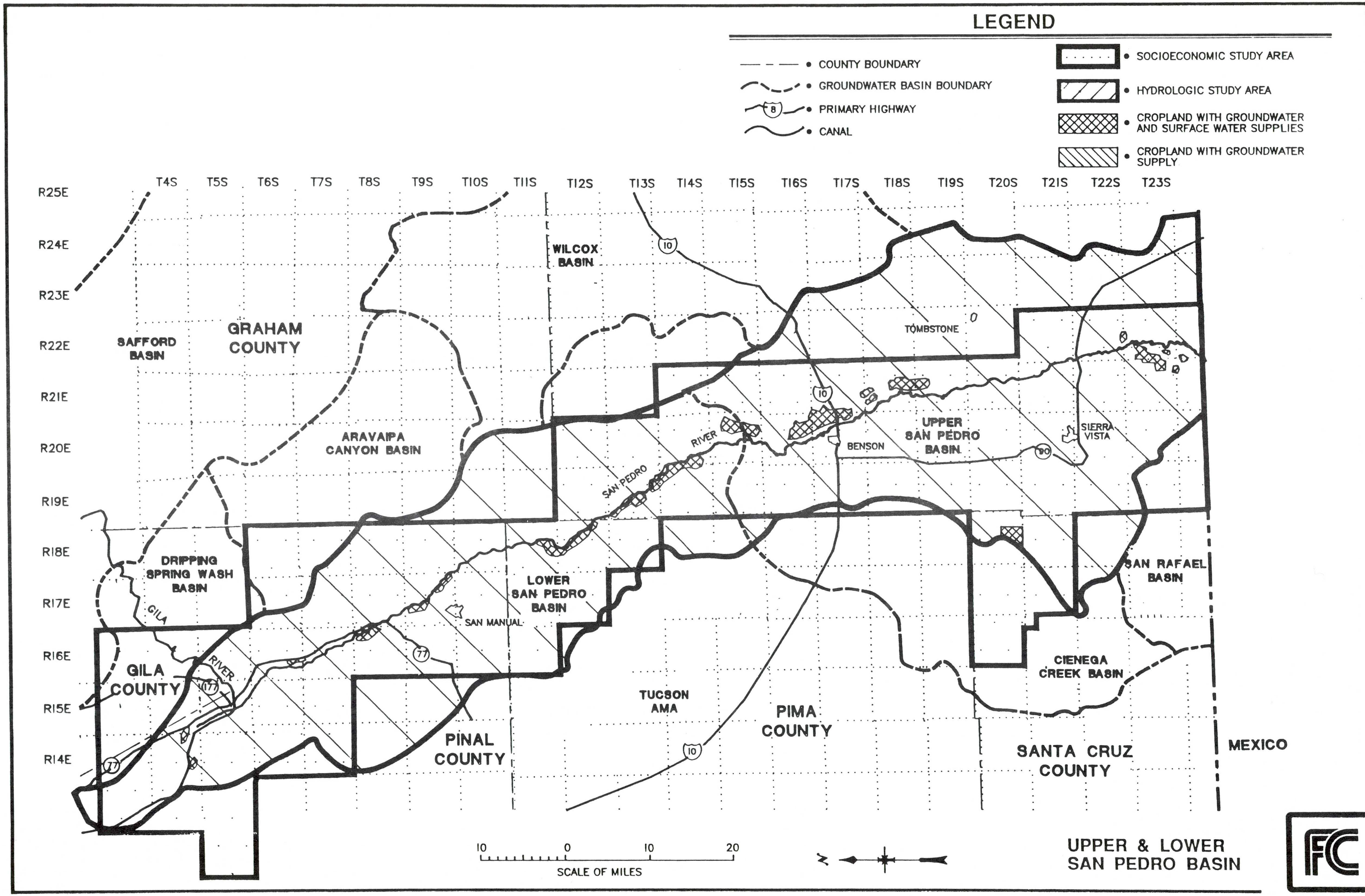
	Primary Assessment			Secondary Assessment		
	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)
Study area total	336,524	10.06	33,862	372,763	2.11	7,861
Legal classes						
1 Mines/Timber	84	10.06	8	84	2.11	2
2 Utilities	39,194	10.06	3,944	39,194	2.11	826
3 Commercial and industrial	68,167	10.06	6,859	77,753	2.11	1,640
4 Agricultural and vacant land	70,067	10.06	7,051	86,817	2.11	1,831
5 Residential	127,478	10.06	12,827	134,661	2.11	2,839
6 Rental residential	27,239	10.06	2,741	29,114	2.11	614
7 Railroads	4,274	10.06	430	5,115	2.11	108
8 Historic Property	21	10.06	2	25	2.11	1
Jurisdictions						
State	336,524	0.38	1,279	372,763	0.00	0
Yavapai County	336,524	2.73	9,195	372,763	0.41	1,536
Towns and Cities	154,647	0.40	621	168,561	0.40	675
Schools	336,524	5.41	18,210	372,763	0.83	3,076
Yavapai Community College	336,524	1.24	4,179	0	0.00	0
Special Districts	336,524	0.11	378	143,453	1.79	2,574

Data compiled by Mountain West

TABLE 8.5
Baseline Net Assessed Value and Tax Revenue Projections (in 1986 dollars)
Verde River-Prescott AMA

	Primary			Secondary		
	1987	2010	2025	1987	2010	2025
Net Assessed Value ($000's)	336,524	624,948	887,406	372,763	682,984	966,769
Ag. and Vacant (%)	20.8	11.2	7.9	23.3	12.7	9.0
Comm. and Indus. (%)	20.3	24.7	29.2	20.9	25.8	30.5
Residential (%)	46.0	48.3	44.3	43.9	46.8	43.1
Other (%)	12.9	15.8	18.6	11.9	14.7	17.4
Cities and Towns Total (%)	46.0	64.6	70.2	45.2	62.1	68.6
Property Tax Revenue ($000's)	33,862	63,349	90,153	7,861	14,861	21,287
State (%)	3.8	3.7	3.7	0.0	0.0	0.0
Counties (%)	27.2	27.0	26.9	19.5	18.9	18.7
Cities and Towns (%)	1.8	2.6	2.8	8.6	11.4	12.5
Schools (%)	53.8	53.4	53.3	39.1	38.0	37.4
Community College (%)	12.3	12.2	12.2	0.0	0.0	0.0
Special Districts (%)	1.1	1.1	1.1	32.8	31.7	31.4
	Local Government Revenues					
Key Nonproperty Tax Revenue ($000's)	16,783	36,119	50,395			
County State Shared (%)	22.0	19.0	19.4			
City State Shared (%)	70.0	71.2	68.2			
City Sales (%)	8.0	9.8	12.4			

Source: Mountain West Research



LEGEND
COUNTY BOUNDARY
GROUNDWATER BASIN BOUNDARY
PRIMARY HIGHWAY
CANAL
SOCIOECONOMIC STUDY AREA
HYDROLOGIC STUDY AREA
CROPLAND WITH GROUNDWATER AND SURFACE WATER SUPPLIES
CROPLAND WITH GROUNDWATER SUPPLY
T4S T5S T6S T7S T8S T9S T10S T11S T12S T13S T14S T15S T16S T17S T18S T19S T20S T21S T22S T23S
R25E R24E R23E R22E R21E R20E R19E R18E R17E R16E R15E R14E
WILCOX BASIN
SAFFORD BASIN
GRAHAM COUNTY
ARAVAIPA CANYON BASIN
DRIPPING SPRING WASH BASIN
GILA RIVER
GILA COUNTY
SAN PEDRO RIVER
LOWER SAN PEDRO BASIN
SAN MANUAL
PINAL COUNTY
TUCSON AMA
PIMA COUNTY
TOMBSTONE
BENSON
UPPER SAN PEDRO BASIN
SIERRA VISTA
SAN RAFAEL BASIN
CIENEGA CREEK BASIN
SANTA CRUZ COUNTY
MEXICO
10 0 10 20
SCALE OF MILES
UPPER & LOWER SAN PEDRO BASIN

FIGURE 9.1

CHAPTER 9

UPPER AND LOWER SAN PEDRO BASIN

9.1 GENERAL DESCRIPTION

The Upper and Lower San Pedro Basin study area (figure 9.1) follows the river as it flows south to north from the border of Mexico to its confluence with the Gila River near Winkleman. The watershed includes parts of Mexico and the Huachuca and Santa Rita Mountains. Colder air settles in the low-lying valley causing winter temperatures to range from the upper 40s to the mid-50s. Summer temperatures range from the low 50s to the low 100s, fluctuating somewhat with the elevation. Precipitation in the valley area is lower than in the surrounding mountains, and averages about 12 inches annually.

9.2 CURRENT HYDROLOGIC PROFILES

The hydrologic study area includes the Upper and Lower San Pedro Basins within the Basin and Range Lowlands Water Province.

9.2.1 Area Groundwater

The major sources of groundwater are from floodplain alluvium and thick basin-fill deposits. The floodplain deposits are from 40 to 150 feet thick, comprised of mostly sand and gravel. The basin-fill deposits are divided into upper and lower parts; the upper part consists of mostly fine-grained deposits and the lower part consists of gravel, sandstone, and siltstone beds. The upper part ranges from about 300 to 800 feet in thickness and the lower part ranges from several tens of feet to over 1,000 feet in thickness.

Groundwater generally occurs under unconfined conditions in the floodplain alluvium and under confined and unconfined conditions in the basin-fill deposits. Flowing wells occur in three general areas, Palominas-Hereford, St. David-Benson, and Mammoth. Water levels range from a few feet above land surface to more than 600 feet below ground surface.

9.2.2 Water Level Declines

Since the late 1960s water levels have declined less than 10 feet throughout the area, except for near Sierra Vista and Fort Huachuca where declines are more significant due to concentrated pumpage.

9.2.3 Water Quality

Total dissolved solids (TDS) values in the area range from 200-2,500 mg/L in the Upper Basin to about 200-1,500 mg/L in the Lower Basin. Fluoride values range from 0.1-5.9 mg/L in the Upper Basin and from 0.3-6.1 mg/L in the Lower Basin. Fluoride concentrations exceeded the EPA maximum contaminant level more frequently in the Lower Basin than in the Upper Basin.

9.2.4 Groundwater Storage

Estimated groundwater in storage to a depth of 1,200 feet was about 78 million acre-feet in 1975 (Arizona Water Commission). About 48 million acre-feet were estimated for the Upper Basin and about 30 million acre-feet for the Lower Basin.

9.2.5 Surface Water Resources

The San Pedro River, a major tributary of the Gila River, drains the area. The San Pedro River at Charleston is ephemeral with flow ranging up to 98,000 cfs. A small portion of the irrigation water supply is diverted from the river.

Table 9.1 shows the water budget for the hydrologic study area.

9.2.6 Irrigation Districts

The two irrigation districts within the study area are the St. David Irrigation District and the Pomerene Water Users' Association.

9.3 SOCIOECONOMIC AND FISCAL PROFILES

The socioeconomic study area is comprised of portions of five counties, Gila, Pinal, Pima, Cochise, and Santa Cruz. It overlaps seven census divisions and contains ten cities and towns. It also contains sixteen school districts, two junior colleges, and eight special districts.

9.3.1 Population and School Enrollment

There were 66,268 persons living in the area according to the 1980 census (table 9.2). The population was slightly younger than that of Arizona as a whole with a median age of 28.1 years old. Nearly 15,900 children (about 72 percent of the area population under the age of 18) were enrolled in school in 1980. Strong growth is projected to occur during the projection period (see table 9.3). The population of the area is projected to increase at an annual compound rate of 2.2 percent, increasing from 72,200 persons in 1987 to

164,400 by the year 2025. School enrollment is projected to grow from about 15,300 students to about 31,200 by 2025.

9.3.2 Household Income

Annual median household income in the area is about equal to that of Arizona. In 1980, the median household income of the socioeconomic study area was $16,500 compared with $16,448 for Arizona.

9.3.3 Labor Force

Unemployment in the socioeconomic study area is relatively high. According to the 1980 census, about 9.2 percent of the 23,100 area residents in the civilian labor force were unemployed.

9.3.4 Employment

In 1980, agriculture, mining, and defense (military facilities) were the key economic sectors in the study area. Many of Arizona's largest copper mines are located in the area. Fort Huachuca, near Sierra Vista employs more than 5,000 civilians. Area employment by economic sector in 1980 was about 17 percent in agriculture, 17 percent in trade, 25 percent in services, and 19 percent in government. The economy of the socioeconomic study area is projected to expand on the strength of increased manufacturing and service industry employment. The agricultural sector is projected to grow more slowly than the economy as a whole. Total employment is projected to increase from about 25,400 jobs to about 68,500 by the year 2025 (table 9.3).

9.3.5 Land Ownership

The study area encompasses about 1.9 million acres, most of which is publicly owned. About 39 percent of the land is state owned, about 31 percent is privately owned, and about 28 percent is other public land, most of which is managed by the U.S. Bureau of Land Management and U.S. Forest Service (table 9.2).

9.3.6 Property Tax Base

The 1986 primary net assessed value totaled about $203 million (table 9.4). Property was taxed at a rate of $9.95 per $100 of the primary assessment and generated approximately $20 million in revenue. The secondary net assessed value totaled about $218 million, was taxed at a rate of $2.18 per $100 of the secondary assessment, and generated about $4.8 million in tax revenue. Residential was the land use class with the greatest aggregate value, followed closely by the commercial and industrial class. Total primary net assessed value in the socioeconomic study area is projected to increase from approximately $203 million in 1987 to about $549 million by the year 2025 (table 9.5). The assessed value of agricultural and vacant land is projected to grow modestly. The values of residential, commercial, industrial, and other (mining) properties are projected to increase during the projection period.

9.3.7 Property Tax Revenues

Schools in the area received $8.9 million in tax revenues based on the primary assessment, counties received $7.1 million and towns received $2.6 million (table 9.4). Property tax revenues for the socioeconomic study area are projected to increase from about $20.0 million to about $55.5 million by 2025 (table 9.5).

9.3.8 Nonproperty Tax Revenues

County state-shared revenues, city state-shared revenues, and city sales tax collections are all expected to grow during the projection period. County state-shared revenues are projected to increase from $2.4 million to $6.6 million, city state-shared revenues are projected to increase from $10.3 million to $26.8 million, and city sales tax collections are projected to increase from $2.6 million to $9.1 million, as calculated from table 9.5.

9.4 CONCLUSIONS

Currently the Upper and Lower San Pedro Basin area is essentially in hydrologic balance. As the population grows, however, the demand is expected to exceed the supply and create an overdraft condition. Although the San Pedro and the Gila rivers could be used to transport water out of the area, uncertainty surrounds the surface water rights. This area was not recommended for further study in Phase II.

TABLE 9.1
Water Transfer Study
Water Budget
Upper and Lower San Pedro Basin

Description	Year 1987	Year 2010	Year 2025
Water Demand (1,000 AF)			
Municipal & Industrial	15	28	35
Agricultural	93	93	93
Total Demand	108	121	128
Incidental Recharge (1,000 AF)			
Municipal & Industrial	8	14	17
Agricultural	19	19	19
Total Incidental Recharge	27	3	36
Water Supplies (1,000 AF)			
Surface Water	5	5	5
Groundwater	103	116	123
Total Supplies	108	121	128
Natural Recharge (1,000 AF)	74	74	74
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	0	9	13
Variables			
Irrigated Acreage (1,000)	18.5	18.5	18.5
Per Capita Muni Use (GPCD)	190	190	190
Avg Crop Consump Use (ft/yr)	4.0	4.0	4.0
Avg Irrigation Efficiency	80%	80%	80%
Irrigation Recharge Factor	20%	20%	20%
Municipal Recharge Factor	50%	50%	50%
Industrial Recharge Factor	50%	50%	50%
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)			
Gross Storage	78,000	77,900	77,700
Recoverable Storage	39,000	38,900	38,800

Data compiled by FRANZOY COREY

TABLE 9.2
Socioeconomic Profile
Upper and Lower San Pedro Basin

Economic Component	Study Area	Arizona
Population (1980)	66,268	2,718,215
Age 0 - 17 (%)	33.2	29.2
Age 18 - 64 (%)	59.7	59.5
Age 65+ (%)	7.1	11.3
Median age	28.1	29.2
School Enrollment (1980)	15,894	652,174
Median household income (1980)	$16,500	$16,448
Less than $5,000 (%)	16.2	12.1
$ 5,000 - $14,999 (%)	40.9	33.3
$15,000 - $29,999 (%)	39.9	36.4
$30,000 - $39,999 (%)	7.6	10.2
$40,000 + (%)	6.4	8.0
Civilian labor force (1980)	23,100	1,238,000
Unemployed (%)	9.2	6.7
Employment (1980)	20,967	1,113,270
Agriculture (%)	17.3	3.0
Construction (%)	6.1	8.3
Manufacturing (%)	7.6	14.8
Trade (%)	16.6	22.6
Services (%)	24.5	30.6
Government (%)	19.4	6.7
Other (%)	8.5	14.0
Land Ownership (000's of acres)	1,865	
Private (%)	30.6	
Indian (%)	2.0	
Public - State (%)	39.2	
Public - Other (%)	28.2	

Data compiled by Mountain West and Econotrend

TABLE 9.3
Baseline Socioeconomic Projections
Upper and Lower San Pedro Basin

	1987	2010	2025
Population	72,200	131,500	164,400
Age 0 - 17 (%)	30.4	26.9	26.9
Age 18 - 64 (%)	57.3	58.5	58.5
Age 65 + (%)	12.3	14.6	14.6
School Enrollment	15,300	25,000	31,200
Employment (no. of employees)	25,400	46,700	68,500
Agriculture (%)	5.1	4.0	2.3
Const. and Mfg. (%)	19.1	24.0	26.8
Trade (%)	18.4	19.2	19.9
Services (%)	20.7	28.0	31.3
Government (%)	18.2	12.9	10.4
Other (%)	18.5	11.9	9.3

Source: Mountain West Research

TABLE 9.4
Property Tax Profile (in 1986 dollars)
Upper and Lower San Pedro Basin

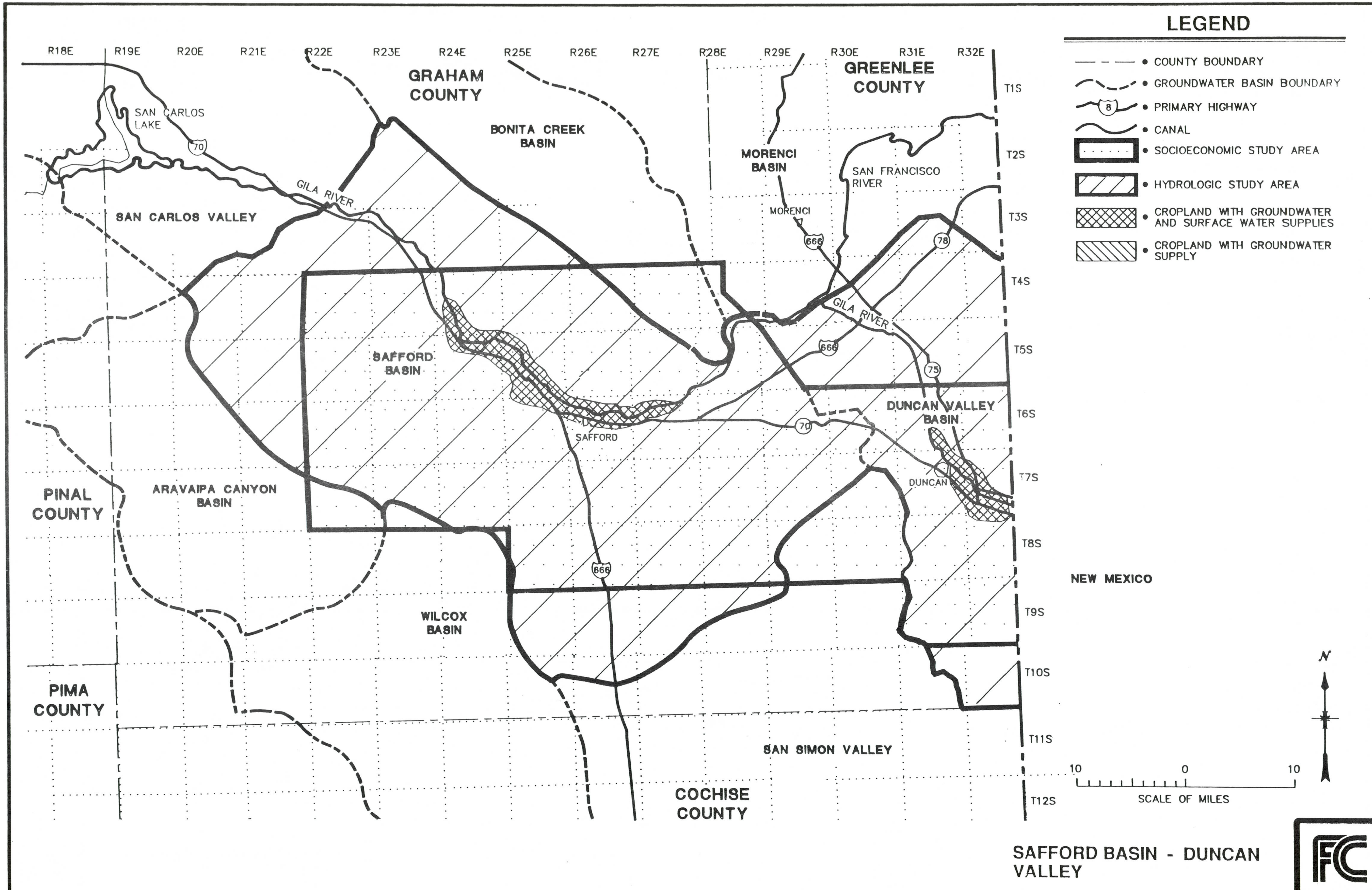
	Primary Assessment			Secondary Assessment		
	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)
Study area total	202,693	9.95	20,169	218,198	2.18	4,758
Legal classes						
1 Mines/Timber	30,362	9.95	3,021	30,362	2.18	662
2 Utilities	22,377	9.95	2,227	22,377	2.18	488
3 Commercial and industrial	53,663	9.95	5,340	56,141	2.18	1,224
4 Agricultural and vacant land	25,535	9.95	2,541	32,663	2.18	712
5 Residential	54,295	9.95	5,402	58,287	2.18	1,271
6 Rental residential	15,052	9.95	1,498	16,681	2.18	364
7 Railroads	1,407	9.95	140	1,685	2.18	37
8 Historic Property	2	9.95	0	2	2.18	0
Jurisdictions						
State	202,691	0.38	770	218,198	0.00	0
Counties	202,691	3.51	7,117	218,198	0.39	852
Towns and Cities	93,394	0.82	770	93,953	0.23	220
Schools	202,691	4.38	8,873	218,198	1.61	3,508
Jr./Community Colleges	171,478	1.52	2,606	185,912	0.02	35
Special Districts	4,923	0.67	33	15,536	0.92	143

Data compiled by Mountain West

TABLE 9.5
Baseline Net Assessed Value and Tax Revenue Projections (in 1986 dollars)
Upper and Lower San Pedro Basin

	Primary			Secondary		
	1987	2010	2025	1987	2010	2025
Net Assessed Value ($000's)	202,693	386,472	548,982	218,198	410,794	578,741
Ag. and Vacant (%)	12.6	7.6	5.0	15.0	9.1	6.1
Comm. and Indus. (%)	26.5	29.7	33.0	25.7	29.3	32.7
Residential (%)	34.2	32.7	28.7	34.4	33.2	29.5
Other (%)	26.7	30.0	33.3	24.9	28.4	31.7
Cities and Towns Total (%)	46.1	61.2	66.1	43.1	59.3	64.9
Property Tax Revenue ($000's)	20,169	38,936	55,528	4,758	9,114	12,914
State (%)	3.8	3.8	3.7	0.0	0.0	0.0
Counties (%)	35.3	34.9	34.7	18.0	17.6	17.5
Cities and Towns (%)	3.8	4.9	5.4	4.6	6.3	6.8
Schools (%)	44.0	43.4	43.3	73.7	72.4	72.0
Community College (%)	12.9	12.8	12.7	0.7	0.7	0.7
Special Districts (%)	0.2	0.2	0.2	3.0	3.0	3.0
	Local Government Revenues					
Key Nonproperty Tax Revenue ($000's)	15,333	31,249	42,469			
County State Shared (%)	15.9	14.8	15.5			
City State Shared (%)	67.3	66.9	63.0			
City Sales (%)	16.8	18.3	21.5			

Source: Mountain West Research



SAFFORD BASIN - DUNCAN VALLEY

FIGURE 10.1

CHAPTER 10

SAFFORD BASIN-DUNCAN VALLEY

10.1 GENERAL DESCRIPTION

The Safford Basin-Duncan Valley study area (figure 10.1) is located in the San Simon Valley in the southeastern corner of Arizona. The valley is surrounded by the Pinaleno (Graham), Gila, and White Mountains. Annual precipitation averages 8.5 inches, but winter precipitation occurs mostly in the southwest portion of the area on the windward side of the Pinaleno Mountains. Summer precipitation generally falls evenly in the area. Winter temperatures range from the low 30s to the mid-60s. Summer temperatures range from the low 60s to the mid-90s.

10.2 CURRENT HYDROLOGIC PROFILES

The hydrologic study area includes the major agricultural areas along the Gila River in the Safford and Duncan Valley basins. The Gila River and its major tributaries, the San Simon and San Francisco Rivers, drain the area.

10.2.1 Area Groundwater

A sparse amount of data indicates the major source of groundwater is from alluvial deposits that underlie the river valleys of the San Simon and Gila Rivers. The major occurrence of these deposits is apparently limited to depths of about 100 feet. A fine-grained sequence underlies the alluvial deposits to depths of 700 feet to 800 feet or more. Thin sandy beds occur in this sequence. The primary occurrence of groundwater is unconfined in the upper deposits, with confined conditions occurring in the fine-grained deposits. Available data indicate groundwater depths range from about 10 feet to 160 feet. These same data suggest that long term water levels essentially are unchanged, responding to wet-and-dry cycles of the Gila River.

10.2.2 Water Quality

Total dissolved solids (TDS) are relatively high, ranging from 1,000-10,000 mg/L. There are no data on fluoride concentrations.

10.2.3 Groundwater Storage

Estimated groundwater in storage to a depth of 1,200 feet as of 1975 (Arizona Water Commission) in the Safford Basin was about 15 million acre-feet, and in the Duncan Valley Basin, about 19 million acre-feet.

10.2.4 Surface Water Resources

The Gila River essentially flows year-round. Flows range from 0-100,000 cfs at the Calva gaging station. Most of the Gila River flow originates as snowmelt. While summer storms can produce large flood peaks, the volumes of water produced are generally small. A majority of the area's water supply originates from the Gila River.

Table 10.1 shows the water budget for the hydrologic study area. The area is in hydrologic balance.

10.2.5 Irrigation Districts

The three irrigation districts within the study area are Franklin Irrigation District, Gila Valley Irrigation District, and Duncan Valley Irrigation District.

10.3 SOCIOECONOMIC AND FISCAL PROFILES

The socioeconomic study area includes portions of Graham and Greenlee Counties, and the communities of Safford, Thatcher, and Duncan. Portions of six school districts, a junior college district and five special districts are located within the study area.

10.3.1 Population and School Enrollment

There were 18,462 persons living in the area according to the 1980 census (table 10.2). The median age of the population was 27.3 years, slightly younger on average than that of Arizona. About 4,480 children, nearly 70 percent of the population under the age of 18 years old, were enrolled in school in 1980. Moderate growth is projected over the course of the projection horizon (table 10.3). The population is projected to grow at a compound annual rate of 1.2 percent, increasing from about 18,000 persons in 1987 to 28,600 by the year 2025. School enrollment is projected to grow from about 4,500 students to about 5,500 by 2025.

10.3.2 Household Income

Income in the socioeconomic study area is relatively low. The median household income in 1980 was $13,700, compared with $16,448 for Arizona.

10.3.3 Labor Force

In 1980, unemployment in the socioeconomic study area was relatively low. According to the 1980 census, about 5.3 percent of the 6,945 area residents in the civilian labor force were unemployed.

10.3.4 Employment

Agriculture was the mainstay of the economy in this area in 1980. Trade and service establishments in the area tend to be small and locally oriented. Area employment by economic sector in 1980 was about 21.3 percent in agriculture, 27.2 percent in services (primarily health and education) and 20.3 percent in trade. The area economy is projected to expand gradually as manufacturing, trade, and service activities increase. Agricultural employment is not projected to grow. Total employment is projected to increase from about 6,400 jobs to 9,200 by 2025 (table 10.3).

10.3.5 Land Ownership

The study area encompasses about 1.0 million acres, most of which is publicly owned. About 50.9 percent of the land is other public land managed primarily by the U.S. Bureau of Land Management, about 9.5 percent is Indian land, about 22.5 percent is state owned, and 17.1 percent is privately owned.

10.3.6 Property Tax Base

The 1986 primary net assessed value totaled about $48.4 million (see table 10.4). Property was taxed at a rate of $6.74 per $100 of the primary assessment and generated approximately $3.3 million in revenue. The total secondary net assessed value of about $50.2 million, was taxed at a rate of $2.57 per $100 of the secondary assessment, and generated about $1.3 million in tax revenue. Residential property was the largest use class, followed closely by the commercial and industrial class, and by utilities. Primary net assessed values in the socioeconomic study area are projected to increase from approximately $48 million in 1987 to about $73 million by 2025 (table 10.5).

10.3.7 Property Tax Revenues

Schools received $1.5 million in tax revenues generated by the primary assessment and the counties received approximately $1 million (table 10.4). Property tax revenues based on the primary assessment are projected to increase from about $3.3 million to about $4.9 million by 2025 (table 10.5).

10.3.8 Nonproperty Tax Revenues

County state-shared revenues, city state-shared revenues, and city sales tax collections are also projected to increase. County state-shared revenues are projected to increase from $0.6 million to $0.9 million, city state-shared revenues are projected to increase from $2.6 million to $4.5 million, and city sales-tax collections are projected to increase from $4.2 million to $7.1 million, as calculated from table 10.5.

10.4 CONCLUSIONS

The Safford Basin-Duncan Valley area has two unresolved water rights issues. First, the Gila River Indian Community is engaged in litigation to reopen the Gila Decree (Globe Equity 59). Second, the U.S. Bureau of Reclamation is studying potential exchanges of Gila River water for CAP water to satisfy the demands of CAP water users along the Upper Gila River and in New Mexico. Because of these uncertainties, the area was not recommended for further study in Phase II.

TABLE 10.1
Water Transfer Study
Water Budget
Safford Basin-Duncan Valley

Description	1987	2010	2025
Water Demand (1,000 AF)			
Municipal & Industrial	3	4	5
Agricultural	198	198	198
Total Demand	201	202	203
Incidental Recharge (1,000 AF)			
Municipal & Industrial	2	2	2
Agricultural	46	46	46
Total Incidental Recharge	48	48	48
Water Supplies (1,000 AF)			
Surface Water	122	122	122
Groundwater	79	80	81
Total Supplies	201	202	203
Natural Recharge (1,000 AF)	35	35	35
Overdraft (1,000 AF) (Total demand minus total incidental recharge, surface water and natural recharge)	0	0	0
Variables			
Irrigated Acreage (1,000)	37.2	37.2	37.2
Per Capita Muni Use (GPCD)	150	150	150
Avg Crop Consump Use (ft/yr)	4.0	4.0	4.0
Avg Irrigation Efficiency	75%	75%	75%
Irrigation Recharge Factor	23%	23%	23%
Municipal Recharge Factor	50%	50%	50%
Industrial Recharge Factor	50%	50%	50%
Water in Storage (1,000 AF) (adjusted from AZ Water Commission, 1975)			
Gross Storage	33,800	33,800	33,800
Recoverable Storage	16,900	16,900	16,900

Data compiled by FRANZOY COREY

TABLE 10.2
Socioeconomic Profile
Safford Basin–Duncan Valley

Economic Component	Study Area	Arizona
Population (1980)	18,462	2,718,215
Age 0 - 17 (%)	34.9	29.2
Age 18 - 64 (%)	54.0	59.5
Age 65+ (%)	11.1	11.3
Median age	27.3	29.2
School Enrollment (1980)	4,480	652,174
Median household income (1980)	$13,700	$16,448
Less than $5,000 (%)	16.7	12.1
$ 5,000 - $14,999 (%)	37.9	33.3
$15,000 - $29,999 (%)	32.6	36.4
$30,000 - $39,999 (%)	7.6	10.2
$40,000 + (%)	5.2	8.0
Civilian labor force (1980)	6,945	1,238,000
Unemployed (%)	5.3	6.7
Employment (1980)	6,579	1,113,270
Agriculture (%)	21.3	3.0
Construction (%)	7.8	8.3
Manufacturing (%)	5.6	14.8
Trade (%)	20.3	22.6
Services (%)	27.2	30.6
Government (%)	10.1	6.7
Other (%)	7.7	14.0
Land Ownership (000's of acres)	1,032	
Private (%)	17.1	
Indian (%)	9.5	
Public - State (%)	22.5	
Public - Other (%)	50.9	

Data compiled by Mountain West and Econotrend

TABLE 10.3
Baseline Socioeconomic Projections
Safford Basin-Duncan Valley

	1987	2010	2025
Population	18,000	24,700	28,600
Age 0 - 17 (%)	34.0	27.0	27.0
Age 18 - 64 (%)	55.4	58.6	58.6
Age 65 + (%)	10.6	14.4	14.4
School Enrollment	4,500	4,800	5,500
Employment (no. of employees)	6,400	7,900	9,200
Agriculture (%)	24.5	19.8	17.0
Const. and Mfg. (%)	9.4	10.0	10.2
Trade (%)	18.8	20.4	21.0
Services (%)	27.9	31.6	34.6
Government (%)	11.7	11.3	10.8
Other (%)	7.7	6.9	6.4

Source: Mountain West Research

TABLE 10.4
Property Tax Profile (in 1986 dollars)
Safford Basin-Duncan Valley

	Primary Assessment			Secondary Assessment		
	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)	Net Assessed Valuation ($000's)	Tax Rate	Revenue ($000's)
Study area total	48,419	6.74	3,262	50,218	2.57	1,289
Legal classes						
1 Mines/Timber	23	6.74	2	23	2.57	1
2 Utilities	9,906	6.74	667	9,906	2.57	254
3 Commercial and industrial	11,886	6.74	801	12,027	2.57	309
4 Agricultural and vacant land	8,501	6.74	573	9,439	2.57	252
5 Residential	13,895	6.74	936	14,279	2.57	367
6 Rental residential	3,213	6.74	216	3,357	2.57	86
7 Railroads	995	6.74	67	1,187	2.57	30
Jurisdictions						
State	48,419	0.38	184	50,218	0.00	0
Counties	48,419	2.03	983	50,218	0.00	0
Towns and Cities	28,292	0.37	105	29,024	0.00	0
Schools	48,419	3.06	1,481	50,218	2.21	1,109
Jr. College	37,568	1.36	509	39,174	0.14	55
Special Districts	0	0.00	0	21,417	0.58	125

Data compiled by Mountain West

TABLE 10.5
Baseline Net Assessed Value and Tax Revenue Projections (in 1986 dollars)
Safford Basin-Duncan Valley

	Primary			Secondary		
	1987	2010	2025	1987	2010	2025
Net Assessed Value ($000's)	48,419	62,336	72,718	50,218	64,442	75,034
Ag. and Vacant (%)	17.6	13.6	11.7	18.8	14.6	12.6
Comm. and Indus. (%)	24.5	25.4	26.6	23.9	24.9	26.1
Residential (%)	35.3	37.7	37.2	35.2	37.5	37.2
Other (%)	22.6	23.3	24.5	22.1	23.0	24.1
Cities and Towns Total (%)	58.4	64.0	66.4	57.8	62.3	64.9
Property Tax Revenue ($000's)	3,262	4,212	4,920	1,289	1,675	1,951
State (%)	5.6	5.6	5.6	0.0	0.0	0.0
Counties (%)	30.2	30.0	30.0	0.0	0.0	0.0
Cities and Towns (%)	3.2	3.5	3.6	0.0	0.0	0.0
Schools (%)	45.4	45.3	45.2	86.0	85.0	85.0
Community College (%)	15.6	15.6	15.6	4.3	5.5	5.5
Special Districts (%)	0.0	0.0	0.0	9.7	9.5	9.5
	Local Government Revenues					
Key Nonproperty Tax Revenue ($000's)	4,210	5,966	7,130			
County State Shared (%)	13.8	12.5	12.2			
City State Shared (%)	61.2	63.3	62.5			
City Sales (%)	25.0	24.2	25.3			

Source: Mountain West Research

CHAPTER 11

EXISTING STATUTES

The transportation of water and the transfer of water rights in Arizona are governed by several statutes, depending on the source and use of the water. Sources of water fall into three broad categories - Colorado River water, other surface water and groundwater.

Colorado River water is, as the name implies, water flowing in the Colorado River. Surface water subject to appropriation is defined by statute to mean the water of all sources, flowing in streams, canyons, ravines, or other natural channels, or in definite underground channels, whether perennial or intermittent flood, waste or surplus water, and of lakes, ponds, and springs on the surface (A.R.S. §45-131.4).

Groundwater is all water under the surface of the earth except water flowing in underground streams with ascertainable beds and banks (A.R.S. §45-101.4).

Colorado River water is under the jurisdiction of the Secretary of the Interior (Secretary). Each user of Colorado River water has a contract with the Secretary. It is clear that the approval of the Secretary would be required to purchase a Colorado River water right and to transport the water for use at a new location. The rules governing such a transfer are unclear because no private parties have attempted such a transfer. The only known transfer of Colorado River water to central Arizona, other than the Central Arizona Project, was as a result of a settlement of Indian claims to water involving an Act of

Congress. The extent to which State law might apply to the purchase of a Colorado River water right and transportation of the water to a new location is unknown.

The use of other surface water in Arizona is governed by the doctrine of prior appropriation, often described as the "first in time, first in right" doctrine. The first legal user of the water has the prior right.

The transportation or transfer of other surface waters within Arizona are governed by statute. Any change in the place of use requires that the person seeking the change apply for a sever and transfer as required by A.R.S. §45-172. A change in the use of surface water is governed by A.R.S. §45-146. These statutes require, among other things, the approval of the Director of the Department of Water Resources for severing and transferring or changing the use of surface waters.

The withdrawal, use, and transportation of groundwater is regulated by the Groundwater Code, A.R.S. §§45-401 through 45-655. The code establishes Active Management Areas (AMAs) which require the active management of groundwater resources within certain geographic areas. The rules governing the transportation and transfer of use of groundwater differ within and outside of AMAs.

Outside of AMAs there is generally no limit on the quantities and use of groundwater nor on the place of use. The right to use groundwater, however, is subject to provisions of the code, A.R.S. §§45-541 through 45-545. A person may withdraw groundwater outside an AMA and transport it for use at a different location, but if the groundwater is transported between subbasins or away from a groundwater basin the transportation is subject to payment of damages. To recover damages, the injured party would have to file a lawsuit.

The code contains stringent restrictions on the use and transfer of groundwater within AMAs. Of particular relevance are the grandfathered water rights provisions, A.R.S. §§45-461 through 45-482. These provisions establish the right of any potential user to use water, define the quantities that may be used, and regulate the manner in which groundwater rights may be transported or changed in use.

Grandfathered water rights are classified as irrigation grandfathered rights, type 1 nonirrigation grandfathered rights, and type 2 nonirrigation grandfathered rights.

Irrigation grandfathered rights are appurtenant, or attached, to land. An irrigation grandfathered right is owned by the owner of the land to which it is appurtenant and may be leased for an irrigation use along with the land to which it is appurtenant. An irrigation grandfathered right may be conveyed only with the land to which it is appurtenant. If an irrigation grandfathered right is conveyed for a nonirrigation use, it becomes a type 1 nonirrigation grandfathered right.

Groundwater withdrawn pursuant to a type 1 nonirrigation grandfathered right may generally be used for any nonirrigation purpose on the land to which it is appurtenant or any other land.

The owner of a type 1 nonirrigation grandfathered right may convey the right only for a nonirrigation use and only with the land to which it is appurtenant. If a type 1 nonirrigation right is conveyed, the full amount of the right is conveyed.

Groundwater may be withdrawn pursuant to a type 2 nonirrigation grandfathered right only from a location within the same AMA in which the certificate was issued. The groundwater may generally be used for any nonirrigation purpose at any location. It is unclear whether water received or withdrawn pursuant to a type 2 nonirrigation grandfathered right may be sold as water for use on other land. The owner of a type 2 nonirrigation right may generally convey the right for any nonirrigation use.

Interstate transfers of water are neither specifically prohibited nor allowed under Arizona law. Any interstate transfers, however, must meet all other statutory requirements.

CHAPTER 12

INSTITUTIONAL CONSTRAINTS

The basic elements governing the transfer of water are the availability of an adequate supply and a system through which the water may be transferred to the point of use. However, there exist certain institutional constraints which may be even more important to the successful acquisition and transfer of water supplies.

For the purposes of this report, institutional constraints are defined as any constraints other than economic and hydrologic limitations to the amount of water that can be withdrawn from an aquifer or surface water source for transfer.

The Groundwater Management Act of 1980 (Act) defined areas which have different levels of control over the withdrawal and use of groundwater. The Active Management Areas (AMAs) are regulated most closely and are, as the name implies actively managed to achieve the water use goal set for each AMA. Irrigation Nonexpansion Areas (INAs) are controlled, but much less stringently than AMAs. Regions not within either an AMA or INA have minimal requirements governing the use of water.

The Act defines the conditions under which water rights may be purchased and transferred from within AMAs for uses other than that for which the right was granted. The amount of water which may be transferred is limited to a maximum of 3 acre-feet/acre. Outside of AMAs the amount of water transferred is not specifically limited but the Act provides for damages to be paid to area water users if more than 3 acre-feet/acre is transferred and the users prove they were damaged. Not addressed in the Act is the transfer of quantities less than 3 acre-feet/acre, which may be more than hydrologic conditions can allow without damage. In addition, there should be a commitment to a 100-year water supply remaining in the basin to meet potential future development and population expansion.

The agricultural land base in some of the study areas will not provide the volumes of water investigated in the study. The question arises as to the course of action if the pumping requirement exceeds the agricultural consumptive use. If this occurs, from where would the water be acquired? Nonagricultural lands in the Pinal AMA study area may not have grandfathered water rights. What would be required to acquire, or use, federal or state lands? How would associated damages, if any, be mitigated?

Two study areas which will require consideration of the acquisition of public lands are the Butler Valley and Mogollon Rim areas. There is insufficient private agricultural land in the Mogollon Rim area to supply the projected transfer volumes and U.S. Forest Service lands must be acquired. The Butler Valley contains a considerable volume of recoverable groundwater but is predominately state land.

The Central Arizona Project is the mechanism by which renewable surface water supplies of the Colorado River will be delivered to Central Arizona. The M & I allotments to the cities are significant, more than enough for near-term growth. Cities are looking to water transfers to supplement their CAP allocations to meet long-term projected needs. A least-cost alternative may dictate that cities initiate transfers and forego the purchase of additional CAP water which may become available as agricultural allocations are reduced. Because of the potential impacts of such economically, induced transfers, the water transfers must be studied carefully. The urban areas also should be required to use fully their local water resources, including conservation measures, before implementing water transfers.

In addition, there has been no official comment from CAP officials as to the permissibility of using the CAP aqueduct to transfer water.

There will be intermittent surplus Colorado River water that could (and should) be used as artificial recharge in many basins along the CAP aqueduct and distribution canals. There are no institutional mechanisms on who bears the costs of such recharge programs, or establishes the ownership of such water. Effective artificial recharge programs by urban areas could be a partial answer to limiting water transfers from rural areas.

A mechanism to further limit water transfers would be the ability of a farmer, or irrigation district, to lease water to an urban area for a period of years. There is no flexibility in the Groundwater Code to allow for a leasing of water (rights) for municipal use and return of the water (rights) to agricultural at the end of the leasing period.

This chapter is not an exhaustive list of institutional constraints. Any constraint, whether real or imagined, must be resolved to protect the rights of the individual landowner and the welfare of citizens in rural and urban areas against those economic forces that bring water to its highest use.

CHAPTER 13

SUMMARY AND CONCLUSIONS

13.1 STUDY AREAS DELETED FROM PHASE II

Three study areas were deleted from the Phase II impact studies because of either insufficient water available for transfer or water-rights problems. These areas were: Verde River-Prescott AMA; Upper and Lower San Pedro Basin; and Safford Basin-Duncan Valley.

13.2 YUMA-WELLTON CORRIDOR-CIBOLA VALLEY

Multiple impact analyses were developed for potential water transfers from dispersed sources in the study area and a concentrated source assumed to be the Wellton-Mohawk area. The water sources in the two analyses were considered to be surface water from the Colorado River.

Hydrologic impacts were indicated to be nominal at all levels of water transfer in both the dispersed and concentrated scenario. No demand was placed on the groundwater resource although this resource could contribute significant quantities of water. Minor changes in water quality of Colorado River diversions may result at high levels of water transfer.

The socioeconomic and fiscal impacts of water transfers from the dispersed source would be modest because the economy of the study area is projected to be relatively diverse. The amount of agricultural land retired under the maximum water transfer is limited on a study-area wide basis. However, the declines in agricultural output, retired agricultural acreage and agricultural employment and fiscal impacts are severe in the concentrated source area.

13.3 HARQUAHALA-MCMULLEN-BUTLER VALLEY

Multiple impact analyses were developed for potential water transfers from La Paz and Maricopa Counties on an equally-shared basis, and from one concentrated source assumed to be Butler Valley.

Hydrologic impacts in Maricopa County are minimal because of the positive effects of CAP water in Harquahala Valley. Conversely, hydrologic impacts in La Paz County and in Butler Valley are significant because of increases in overdraft and water level decline rates. Land subsidence and earth fissures are a long-term potential in McMullen and Butler Valleys.

The La Paz and Maricopa County portions of the study area are predominantly agricultural. As a result, the socioeconomic and fiscal impacts associated with water transfers will be large. Since Butler Valley is primarily federal and state lands no socioeconomic and fiscal impact analyses were conducted.

13.4 MOGOLLON RIM

A single impact analysis was developed for potential water transfers from the Mogollon Rim study area.

Hydrologic impacts in the study area appear to be minimal based upon available data. However, this study area, more than any other study area, would require hydrologic and geologic investigations to substantiate any potential water transfer. For purposes of the analysis it was assumed that new well fields to implement water transfers would be located on U.S. Forest Service lands in favorable areas of the Coconino aquifer.

The socioeconomic and fiscal impacts associated with agricultural land and agricultural employment would be nominal.

13.5 PINAL AMA

A single impact analysis was developed for potential water transfers from the Pinal AMA study area.

The introduction of CAP water supplies into this study area and their effect on the hydrology of the study area cannot be overemphasized. The immediate impact of CAP water is assumed to be a period of dynamic change as pumpage and the long-term overdraft is sharply reduced. By mandate of the Groundwater Code, the Pinal AMA has a goal to preserve groundwater supplies for future nonagricultural uses. The CAP implements that goal. Water transfers are the future nonagricultural uses. The hydrologic impacts in the study area are minimal.

The economy of the Pinal AMA is relatively diverse, and the amount of agricultural land to be retired under the high volume transfer is relatively limited. Overall, the socioeconomic and fiscal impacts of water transfers would be relatively modest.

13.6 GILA BEND

A single impact analysis was developed for potential water transfers from the Gila Bend study area.

At the maximum rate of water transfer in year 2010, and at the medium and maximum rates in year 2025, overdraft is significantly increased at the maximum rate in year 2025 almost four-fold from baseline conditions. The hydrologic impacts would comprise accelerated water level declines and increased potential for land subsidence and earth fissures (particularly in the Theba area).

The socioeconomic and fiscal impacts of water transfers can be expected to produce substantial impacts in the Gila Bend study area. The study area is a predominantly agricultural economy and the retirement of agricultural land needed to support the water transfers are very high relative to the amount of available irrigated land.

13.7 ADDITIONAL IMPACTS

The impacts identified and quantified were those selected by the scope of work attached to the contract. Certainly, other impacts could have been identified and quantified. The budget restrictions placed upon this contract did not allow for comprehensive identification of impacts, particularly on the one impact referred to in several public hearings -- quality of life.

BIBLIOGRAPHY

Arizona Agricultural Statistics Service, 1986 Arizona Agricultural Statistics, Bulletin S-22, Phoenix, Arizona: U.S. Department of Agriculture, July 1987.

Arizona Agricultural Statistics Service, 1985 Arizona Agricultural Statistics, Bulletin S-21, Phoenix, Arizona: U.S. Department of Agriculture, July 1986.

Arizona Crop and Livestock Reporting Service, 1984 Arizona Agricultural Statistics, Bulletin S-20, Phoenix, Arizona: U.S. Department of Agriculture, July 1985.

Arizona Crop and Livestock Reporting Service, 1983 Arizona Agricultural Statistics, Bulletin S-19, Phoenix, Arizona: U.S. Department of Agriculture, June 1984.

Arizona Crop and Livestock Reporting Service, 1981 Arizona Agricultural Statistics, Bulletin S-17, Phoenix, Arizona: U.S. Department of Agriculture, April 1982.

Arizona Crop and Livestock Reporting Service, 1980 Arizona Agricultural Statistics, Bulletin S-16, Phoenix, Arizona: U.S. Department of Agriculture, April 1981.

Arizona Crop and Livestock Reporting Service, Cropland Atlas of Arizona, Phoenix, Arizona: U.S. Department of Agriculture, October 1974.

Arizona Department of Water Resources. Pinal Active Management Area, Management Plan For First Management Period: 1980-1990. Phoenix, Arizona: Department of Water Resources, December 1985.

__________. Analysis of Butler Valley Aquifer Test. Open-File Report No. 1. Phoenix, Arizona: Department of Water Resources, April 1986.

__________. Water Services Organizations in Arizona: Phoenix, Arizona: Department of Water Resources, 1983.

Babcock, H.M., K.K. Kendall and J.D. Hem of the U.S. Geological Survey, Department of the Interior. Geology and Ground-Water Resources of the Gila Bend Basin, Maricopa County, Arizona. Prepared in cooperation with Arizona State Land Department. An open-file report of the U.S. Geological Survey, Water Resources Division. Tucson, Arizona, February 1948.

Briggs, P.C. of the U.S. Geological Survey, Department of the Interior. Ground-Water Conditions in McMullen Valley, Maricopa, Yuma and Yavapai Counties, Arizona. Water Resources Report Number 40. Phoenix, Arizona: Arizona State Land Department, July 1969.

__________. Ground-Water Conditions in the Ranegras Plain, Yuma County, Arizona. Water Resources Report Number 41. Phoenix, Arizona: Arizona State Land Department, September 1969.

Brown, S.G., E.S. Davidson, L.R. Kister, and B.W. Thomsen of the U.S. Geological Survey, Department of the Interior. Water Resources of Fort Huachuca Military Reservation, Southeastern Arizona. Geological Survey Water-Supply Paper 1819-D. Washington, D.C.: U.S. Government Printing Office, 1966.

Bryan, Kirk, G.E.P. Smith, and Gerald A. Waring. Ground-Water Supplies and Irrigation in San Pedro Valley, Arizona. An open-file report of the U.S. Geological Survey, Water Resources Division, Tucson, Arizona, 1934.

Bureau of Land Management, 30 X 60 Minute Quadrangle Map of Surface Management Status, Scale 1:100,000 for following areas: Tinajas Atlas Mts., 1980; Dateland, 1980; Trigo Mountains, 1979; Yuma, 1981; Little Horn Mts., 1981; Salome, 1978; Alamo Lake, 1979; Bradshaw Mts., 1981; Prescott, 1981; Sedona, 1980; Payson, 1981; Williams, 1981; Holbrook, 1980; Show Low, 1981; Saint Johns, 1981; Casa Grande, 1979; Springerville, 1981; Mesa, 1979; Phoenix South, 1981; Gila Bend, 1981; Fort Huachuca, 1979; Nogales, 1979; Tucson, 1979; Mammoth, 1978; Globe, 1979; Safford, 1973; and Clifton, 1973.

Bureau of Land Management, Map of Surface Management Status, State of Arizona, Scale 1:1,000,000, 1979.

Daniel, D.L. Maps Showing Total Dissolved Solids Content of Groundwater in Arizona. Prepared in cooperation with the Arizona Department of Health Services. Hydrologic Map Series Report Number 2. Phoenix, Arizona: Department of Water Resources, State of Arizona, January 1981.

Denis, E.E. of the U.S. Gological Survey, Department of the Interior. Ground-Water Conditions in the Harquahala Plains, Maricopa and Yuma Counties, Arizona. Water Resources Report Number 45. Phoenix, Arizona: Arizona State Land Department, April 1971.

Gookin, W.S. & Associates. Comprehensive Water Management Study, City of Prescott and Environs. A report prepared for the City of Prescott, 1978.

__________. Comprehensive Water Study of The City of Prescott and Environs. A report prepared for the City of Prescott, 1977.

__________. Maps Showing Ground-Water Conditions in the Harquahala Plains Area, Maricopa and Yuma Counties, Arizona-1975. An open-file report 76-33 of the U.S. Geological Survey, Department of the Interior, Tucson, Arizona, April 1976.

Graf, C.G. Maps Showing Ground-Water Conditions in the Harquahala Plains Area, Maricopa and Yuma Counties, Arizona-1980. Prepared in cooperation with the U.S. Geological Survey. Hydrologic Map Series Report Number 1. Phoenix, Arizona: Department of Water Resources, State of Arizona, December 1980.

Graf, Charles of the Arizona Water Commission. "Origin, Development, and Chemical Character of a Perched Water Zone, Harquahala Valley, Arizona," The 1980 Meetings of the Arizona Section - American Water Resources Assn. and the Hydrology Section - Arizona-Nevada Academy of Science, Proceedings. Arizona Water Commission: April 1980.

Harper, R.W. and T.W. Anderson. Maps Showing Ground-Water Conditions in the Concho, St. Johns, and White Mountains Areas, Apache and Navajo Counties, Arizona-1975. An open-file report 76-104 of the U.S. Geological Survey, Department of the Interior. Tucson, Arizona, August 1976.

Herndon, Roy Lee. "Hydrogeology of Butler Valley, Arizona: An Artificial Recharge and Groundwater Storage Prefeasibility Study", A Master's thesis submitted to the Department of Hydrology and Water Resources, University of Arizona, 1985.

James M. Montgomery, Consulting Engineers, Inc. Water Resources Study McMullen Valley. A report prepared for the City of Phoenix, Arizona. 1986.

Johnson Division UOP. Ground Water and Wells, Johnson Division, UOP Inc., St. Paul, Minnesota, 1975.

Jones, S.C. Maps Showing Ground-Water Conditions in the Lower San Pedro Basin Area, Pinal, Cochise, Pima, and Graham Counties, Arizona-1979. An open-file report 80-954 of the U.S. Geological Survey, Department of the Interior. Tucson, Arizona, July 1980.

Kam, William of the U.S. Geological Survey, Department of the Interior. Geology and Ground-Water Resources of McMullen Valley, Maricopa, Yavapai, and Yuma Counties, Arizona. Geological Survey Water-Supply Paper 1665. Washington, D.C.: U.S. Government Printing Office, 1964.

Konieczki, A.D. Maps Showing Ground-Water Conditions in the Upper San Pedro Basin Area, Pima, Santa Cruz, and Cochise Counties, Arizona-1978. An open-file report 80-1192 of the U.S. Geological Survey, Department of the Interior. Tucson, Arizona, October 1980.

Leake, S.A. and D.M. Clay. Maps Showing Ground-Water Conditions in the Gila River Drainage from Texas Hill to Dome Area and in the Western Mexican Drainage Area, Maricopa, Pima, and Yuma Counties, Arizona-1977. An open-file report 79-1540 of the U.S. Geological Survey, Department of the Interior. Tucson, Arizona September 1979.

Levings, Gary W. and Larry J. Mann. Maps Showing Ground-Water Conditions in the Upper Verde River Area, Yavapai and Coconino Counties, Arizona-1978. An open-file report 80-726 of the U.S. Geological Survey, Department of the Interior. Tucson, Arizona, April 1980.

Mann, Larry J. of the U.S. Geological Survey, Department of the Interior. Ground-Water Resources and Water Use in Southern Navajo County, Arizona. Arizona Water Commission Bulletin 10. Phoenix, Arizona: Arizona Water Commission, May 1976.

Mann, Larry J. of the U.S. Geological Survey, Department of the Interior, and E. A. Nemecek of the Arizona Department of Water Resources. Geohydrology and Water Use in Southern Apache County, Arizona. Arizona Department of Water Resources Bulletin 1. Phoenix, Arizona: Arizona Department of Water Resources, January 1983.

McGavock, E.H. and T.W. Anderson, Otto Moosburner, and Larry J. Mann of the U.S. Geological Survey, Department of the Interior. Water Resources of Southern Coconino County, Arizona. Arizona Department of Water Resources Bulletin 4. Tucson, Arizona: Arizona Department Water Resources, 1986.

Metzger, D.G. of the U.S. Geological Survey, Department of the Interior. Geology and Ground-Water Resources of the Harquahala Plains Area, Maricopa and Yuma Counties, Arizona. Water Resources Report Number 3. Phoenix, Arizona: Arizona State Land Department, September 1957.

__________. Geology and Ground-Water Resources of the Northern Part of the Ranegras Plain Area, Yuma County, Arizona. Prepared in cooperation with Arizona State Land Department. An open-file report of the U.S. Geological Survey, Water Resources Division. Tucson, Arizona, February 1951.

Olmsted, F.H., O.J. Loeltz, and Burdge Irelan of the U.S. Geological Survey, Department of the Interior. Geohydrology of the Yuma Area, Arizona and California. Geological Survey Professional Paper 486-H. Washington, D.C.: U.S. Government Printing Office, 1973.

Owen-Joyce, Sandra J. of the U.S. Geological Survey, Department of the Interior. Hydrology of a Stream-Aquifer System in the Camp Verde Area, Yavapai County, Arizona. Arizona Department of Water Resources Bulletin 3. Tucson, Arizona: Arizona Department of Water Resources, 1984.

Owen-Joyce, Sandra J. and C.K. Bell of the U.S. Geological Survey, Department of the Interior. Appraisal of Water Resources in the Upper Verde River Area Yavapai and Coconino Counties, Arizona. Arizona Department of Water Resources Bulletin 2. Phoenix, Arizona: Arizona Department of Water Resources, March 1983.

Remick, W.H. Maps Showing Groundwater Conditions in the Prescott Active Management Area, Yavapai County, Arizona-1982. Prepared in cooperation with the U.S. Geological Survey. Hyrologic Map Series Report Number 9. Phoenix, Arizona: Department of Water Resources, State of Arizona, March 1983.

__________. Maps Showing Ground-Water Conditions in the McMullen Valley Area, Maricopa, Yavapai, and Yuma Counties, Arizona-1981. Prepared in cooperation with the U.S. Geological Survey. Hydrologic Map Series Report Number 6. Phoenix, Arizona: Department of Water Resources, State of Arizona, December 1981.

Roeske, R.H. and W.L. Werrell of the U.S. Geological Survey, Department of the Interior. Hydrologic Conditions in the San Pedro River Valley, Arizona 1971. Arizona Water Commission Bulletin 4. Phoenix, Arizona: Arizona Water Commission, March 1973.

Sanger, H.W. and G.R. Littin. Maps Showing Ground-Water Conditions in the Bill Williams Area, Mohave, Yavapai, and Yuma Counties, Arizona-1980. An open-file report 82-87 of the U.S. Geological Survey, Department of the Interior. Tucson, Arizona, November 1981.

Sebenik, P.G. Maps Showing Ground-Water Conditions in the Gila Bend Basin Area, Maricopa County, Arizona-1979. Prepared in cooperation with the U.S. Geological Survey. Hydrologic Map Series Report Number 3. Phoenix, Arizona: Department of Water Resources, State of Arizona, May 1981.

Stulik, R.S. of the U.S. Geological Survey, Department of the Interior. Effects of Ground-Water Withdrawal, 1954-63, in the Lower Harquahala Plains, Maricopa County, Arizona. Water Resources Report Number 17. Phoenix, Arizona: Arizona State Land Department, September 1964.

Stulik, R.S. and Otto Moosburner of the U.S. Geological Survey, Department of the Interior. Hydrologic Conditions in the Gila Bend Basin, Maricopa County, Arizona. Water Resources Report Number 39. Phoenix, Arizona: Arizona State Land Department, March 1969.

Twenter, F.R. and D.G. Metzger of the U.S. Geological Survey, Department of the Interior. Geology and Ground Water in Verde Valley-the Mogollon Rim Region Arizona. Geological Survey Bulletin 1177. Washington, D.C.: U.S. Government Printing Office, 1963.

U.S. Department of the Interior, Bureau of Reclamation, Lower Colorado Region. Central Arizona Project, Geology and Groundwater Resources Report, Maricopa and Pinal Counties, Arizona - Volume 1. Phoenix, Arizona: Arizona Projects Office, October 1977.

U.S. Department of the Interior, Bureau of Reclamation, Yuma Projects Office. Ground-Water Status Report 1982 Yuma Area - Arizona, California. Yuma, Arizona: U.S. Bureau of Reclamation, October 1983.

___________. Ground-Water Status Report 1984 Yuma Area - Arizona, California. Yuma, Arizona: U.S. Bureau of Reclamation, October 1985.

U.S. Department of the Interior, Geological Survey. Annual Summary of Ground-Water Conditions in Arizona, Spring 1982 to Spring 1983. An open-file report 84-428 of the U.S. Geological Survey prepared in cooperation with the Arizona Department of Water Resources. Tucson, Arizona, May 1984.

U.S. Department of the Interior, Geological Survey. Annual Report on Ground Water in Arizona with emphasis on Gila Bend Basin McMullen Valley and the southeast part of the Harquahala Plains Spring 1973 to Spring 1974. Arizona Water Commission Bulletin Number 9. Phoenix Arizona: Arizona Water Commission, February 1975.

University of Arizona, 1987 Arizona Vegetable Crop Budgets, Maricopa County Volumes 1 & 2, Tucson, Arizona: April 1987.

University of Arizona, 1987 Arizona Field Crop Budgets, Maricopa County, Tucson, Arizona: April 1987.

University of Arizona, 187 Arizona Field Crop Budgets, Pinal County, Tucson, Arizona: April 1987.

University of Arizona, 1987 Arizona Field Crop Budgets, Yuma County, Tucson, Arizona: April 1987

University of Arizona, 1987 Arizona Field Crop Budgets, La Paz County, Tucson, Arizona: April 1987.

University of Arizona, 1987 Arizona Field Crop Budgets, Greenlee County, Tucson, Arizona: April 1987.

University of Arizona, 1987 Arizona Field Crop Budgets, Graham County, Tucson, Arizona: April 1987.

University of Arizona, 1987 Field Crop Budgets, Navajo County, Tucson, Arizona: April 1987.

Wallace, B.L. and R. L. Laney. Maps Showing Ground-Water Conditions in the Lower Big Chino Valley and Williamson Valley Areas, Yavapai and Coconino Counties, Arizona-1975-76. An open-file report 76-78 of the U.S. Geological Survey, Department of the Interior. Tucson, Arizona, June 1976.

Wilkins, D.W. Maps Showing Ground-Water Conditions in the Yuma Area, Yuma County, Arizona-1975. An open-file report 78-62 of the U.S. Geological Survey, Department of the Interior. Tucson, Arizona, April 1978.

BIBLIOGRAPHY
Economic and Fiscal Analysis
Economic Impacts of Water Transfers

Abstract and Assessment Roll, 1986, Arizona Department of Revenue. No date.

Annual Report of the Superintendent of Public Instruction, 1980-81 and 1985-86, Arizona Department of Education. 1981 & 1986.

Arizona Census of the Population: Standard Tape Files 1A and 3A, United States Bureau of the Census. No date.

Community Profiles, Arizona Department of Commerce. Various issues and dates.

Employment Estimates, Arizona Department of Economic Security, Labor Market Information Section. No date.

General Population Characteristics, Census of the Population: 1980, United States Bureau of the Census. April 1982.

Population Estimates for Arizona, Arizona Department of Economic Security, Population Statistics Unit. Winter 1986.

Population Populations for Arizona, Arizona Department of Economic Security, Population Statistics Unit. 1986.

Property Tax Rates and Assessed Values, 1986, Arizona Tax Research Foundation. 1987.

Update of the Socioeconomic Database for Maricopa County, 1985-2015, Maricopa Association of Governments. May 1987.

APPENDIX A

GROUNDWATER STORAGE

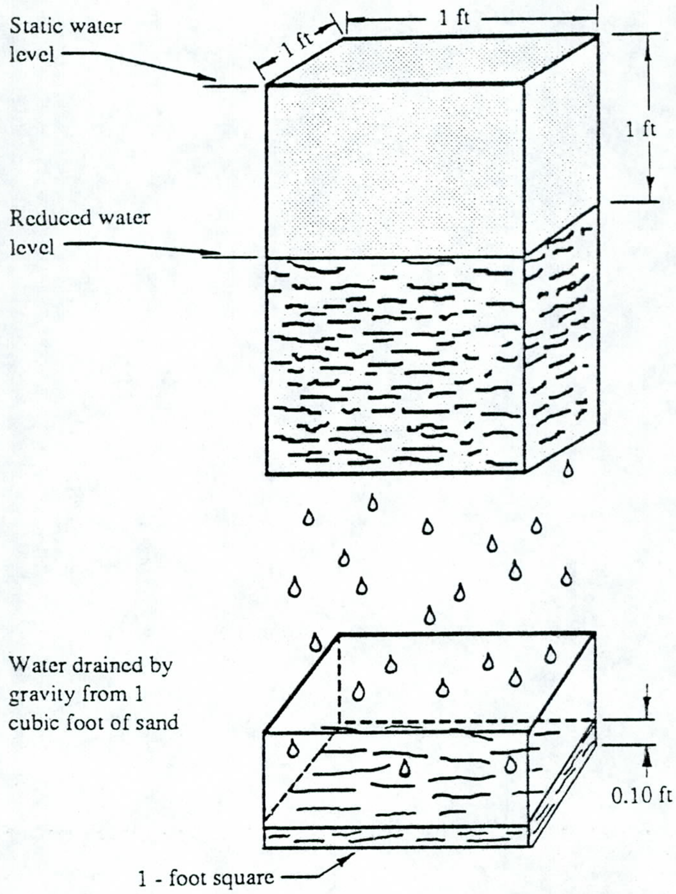
During the presentations and public hearings it became apparent that the concepts of gross and recoverable groundwater storage, as quantified in the study area water budgets, were unclear to many people. The following paragraphs explain gross and recoverable storage.

The porosity of a water-bearing formation is that part of the volume which consists of openings not occupied by solid material. Porosity is usually expressed as a percentage of the bulk volume of the material. For example, if 1 cubic foot of sand contains 0.30 cubic foot of open areas or pores, the porosity is 30 percent. Although porosity represents the amount of water an aquifer will hold, it does not indicate how much water the porous material will yield. When water is drained from a saturated material by gravity force, only part of the total volume stored in the pores is released. That part of the water that is not removed by gravity drainage is held against the force of gravity by molecular attraction and capillarity.

That quantity of water that a unit volume of the aquifer will give up when drained by gravity is called the specific yield. Specific yield is also expressed as a percentage. If 0.10 cubic foot of water is drained from 1 cubic foot of saturated sand, the specific yield of the sand is 10 percent (figure A.1). If the porosity of the sand is 30 percent, the other 20 percent of the water is retained in the sand by molecular attraction and capillarity. This retained quantity of water is called specific retention, also expressed as a percentage. Specific yield plus specific retention equals porosity.

When calculating gross groundwater storage, an average specific yield is applied to a volume of water-bearing material. For example, an aquifer extending under a surface area of 10,000 acres with an average saturated thickness of 100 feet occupies a volume of 1 million acre-feet (10,000 acres x 100 feet). If the specific yield of the aquifer is 10 percent, 100,000 acre-feet could be extracted from the aquifer. This 100,000 acre-feet is the gross groundwater storage. To relate this gross storage to water level declines one further calculation is required. If the upper 1 foot of the same 100-foot-thick aquifer was drained by lowering the water level 1 foot (figure A.1), the yield from that 1 foot would be 1,000 acre-feet. A 100-foot decline would yield 100,000 acre-feet, completely dewatering the aquifer.

Since geologic materials are rarely homogenous in a given groundwater basin, and the specific yield is estimated from fragmentary and/or assumed data, the conservative practice is to quantify only a portion of the gross storage as recoverable storage. For the water transfer study, it was considered prudent to use an estimate of 50 percent as that portion of gross storage judged as recoverable storage. This very conservative approach insured that a more than adequate quantity of recoverable storage would be available to local water users upon implementation of potential water transfers. This approach maximized the hydrologic impacts of water transfers, but had an apparent minimizing impact on the life of the recoverable groundwater storage. It must be noted that DWR, when evaluating studies for 100-year assured water supplies, utilizes total gross storage to 1,200 feet and does not even consider recoverable storage as defined herein.



Specific yield of sand can be visualized from this diagram. Its value here is 0.10 cubic foot per cubic foot of aquifer material, or 10 percent. (From: GROUND WATER and WELLS, 1975)

FIGURE A - 1
ILLUSTRATION OF SPECIFIC YIELD

APPENDIX B

IMPACTS ON IRRIGATION DISTRICTS

B.1 INTRODUCTION

A major concern at the outset of this study was the potential adverse impacts on irrigation districts that may result from land purchases within its boundaries by a municipality. There are two issues to be addressed: (1) how do land purchases affect fixed debt obligations; and (2) what is the impact of reduced water deliveries on annual cash flow.

B.2 FIXED DEBT OBLIGATIONS

Fixed debt obligations consist of medium- to long-term loans and bonds which usually have been incurred to finance construction of major works in the district. Irrigation districts have the power to tax the land within its boundaries and receive the revenues through county collection processes or directly from land owners.

For example, a typical land owner in the HoHoKam Irrigation and Drainage District near Coolidge, Arizona would be assessed a total payment of $203.92 per acre under existing estimates of district costs. This cost can be separated into the following categories:

Debt Service and Reserve	$18.21/ac/yr
O.M. & R.	$19.69/ac/yr
C.A.P. Water	$89.51/ac/yr
Energy	$76.51/ac/yr
	$203.92/ac/yr

SOURCE: Addendum Report to Distribution System Loan Application Report and Feasibility Study, February 1984.

Landowners are required to pay the debt service and reserve charge of $18.21 per acre as well as the fixed O.M. & R. of $19.69 regardless of whether any water deliveries are ordered. The CAP water and energy costs are representative of typical amounts delivered to agricultural users but are fully dependent upon the amount of water used.

New purchasers of land within irrigation districts assume the fixed debt obligation regardless of whether they are municipalities or private parties. In the case where a municipality purchases land within this irrigation district and retires all acres from production, it would still have a fixed annual liability of $37.90 per acre ($18.21 plus $19.69). This assessment by the district is, in essence, a lien on the property.

Municipal ownership of lands would not affect the financial "wholeness" of the district because debt service payments would continue until these obligations are retired. In some instances, municipal ownership of lands may even strengthen the financial capacity of a district because it brings almost complete assurance that payments will be made in a timely manner.

B.3 REDUCED WATER DELIVERIES

If a municipality retires land from agricultural production, no water deliveries by the district will be required. The municipality would not be assessed the $166.02 ($89.51 and $76.51) per acre associated with the typical amount of water delivered to land in production.

In the event that the water not used by the municipality is sold to another purchaser within the district, annual revenues would not be affected. If the water is purchased by an entity outside of the district, it may result in additional net revenues to the district due to the fact that less staff and lower operational costs are required for the same volume of sales.

Where the water cannot be sold to another user, municipal ownership may affect the size of district operations and result in fewer staff due to smaller annual revenues. However, a smaller service area would require less staff for operations which may offset lower annual revenues from sales. In this case, reduced water sales would reduce the operational size of the district without significantly affecting its financial well being. A possible exception to this trend is the situation where municipal land is purchased in a "checker board" manner throughout the district rather than in one or more contiguous blocks. This situation still requires maintenance for the same length of canals and laterals. The most likely result would be minor reductions in operations staff and no change in maintenance expenditures.

B.4 CONCLUSIONS

Since irrigation districts have taxing authority, fixed debt obligations can be met from property owners regardless of whether land is in public or private ownership. The amount of annual district revenues may be affected depending upon the disposition of water not delivered to municipal lands. Reduced water sales would result in lower total revenues with minimum adverse impacts on net revenues.

These observations support a conclusion that municipal ownership of land in an irrigation district would have minimal adverse impacts on the financial viability of the district.

APPENDIX C

CONTROL OF NOXIOUS WEEDS AND DUST

C.1 INTRODUCTION

Retired agricultural lands require a certain degree of maintenance to prevent problems associated with noxious weeds, dust and other undesireable effects to adjacent lands remaining in agricultural production. Ultimate selection of control methods will be highly dependent upon site-specific conditions and the timetable of water transfers.

For example, in the case where water transfers are not planned until 10 to 15 years into the future, lands could remain in cultivation. It may be desirable from the municipal viewpoint to reduce pumping during the interim and retire portions of the land under an annual rotation program. Under this system, lessees and/or operators of the land would control weeds and dust as part of their normal fallowing practices.

Normal fallowing practices consist of disking to control weeds and applying water to control dust. In most cases, fallowed land is out of production one season and intensive fallowing practices are only intended for a short period of time. Otherwise, fallowing costs become excessive.

If intensive fallowing practices were extended to a year-round operation, it is estimated that an average of six (6) diskings would be required. Based on cost data presented in table C.1, disking costs are approximately $8.96 per acre each time the operation is performed. Six operations per year would total $53.76 per acre.

Dust problems are caused by many factors with the most predominant being soil characteristics and wind. Lands that have no vegetation are more likely to cause dust problems than lands with crops, crop residues, scattered plants or shrubs. Therefore, a year-round fallowing program in which lands are kept relatively vegetation-free would be quite susceptible to dust problems where wind conditions cause soil erosion. Furthermore, disking increases the likelihood of dust problems on these lands.

Under normal fallowing practices, light irrigations are applied to control wind erosion of lands without vegetation, especially after disking. Approximately 6 inches of water are considered as a light irrigation (this may vary from 4 to 8 inches in some areas). Irrigation costs vary dramatically for different areas as demonstrated in appendix A. Costs per acre-foot can range from a low of $25.00 to over $100.00. If it is assumed that water costs $60.00 per acre-foot and two irrigations are required per year, then total annual costs for water and disking could amount to over $110.00 per acre.

Applying water to these lands controls the dust but easy availability of moisture also encourages rapid regeneration of weeds which, in turn, necessitates more frequent disking. Due to the costs, this type of land maintenance is only an interim solution at most and not cost effective for lands retired from agricultural production.

C.2 ALTERNATIVE LAND MAINTENANCE OPTIONS

Regardless of interim land management arrangements, water will eventually be transferred and the land will either be transformed to other uses or left vacant. Land transformed into other uses will be controlled and maintained in order to alleviate weed and dust problems. Concern for control of weeds and dust is primarily related to large areas of vacant lands.

Three options to control weeds and dust on retired agricultural lands, with the following preconditions, are investigated in this analysis:

- Land without crop residue;
- Land with crop residue from small grains or alfalfa; and
- Land where late milo or similar crop has been planted just prior to retirement.

A fourth option is to do nothing with retired agricultural land. This option has not been considered in the present analysis because the potential for litigation is high and would probably result in some type of control in order to prevent future damages to neighboring farm operations.

C.2.1 Land Without Crop Residues

The first precondition is to begin maintenance procedures with clean land. One of the first plant species to appear is tumbleweed. Tumbleweed is very prolific and disperses its seed quickly and efficiently. If uncontrolled, tumbleweed will soon dominate other plant species and cover a large portion of the land. Problems result when tumbleweeds lodge in fence lines and other crops such as cotton and small grains.

It has been found that tumbleweeds are less prolific when the land has some type of ground cover. This can be accomplished in the early years by cutting the tumbleweed stands with a stalk cutter. The City of Tucson uses a 4-row flail cutter that chops the tumbleweeds and leaves a residue which serves to decrease the rate of regermination. This also keeps the tumbleweeds from flowing off the land to adjacent fields.

Broadcasting of range grass or other types of seed during or after mowing operations also helps to establish additional ground cover. Increased ground cover from chopped weeds and newly seeded grasses results in fewer tumbleweeds and a reduction in the area over which the mowing operation is required.

Mechanical control of weeds is preferable to chemical controls because of the danger that deep percolation of water will contaminate the aquifer. In some instances, a light mixture of diesel, water, and detergent are applied to ditch banks and other places where mowing cannot be used. Such operations should be applied sparingly and on an "as needed" basis to very small areas.

Estimated costs for maintaining retired agricultural lands through mowing and limited reseeding have been developed in table C.2. During the first 4 years, mowing is more intensive than in subsequent years. In the first year, it is estimated that four mowing operations will be required where approximately 80 percent of each acre is mowed. The estimated cost of mowing in the first year would be $20.77 per acre and inclusion of broadcasting additional seed results in a total cost of $30.57 per acre.

Second year costs are estimated to be $26.17 per acre, slightly lower than the first year costs due to a smaller area (70 percent) that require mowing. The third and fourth year costs decrease for the same reason and approximate $15.58 per acre and $12.98 per acre, respectively.

After the first 4 years, the tumbleweed problem usually requires much less maintenance. Most other vegetation is self-maintaining and problem-free to adjoining farm lands. During years 5 through 8, it is estimated that only 2 mowing operations per year will be required during these 4 years are estimated to be $6.49 per acre per year. In years 9 through 12, mowing costs decrease to $5.19 per acre per year. Thereafter, it is estimated that maintenance costs will average $2.60 per acre per year.

It is obvious from table C.2 that most of the maintenance costs are required in the first 4 years, averaging about $21.33 per acre per year. During the remaining years, the annual average cost per acre is $3.83.

C.2.2 Land With Crop Residues

Another option would be to leave crop aftermath in place upon completion of the farming activities. For instance, if the last crop to be grown was alfalfa or small grains, stubble and other residue could be left in place. This would retard the tumbleweed population in the early years and result in lower overall maintenance costs.

As shown in table C.3, this option has lower average maintenance costs per acre. For example, during the first 4 years, average annual costs would be $13.21 per acre compared to $21.33 per acre for the option discussed in the previous section. Annual costs for the remaining years would average $2.54 per acre.

This option appears much more cost effective than the "clean land" option discussed in the previous section. However, the relative profitability of small grains compared to cotton and other cropping alternatives make this an unattractive option to farmers. Under prevailing economic conditions, typical cropping patterns would include only limited acreages of small grains. Nevertheless, portions of potential agricultural lands could be retired using this technique depending upon the cropping pattern at the time of retirement.

C.2.3 Land With Planted Crops

A modification to leaving crop residues is to plant a cover crop such as late milo or fast-growing grasses. This would occur most often where economic incentives were too low for farmers to plant small grains as a last crop. This option would involve the field preparation and planting of a cover crop just before the land is retired from production.

As shown in table C.4, planting a last crop such as late milo would include land preparation, seeding and irrigation. Once emergence is achieved, the crop will only be mowed at appropriate times to generate additional growth and provide ground cover.

The first year cost of this option is more than in either of the two options discussed above. However, maintenance costs decrease markedly in the second year and parallel the costs of maintaining lands with crop residues.

The average annual costs for the first four years is $20.50 per acre, comparable to the average of the clean-land option. Costs for the remaining 21 years average $2.41 per acre per year, which is slightly lower than the crop residue alternative.

C.3 SUMMARY

Average costs during the first four years of the three land maintenance programs in this analysis range from a low of $13.21 annual per acre to a high of $21.33 per acre per year. Annual costs for the remaining 21 years of the analysis are very similar among the three alternatives ranging from $2.41 to $2.6 per acre. These costs are summarized below.

	Clean Land Option	Crop Residue Option	Planted Crop Option
	(annual costs per acre)		
Years 1-4	$21.33	$13.21	$20.50
Years 5-25	$ 2.60	$ 2.54	$ 2.41

Based upon cost effectiveness, the crop residue option is the most preferable. The clean land option is the least preferable and the planted crop option is marginally better. In practice, all three options or modifications thereof will probably be used to varying degrees in a land retirement program.

The clean land option would necessarily follow a last crop of cotton due to existing regulations. Planting some of the cotton land into small grains just before retirement will decrease the amount of clean land acreage. Finally, the acreage in crops which provide good residues will be left in that condition and carried over into the retirement program.

The land maintenance options in this analysis are representative of typical retirement methods and used as a basis to estimate costs. Actual maintenance operations may vary somewhat due to localized conditions.

TABLE C.1
Ownership, Operation, and Labor Costs for Selected Machinery (Hourly and Per Acre Basis)

SUMMARY PER ACRE AND PER HOUR COSTS

	Disking	Listing	Planting	Mowing
Power	$21.66	$14.21	$10.06	$10.40
Machinery	$16.57	$7.16	$22.66	$8.98
Labor	$6.57	$6.57	$6.57	$6.57
TOTAL COSTS PER HOUR	$44.80	$27.94	$39.29	$25.95
ACRES PER HOUR	5.0	5.0	5.0	4.0
COSTS PER ACRE	$8.96	$5.59	$7.86	$6.49

DETAILED COST DATA

	DISKING COSTS PER HOUR		LISTING COSTS PER HOUR		PLANTING COSTS PER HOUR		MOWING COSTS PER HOUR	
COST ITEM	150-hp Tractor	18-ft Off-set Disk	100-hp Tractor	7-Bottom Lister	70-hp Tractor	6-Row Planter	80-hp Tractor	4-Row Flail
Depreciation	$3.58	$4.70	$2.33	$2.03	$1.67	$7.02	$1.67	$3.27
Interest	$3.29	$3.82	$2.14	$1.65	$1.53	$5.02	$1.53	$2.34
Taxes, Ins. & Housing	$1.45	$1.57	$0.94	$0.68	$0.67	$2.06	$0.67	$0.96
Repairs	$6.09	$6.48	$3.97	$2.80	$2.84	$8.56	$2.84	$2.41
Fuel/Oil	$7.25		$4.83		$3.35		$3.69	
	$21.66	$16.57	$14.21	$7.16	$10.06	$22.66	$10.40	$8.98

	LABOR COSTS PER HOUR
Hourly Rate	$5.00
FICA Match	$0.36
Workman Compensation	$0.39
Unemployment Ins.	$0.18
Fringe	$0.65
	$6.57

Source: "1987 Arizona Field Crops Budgets", Maricopa, La Paz and Pinal counties, University of Arizona, Tucson, Arizona, January 1987.

TABLE C.2
Estimated Maintenance Costs For Retired Agricultural Lands With No Crop Residues
(1986 Costs per Acre)

Year	Operation	Times Performed	Land Covered	Cost Per Operation	Total Costs
1	Mowing	4	80%	$6.49	$20.77
	Seed 8 lbs/acre			4.80	4.80
	Broadcasting	1		5.00	5.00
	Total Year 1				$30.57
2	Mowing	4	70%	$6.49	$18.17
	Seed 5 lbs/acre			3.00	3.00
	Broadcasting	1		5.00	5.00
	Total Year 2				$26.17
3	Mowing	4	60%	$6.49	$15.58
4	Mowing	4	50%	$6.49	$12.98
5–8	Mowing	2	50%	$6.49	$6.49
9–12	Mowing	2	40%	$6.49	$5.19
13–25	Mowing	1	40%	$6.49	$2.60

Source: Computed from table C.1.

TABLE C.3
Estimated Maintenance Costs For Retired Agricultural Lands With Crop Residues
(1986 Costs per Acre)

Year	Operation	Times Performed	Land Covered	Cost Per Operation	Total Costs
1	Mowing	2	80%	$6.49	$10.38
	Seed 8 lbs/acre			4.80	4.80
	Broadcasting	1		5.00	5.00
	Total Year 1				$20.18
2	Mowing	2	70%	$6.49	$9.09
	Seed 5 lbs/acre			3.00	3.00
	Broadcasting	1		5.00	5.00
	Total Year 2				$17.09
3–5	Mowing	2	60%	$6.49	$7.79
6–10	Mowing	1	50%	$6.49	$3.25
10–25	Mowing	1	30%	$6.49	$1.95

Source: Computed from table C.1.

TABLE C.4
Estimated Maintenance Costs For Retired Agricultural Lands With A Planted Crop
(1986 Costs per Acre)

Year	Operation	Times Performed	Land Covered	Cost Per Operation	Total Costs
1	Disk	1	100%	$8.96	$8.96
	List/Plant	1	100%	13.45	13.45
	Seed 10 lbs/acre			5.00	5.00
	Irrigate 6 A.I.			32.50	32.50
	Mow	1	100%	6.49	6.49
	Total Year 1				$66.40
2-5	Mowing	1	80%	$6.49	$5.19
6-10	Mowing	1	50%	$6.49	$3.25
10-25	Mowing	1	30%	$6.49	$1.95

Source: Computed from table C.1.