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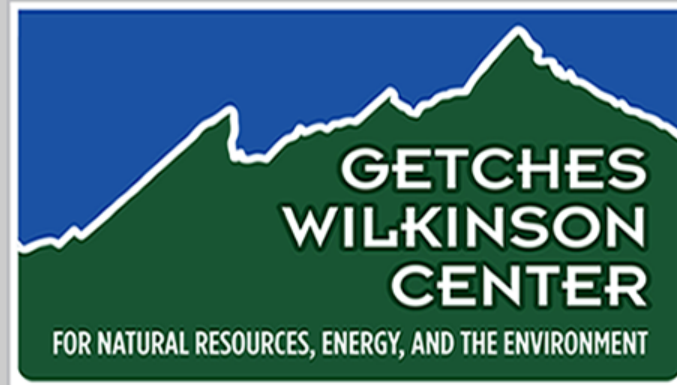
Robert S. Robinson & Lawrence J. MacDonnell, The Water Transfer Process as a Management Option for Meeting Changing Water Demands, Volume I (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law 1990).

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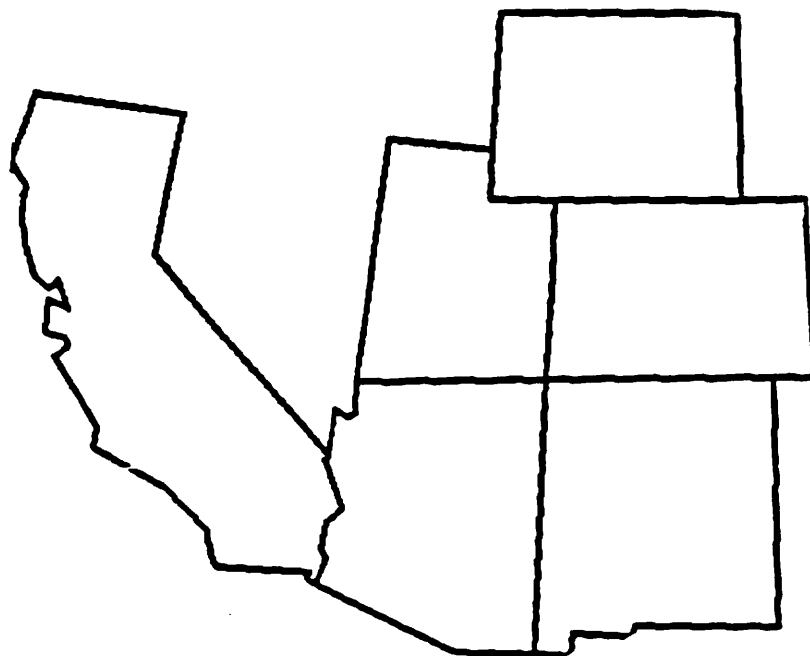


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THE WATER TRANSFER PROCESS AS A MANAGEMENT OPTION FOR MEETING CHANGING WATER DEMANDS



VOLUME I

**Submitted to the U.S. Geological Survey
in Fulfillment of
Grant Award Number 14-08-0001-G1538**

Dr. Robert S. Robinson, Project Officer

by

**Dr. Lawrence J. MacDonnell, Principal Investigator
April 1990**

FOREWORD

This report represents the collaborative work of an interdisciplinary team of researchers from six western states between October 1987 and March 1990. The report's objective is to provide a detailed evaluation of the processes by which water can be shifted from an existing use to a new or different use. In particular, it focuses on the laws and procedures governing changes in the purpose or place of use of water in Arizona, California, Colorado, New Mexico, Utah, and Wyoming. It provides an empirical examination of water transfer activity subject to state review occurring in the study states between 1975 and 1984.

The report is divided into two volumes. The first volume contains the general findings from the study. It includes summaries of each of the state reports as well as a comparative analysis of the legal and empirical findings from the states. The second volume contains detailed presentations of research results from each of the six study states.

The report represents the collective work of the study team members. The state reports included in volume II were prepared by members of the state team identified at the beginning of the chapter. Volume I was prepared primarily by the Principal Investigator with important contributions from Lee Brown, Charles Howe, and Teresa Rice. Special acknowledgement goes to Gary Woodard and Cara McCarthy for their work providing statistical analysis of the data sets gathered in Colorado, New Mexico, Utah, and Wyoming. They also provided most of the graphics used in volume I.

The contents of this report were developed, in part, under a grant from the Department of the Interior, U.S. Geological Survey. However, these contents do not necessarily represent the policy of that agency, and you should not assume endorsement by the Federal Government.

**Larry MacDonnell
Boulder, Colorado**

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The General Service Foundation provided a grant that supported a project advisory group. This group met with researchers in Denver in October 1988 to discuss project objectives and approach. It met again in San Francisco in December 1989 to discuss the draft project report. The guidance of this group has been instrumental in strengthening and sharpening the final report and the individual state reports. Members of this group are listed below.

At the Natural Resources Law Center, Teresa Rice provided valuable assistance in putting the report together and Althira Weber did her usual outstanding job of producing the typed copy.

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Chapter 1

Introduction

Section 1: Project Origin, Objectives, and Approach

The water needs of the West are changing. New demands for consumptive uses of water are being driven primarily by the increasing urbanization of the West.¹ Instream uses of water for recreation, maintenance of fisheries, and water quality are gaining in importance.² Irrigation water use actually declined between 1980 and 1985 after decades of increases.³

At the same time, opportunities for the additional development of water supplies are increasingly limited. An assessment of water supplies physically available in the United States in the year 1975 determined that 86 percent of the nation's average annual streamflows already were used.⁴ In the West, water use exceeded the average renewable supply in four water resource regions and in twenty-four water resource subregions.⁵ In regions where developable supplies are still available, there are major physical, economic, and environmental constraints to such development.⁶

Most existing uses of water in the West are based on water rights established under state law. Particularly for surface water, these rights were established long ago. Commonly, they are specific to a place and purpose of use. As land uses change, water rights sometimes are abandoned. More often, the water uses authorized by the original water right are changed to enable a new use to be made.

Water transfers provide an important means of supplying changing western water

requirements. For purposes of this study water transfers are defined as the voluntary permanent or temporary change in the existing purpose and/or place of use of water under an established legal right or entitlement. Legal entitlements encompass appropriative water rights or shares in such rights, a contract right, a riparian right, and a groundwater development right. The change in place or purpose of use may be short-term or long-term. The change may occur informally or it may be subject to some kind of governmental review but it is not mandated by government action.

The economic attractiveness of reallocating a portion of existing water uses is demonstrated by studies indicating a marked disparity in the value of water in many existing uses compared with its value in alternative uses.⁷ And, in fact, water transfers are occurring in the western states.⁸ Economists and others have argued, however, that transfers are not occurring as widely as would be suggested by the apparent economic incentives.⁹ Some have suggested that the reasons for this less than economically desirable level of transfer activity can be found in legal barriers or impediments that either absolutely prevent transfers or make them so expensive as to dissipate necessary economic incentives.¹⁰

The importance of the water transfer option in the West prompted this research project. The objectives of the research reported here were:

- (1) to ascertain the level and kind of water transfer activities in six western states;

(2) to determine the major legal and institutional factors influencing the efficiency and equity of these transfer activities;

(3) to measure the transactions costs imposed on water transfer activities by the legal requirements of the states; and

(4) to compare findings from the six states and evaluate the transfer processes in efficiency and equity terms.

The study area encompassed Arizona, California, Colorado, New Mexico, Utah, and Wyoming. The study team consisted of researchers from each of these states already familiar with water issues in their states.¹¹ A research framework common to all the states was developed by the team. State teams were responsible for the research within their individual states.

Each state team first analyzed the laws relating to water transfers in their state. They identified the types of legal rights to use water and analyzed the legal rules pertaining to the transferability of those rights.¹² Next, each state team examined available records concerning transfers of water uses between 1975 and 1984. Specifically, they collected information regarding changes of appropriative water rights subject to state review. The research concentrated on water transfers involving a change in the existing purpose or place of use of water. Information gathered included the type of use, the quantity of water involved, and the length of time to pass through the state review process. Most state teams also analyzed some selection of case examples in greater detail. Several state teams gathered information concerning transactions costs for a sample of transfer cases.

Each state has prepared a detailed written summary of the results of their state study.

These studies are included in volume II of this report. An executive summary of each state report is presented in chapter 2 of this volume. This volume also contains a comparison of the findings from the state studies in three areas: the characteristics of the water transfer activity in the study states, the legal frameworks governing transfers in those states, and transactions costs. In this introductory chapter, the study states are compared in economic and demographic terms and in terms of water availability and use.

Section 2: Demographic and Economic Comparison of the Six Study States

Some quantitative comparison of the six states will be useful by way of description and for future reference. Although they all share the Colorado River basin and are each at least partial subscribers to the legal doctrine of prior appropriation, there are substantial differences among the six demographically, economically, and in the pattern and quantum of water use. Table 1.2.1 presents basic information regarding the population of the six states.

California obviously dwarfs the other states in the study even when the latter are combined. Yet, with the exception of Wyoming, all of the states are experiencing population growth rates substantially higher than the corresponding national figure of 8.5% for the same period. By Census definition, California is also the most heavily urbanized of the six states followed by Utah, Arizona, and Colorado at approximately the same percentage, then by New Mexico and finally Wyoming. If a higher threshold for separating urban and rural population were employed, the percentages of all six states would drop, but it is likely that the drop for New Mexico and Wyoming would be more precipitous than for the others.

TABLE 1.2.1

POPULATION STATISTICS FOR SIX STATES
(In thousands)

State	1970	1980	1988(Est.)	%Change(80-88)	%Urban(1980)
Arizona	1,775	2,718	3,489	28.4%	83.8%
California	19,971	23,668	28,314	19.6%	91.3%
Colorado	2,210	2,890	3,301	14.2%	80.6%
New Mexico	1,017	1,303	1,507	15.6%	72.1%
Utah	1,059	1,461	1,680	15.7%	84.4%
Wyoming	332	470	479	2.1%	62.7%

Source: Bureau of the Census.¹³

In terms of employment, California is again the dominant member of the six state study area. Colorado and Arizona are comparable at the second rank followed by Utah and New Mexico and then Wyoming. Five of the six states exhibit substantial growth in jobs during the eighties with only Wyoming showing a decline. See Table 1.2.2.

For purposes of this study, it is important to note that the percentage of jobs occurring in the agriculture sector in each state has been declining in all six states as has also been the case nationally. It is this

relative shift of jobs from agriculture to non-agriculture activities, coupled with the continued population growth in these states, that together constitute the major force creating pressure for reallocation of water from agricultural to urban uses in the six state area. Historically, irrigated agriculture has been a major factor in the drive for water development and reclamation projects in the West broadly and in the Colorado River basin particularly. Now, urban interests are the principal force behind most water development projects still being advocated.

TABLE 1.2.2

TOTAL EMPLOYMENT IN THE SIX STATES
(In thousands)

State	1970(%Agri.)	1980(%Agri.)	1987(%Agri.)	%Chg.(80-87)
Arizona	733 (3.4%)	1,261 (1.7%)	1,755 (1.2%)	39.2%
California	8,857 (3.0%)	12,513 (2.3%)	15,239 (1.6%)	21.8%
Colorado	1,001 (4.7%)	1,614 (2.9%)	1,907 (2.3%)	18.2%
New Mexico	392 (5.2%)	590 (3.8%)	690 (2.7%)	16.9%
Utah	446 (4.7%)	680 (2.9%)	809 (2.4%)	19.0%
Wyoming	157 (9.3%)	274 (5.5%)	255 (5.2%)	-6.9%

Source: Bureau of Economic Analysis, U.S. Department of Commerce.¹⁴

It is also useful to group the six states according to the percentage of the jobs belonging to the agricultural sector of the respective state economies. Although, as noted, these percentages are small for all six states, there are essentially three tiers. Arizona and California report the smallest percentages of jobs held in agriculture followed by Colorado, Utah, and New Mexico. Then, Wyoming, once again, is in a category by itself. A similar separation is reflected in the income statistics for the six states as reported in Tables 1.2.3 and 1.2.4.

Here, California is once again seen to be a much larger scale economy than any of the other states whether measured in total personal income or on a per capita basis. In growth rate, Arizona and California are comparable in income measures just as they were in percentage employed in agriculture. Colorado, New Mexico, and Utah also have similar growth rates in income, while Wyoming is growing much slower. It should be noted, however, that per capita income in Wyoming exceeds the comparable numbers for New Mexico and Utah, and Colorado's per capita income is above Arizona's.

TABLE 1.2.3

PERSONAL INCOME IN THE SIX STATES
(In millions of dollars)

State	1970	1980	1988	%Chg. (80-88)	% of U.S.
Arizona	6,801	25,091	51,592	105.6%	1.3%
California	95,039	276,107	531,100	92.4%	13.1%
Colorado	8,951	30,836	54,004	75.1%	1.3%
New Mexico	3,218	10,704	18,842	76.0%	.5%
Utah	3,513	11,710	20,315	73.5%	.5%
Wyoming	1,267	5,382	8,455	19.9%	.2%

Source: Bureau of Economic Analysis, U.S. Department of Commerce.¹⁸

TABLE 1.2.4

PER CAPITA INCOME IN THE SIX STATES

State	1970	1980	1988	%Chg. (80-88)	% of U.S.
Arizona	3,789	9,172	14,887	62.3%	90.5%
California	4,748	11,603	18,855	62.5%	114.7%
Colorado	4,025	10,598	16,417	54.9%	99.8%
New Mexico	3,145	8,169	12,481	52.8%	75.9%
Utah	3,297	7,952	12,013	51.1%	73.1%
Wyoming	3,797	11,339	13,718	21.0%	83.4%

Source: Bureau of Economic Analysis, U.S. Department of Commerce.¹⁸

In summary, the economic and demographic picture of the six states that emerges from these few descriptive statistics substantiates some significant differences amid a few general patterns. California, as is repeatedly emphasized in these statistics, is a demographically large, highly developed economy with few superficial resemblances to the other five states. Yet, there are similarities to Arizona in both income and employment growth rates and in the relatively low percentage of jobs associated with agriculture. Arizona has the fastest growth rates in employment and total personal income among the six.

Colorado, while a more affluent economy than either Utah or New Mexico as measured by per capita income, is nevertheless similar to the other two states in population, employment, and income growth rates. Moreover, it falls into the same middle grouping of these three states in terms of the percent of employment occurring in agriculture. Wyoming, by most measures is in a class by itself, having much lower growth rates in population, employment, and income than the other five, and a relatively higher portion of jobs held in agriculture.

Section 3: Comparison of Water Use Characteristics of the Six Study States

Demands on the Water Supply

While the United States as a whole has an abundant supply of water resources to meet present and future demands, the supply in the six state study area appears already inadequate to meet current needs in the absence of actions such as transfers, conservation, or additional storage. The most recent comprehensive effort to assess the adequacy of our nation's renewable water resources illustrates the critical supply problems facing the study area.¹⁷ This

assessment covered 21 regions and 106 subregions. Water use in the 1975 study year exceeded average renewable supply in four regions and 24 subregions.¹⁸ The six state study area lies within all four of these water deficit regions and is largely covered by 23 of the 24 deficit subregions (see Figure 1.3.1). The states of New Mexico and Arizona are almost entirely within the deficit region, while Wyoming appears to have a sufficient water supply except for the southeast corner of the state. Southern California, western Utah and eastern Colorado are also dominated by water deficits. Additionally, groundwater overdraft occurred in seven of the eight regions and 26 of the 32 subregions covering our study area.¹⁹

Water Supply

The quantity of available water resources varies both geographically and seasonally. Average annual precipitation in the six state study area ranges from 12.6 inches in Arizona to 22.7 inches in California (see Table 1.3.1).²⁰ During the year, there may be significant seasonal fluctuations which cause streams to regularly dry up in some months and flood their banks during others.²¹

More indicative than precipitation of an area's renewable water supply is the average annual runoff, or the difference between precipitation and evapotranspiration.²² Runoff in the six state study area ranges from 0.2 inches in Arizona to 8.5 inches in California (see Table 1.3.1). The balance of the precipitation is lost to evaporation or consumed by trees and plants and is unavailable for either instream or offstream water uses.²³

Runoff patterns within the states vary greatly. For example, in Arizona average runoff ranges from less than 0.1 inches in certain desert areas to as much as 5 inches in the more mountainous areas.²⁴

TABLE 1.3.1
LONG-TERM AVERAGE ANNUAL PRECIPITATION AND RUNOFF
(in inches)²⁶

State	Precipitation	Runoff
Arizona	12.6	0.2
California	22.7	8.5
Colorado	17.0	3.0
New Mexico	13.1	0.4
Utah	13.0	1.2
Wyoming	14.0	3.4

Source: Carr, J.E., Chase, E.B., Paulson, R.W., Moody, D.W., Compilers,
1990, National Water Summary 1987-Hydrologic Events and Water
Supply and Use: U.S. Geological Survey WATER SUPPLY Paper 2350.

Groundwater accounts for a significant portion of the six states' water supplies. In Arizona, California and New Mexico, groundwater supplies over 40 percent of the freshwater uses.²⁶ In Colorado, Utah and Wyoming, groundwater constitutes less than 25 percent of the renewable water supplies.²⁷ Past and present overdraft problems indicate that groundwater levels are dropping, and future supplies may be impaired.²⁸

Water Use

Figures from 1985 estimated water use disclose that the major type of consumptive use in the six state study area is irrigation (see Table 1.3.2). Irrigation accounts for over 90 percent of the total freshwater consumptive use. Domestic use was second largest, comprising four percent of the total. The other consumptive uses included commercial, livestock, industrial, mining and thermoelectric.²⁹

Between 1980 and 1985 overall consumptive water use declined by an average of 12 percent in our study area.³⁰ A primary source of this overall decline was irrigation use which dropped from 37,200 millions of gallons per day (mgd) to about 32,800 mgd (see Table 1.3.3). This translates to a decrease of almost 12 percent. Wyoming and Colorado did not follow this trend; consumptive use of water for irrigation increased during this period by 2 percent and 27 percent respectively (see Table 1.3.4). Overall consumptive use in Wyoming and Colorado also increased during this five-year period by 3 percent and 21 percent respectively (see Table 1.3.3).

During this same five-year period, the number of people served by public water supply systems within the six state study area increased about 12 percent, from 29.8 million to 33.3 million (see Table 1.3.5). There is another approximately ten percent of the population who are served by their own water systems.³¹

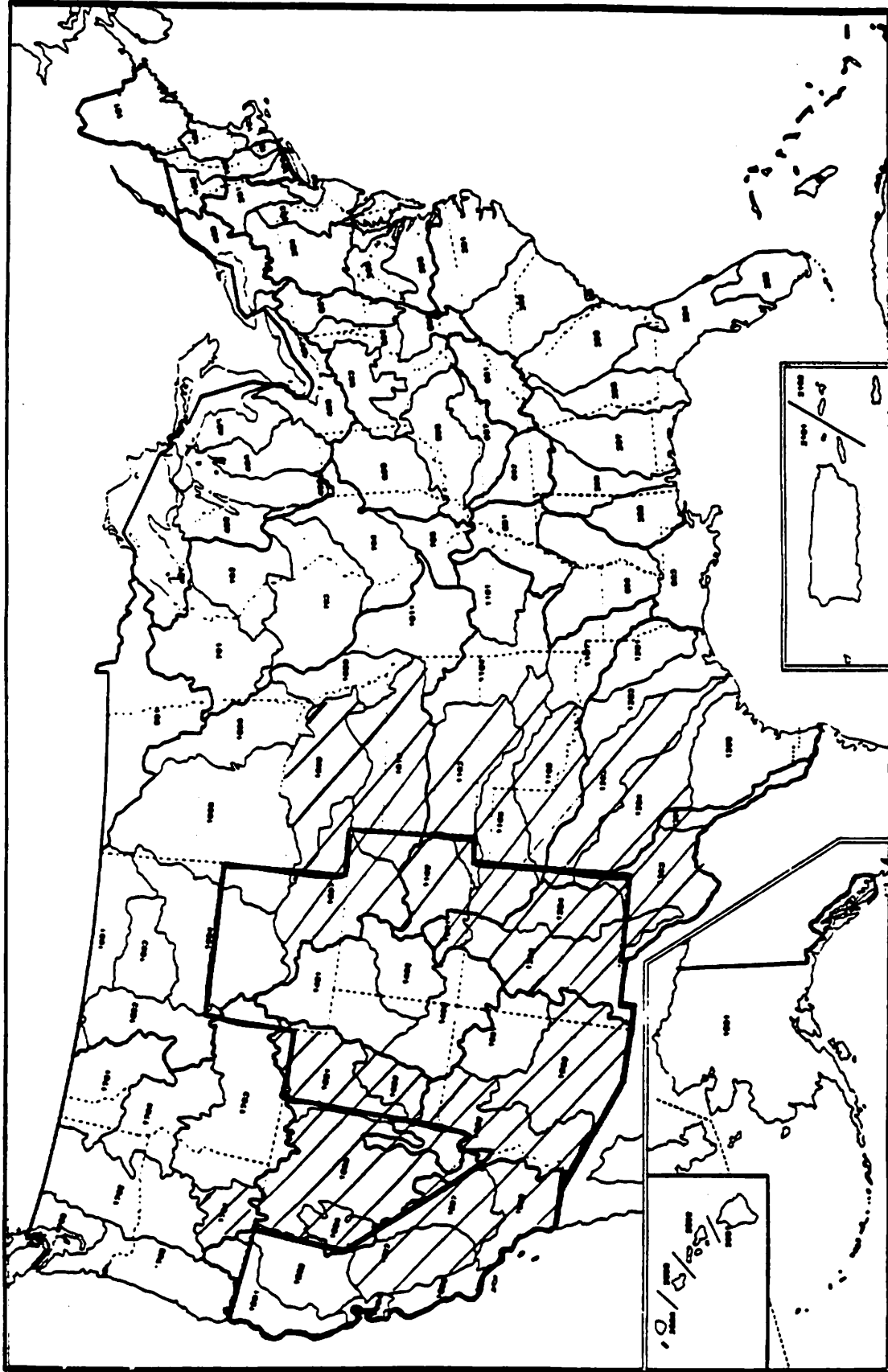


Figure 1.3.1 Water deficit subregions

Source: Adapted from U.S. Water Resources Council, Second National Water Assessment, Vol. 3, App. II, at Fig. 5.

TABLE 1.3.2**ESTIMATED CONSUMPTIVE FRESHWATER USE BY STATE, 1985**
(In millions of gallons per day)

	Irrigation	Domestic	Other	Total
Arizona	3170	275	266.8	3711.8
California	19300	879	993	21172
Colorado	4570	145	138	4853
New Mexico	1270	106	154.1	1530.1
Utah	1940	119	193.5	2252.5
Wyoming	2560	30	83.4	2673.4
Totals	32810	1554	1828.8	36192.8
Percentage of all uses (approximate)	91%	4%	5%	100%

Source: Adapted from Estimated Use of Water in the United States in 1985 (U.S. Geological Survey Circular 1004) (1987) at Tables 4,6,8,10,12,14 and 16.

TABLE 1.3.3**ESTIMATED CONSUMPTIVE FRESHWATER USE BY STATE, 1980 AND 1985**
(In millions of gallons per day)

State	1980	1985	% change
Arizona	4500	3700	-18%
California	25000	21100	-16%
Colorado	4000	4850	+21%
New Mexico	1900	1530	-19%
Utah	2900	2130	-26%
Wyoming	2600	2670	+3%
Totals	40,900	35,980	-12%

Source: Adapted from Estimated Use of Water in the United States in 1980 (Table 14) and in 1985 (Table 24), U.S. Geological Survey Circulars 1001 and 1004 (1983 and 1987).

TABLE 1.3.4

ESTIMATED CONSUMPTIVE IRRIGATION FRESHWATER USE, 1980 AND 1985
(in millions of gallons per day)

State	1980			-	1985		
	With- drawals (ground, surface and re- claimed sewage)	Convey- ance losses water	Consump- tive use, fresh water		With- drawals (ground surface and re- claimed sewage)	Convey- ance losses	Consumptive use, fresh water
Ariz.	7,100	900	4,000	-	5,549	1,180	3,170 (-20%)*
Calif.	37,000	5,600	23,000	-	30,835	929	19,300 (-16%)
Colo.	14,000	1,600	3,600	-	12,404.9	2,880	4,570 (+27%)
New Mex.	3,600	31	1,700	-	2,820	0	1,270 (-25%)
Utah	3,200	320	2,400	-	3,595.8	305	1,940 (-19%)
Wyo.	4,900	1,600	2,500	-	5,660	1,810	2,560 (+ 2%)
Totals	69,800	10,051	37,200	-	60,864.7	6,904	32,810 (-12%)

Source: Adapted from Estimated Use of Water in the United States in 1980 (Table 5) and in 1985 (Table 9) (U.S. Geological Survey Circulars 1001 and 1004, 1983 and 1987).

* percent change 1980-1985

TABLE 1.3.5

PUBLIC SUPPLY SERVICE POPULATION AND WITHDRAWALS/DELIVERIES, 1980 AND 1985

State	1980		1985	
	Population served, in thousands	Withdrawals (mgd)	Population served, in thousands	Deliveries (mgd)
Arizona	2,440	260	3,090	449
California	22,300	2,200	24,300	3,240
Colorado	2,540	540	3,010	456
New Mexico	880	21	1,000	179
Utah	1,300	370	1,570	340
Wyoming	322	55	329	61
Totals	29,782	3,446	33,299	4,725

Source: Adapted from Estimated Use of Water in the United States in 1980 (Table 1) and in 1985 (Table 4), U.S. Geological Survey Circulars 1001 and 1004 (1983 and 1987); comparable withdrawals/delivery figures unavailable.

ENDNOTES TO CHAPTER ONE

1. More than three-quarters of the people in the West live in metropolitan areas, making the West the most urban region of the United States. *Water and Arid Lands of the Western United States* 7 (M. El-Ashey & D. Gibbons eds. 1988).
2. See, e.g., Ward, *Economics of Water Allocation to Instream Uses in a Fully Appropriated River Basin: Evidence From a New Mexico Wild River*, 23 *Water Resources Research* 381 (1987) (reservoir releases augmenting streamflows estimated to provide \$900 to \$1100 of gross recreation benefits per acre-foot of water consumed compared to \$40 per acre-foot alternative opportunity cost for use of the water); Daubert & Young, *Recreation Demand for Maintaining Instream Flows*, 63 *Amer. J. Agr. Econ.* 666 (1981); Colby, *The Economic Value of Instream Flows - Can Instream Values Compete in the Market for Water Rights?* in *Instream Flow Protection in the West* (L. MacDonnell, T. Rice & S. Shupe eds. 1989).
3. Solley, Merk, & Pierce, *Estimated Use of Water in the United States in 1985*, U.S. Geological Survey Circular 1004 (1988).
4. U.S. Water Resources Council, *Second National Water Assessment*, 1978. Total water use was defined as the sum of consumptive use and estimated minimum instream flow needs.
5. *Id.* Deficits were made up either by reducing streamflows below minimum needs or by groundwater mining.
6. Banks, Williams & Harris, *Developing New Water Supplies in Water Scarcity: Impacts on Western Agriculture* (E. Engelbert with A. Scheuring eds. 1984).
7. See, e.g., D. Gibbons, *The Economic Value of Water* (1986); Young, *Local and Regional Economic Impacts in Water Scarcity: Impacts on Western Agriculture* (E. Engelbert with A. Scheuring eds. 1984).
8. B. Colby Saliba & D. Bush, *Water Markets in Theory and Practice: Market Transfer, Water Values and Public Policy* (1987). Leases and sales of water rights in the western states are reported in *Water Market Update*, a monthly newsletter produced by Shupe and Associates in Santa Fe, New Mexico.
9. Milliman, *Water Law and Private Decision Making: A Critique*, *J. Law & Econ.* 41 (1959); Gaffney, *Diseconomies Inherent in Western Water Laws: A California Case Study*, *Western Ag. Econ. Research Council Proc.* (1961); L. Hartman & D. Seastone, *Water Transfer: Economic Efficiency and Alternative Institutions* (1970); Meyers & Posner, *Market Transfers of Water Rights: Toward An Improved Market in Water Resources*, National Water Commission Legal Study No. 4 (July 1971); Johnson, Gisser, & Werner, *The Definition of a Surface Water Right and Transferability*, 24 *J. Law and Econ.* 273 (1981); T. Anderson, *Water Crisis: Ending the Policy Drought* (1983); Young, *Why Are There So Few Transactions Among Water Users?* 68 *Am. J. Agric. Econ.* 1143 (1986).
10. Meyers & Posner, *Market Transfers of Water Rights: Toward An Improved Market in Water Resources*, National Water Commission Legal Study No. 4 (July 1971); Pring & Tomb, *License to Waste: Legal Barriers to Conservation and Efficient Use of Water in the West*, 25 *Rocky Mt. Min. L. Inst.* 25-1 (1979); Clyde, *Legal and Institutional Barriers to Transfers and Reallocation of Water Resources*, 29 *S. Dak. L. Rev.* 232 (1984); Gould, *Water Rights Transfers and Third Party Effects*, 23 *Land & Water L. Rev.* 1 (1988).
11. Principal Investigator - Lawrence J. MacDonnell; State Lead Investigators - F. Lee Brown, Brian Gray, J. Paul Riley, Mark Squillace, Gary C. Woodard; State Investigators - Bonnie D. Colby, Ray Jay Davis, Tim DeYoung, Charles DuMars, Charles W. Howe, Teresa Rice.
12. The detailed findings from these analyses are published in 31 *Ariz. L. Rev.* 721-904 (1989).
13. As defined for the 1980 Census, the urban population comprises all persons living in urbanized areas and in places of 2,500 or more inhabitants outside urbanized areas.

14. Includes proprietors as well as wage and salary workers.
15. All figures in 1988 dollars.
16. All figures in 1988 dollars.
17. U.S. Water Resources Council, *The Nation's Water Resources 1975-2000* (Wash., D.C. GPO, 1978).
18. *Id.* at vol. 3, app. II, Table 11-5.
19. *Id.*
20. One inch of rain equals 17.4 million gallons per square mile or 27,200 gallons per acre.
21. K. Frederick, *The Nation's Water Resources: Past-Trends and Current Challenges*, Resources For The Future Discussion Paper ENR 90-02 (Dec. 1989) at 7.
22. *Id.* at 3.
23. U.S. Geological Survey, *National Water Summary 1985 - Hydrologic Events and Surface Water Resources* (Water Supply Paper 2300) (1986) at 145.
24. U.S. Geological Survey, *National Water Summary 1985 - Hydrologic Events and Surface Water Resources* (Water Supply Paper 2300) (1986) at 145.
25. Figures were converted from millions of gallons per day to inches per telephone conversation with David W. Moody, U.S. Geological Survey (Mar. 16, 1990).
26. Z. Smith, *Groundwater in the West* (1989) at 37, 53 and 163.
27. *Id.* at 73, 243 and 263.
28. *Id.* at 14-16.
29. Each of these other uses accounted for about one percent of the total freshwater consumed.
30. These trends in water use for the six state study area generally follow the national pattern of use with a few qualifications. Nationally, irrigation use decreased six percent from 1980 to 1985. Overall there was a ten percent reduction in total water withdrawals. The two exceptions to the general decrease were water withdrawals for public water supply and rural use. Public supply increased seven percent nationally, corresponding to a seven percent increase in the population served by these systems. Withdrawals for rural use increased 39 percent nationally, attributable to large increases in fish farming. See *Estimated Use of Water in the United States in 1985* (U.S. Geological Survey Circular 1004) (1987) at 68-69. Irrigation use may have been down somewhat due to more plentiful streamflow in 1985 than 1980, and due to an economic slowdown and depressed commodity prices in 1985. *Id.* at 71.
31. This is based on 1985 figures, and was determined by subtracting the number of people served by public suppliers from the total population as reported by the U.S. Bureau of the Census. Nationally, 18 percent of the population is estimated to be served by their own water systems in 1985 which represents a two percent decrease from 1980. See *Estimated Use of Water in the United States in 1985* (U.S. Geological Survey Circular 1004) (1987) at 14 and Table 4.

Chapter 2

Summaries of State Reports

Section 1: Water Transfers in Arizona

Despite being an arid state with relatively little surface water, Arizona has seen surprisingly few transfers of water rights. Between 1975 and 1984, 30 sever and transfer requests involving a change in the purpose and/or place of use were filed, fewer than in any other study state except California. Most of these applications involved changes of use within the agricultural sector.

There are a number of reasons for this dearth of traditional transfer activity. Historically, Arizona courts were not receptive to the concept of water transfers. In 1901, the Arizona Supreme Court ruled that water rights were appurtenant to the land and could be transferred only if the land itself became unusable through natural causes. The court was concerned about potential abuses involving absentee owners of canal companies who rented shares to farmers for irrigation. To prevent this, the court ruled that appropriators must own the land on which the water was to be used. This decision was enacted into law in 1919.

Other reasons for the lack of traditional water transfers applications include the prohibition against transferring water outside the boundaries of the Salt River Project (SRP), the state's largest water provider. In addition, the more populous basin and range provinces of central and southern Arizona are characterized by extensive groundwater aquifers. The absence of legal recognition of the hydrologic connection between surface and groundwater

and the ability to overdraft these immense, high-quality aquifers postponed the need to reallocate the state's limited renewable supplies.

Surface Water Law'

Surface water in Arizona belongs to the public and is subject to private appropriation. Current surface water law was enacted in 1962. Under Arizona's prior appropriation system, a permanent water right is granted to those who first appropriate surface waters. A surface water right is established and maintained by the diversion and application of water to a specific beneficial use. If appropriated surface water goes unused for five consecutive years the right may be forfeited and become available to new appropriators.

In Arizona, as in most Western states, the point of diversion of a water right may be changed provided the source of the water does not change and other users' rights are not adversely affected. Surface water rights may be transferred to a new place of use only with state approval. Prior to approval, an application for severance and transfer is made, followed by a hearing at which any interested person may contest the application.

Transfers of water rights within water service organizations such as irrigation districts, agricultural improvement districts or water users associations, are permitted only with the prior written consent of the organization. In the case of a transfer involving

irrigation water from a watershed or drainage area which supplies water to lands within a water service organization, the transfer must be consented to by each organization within the drainage basin. Such consent can be arbitrarily withheld, and the state is prohibited from even accepting an application for severance and transfer of a water right unless the consent of downstream water service organizations is first obtained. In addition, Arizona alone among the study states has no provision for authorizing temporary transfers of water.

Changes in type of use also require state approval if water is moved from the land. Although the statutes are silent regarding criteria for deciding on applications for change of use, the case law clearly establishes that a lawful change of use may not have any adverse effect on other vested water rights.

Other Transfer Types

The small number of sever and transfer applications is seriously misleading as to the amount of water that is being shifted from one use to another in Arizona, particularly over the last decade. Only those surface appropriative water rights that are being severed from the original place of use undergo state review. So long as the use stays with the land, no permission or notification is required. As land uses in irrigation districts and water user associations change, so too do the water uses. The best example of this is the SRP, a rapidly urbanizing area in the Phoenix metropolitan area. As SRP land moves out of irrigated agriculture into various urban uses, the associated water rights revert back to the same parcels but in the form of domestic water delivered to the municipal providers. In 1950, less than 14 percent of the Project's 240,000 acres were urbanized. By 1980, 57 percent was urbanized and today nearly 75

percent of the land and 60 percent of the water are devoted to urban uses.

In addition, changes in Arizona's groundwater code made in 1980 triggered a new type of water transfer activity. Water farming, or the acquisition of large tracts of remote rural land solely for access to groundwater, has resulted in the change in control of vast amounts of water and land.

Groundwater Transfers Law

Much of the water supply in Arizona is groundwater. Prior to 1980, groundwater pumping in Arizona was essentially unregulated. Transfers of pumped groundwater were governed by court-made rules which gave injunctive relief to neighboring pumpers who could prove they were harmed. Subsequent decisions allowed purchasers of irrigated agricultural land to retire the land and transfer the historic consumptive use.

In 1980, the Arizona Legislature was called into special session to enact a groundwater code that replaced the patchwork of common law and legal decisions that regulated groundwater use. Passage of the 1980 Groundwater Management Act (GWMA) ostensibly was motivated by the obvious need for Arizona to deal with some serious long-standing water resource problems. Several parts of the state, including the two major urban areas, were experiencing long-term groundwater level declines. More immediate motivation came in the forms of a threatened cut-off of federal funding of the Central Arizona Project (CAP) and the growing realization that out-of-state perceptions of Arizona as a state running out of water eventually would dry up sources of investment capital as well.

The Groundwater Code established four Active Management Areas (AMAs) in

the state, focusing water management efforts in those areas with severe overdraft conditions. The goal of the management efforts in the Phoenix, Prescott and Tucson AMAs is to achieve safe yield, defined as a balance between average demand for groundwater and the average rate of replenishment. The goal in the Pinal AMA is to preserve the agricultural economy for as long as possible while reserving some groundwater supplies for non-irrigation uses.

A landowner within an AMA is not automatically granted the right to withdraw groundwater. In most instances, groundwater users within AMAs must have one of the following rights or permits to withdraw groundwater: grandfathered rights, withdrawal permits, service area rights, or storage and recovery permits. The transferability of groundwater within an AMA depends on the type of right to which the groundwater is associated.

There are three types of grandfathered rights. Irrigation grandfathered rights are quantified based on historic patterns of use and may not be sold apart from the associated land; in other words, the right is appurtenant to the land. The groundwater withdrawn under this right may be used only to irrigate the land to which the right pertains. In order to apply an irrigation grandfathered right to a non-irrigation use it first must be converted to a Type 1 right.

Type 1 non-irrigation grandfathered rights allow the owner of land which was retired from agriculture in anticipation of a non-irrigation purpose to retain entitlement to use water. With few exceptions, the irrigated land being retired must be located outside the service area of a city, town or private water company. The quantity of groundwater that can be pumped annually pursuant to a Type 1 right is fixed at the time of conversion from an irrigation

grandfathered right and is equal to the lesser of estimated historic consumptive use or three acre-feet per acre.

Type 2 non-irrigation grandfathered rights are based on historical pumping of groundwater for uses other than crop irrigation such as for livestock, golf course, or industrial purposes. Unlike an irrigation or Type 1 right, a Type 2 right is not appurtenant to any land and may be sold or leased for some non-irrigation purpose within the same AMA.

Service area rights permit cities, towns, private water companies and irrigation districts to withdraw groundwater to serve their customers. Service area rights are transferable when, for example, a city purchases a private water company and pumps pursuant to the former water company's service area right.

There are no quantified groundwater rights outside of an AMA. Instead, a landowner simply has the right to pump water underlying the land. The groundwater must be withdrawn for "reasonable and beneficial" use -- a fairly loose standard -- but aside from this standard there are no limitations on the amount withdrawn or on the place of use. Transportation of this water outside the area of origin may require payment of damages to other groundwater users in the areas. The transferability of all major surface and groundwater rights in Arizona is summarized in Table 2.1.1.

The Water Farm Phenomenon

Arizona's 1980 Groundwater Management Act is the driving force behind water farm purchases in Arizona. The GWMA created the Arizona Department of Water Resources (ADWR), which was given an array of regulatory tools and the goal of eliminating groundwater overdraft, or reaching

"safe yield" by the year 2025. There are three primary tools available to ADWR to eliminate groundwater mining in the AMAs: mandatory conservation programs to reduce demand in all water-using sectors; an augmentation program to increase available supplies; and the assured water supply program.

The 1980 GWMA made demonstration of assured water supply a precondition to sales of subdivided property within AMAs. Defined as enough water of a suitable quality to serve the proposed uses for 100 years, assured water supply rules are intended to protect the public by ensuring that water is physically available. The new rules incorporated the concept that proposed water uses must be consistent with the management plan and management goal for the AMA. This has been interpreted by ADWR as meaning that the practice of basing new development on mined groundwater must be phased out. Therefore, the maximum groundwater pumpage allowed that can be counted towards an assured water supply is decreasing over time. Cities and towns which have signed contracts to receive CAP water are presumed to have assured water supplies until the year 2001. At this time the determination is subject to review by the Director.

Cities feel that their growth after 2001 is jeopardized by the need to prove a 100-year assured water supply. The uncertainty created by this provision drives many municipalities with seemingly adequate CAP supplies to seek additional water rights outside their AMAs. In addition to municipalities, private developers are buying water farms in rural areas to guarantee a water supply for their development projects within AMAs. Eventually, developers may transport the water for use within an AMA, or may instead seek to trade water farm acreage to a municipal government in

exchange for guaranteed water service to property that could be developed within the AMA. Private investment companies have been actively acquiring water rights, as a perception prevails in the West that the value of water will rise as depletion of finite supplies leads to increased scarcity. The federal government also is in the market for additional water to satisfy tribal water claims and compensate urban areas for loss of proposed storage facilities.

Such actions are a natural outgrowth of the assured water supply provisions, and also are brought on by provisions of the groundwater code which limit the legal remedies available to groundwater pumpers harmed by the pumping and transfer of water from nearby wells. Water farm purchasers often plan to avoid potential damage claims by other groundwater users in the basin by buying large amounts of irrigated acreage and limiting withdrawals to historic consumptive use. All told, approximately one-third billion dollars has been spent to acquire more than half a million acres of deeded and leased land for this purpose over the last few years. Some of these purchases contain significant amounts of irrigated farmland, which eventually will be retired. Other purchases consist entirely of undeveloped land overlying untapped aquifers. In either case, to this point, there has been a transfer of ownership only -- not a transfer in the purpose and/or place of use.

This activity has led to concern among residents of rural areas of origin who fear the effects of such acquisitions on their tax base and agricultural economies. They also fear the impacts on prospects for future economic development. Others are concerned about potential environmental impacts. The result is a serious urban-rural controversy, which the legislature has addressed in the last three sessions. While bills dealing with specific aspects of the problem have been passed,

TABLE 2.1.1.

TRANSFERABILITY AND OTHER CHARACTERISTICS
OF ARIZONA WATER RIGHTS

TYPE OF RIGHT		IS THE RIGHT TRANSFERABLE?	CAN THE WATER BE TRANSPORTED?	LIMITS TO RIGHT	OTHER IMPORTANT CHARACTERISTICS	
GROUNDWATER	AMA	IGR	Yes, but only with the appurtenant land.	No, the right is tied to specific acres.	Limited by the water duty for the AMA.	IGR must first be converted to a Type 1 right to be applied to a non-irrigation use.
		Type 1	Yes, but only with the appurtenant land.	Yes, with no liability for damages, but new owner can't move water out of AMA.	Limited to the lesser of historic consumptive use or 3 acre-feet per acre.	New Type 1 rights created by the retirement and conversion of an IGR.
		Type 2	Yes, and may be sold apart from the land, but can't leave AMA.	Yes, but subject to payment for damages.	Right is quantified and is indivisible, but may be leased.	Does not enhance the assured water supply of AMA. Very flexible since it is not appurtenant to any land.
		Service Area Right	Yes, via purchase of private water companies or the acquisition of city-owned service areas.	Yes, but only within a service area and subject to payment for damages only across sub-basins.	Limited by conservation requirements for the AMA.	Does not enhance the assured water supply of the AMA.
	Non-AMA	Yes, the right to pump water underlying the land is transferable with the land.	Yes, subject to payment for damages.	Water must be applied to "reasonable and beneficial use."	Since no quantified groundwater rights exist outside AMAs, the amount of water which can be withdrawn is virtually unlimited.	
SURFACE	Non-Colorado River Right	Yes, with the land to which the right pertains.	Yes, provided no other rightsholders are damaged.	Water must be applied to "reasonable and beneficial" use on appurtenant land.	Right subject to forfeiture for non-use. Seniority of right determines priority in times of shortage.	
	Colorado River Right	Not clear. Non-use by holder may free up water for junior rightsholders.	Not clear for interstate transfers and particularly for interbasin transfers.	Water must be applied to "reasonable and beneficial use." Limited by contract with Sec. of Interior.	Seniority of right determines priority in times of shortage.	
EFFLUENT		Yes, and with no attachments to the land.	Yes, but if placed in a natural streambed, it reverts to surface water. No liabilities for damages, even outside an AMA.	Water must be applied to "reasonable and beneficial use."	May be subject to future legislative regulation.	

comprehensive legislation to deal with all water farming issues proposed in 1988 and again in 1989 failed to pass.

Despite repeated attempts by the Arizona legislature to pass a comprehensive transfers bill, transfers from rural areas of origin to urban areas of use remain largely unregulated in Arizona. Principal issues revolve around third party interests in areas of origin, including forms of compensation for fiscal and economic damages traced to water farm purchases and reserving some portion of water for local use.²

Currently, formation of water supply (augmentation) agencies for Arizona's two metropolitan areas is viewed as a promising approach to settling a number of transfer-related issues. The concept appeared in the final agonies of the 1989 Water Transfer Legislation as a possible panacea for the predator-prey relationship that has developed between rural and urban interests. Having a regional or statewide agency in the business of procuring supplies would minimize the number of players in the game, thereby minimizing the rush to buy farms to acquire water supplies that may never be needed.

Augmentation agencies could address a number of specific issues, including: resolving regional conflicts in purchase and delivery of new supplies; developing cooperative projects, such as conveyance mechanisms, with greater economies of scale; promoting the use of renewable supplies rather than mined groundwater; and managing water farms or other water rights owned by participants. In addition, having one entity holding a portfolio of water rights for an entire metropolitan area allows spreading of risks and pursuing certain supply options on a state-wide basis that may be presently unattainable by individual water users, including leases of Colorado River Indian

Tribe water and Colorado River exchange options.

Water farming is troubling for reasons other than the potential impacts on areas of origin. The majority of water being acquired through water farming is groundwater underlying arid basins that receive negligible amounts of natural recharge. There is an inherent logical flaw in importing mined groundwater for the purposes of meeting the assured water supply provisions of the GWMA. So far, this has not been addressed in transfer legislation.

Water Farms Characterized

There are approximately a score of actual and pending water farm transactions.³ The transactions, while few in number, typically involve considerable amounts of land, water and money. If the quantity of water secured or being negotiated all were used for M&I uses at the rate of 140 gallons per person per day (the per capita consumption rate target set by the Department of Water Resources), then enough water for 3.2 million persons is being marketed in Arizona. Current state population is 3.7 million.

A typical water farm has a price of \$15 million and can supply 15,000 acre-feet per year, based on a 100-year pumping regime for groundwater. While this limited number does not constitute an adequate data base for determining patterns and trends, certain observations can be made. First, as noted above, very little transfers of wet water have actually occurred with respect to any of these water farms. In most cases, methods and costs of physically transporting the water and treating it remain to be worked out.

Roughly 75 percent of the water acquired is groundwater. Water farms by water source break down roughly as 1/2 groundwater only, 1/4 surface water only and

1/4 mixed. State and federal interests appear less likely to buy groundwater than are municipalities and private interests. On the other hand, the state/federal negotiations have come lately, and the interest in surface water might reflect continued uncertainties over state regulation of groundwater transfers.

There is no apparent trend in price over time. Similarly, the source of water does not appear to affect price. Median price paid for water farms with groundwater only is \$988/per acre-feet; those with surface water sold for a median price of \$859. Instead, individual features of water farms seem to be setting the price. Transportability of the water, usually measured in terms of access to the Central Arizona Project Canal, is key. Also important are water quality and the value of the land acquired for other purposes.

Finally, it appears that the price per acre-foot may decline somewhat with the quantity purchased. However, individual characteristics of water farm properties appear to overwhelm any trends or patterns in price.

Inter-basin water transfers in Arizona currently are being planned and executed in an atmosphere characterized by high levels of uncertainty. Current Arizona law with regard to these transfers is fairly straightforward, but it is widely assumed that the state legislature will act within the near future to regulate such transfers so as to clarify their role in state water management and provide protection and compensation to areas of origin.

Another area of uncertainty involves physical transport of water from areas of origin to areas of use. All water farm purchases to date involve property located near to the CAP aqueduct, which could be used to move water to Arizona's urban areas. However, uncertainties as to the future excess

capacity of the aqueduct, the amount of non-project water that could be transported, the costs involved and the terms and conditions under which such transport would be allowed all are unknown. The Central Arizona Water Conservation District, which governs the use of the CAP and is the repayment entity to the federal government, has stated that it will allow non-CAP water in the aqueduct based on a priority system. However, excess capacity in the aqueduct, the costs involved, and the terms and conditions under which such transport would be allowed remain unclear. The results of these uncertainties include delay and decision-making with incomplete information.

The potential for transferring water in Arizona has only begun to be explored. Future innovative transfer strategies are likely to include some new players, including Indian tribes, special water districts, and even the Arizona Department of Water Resources.

Section 2: Water Transfers in California: 1981-1989

Introduction

Throughout the 1980s, the California Legislature enacted a series of statutes that encourage and facilitate the voluntary transfer of water and water rights. These statutes were the product of the Legislature's conclusion that reallocation of California's water resources through private transactions, rather than by administrative fiat, represents a partial solution to the state's chronic (and increasing) inability to supply competing urban, industrial, agricultural, instream, environmental, and other uses with sufficient water to meet their reasonable demands. Paradoxically, for all of the Legislature's efforts, there have been far fewer state-administered transfers of water in California than in any of the other five states reviewed

in this study. Indeed, the lion's share of transfers occurred without reference to the water transfer laws enacted during the decade.

With only minor exceptions, all of the transfers of water that have occurred within the last decade have involved two types of water rights: (1) appropriative rights to surface water established by permit or license issued by the State Water Resources Control Board, and (2) contract rights to supplies developed by the United States Bureau of Reclamation, the California Department of Water Resources, or a local water agency. There were no transfers of water rights in California during the 1980s. Rather, each of the transfers analyzed in this study was simply a transfer of water; the water right or contract right remained with the transferor throughout the term of the transfer agreement.

Transfers Subject to the Jurisdiction of the State Water Resources Control Board

The Board has jurisdiction over all transfers of water that involve a change in the point of diversion, place of use, or purpose of use set forth in the appropriator's permit or license. Between 1981 and 1989, the Board received twenty-four petitions to transfer water. All but one of these applications were for short-term transfers of water. Fourteen of the petitions requested a Temporary Change pursuant to sections 1725 through 1732 of the Water Code. Six involved Temporary Urgency Changes authorized by sections 1435 through 1442 of the Water Code. Three of the petitions were for Trial Transfers under Water Code sections 1735 through 1739, which the Legislature repealed in 1988. The final application was for a long-term exchange of water between the Arvin-Edison Water Storage District and the Metropolitan Water District, which the Bureau of Reclamation

filed on behalf of the parties as a Long-Term Transfer pursuant to section 1735 of the Water Code.

The Board approved nineteen of the petitions and denied two; two petitions were withdrawn. The long-term transfer petition is currently pending before the Board.

The transfers authorized by the Board were of the following type:

Municipal & Industrial to M & I	6
Surplus Supply to Irrigation	5
Consumptive to Environmental	3
Surplus Supply to M & I	2
Hydroelectric to M & I	1
Irrigation to Hydroelectric	1
Recreation to Irrigation	1

Three of the transfer applications that were denied or withdrawn were from an irrigation use to another irrigation use; the other involved a proposal to trade lower quality M & I water for higher quality irrigation water. The twenty-four transfer petitions filed with the Board between 1981 and 1989 are described in chapter two of volume II.

Although there was a tremendous range in the quantity of water transferred (from 18 acre-feet to 125,000 acre-feet), virtually all of the approved transfers share the characteristic of being limited to a few months. For the most part, the transfers approved by the Board during the study period were for specific and very short-term purposes such as augmenting supply during one irrigation season, conducting water quality studies, maintaining instream flows during times of low natural flow, and providing contingency supplies during the 1987-1989 drought. Indeed, all of the largest authorized transfers--i.e., those exceeding 5,000 acre-feet--were for emergency drought supply, protection of fish and wildlife, or maintenance of Delta outflow.

It also is interesting to note that over half of the nineteen transfers approved by the Board involved the same transferor: the Yuba County Water Agency. During the eight years covered by the study, YCWA entered into contracts to sell 561,516 acre-feet of water. Indeed, during the 1987-1989 drought, the Agency was the principal source of temporary supply for water agencies in the Bay Area, which either experienced actual shortfalls in their regular sources of supply or anticipated shortages if the drought had continued into 1990. YCWA became the largest transferor of water during the 1980s because the capacity of its storage facilities on the Yuba River, New Bullards Bar Reservoir, substantially exceeded the demands for water within the Agency's service area. Thus, YCWA was able to take advantage of the surplus transfer provisions of the Water Code, sections 380-387.

The transfers approved by the Board during the 1980s demonstrate that California's water transfer legislation works well in times of drought when it is necessary to reallocate water on a short-term basis to ensure that no region of the state suffers inordinate hardship. The categorical exemption of Temporary Changes from the environmental review requirements of the California Environmental Quality Act and the Board's practice of filing notices of exemption for Temporary Urgency Changes enable the Board to expedite its review of drought-related transfer petitions.

The transfer laws also function effectively for small, short-term transfers. Whether the California statutes are adequate to the task of inducing and facilitating long-term transfers of substantial amounts of water remains to be seen. As described in the discussion on transfers of Colorado River water, one long-term transfer and two long-term exchanges have occurred in Southern

California. Although these transactions were not subject to the Board's change in water right jurisdiction, the thirty year transfer from the Imperial Irrigation District to the Metropolitan Water District was based in part on the conserved water transfer provisions of the California Water Code, particularly sections 1011 and 1244. This transfer has established that the reallocation of existing supplies is a viable means of responding to new demands for water on a long-term, if not permanent, basis. The first long-term transfer petition that has come before the Board was filed in September 1989 and will not be considered until mid-1990. The Board's review of this petition—a proposal for a thirty year exchange of over 100,000 acre-feet per year between the Arvin-Edison Water Storage District and the Metropolitan Water District—will provide much-needed information about the efficacy of the transfer statutes for long-term transfers.

Transfers Within the Central Valley Project System

In contrast to the small number of transfers approved by the State Water Resources Control Board, recipients of water supplied by the Central Valley Project engaged in over 1,200 transfers during the period of this study. Between 1981 and 1988, CVP contractors transferred over 3 million acre-feet. These transactions ranged in size from a few acre feet to over 100,000 acre-feet. The primary purpose of the transfers was to accommodate fluctuations in water needs during the year due to changes in cropping patterns and weather.

The most common method of reallocating CVP water was by ad hoc agreement between individual contractors. In addition, two associations of CVP contractors formed water pools, which provide a more regular and formal means of transferring water among contractors along the

Sacramento River and the adjacent Tehama-Colusa Canal. As with the transfers subject to the jurisdiction of the State Water Resources Control Board, none of the transfers of federal project water involved a transfer of a water right or a contract right. Rather, all of the transfers within the CVP system were of water only and lasted for no more than a few months.

The transfers between CVP contractors are routine and occur on an informal basis. Because they do not require a change in the Bureau of Reclamations's water rights permits for the CVP, the transfers are neither not subject to the Board's jurisdiction nor reported to the Board. Although the parties submit their transfer proposals to the Bureau and request its approval, the Bureau generally does not evaluate the proposals. Rather, the Bureau routinely approves ad hoc transfers between its contractors as a means of reallocating CVP water to remedy short-term disparities between supply and demand.

The Bureau imposes six restrictions on transfers between CVP contractors. First, the transferor must have excess water available under its allotment from the Bureau. The Bureau normally does not challenge the transferor's declaration that it has a temporary surplus that is available for transfer. Second, agreements to transfer water may be only for the current water delivery year and all deliveries must be completed within that period. Third, the transferee must have a contract with the Bureau for a use of water authorized by the transferor's contract. For example, the Bureau will approve a transfer from an irrigation contractor to a domestic supplier only if the transferor's contract permits water to be used for municipal and industrial purposes. Since the vast majority of Bureau contracts are with irrigation districts for the purpose of agricultural use only, CVP

contractors generally are not able to transfer water to a municipal and industrial user. While such transfers are rare, they have occurred where the transferor district's contract with the Bureau authorizes the district to supply water to both irrigation and municipal and industrial users.

Fourth, the transferee's use must not violate federal reclamation law. The Bureau insists, for example, that transferees who are irrigation users comply with the acreage limitations of the Reclamation Reform Act. Fifth, the Bureau reviews the price that may be charged under a transfer agreement. A transferor may not make a profit on the transfer of water; however, it may charge reasonable service fee to recoup all costs associated with the transaction. The service fee is negotiated by the parties and is not subject to close scrutiny by the Bureau. Where a transferor and transferee pay different water rates, the transferee is charged the higher of the two rates. Sixth, the Bureau does not permit transfers between field divisions, except for Tracy and Fresno. This policy effectively prevents transfers between CVP contractors across the Sacramento-San Joaquin Delta.

The CVP is divided into five field divisions. In turn, each field division is divided into service areas. The Bureau refers to transfers between contractors within the same service area as "transfers." Transactions between contractors in different service areas are designated as "exchanges." During the eight years covered by this study, all transfers and most exchanges took place within the same field division. The only exchanges between contractors in different field divisions were from users in the Tracy Field Division to users in the Fresno Field Division. The transfers between CVP contractors are summarized in volume II.

In addition to the transfers among individual CVP contractors, two groups of contractors have created permanent pooling arrangements. Both involve contractors in the Sacramento River Valley. The Sacramento River Water Contractors Association entered into a pooling agreement in 1974. The Tehama-Colusa Canal Authority began pooling in 1981. The purpose of both pools is to establish an on-going water bank into which members can contribute water when they have a surplus and from which they may obtain water when they have a deficit. The deposits into and withdrawals from the pools are summarized in volume II.

Along with these transfers and pooling arrangements, the Bureau itself transferred water within its existing service area by wheeling water through the California Aqueduct, which is owned and operated by the California Department of Water Resources. Historically, the CVP supplies have exceeded the Bureau's contract obligations. Similarly, the capacity of the California Aqueduct has exceeded the amount of water available under DWR's permits. Consequently, as part of the Coordinated Operating Agreement signed in 1986, DWR agreed to make available to the Bureau excess capacity in the aqueduct to allow the Bureau more efficiently to transfer water from the Delta to users in the San Joaquin Valley.

Section 10h of the Coordinated Operating Agreement authorizes the Bureau to "wheel" water through the California Aqueduct. To use the aqueduct in this manner, the Bureau must divert water from the Delta through the state's pumping plant located at Clifton Court Forebay, which is one mile west of the federal pumping plant for the Delta-Mendota Canal located at Tracy. Because this represents a change in the point of diversion under its water rights

permits, the Bureau's use of the California Aqueduct is subject to the approval of the State Water Resources Control Board.

From 1985 through 1989, the Bureau submitted ten applications for a Temporary Urgency Change in its permits to change the point of diversion to Clifton Court Forebay. The Board approved all ten changes, which allowed the Bureau to wheel water through the California Aqueduct for use in the San Joaquin Valley at times when the CVP facilities were operating at full capacity. With one exception, the purpose of each of the changes approved by the Board was environmental—to support salmon spawning and migration, to provide greater instream flows in the Delta, or to supply water to national wildlife refuges in the San Joaquin Valley.

These Temporary Urgency Changes were not transfers of water because the right to use the water always remained with the Bureau of Reclamation. They are included in this report because they were authorized by the Board and show how the CVP and SWP facilities may be used conjunctively to obtain maximum beneficial use of the waters available to the two projects. The ten Temporary Urgency Changes are described in volume II.

Transfers Within the State Water Project System

Unlike users within the CVP system, the contractors of the State Water Project have not established an on-going system of water marketing. Apart from the exchange agreements involving the Coachella Valley Water District, the Desert Water Agency, and the Metropolitan Water District discussed below, there were no transfers of SWP water between state contractors. Two SWP contractors have filed an Environmental Impact Report on a proposed transfer of

project water. The Castaic Lake Water Agency has purchased 8,500 acres of land within in the Devil's Den Water District, which is located within Kings and Kern Counties. Castaic proposes to retire this land and transfer the conserved water through the California Aqueduct to its service area. Devil's Den has a contract entitlement to 12,700 acre-feet per year of SWP water. The parties do not expect to begin the transfer until 1997. In addition, the Kern County Water Agency recently transferred 50,000 acre-feet to the Westlands Water District, a CVP contractor, in exchange for future deliveries of CVP water from Westlands' federal entitlement. This was the first transfer of SWP water to a non-state contractor.

Within the thirty state contracting agencies there are few examples of formal or informal water transfer arrangements. Two contractors in the southern portion of the San Joaquin Valley--the Kern County Water Agency and the Kings County Water Agency--have long-standing water marketing programs for their member agencies. It appears that these transfers have been exclusively between agricultural users or from municipal and industrial entitlement to agricultural users. These two agencies were the only state contractors that reported water transfers among their subcontractors.

Transfers of Colorado River Water in Southern California

The only long-term transfers of water that occurred in California during the decade covered by this study both involve water supplied by the Bureau of Reclamation's Boulder Canyon Project on the Colorado River.

Two water agencies in the Coachella Valley have entered into fifty year contracts with the Metropolitan Water District.

Pursuant to these agreements, the Coachella Water District and the Desert Water Agency have exchanged their entitlements from the State Water Project for an equivalent amount of MWD's entitlement from the Colorado River. These agreements were motivated by three purposes. First, Coachella and Desert have water supply contracts with the State Water Project, but there is no canal through which to transport SWP water to them. By exchanging their SWP entitlement with MWD for a portion of MWD's entitlement from the Colorado River, these agencies could make use of their SWP contracts. Second, both Coachella and Desert pump groundwater and have been concerned about long-term overdraft. A supplemental source of surface water would help to reduce overdraft and could be used periodically to recharge the aquifer. Third, SWP water is lower in salinity than is water taken from the Colorado River. Thus, by exchanging some of its federal supplies for Coachella's and Desert's SWP entitlement, MWD could enhance its water quality.

The parties entered into the original exchange agreements in 1967 and amended them in 1983 to extend the term until 2035. These agreements authorize MWD to receive the other agencies' SWP entitlement in exchange for an equivalent amount of MWD's Colorado River entitlement. Both agreements declare that they are for an exchange of water only; the parties retain their original contracts with the Department of Water Resources and the Bureau of Reclamation. Thus, Coachella and Desert pay DWR for the water taken by MWD, and MWD pays the Bureau for the exchange water delivered to the other agencies. The Coachella-MWD exchange is for 61,000 acre-feet per year. The amount of water transferred in the Desert-MWD exchange is variable and rises with Desert's SWP entitlement. It began at 8,000 acre-feet per

year and reaches a plateau of 38,100 acre-feet per year from 1990 through 2035.

The transfer of SWP water from Coachella and Desert to MWD was not subject to the jurisdiction of the State Water Resources Control Board, because the water rights permits of the Department of Water Resources define the place of use for the SWP as including both the Coachella-Desert Service areas and the MWD services area. Thus, as with the transfers of CVP water described above, this part of the exchanges could be accomplished without changing either the place of use or the purpose of use of the State Water Project.

The associated transfer of Colorado River water from MWD to Coachella and Desert also fell outside the Board's jurisdiction, but for a different reason. Because this water is distributed by the Secretary of the Interior under the exclusive authority of federal law, the Board's change in water right jurisdiction is preempted. The exchange contracts were subject, however, to the approval of the Department of the Interior.

The exchanges began in 1973 and have been interrupted only once, by the 1976-1977 drought. They are successful examples of how water transfers, conjunctive use of alternative supplies, and water banking can expand the efficiency and supply capacity of systems that, considered in isolation, are at their physical limits.

The most prominent transfer that occurred in California during the 1980s was the recently executed agreement between the Imperial Irrigation District and the Metropolitan Water District of Southern California. According to this agreement, IID will transfer 100,000 acre-feet per year to MWD for 35 years in exchange for MWD's funding of delivery and irrigation system

improvements and other conservation measures in the Imperial Valley. The agreement also provides that MWD will reimburse IID for indirect expenses associated with the program, such as lost hydroelectric power revenue, mitigation of adverse effects on agriculture from increased salinity, environmental mitigation, and public information expenses. The parties estimated that the capital costs will be approximately \$92 million and that the annual costs will exceed \$3 million. They fixed MWD's liability for indirect costs at \$23 million.

As with the Coachella and Desert exchanges discussed above, this transfer was not subject to the approval of the State Water Resources Control Board because it involved federally supplied Colorado River water. Unlike those exchanges, however, the Board played a significant role in the IID-MWD transfer. An important inducement to this transfer was the State Water Resources Control Board's finding that IID's use of unlined canals, failure to construct regulating reservoirs, and methods of irrigation constitute unreasonable use of water in violation of Article X, Section 2 of the California Constitution. The Board ordered IID to conserve at least 100,000 acre-feet per year by 1994. Three months after the Board issued this order, IID agreed to the transfer. The IID-MWD agreement thus illustrates the way in which the reasonable use doctrine, and the threat of state-ordered forfeiture of water rights for waste, can serve as an inducement to the "voluntary" reallocation of water from inefficient to higher-valued uses.

Findings and Conclusions

Principal findings

1. There were far fewer state-authorized transfers in California than in the other five states represented in this study.

Between 1981 and 1989, twenty-four petitions to transfer water were submitted to the State Water Resources Control Board. The Board approved nineteen of the petitions and denied two. Two petitions were withdrawn, and one is pending.

2. The total number of transfers during the 1980s, including those that were not subject to the Board's jurisdiction, was much larger than expected.

a. In addition to the nineteen approved by the SWRCB, there were more than 1,200 transfers between contractors of the Bureau of Reclamation of water supplied by the Central Valley Project between 1981 and 1988.

b. Three long-term transfers occurred in Southern California between users of water supplied by the Boulder Canyon Project on the Colorado River.

c. Numerous routine transfers also took place between users within the Kings and Kern County Water Agencies.

3. There was a tremendous range in the amount of water transferred.

The transactions ranged in size from a few acre feet to over 100,000 acre-feet.

4. Virtually all of the transfers were for a term of less than one year.

a. Each of the nineteen transfers approved by the SWRCB was for a specific, short-term purposes such as augmenting supply during one irrigation season, conducting water

quality studies, maintaining instream flows during times of low natural flow, and providing contingency supplies during the 1987-1989 drought.

b. The transfers of CVP water were routine and for the purpose of distributing water among the federal contractors as needed during each irrigation season.

5. In contrast to the CVP system, there were only two transfers between State Water Project contractors of water supplied by the SWP.

a. Pursuant to these agreements, the Coachella Valley Water District and the Desert Water Agency have exchanged their SWP entitlement for an equal quantity of the Metropolitan Water District's entitlement from the Colorado River.

b. The Coachella exchange involves 61,000 acre-feet per year; the Desert exchange will reach 38,100 acre-feet per year from 1990 through 2035.

c. The purposes of the exchanges were: (1) to allow Coachella and Desert to make use of their SWP entitlements; (2) to enhance the quality of water that MWD supplies to municipal and industrial users by substituting the higher quality SWP water for a portion of MWD's Colorado River supplies; and (3) to allow Coachella and Desert to use the substitute Colorado River supplies to recharge the aquifer from which they pump groundwater.

d. The exchange contracts are long-term (50 years).

6. Most of the transfers were not subject to the jurisdiction of the SWRCB, either because they did not involve a change in the type of use, place of use, or point of diversion or because the water transferred is not within the Board's jurisdiction.

a. The multi-purpose type of use and extensive place of use terms of the water rights permits for the CVP and the SWP allow water to be transferred among federal contractors and among state contractors without triggering the Board's jurisdiction.

b. The largest transfer that occurred within California—the 35-year, 100,000 acre-feet per year transfer of conserved water from the Imperial Irrigation District to the Metropolitan Water District—was exempt from the SWRCB's transfer jurisdiction because it involved Colorado River water allocated according to federal law.

7. There were no transfers of water rights during the study period.

Conclusions

1. Of the six states reviewed in this study, California has the strongest statutory directives to promote water transfers.

2. Ironically, most of the transfers that occurred during the 1980s were not based on these statutes.

3. This pattern is likely to continue for several reasons.

a. The large service areas of the CVP, the SWP, and other regional agencies allow many water contractors to

transfer water without changing the terms of the water right pursuant to which the water is appropriated. In these cases, the SWRCB has no jurisdiction over the transfers.

b. State jurisdiction over water delivered to California users from the Colorado River is preempted by federal law.

c. These sources account for 42 percent of the surface water consumed in the state.

4. These transfers should not be brought under the Board's jurisdiction because the state should not regulate existing water markets that facilitate transfers in which water rights are not changed and third parties are not adversely affected.

5. Notwithstanding their limited use and applicability, the California water transfer statutes enacted during the 1980s played an important role in the state-wide response to the 1987-1990 drought by facilitating a number of short-term transfers to areas that faced critical shortages.

6. The modern California statutes will make a significant contribution to the future management of the state's water resources for three reasons.

a. By authorizing the transfer of conserved and surplus water, the statutes will help to minimize the risk that an offer of water for sale or lease could result in an investigation of waste or unreasonable use and a decree divesting the transferor of a portion of its water rights.

b. As the IID-MWD transfer demonstrates, the threat of such an investigation and decree could help to

induce transfers as a means of both avoiding forfeiture and financing water conservation improvements.

c. The water transfer statutes have contributed to a growing appreciation in the water industry that transfers are a viable means of supplying new demands and of reallocating water from less valued uses to greater valued consumptive and instream uses.

7. The essential elements of an efficient, fair, and forceful transfer law are already in place in the California Water Code. The law should be reorganized to resolve inconsistencies and to establish a cohesive system for the transfer of water on both short-term and long-term bases. The substance of the transfer statutes otherwise should not be significantly altered.

Section 3: Transfers of Water Use in Colorado

Colorado law favors transferability of the rights to use water. It promotes that objective in several ways. First, Colorado law regards water rights as vested property rights which may be transferred and conveyed in the same manner as other property rights. Second, it limits the basis for legal review of water rights transfers. Third, it treats water resources as largely interchangeable and promotes their maximum utilization. Correspondingly, our study found that change of water right activity in Colorado between 1975 and 1984 ranked third among the six study states.

At the same time, the study found that the Colorado system is highly legalistic and complex; that the review process is adversarially oriented, slower than the other study states, and apparently more costly to go through; and that important interests

potentially adversely affected by transfers are not considered in the review process. Major recommendations are that transfer applications should be reviewed by the division engineer concerning injury to other water rights and that means should be found to provide adequate consideration of other interests potentially affected by water transfers.

Water Transfer Law

Water rights in Colorado are of two basic types: those based on the appropriation of water and those based on land ownership. Simple changes in ownership of water rights may occur without restriction. Transfers involving changes in other attributes of a water right such as the purpose or place of use, however, are subject to legal review.

Appropriative water rights, both absolute and conditional, may be changed with respect to the point of diversion, the type, place, or time of use, or between direct flow and storage rights. The water court must approve a change request if the applicant demonstrates that there will be no injury to other water rights or if terms and conditions can be imposed that will eliminate injury. Water rights may be voluntarily exchanged in Colorado. Involuntary exchanges also may be effected through the provision of substituted supplies. Imported water and nontributary groundwater are common sources of water for this kind of involuntary exchange. Out-of-priority development of tributary groundwater is permitted under a plan for augmentation so long as depletions of the stream are fully replaced. Commonly, consumptive uses under existing rights are retired to offset the depletions from the new use.

Water Transfer Activity

Changes in water rights involving a change in the purpose or place of use of water are common in Colorado. An examination of water rights applications filed between 1975 and 1984 indicated that 858 involved a change of water use. As of July 1988, 689 of these applications had been approved, 84 had been withdrawn or dismissed, 74 were still pending, and 11 had been denied.

Most applications are filed in Water Division One, that division encompassing the most populous part of Colorado. Second in activity is Water Division Five, the mainstem of the Colorado River.

About 67 percent of the applications filed during this period involved a proposed shift in use of water from primarily agricultural to primarily non-agricultural purposes. About ten percent of the proposed new uses were within the agricultural sector. About half of the approved changes involved plans for augmentation.

The quantities of water involved in the approved transfers typically were quite small. For changes involving direct flow rights, 50 percent of the cases involved 0.5 cubic feet per second or less. For changes involving storage rights, 50 percent were for ten acre-feet or less.

Statements of opposition were made in about 60 percent of all change of use cases filed between 1975 and 1984. Changes were most likely to be opposed in Divisions One and Five, the two most active areas in the state for changes of use. Statements of opposition were filed in 84 percent of the cases in Division One and in 74 percent of the cases in Division Five. By comparison, only 37 percent of the cases in Division Four were opposed and only 40 percent in Divisions Six and Seven.

The average time for a decision in these cases was about 21 months. On average, applications were approved in about 19 1/2 months. The few denials averaged 27 months. There is a very strong correlation between length of time to decision and whether a statement of opposition was filed.

Case Studies

Historically, most changes in the use of water have occurred through urban encroachment into previously agricultural areas, and there has been little change in the general location of use. This pattern in Colorado is illustrated in our study of the Clear Creek basin. More recently, cities have been reaching further away to acquire water supplies. The South Park case study illustrates a situation where upstream agricultural water uses were transferred to downstream urban uses. The Arkansas case study involves the out-of-basin transfer of water from agricultural to urban use. Based on our study, these are not common types of transfers but they are visible and controversial because they involve relatively large areas of agricultural land and the associated water.

Transactions Costs

Analysis of nine out of 21 randomly selected cases (those for which we were able to obtain cost data) indicates a wide range of transactions costs. Transactions costs per acre-foot ranged from \$0.37 to \$1702. Statistical analysis of this small data set indicates several relationships: unit costs appear to go down as the quantities of water involved increase; and opposition raises costs.

Conclusions and Recommendations

The practice of transferring the use of water through a change of an appropriate water right is well-established in Colorado. There are a number of factors, however,

suggesting the need to review the present approach. Recommendations for change are made in three general areas: changes in the review process, changes in the impacts considered, and modifications in aspects of Colorado water transfer law. The report suggests that review of matters of injury to other water rights should be handled by the division engineer since they involve primarily technical, factual issues rather than legal issues. It urges recognition of the broader set of interests implicated by water transfers beyond other water rights and suggests alternative approaches to addressing those interests. Finally, it suggests changes in Colorado law to clarify transferability of salvaged water and to facilitate temporary transfers.

Colorado water law and policy strongly support voluntary transfers of water and water rights among users in the state. This favorable attitude is reflected in the number of changes of water rights documented in our study. Most of these changes are made without great difficulty or expense. Improvements, could be made, however, to facilitate aspects of the review process and to broaden the considerations in water transfers. These changes can help to assure that the water transfer process will continue to serve Colorado's interests.

Section 4: Water Rights Transfers in New Mexico

The water transfer process in New Mexico is active and in most respects free of contention. Over the study period⁴ there have been 1309 applications to change the place or purpose of use of which 1225 or 93.6 percent had been approved at this writing. Only 59 applications or 4.5 percent were protested during the entire period. On a statewide basis, though there is considerable year to year fluctuation, the applications show

a general increase during the early portion of the study period. An annual peak was reached in 1981 followed by a gradual decline to the same levels that existed in the early years of the study period. Similar patterns exist for many of the individual water basins separately.⁵

All water rights in New Mexico are measured in acre-feet, and when rights are being transferred into municipal or industrial use it is common practice to convert them from a diversionary base into a consumptive use quantum. For purposes of this study, simplifying assumptions were employed to convert all transfers into a consumptive use basis. By this volumetric method the 1309 applications reported above comprise 118,884 acre-feet of consumptive use. The approved transfers, similarly, carry rights to 106,855 acre-feet of consumptive use or 89.9 percent.

There is less pattern to the annual and basin volumetric totals for either applications or approved transfers which in large part reflects the lumpiness of water right holdings that come onto the market. And, it is difficult to put the volume into perspective as to whether it constitutes a large or small quantity of water rights compared to the available supply. Most basins in New Mexico have not been adjudicated, and a volumetric measure of the total stock of water rights in a given basin is unavailable. However, estimates of annual consumptive use within basins are prepared by the State Engineer's Office (SEO) every five years, and these quantities can be used as proxies for the volume of water rights in the basin.

On this basis, the transferred rights in four basins (the Rio Grande, the San Juan, the Pecos, and the Gila/San Francisco) are respectively 4.8 percent, 1.1 percent, 5.4 percent, and 9.6 percent. It is likely that substantial, though unknown, additional quantities of water rights have also passed

into the control of new owners such as municipalities and corporations but are not yet recorded at the SEO because they continue to be used in agriculture until they are needed for the new purposes for which they were purchased.

The average size of an application is 91 acre-feet of consumptive use though fifty-one percent of transfers involve quantities that are less than 10 acre-feet in size. At the same time, 90,268 acre-feet of consumptive use transferred are contained in transfers that are larger than one hundred acre-feet. Thus, the bulk of the transferred water occurs in only 13 percent of the approved transfers. Most of the transfers involve small amounts of water.

As noted, few applications are protested. The 59 which were protested contained 12,881 acre-feet of consumptive use or 10.8 percent of the total volume for which application was made. The average size of a protested application, then, was 218 acre-feet compared with the 91 acre-feet contained in the average application, as reported above. Overall, there does not seem to be a significant pattern to the protested applications. In a few basins there were single years with a large number of protests followed by very few additional protests in subsequent years. In other words, what problems existed appear to have been resolved.

Fifty-four (54) percent of all transfers were approved within three months; 78 percent within six months; and 95 percent within two years. Volumetrically, 78 percent were also approved within six months though 9 percent of the volume took longer than two years to approve. Looked at differently, the average volume of a transfer approved within three months was 79 acre-feet, and the average volume for those taking longer than four years was 312 acre-feet.

Thirty-two (32) percent of the volume transferred move from agriculture into non-agricultural use or a mixture of both. Another 37.9 percent moved from non-agricultural use into other non-agricultural use. The surprising statistic, as yet unexplained, is the 26.3 percent of water rights being transferred and yet staying within the agricultural sector. Because effort was made to eliminate simple change of place of use by one owner, this statistic warrants further investigation since it is out of line with the experience in other states.

The transaction cost associated with most small applications that are not protested is minimal, and as stated above, this is by far the largest group of transfers numerically. When a transfer is protested the expense may become considerable, and there is evidence that average transactions cost are increasing significantly beyond the rate of inflation.

The transfer process in New Mexico is well defined and routine in most instances. Although there is no explicit legislative or executive policy endorsing transfers as occurs in California, the basic laws and practices of the State implicitly accept and even encourage transfers as a principal means of meeting new water demands in fully appropriated basins.

As is common to other western states, New Mexico disallows proposed transfers that may impair the water rights of others. Most recently, New Mexico adopted a statute which broadens the basis for protesting a transfer to include situations which are considered adverse to the public welfare or contrary to the conservation of water within the state. The experience with these new conditions has not been great as yet, and there remain significantly different opinions as to what these clauses may eventually come to mean. One section of the New Mexico report in Volume II argues for a political process for

determining the public welfare as contrasted with an administrative or judicial determination.

To summarize, the water rights system in New Mexico possesses considerable flexibility in terms of the transferability of water rights, and this flexibility is counted upon as the State experiences growth. There is circumstantial evidence that some consolidation and concentration of water rights holdings may be occurring, but these are only potential problems for the future. Most immediately, the principal issue remains the definition of public welfare⁴ as it will operate within the transfer process.

Section 5: The Water Right Transfer Process in Utah

This project focused on the identification of the legal basis of Utah's water right transfer system, trend analyses through retrieval of State "change" and "exchange" records and case studies to identify motivating and inhibiting factors. Research included identification of the status of Federal contract waters and reserved Indian water rights.

Legal System

Utah follows the prior appropriation doctrine for water right acquisition. This is administered by the State Engineer Office through a permitting process. The State is divided into seven regions, each consisting of several hydrologic subbasins overseen by area engineers and ultimately the State Engineer. The State Engineer's duties include "securing the equitable and fair apportionment and distribution of the water according to the respective rights of appropriators." A detailed chart of the procedure for adjudicating water rights and/or change applications in Utah is shown by Figure 2.5.1.

Two types of amendment(s) or transfer(s) of existing water rights were researched from Division of Water Rights records. These are defined as "formal" transfers since they require State Engineer approval. The first type is a "change" which refers to a change in point of diversion, place of use and/or nature of use of a water right. The other type of amendment is called an "exchange" where no title of the right is necessarily transferred but involves a contractual agreement between two or more water users. Temporary changes and changes in ownership only, were not included in this study.

Another type of transfer which does not appear on the Division of Water Rights records but occurs regularly is the exchange of water shares within mutual irrigation companies and water districts. This activity is defined as "informal" since it does not require approval by the State Engineer.

Data Analysis

A total of 6493 "change" applications and 1721 "exchange" applications were filed with the Division of Water Rights during the 1975-1987 study period. At the time of data retrieval only a portion of these records were on computer files. Manual retrieval of the remaining files resulted in a small percentage of the records being unavailable for analysis. Therefore, this research included 88 and 94 percent of the total change and exchange applications, respectively.

Changes

The peak number of applications occurred in 1977 with the low in 1984 which were "dry" and "wet" water years, respectively. The highest number of applications occurred in the Southwest area, representing 35 percent of the total. This area has

experienced a high growth rate and is also generally closed to new water appropriation applications.

The following data reflect removal of filings for change in point of diversion only, amounting to 22 percent of the total.

More than 85 percent of the sampled change applications were approved while less than 3 percent were rejected. Undecided applications totaled 8.4 percent with the remainder being lapsed, withdrawn or unknown. Protests to change applications can be readily identified on State records only since 1984. Computer records indicate that the percentage of change applications which were protested for each of the years 1985, 1986, and 1987 were, respectively, 13.2, 17.5, and 24.4 percent. These figures indicate that during this recent period there was a significant increase in the protest rate. The Sevier River area now receives a protest for most applications, representing 40 percent of the total recorded protests.

For the State, the peak percentage of approved changes (42.1 percent) were decided within 3-6 months and 83.2 percent within 12 months. The Sevier River area was noticeably slower with a peak of 36.9 percent decided within 6-12 months and only 59.4 percent within 12 months. This is attributed to the large number of protests, heavily litigated IPP transfers and its closed basin status. Rejected applications are generally significantly slower with only 50 percent decided within 12 months. A steady decline in percent of yearly total changes approved within 6 and 12 months, respectively, occurred from 1975 through 1983 with a significantly quicker turnaround time beginning in 1984. This is largely attributed to improvements in the computer system.

Less than 60 percent of the approved water right changes were quantified in acre-

feet (af) and of those, approximately 61 percent involved less than 10 af. For changes quantified in cfs only, 69 percent involved less than 0.5 cfs.

Movement of the water source through transfer was found to include 74 percent groundwater to groundwater transfers with 19, 6 and 1 percent surface to surface, surface to ground, and ground to surface waters, respectively. Since irrigation districts largely control surface waters, it is suspected that many of the surface to surface transfers do not appear on State Engineer records but occur through informal transfers. Many of the groundwater transfers occurred in the closed Southwest and Sevier River basins.

Applications involving a change in nature of use included 61 percent of the approved filings with 28.3 percent transferring to non-agricultural uses and the remaining maintaining at least some agricultural use after transfer. New agricultural uses averaged 6.8 percent of the total per year while new municipal and industrial uses totaled 26.2 percent. The number of uses per water right increased after transfer indicating a diversification trend. The total uses before and after transfer show total agricultural uses decreasing by 36 percent with municipal, industrial and single family uses increasing 130, 161, and 22 percent, respectively.

Exchanges

The Ogden-Weber River area produced 82 percent of the total exchange applications, with the peak occurring in 1981 and significantly decreasing since. The State Engineer ordered a moratorium on exchanges greater than 1 acre-feet for the Snyderville Basin within this area in 1981 due to rapid development and lack of definitive hydrologic data.

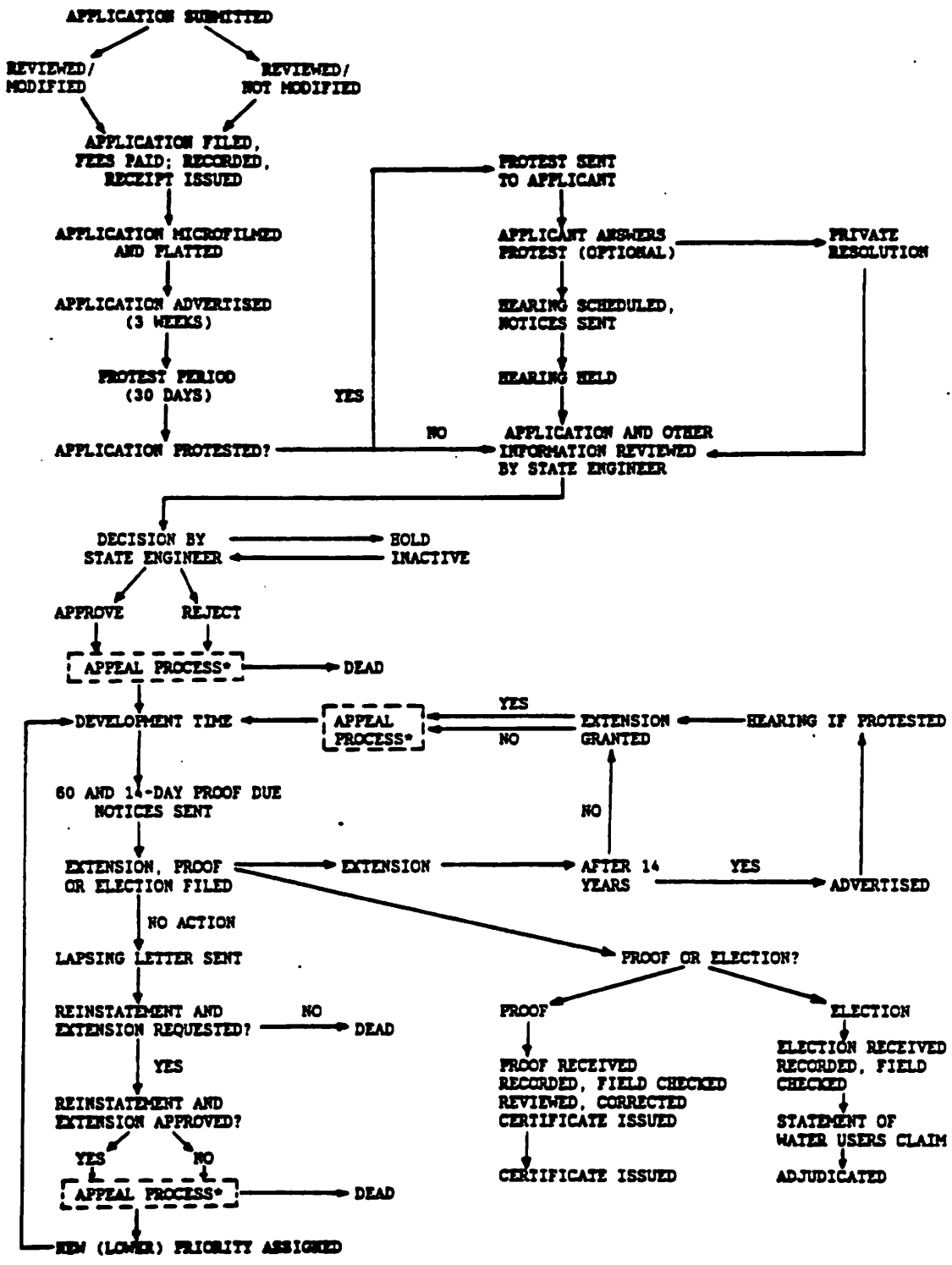


Figure 2.5.1 Detailed Procedure for Granting Water Rights and/or Change Applications

Approval of applications total 88 percent with 4 percent being rejected or withdrawn and 8 percent undecided. Protests were consistently noted on state records only after 1984 so that annual protest figures for the period before 1985 were not included in the analysis. Protested exchange applications for the years 1985, 1986, and 1987 were, respectively, 19.7, 14.9, and 7.9 percent.

More than 98 percent of the exchanges were quantified in acre-feet and of those 88.6 percent involved quantities of less than 10 acre-feet.

Case studies

Selected change cases were investigated. Particular emphasis was given to changes which involved large transfers, long decision periods, and high protest levels. The applications were researched to identify inhibiting factors and the basis of the State Engineer's decision.

Informal Transfers

Informal transfers within districts and mutual irrigation companies occur where water shares are exchanged within the designated boundaries of the district or company and the legally defined types of use remained the same. This activity is, therefore, not monitored by the State Engineer. The water rights held by many districts originated through federal projects; however, a large number of mutual irrigation companies have operated since the original pioneer settlement of the State. The development of water sources and distribution systems were often cooperative efforts resulting in the distribution of water shares which can be rented, sold or traded within company boundaries. There was a general hesitancy by irrigation district or company representatives to provide information regarding informal transfers. Data gathered

from larger districts in the State indicate a broad range of possible informal activity. This activity ranges from none to as much as 4500 acre-feet per year.

Federal Contract Water

Federally developed water in Utah began with the Strawberry Valley Project, completed in 1913. Many other projects have since been completed with the present Jordanelle Dam construction anticipated to be the last of the large USBR Projects.

There are only a few cases in the State where a block of federally developed water has changed its nature of use. One of these involved the Emery County Project and Utah Power & Light. In 1972, UP&L bought water rights and land from private owners and changed the use of 6,000 acre-feet of district water from agricultural to industrial use. In the fall of 1988, a second transfer of 2576 acre-feet occurred between the same entities. The changed rate of repayment to the Federal Government from an agricultural to a higher industrial rate was seen as motivation for the transfer by the district.

Contracts for Federal projects appear to inhibit transfers by the requirement that water remain on project ground and be used only as per the original contract.

Indian Water Rights

Four Indian tribes in the State claim reserved water rights, the largest being the Uintah-Ouray Tribe or "Ute" Indian Tribe.

Attempts to quantify waters held by the Ute Indians have been made in recent years through the Ute Indian Water Compact of 1980 and a bill introduced in Congress in March 1989. Recent tribal leadership changes have complicated resolution of conflicts regarding the adequacy of

compensation for deferred water rights. Negotiations between the Ute Tribe and government agencies continue. Similar disputes are being faced by the other tribes in the State and undoubtedly will require considerable time and effort to be resolved.

Section 6: Water Rights Transfers in Wyoming

Unlike many of its sister states, Wyoming has traditionally adhered to a conservative policy towards water transfers. This tradition dates back to Elwood Mead, Wyoming's first State Engineer, who feared that a liberal water transfers policy would lead to speculative water rights acquisition. While Mead's arguments may have been compelling when they were made, the changed circumstances of today warrant a reevaluation of Wyoming's transfer policy.

The report begins with a brief review of the Wyoming water rights allocation and transfer system. It then summarizes data on the 42 Wyoming water transfer applications that have been filed with the State since the current Wyoming water transfer law was enacted in 1973. Twenty cases were chosen for further study. Case selection was based on the potential for illustrating trends and issues that have developed with the water transfer process in Wyoming. The report concludes with recommendations for improving Wyoming's water transfer system.

Wyoming's Water Transfer Laws

Wyoming enacted legislation in 1973 expressly authorizing changes in use and place of use for water rights. Such changes are the most common type of water transfer in Wyoming. They are initiated by filing a petition with the Board of Control. The petition must set forth information about the existing use and the proposed change in use,

and the Board may hold one or more public hearings at the petitioner's expense. The decision to grant or deny the petition is based on a statutory modification of the common law "no injury" rule. The Board may not grant a petition unless the following requirements are met:

- (1) The quantity of water transferred does not exceed the amount of water historically diverted.
- (2) The proposed new use will not divert water at a higher rate than the historic rate of diversion.
- (3) The proposed new use will not consume more water than was historically and beneficially consumed by the existing use.
- (4) The proposed new use will not decrease the historic amount of return flow, nor change the place of return flow so as to injure another water user, nor cause any other injury to a lawful appropriator.

In addition to the above requirements, the Board may consider other factors unrelated to other water users. These include:

- (1) The economic loss to the community and the state if the use from which the water right is transferred is discontinued;
- (2) The extent to which the economic loss will be offset by the new use;
- (3) Whether other sources are available for the new use.

Arguably, the Board of Control may also deny a transfer where demanded by the public interest, under their general constitutional

authority to deny original applications on public interest grounds.

One of the more interesting limits on transfers concerns that relating to the *historic and beneficial* consumptive use. The statute itself limits transfers only to that water which has been historically consumed. But in *Basin Electric Power Cooperative v. State Board of Control*, the Wyoming Supreme Court held that this water must be consumed beneficially as well. In the *Basin Electric* case, the transferor was using water for agricultural purposes. The transferee, Basin Electric, proposed to use the water for power production in another watershed. Under the 1973 Wyoming statute, the amount of water available to be transferred was limited to that amount of water that was consumed by the transferor in his agricultural use.

Wyoming's Water Transfer Experience

Wyoming's early experience with water transfers is thoroughly described by Frank Trelease and Dallas Lee in a study published in the premier issue of the *Land and Water Law Review* in 1966. That study was aimed primarily at refuting the notion that water transfers in Wyoming were virtually non-existent due to the "no change" language of the 1909 Wyoming statute. The study ably discredits that notion. Some improvements have been made since Trelease and Lee looked at Wyoming water transfers in 1966. Most significantly, of course, the legislature adopted specific legislation in 1973 that expressly allows transfers. But many restrictions on transfers remain.

The 1973 water transfers legislation was made applicable to all applications filed after February 1, 1974. Since that time, 42 water transfer applications have been filed. Of these, 25 were granted without conditions, 7 were granted conditionally, and 9 were denied. One application is currently pending.

The time for processing transfers of agricultural water to a non-agricultural use ranged from 3 to 61 months, with an average processing time of 16.67 months. Twelve transfer applications were protested and two decisions were challenged in court—in both cases by the applicant and not a protestant. Transfers from agricultural to a non-agricultural use resulted, on average, in reducing the total water right by 57.4 percent. Transfers of agricultural water that did not involve a change in use generally did not affect the amount of the water right. The chart set forth as appendix A to the Wyoming State Report describes all of the water transfer activity in Wyoming since February 1, 1973—the date that the 1973 statute went into effect.

The general dearth of transfers in Wyoming contrasts sharply with transfer activity in other states in the Rocky Mountain region where substantial transfer activity has been recorded. Wyoming's relatively small population base surely accounts for some of this difference. But other factors appear to have contributed to the lower level of transfer activity as well.

First, Wyoming has a long-standing reputation as a state with restrictive transfer laws. Despite the effort to liberalize Wyoming's transfer laws, court decisions such as *Basin Electric* continue to fuel the perception that Wyoming is not receptive to water transfers. To some extent, this reputation is unfair. The Board of Control fully and fairly considers transfer applications and as the data suggests, several significant water transfers have been approved. But the Board does show a decidedly conservative approach to transfer proposals. Moreover, whether deserved or not, Wyoming's reputation as hostile to water transfers undoubtedly discourages would-be applicants from looking at transfers as possible sources of water supplies.

Second, the 1973 statute which authorizes transfers is extremely narrow. In addition to prohibiting transfers that cause injury to other appropriators, the statute precludes transfers that increase the amount of water historically diverted, or increase the historic rate of diversion, or increase the historic amount consumptively used, or decrease the historic amount of return flows. In addition, as noted previously, the Board retains broad discretion to deny in other circumstances as well. Finally, as previously described in the *Basin Electric* case, the Board interprets the law narrowly so as to further limit transfers.

The Future of Water Marketing in Wyoming

Some water marketing is taking place in Wyoming but the restrictions on water transfers imposed by the state appear to discourage significant transfer activity. By artificially limiting the water market, the state discourages the most efficient use of its limited water resources. In some respects, this may have a salutary, if unintended, consequence. By discouraging greater consumptive uses of water, state policy may help ensure that more water finds its way into streams where it may help protect the stream environment and help dilute the effects of water pollution. It may also help to store water in the stream system for use later in the irrigation system. But it may also encourage new (and expensive) water development projects that might be unnecessary if existing water rights could be used more efficiently.

The CAID project, described in the Wyoming report, is an excellent example of how incentives for more efficient use of existing water rights can provide substantial quantities of water for other uses at a cost that is competitive with the cost of developing new sources of water. State law

should build on its experience with the CAID project to promote more efficient use of its limited water resources. Set forth below are some suggestions for improving Wyoming's current water transfer laws.

Improving Wyoming Water Transfers Law

Despite the difficulty in gathering accurate data on the effects of a water transfer on the water system, the state's insistence that the applicant provide sufficient evidence of those effects is reasonable. Nonetheless, improvements over existing law can be made. At the outset, the state should shed its historical distrust of water transfers. Perhaps transfers do reward speculation and waste as Elwood Mead feared. But Wyoming water law currently affords few sanctions against those who speculate or use water less efficiently than can reasonable be achieved. Nor can it realistically do so, absent a total overhaul of the prior appropriation system. Many in Wyoming's farming community simply cannot afford to change their historical irrigation practices, however wasteful they might seem to the casual observer. Instead, the law should provide water users with incentives to make the use of scarce water more efficient. One obvious way to achieve this objective is by promoting water transfers. The following changes to current law would help to achieve this objective.

1. **Water Transfers Policy:** A statement of policy in the proposed law should reflect that state's fundamental support for water transfers, particularly those that promote efficient use of scarce water resources.

2. **Return to the "No Injury" Rule:** Wyoming should join other western states and allow transfers in any case so long as no injury is shown to other appropriators or the public interest.

3. Shift the Burden of Proof to Show "Injury" to the Protestants: The applicant for a water transfer should be obliged to come forward with return flow studies, historical water usage data, and other information sufficient to make a prima facie case that the proposed transfer will not injure other appropriators. The applicant's requirements for establishing a prima facie case should be made explicit in regulations or statutes. In order to encourage transfers, however, the ultimate burden of persuasion that an injury will occur should fall on the person claiming injury. The Board should avoid conducting its own investigations, but rather should limit its role to that of the impartial decision-maker.

4. Allow Contingent Transfers: In order to promote programs like CAID, the State should allow persons to sell water rights that will result from any proposed water savings program. The transfer would be contingent upon a subsequent showing that the amount of water sought to be transferred was actually saved without injury to other appropriators, as determined by the Board of Control. Thus, for example, a person in need of water might agree to line the ditches of another water rights holder, in exchange for all or part of the water rights that would be saved by the project.

5. Establish a Statewide Water Conservation Bank: Water banks are not new. They are used in a variety of contexts, but primarily for short-term water transfers such as those that take place informally within

irrigation districts. The bank proposed here would be fundamentally different from any of those currently in use. Under current law, a person holding water rights must use his water or risk losing it to abandonment or forfeiture. Moreover, a person cannot use appropriated water on land other than that for which it has been appropriated or for other uses without first complying with the water transfers process. In most cases such transfers cannot be approved even where no one is injured because they will increase the total amount of consumed water or reduce the amount of return flows. Thus a person with adequate water supplies to flood irrigate would be foolish to consider more efficient irrigation techniques. The initial capital costs for a pivot sprinkler can be substantial and though the water rights holder would save water, he would eventually lose all rights to the water that was saved. Suppose, however, that the water saved by using a more efficient technique could be banked. The state would issue the water rights holder a certificate indicating the amount of water banked. Banked rights could not be lost through abandonment or forfeiture, and they would retain their original priority date. Certificates would be freely marketable. The purchaser would still have to comply with the general transfer provisions of a revised and less onerous state law; but the assessment of water savings should be readily available to the applicant, thus holding promise for a simpler administrative approval process.

Conclusion

Wyoming has seen only limited water marketing activity since its water transfer laws were liberalized in 1973. One of the reasons for this is that the 1973 legislation did not go far enough. Water marketing holds much promise for encouraging more efficient use of water resources and more efficient water usage could benefit Wyoming substantially. But water marketing is not likely to increase unless significant changes to Wyoming's current laws are made. This report is intended to help push the state in that direction and to help Wyoming reclaim its reputation as an innovator in western water law.

ENDNOTES TO CHAPTER TWO

1. The current legal framework for water transfers in Arizona and the issues confronting the legislature are describes in Woodard and Checchio, *The Legal Framework for Water Transfers In Arizona*, 31 *Ariz. L. Rev.* 721 (1989).
2. For an analysis of economic and fiscal impacts associated with water farming in La Paz County, Arizona, see *Water Farming Study Estimates Economic Losses in La Paz County, Arizona's Economy* (Sept. 1989).
3. For detailed information on water farm transactions occurring in Arizona, see3. Woodard, Checchio, Thacker and Colby, *The Water Transfer Process in Arizona: Analysis of Impacts and Legislative Options*, Division of Economic and Business Research, University of Arizona, April 1988, 170 pages.
4. The study period in New Mexico was expanded to include all years from 1875 to 1987 inclusively.
5. In particular, the Pecos, the Gila/San Francisco, the Middle Rio Grande, the Southeast Groundwater, and the San Juan basins exhibit a similar pattern.
6. In particular, instream uses have not been recognized as a beneficial use in New Mexico which gives rise to the possibility that proponents of instream values could seek to include these values under the public welfare clause.

Chapter 3

Findings and Comparative Analysis

This chapter summarizes the comparative findings of the six state study of water transfer processes. In particular, it focuses on four main dimensions of water transfers in these states: 1) types of transfer activities; 2) water transfer policy, law, and procedure; 3) water transfer characteristics; and 4) transactions costs. Its aim is to establish a comparative description and analysis of these dimensions as a basis for the conclusions drawn in Chapter Four.

Section 1: Types of Transfers

Water transfers, defined as the voluntary change in the existing purpose and/or place of use of water under an established legal entitlement, occur in many ways in the six study states. While this study concentrates primarily on the transfers that are subjected to state review—generally involving permanent changes of an appropriative water right—water uses change in other ways. This section provides a brief overview of the forms that water transfers take in the study states.

Water rights often are traded or loaned on an informal basis for short-term uses. This commonly involves seasonal arrangements among water users in the same water supply system reallocating shares of water rights. Because these changes generally occur within the boundaries of a water district and are short-term, they are not subject to state review.

Many water users are supplied on a contract basis. For example, the Bureau of

Reclamation provides water to users in some instances under service contracts. Water districts may supply water to users on a contract basis. Urban water supply agencies also may provide water to users on a contract basis. Depending upon the terms of the contract, water transfers may occur through assignment of the contract right. At the end of the contract term the water may be reallocated through an administrative process. State review usually is not involved.

Water transfers also may occur in conjunction with a change in land use. In California, riparian rights still are important in some locations and changes of use of those riparian lands may involve some change in the associated water use. Groundwater development in California and in areas of Arizona and Colorado essentially is a right of land ownership. No state review is involved if there is a change of use of groundwater on this land. In Arizona, appropriative water rights are considered permanently appurtenant to the land on which they are used. Apparently there is no state review of a change of use of these rights so long as the use stays with the land. This applies even to changes occurring within a water district. For example, much of the land within the Salt River Project within the Phoenix metropolitan area is shifting from agricultural to nonagricultural uses and the water uses within the area are changing accordingly. No state review of these changes is involved.

Most of the rights to use water in the six study states are based on appropriation. An appropriative water right commonly contains a number of elements including a specified rate of diversion, a specified point

of diversion, a specified place of use, and a specified purpose of use. As discussed in Section 2 below, all of the study states allow the holder of a valid appropriative water right to make changes in the point of diversion or the place or purpose of use without loss of priority so long as there is no impairment of other water rights. The water transfers studied in this project primarily involved changes in purpose or place of use of an existing appropriative water right.

Water rights are considered to be property rights even though, unlike most property rights, they must be exercised to be maintained. The property possessed in a water right is not the water itself but the use of no more than a certain flow or quantity of water from a particular source with a particular priority. All the study states allow the permanent transfer of *ownership* of appropriative water rights to occur without state supervision, in contrast to changes in purpose or place of use.

Water marketing generally refers to the negotiated transfer of the right to use water, either on a short-term or long-term basis, between the holder of the right and the individual or entity desiring the use of the right. The transaction concerns transferring the right to use water and does not necessarily involve changing the purpose or place of use. Water transfers in this sense take many forms. The water right itself or a legal share in the right may be sold. It may be leased for short or long periods. Option-like arrangements to take the use of the right under certain circumstances, as in a drought, may be made. Water rights may be exchanged by users if there are mutual benefits. Under some circumstances a portion of the right may be transferred if, for example, water can be conserved in the existing use and made available for another use without injury to other water rights. Generally, if there is to be a change in the

purpose or place of use of the original water right, state review will be necessary. In the next section, laws of the study states relating to water transfer are discussed.

Section 2: Water Transfer Laws and Procedures

This section provides a summary of the origin and evolution of the legal principles applying to the transfer of use of appropriative water rights. It presents some comparative observations concerning the laws and procedures governing change of water uses in the six states discussed in this report.¹ Finally, it uses empirical findings to compare the efficiency of the transfer review process in several of the states.

The Origin of Water Transfer Principles

California courts, which were the first to recognize appropriation in establishing the legal right to use water, also were the first to consider an appropriator's right to make changes in the original use. The early disputes turned on the question of priority: did an appropriator lose his priority by making some change in the original manner of use? A trilogy of decisions between 1857 and 1867 established the fundamental principles of law in this area. *Maeris v. Bicknell*² concerned the effect of shifting the use of water under a water right from one mining claim to another. The California Supreme Court concluded:

It would seem clear that a mere change in the place of use of water, from one mining locality to another, by the extension of the ditch, or by the construction of branches of the same ditch, would by no means affect the prior right of the party. It would destroy

the utility of such works were any other rule adopted.³

*Kidd v. Laird*⁴ involved a change in the point of diversion by a senior appropriator to a place upstream above the complaining junior appropriator's point of diversion. In preserving the senior's priority, the court set forth an expansive view of the right to make changes. It noted that an appropriative water right creates a right to the use of water that is regarded as a property right. Looking to well-established principles regarding rights to the use of property, the court concluded that the only limitation is that the use not cause "injurious consequences" to the rights of others.⁵ In the absence of injury to others, any change that a party chooses to make is legal and proper.⁶

Finally, *Davis v. Gale*⁷ concerned the effect of a sale of a water right and its subsequent use at a different location and for a different use than under the original right. In its decision, the California Supreme Court first set out a number of examples in which an appropriator would find it economically necessary or beneficial to change the place or purpose of use.⁸ The court then asked whether such changes should be able to be made without loss of priority and answered that question in the affirmative:

In cases like the present a party acquires a right to a given quantity of water by appropriation and use, and he loses that right by nonuse or abandonment. Appropriation, use and nonuse are the tests of his right; and the place of use and character of use are not. When he has made his appropriation he becomes entitled to the use of the quantity which he has appropriated at any place

where he may choose to convey it, and for any useful and beneficial purpose to which he may choose to apply it. Any other rule would lead to endless complications and most materially impair the value of water rights and privileges.⁹

The elements critical to maintaining a water right, then, are the physical appropriation of water and the continuing application of that water to a beneficial use. The particular purpose of use or place of use are not fundamental to the existence of the right and may be changed without loss of priority so long as no injurious consequences result to other water users.¹⁰

The court was strongly impressed by the prevalence of the practice of selling ditches, which were then extended for other uses, and the considerable investments that had already been made in apparent reliance on the original priority of the water right associated with the ditch:

The water rights involved in this case may not be of great value, and their acquisition may not have been attended with much expense, but there are many similar privileges which have been secured only by the use of large sums of money, and to hold that they are limited to the particular place or to the particular purpose in view of which they were first sought would, for obvious reasons, lead to most pernicious results and greatly delay and embarrass the development of the resources of the country.¹¹

By allowing changes in water rights, the California courts were simply recognizing existing, well established practices—just as they had in recognizing rights to appropriate water.

The courts of other western states generally accepted California's water transfer principles.¹² Several states enacted legislative provisions specifically authorizing changes in water rights.¹³ These provisions required that there be no injury to other water rights and usually established some kind of state review.

Transfers Reconsidered

This initial acceptance of water transfers began to falter as conditions changed and problems arose. The California trilogy involved appropriations of water for mining. Mineral exploration and development is, by its nature, speculative and often short-lived. Many prospects are pursued but few yield long-term economic rewards. As the miners moved from claim to claim they took their water rights with them. When they decided that they had had enough of mining, often the only valuable asset they had was their water rights and the water conveyance systems they had built. It made eminent sense to allow changes and transfers of water rights under such circumstances.

As irrigated agriculture displaced mining as the dominant water user in the West, circumstances changed. Stability became important since patterns of water use in agriculture generally follow regular cycles. Farmers tended not to move the way miners did. And, in the arid West, farmers generally viewed water less as an asset to be bought and sold and more as an integral and permanent part of their lives.¹⁴ The agricultural community created mutual ditch and storage companies and irrigation districts to cooperatively develop the water supply. With the creation of the Bureau of

Reclamation in 1902, major water storage and supply projects were built throughout the West with federal financial and technical support. Settlement and development of the West proceeded through the widespread irrigation of arid and semi-arid but cultivatable lands.

In 1901, the Arizona Supreme Court ruled that water rights in that state were appurtenant to the land on which they are used and could be transferred only if the land itself becomes unusable through natural causes.¹⁵ This decision resulted from a concern about widespread ownership of canal company shares by investors who were renting these shares to farmers needing irrigation water.¹⁶ To prevent this practice the court determined that an appropriator must own the land on which the appropriation of water is to be used.¹⁷ The Arizona legislature codified this requirement in enacting a general water code in 1919.¹⁸

In 1909, the Wyoming legislature enacted a statute providing that "[w]ater rights cannot be detached from the lands, place or purpose for which they are acquired, without loss of priority."¹⁹ This statute directly overruled earlier Wyoming Supreme Court decisions allowing water transfers²⁰ and reflected the influence of former Wyoming State Engineer Elwood Mead. In his 1903 book, *Irrigation Institutions*, Mead had criticized the practice of selling water rights.²¹ Like the Arizona Supreme Court, he believed that water rights should be directly attached to the land, and his views prevailed with the Wyoming legislature.

Reflected in these Arizona and Wyoming statutes are two different types of concerns about water transfers. One has to do with considerations of water rights administration. Making changes in water rights highlights the lack of precise definition in these rights.²² People like Elwood Mead

feared that the problems raised by allowing changes in water rights, especially in protecting junior appropriators, would outweigh the benefits of the changes.

The major issues that arise in transfer cases are the validity of the original right (e.g. has it been abandoned?), the extent of the right—especially the quantity of water historically used, and whether the transfer will cause injury to other water rights. Each of these issues requires considerable technical and, perhaps, legal analysis.²⁹ In states such as Colorado, New Mexico, and Utah where changes occur on a regular basis, the procedures and requirements for these analyses are well understood. Much of the uncertainty with which Mead was concerned has been eliminated by defining a water right according to its historical use. An abandoned right cannot be transferred nor can an unused portion of a right. Concerns about injury to other rights have been met by limiting the net depletion of the stream following the transfer to the quantity of water historically consumed in the original use. Additional terms and conditions may be added to the transfer approval if necessary to offset injury. As Mead recognized, these are not simple matters to resolve. But they are resolved in most cases.³⁰

The second type of concern reflected in these statutes is the treatment of water as a commodity to be traded and sold.³¹ Many in the West, including Elwood Mead, have argued that water is a public resource, that its use is intended to serve the public good, and that it should not be the basis for private profit except as results from direct beneficial use.³² Thus the Arizona legislature limited those who could hold rights to irrigation water to those owning the lands on which the water was used.

Linked to this concern is the belief that water is an essential part of the

community that it serves. Control and use of the resource should be governed by the collective community, not by individual users whose interests may differ from that of the community generally.³³ This view is reflected most clearly in state statutes giving irrigation districts control over the allocation and use of water resources within their boundaries and limiting transfers of water to locations within the district.³⁴ Protection provided to areas of origin in several states also reflects this concern.³⁵

The Barriers Come Down But . . .

In recent years, water transfers have been viewed more favorably in the West. Shifting economic and demographic forces have increased the power of cities which need the water and reduced the relative value of water used for irrigation. Some groups have seized on water transfers as a means of avoiding the need for construction of environmentally damaging dams.³⁶ Conservatives are attracted to the market-oriented approaches that have been used to reallocate water.³⁷

In 1962, Arizona eliminated its strict appurtenancy requirement and explicitly allowed the transfer of water rights.³⁸ Wyoming enacted legislation in 1973 expressly authorizing changes in water rights.³⁹ In 1980, the California legislature announced a general policy favoring voluntary water transfers.⁴⁰ In 1988, the Utah legislature removed the restrictions against transfers of water outside conservancy district boundaries,⁴¹ and in 1989 the Colorado legislature allowed the leasing of water outside conservancy district boundaries.⁴² Other western states have eliminated restrictions against transfers in recent years as well.⁴³

While many of the absolute barriers to transfers are being removed, protective limitations beyond the traditional no injury

rule are being instituted in their place. For example, the Arizona transfers legislation enacted in 1962 requires the approval of any irrigation district, agricultural improvement district or water users association affected by a transfer.³⁹ The Wyoming legislation makes transfers potentially subject to review concerning (1) economic losses to the community and the state related to the transfer, (2) the extent to which these economic losses would be offset by benefits from the new use, and (3) the availability of other sources of water.⁴⁰ The new California law requires that transfers not "unreasonably" affect fish, wildlife, or other instream beneficial uses or the economy of the area from which the water is to be transferred.⁴¹ In 1985, the New Mexico legislature subjected water transfers to a requirement that they not be detrimental to the public welfare or the conservation of water.⁴² And in 1989, the Utah Supreme Court ruled that water transfers in that state must pass a public interest review.⁴³

In short, while there is more general acceptance of water transfers, there also is a trend toward conditioning approval of transfers on protection of an increasingly broad set of interests. The effect of this trend is difficult to assess. Removing barriers at least makes transfers possible. On the other hand, the imposition of additional protective conditions is likely to add to the cost and complexity of making a transfer. The obligations of transferor now must be identified and defined. Content needs to be given to open-ended public interest standards. Growing recognition of the importance of a broad set of water-based values needs to be translated into reasonably objective requirements for protection. Concern about effects on rural areas related to water transfers needs to be met by finding fair and effective means of compensation.⁴⁴ The review process itself may well have to be changed in some states to accommodate consideration of these

matters.

Comparison of Present Laws and Procedures

Changes of water rights are specifically authorized by statute in each of the study states.⁴⁵ Consistent with the principles established by the California trilogy, elements of an appropriative right including the point of diversion, the place of use, and the type or purpose of use may be changed without loss of priority so long as there is no injury to other authorized uses of water. Each of the states subjects applications for changes to a review process, primarily to protect other water rights.

Review process

A recent report by Colby and others summarizes the review procedures in eight western states.⁴⁶ The general procedures are very similar. The holder of the water right must file an application with the appropriate state review entity. Generally, forms are available specifying the information that must be supplied by the applicant. The state agency then publishes notice of the application, typically in a general circulation newspaper. Protests to the change may be filed with the review entity by an interested party. Provision is made for a formal hearing but such hearings are not common. The final decision by the review authority always is appealable, typically to a court. Tables 3.2.1, 3.2.2, and 3.2.3, taken from the Colby report, provide a convenient summary comparison of procedures and requirements in several western states.

Traditionally, the only requirement a transferor must meet is that the change not injure other water rights. All the study states specifically impose a no injury or no impairment rule by statute.⁴⁷ Wyoming has attempted to spell out the elements of its no injury requirement. By statute, the quantity

TABLE 3.2.1
TERMINOLOGY, FILING AND PUBLIC NOTICE POLICIES

STATE:	NEW MEXICO	UTAH	NEVADA	COLORADO	ARIZONA	ARIZONA	MONTANA	IDAHO	WYOMING
					Groundwater (1)	Surface Water (2)			
State Agency Administering Changes in Water Rights	State Engineer	Division of Water Rights	Department of Conservation and Natural Resources	Division of Water Resources	Department of Water Resources	Department of Water Resources	Department of Natural Resources and Conservation	Department of Water Resources	Board of Control
Term for person drafting change:	Applicant	Applicant	Applicant	Applicant	Applicant	Applicant	Applicant	Applicant	Petitioner
Term for person opposed to change:	Protestant	Protestant	Protestant	Opposer	Protestant	Protestant	Objector	Protestant	Protestant
Filing fee; applicant to change purpose of use:	\$5	\$30-\$450	\$40	\$150	\$30	\$50	\$50	\$50; \$30 if less than 0.3 cfs	\$30
Standard form available for filing applications?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No, affidavit
Application submitted to:	SE district office	Area office	Division SE central office	Water Court	AMA office	ADWR	Field office	Regional office	State Board of Control
Time required for public notice:	Once a week for 3 weeks	Once a week for 3 weeks	Once a week for 5 weeks	Once	No public notice	Once a week for 3 weeks	Once	Once a week for 3 weeks	Once during 30 days

NOTES:
 (1) Groundwater data for Arizona reflects a conversion of EFRs to Type 1 rights.
 (2) Surface water data for Arizona reflects a conversion and transfer.

Source: Colby et al., Transferring Water Rights in the Western States--A Comparison of Policies and Procedures (Table 1).

TABLE 3.2.2

PROTEST AND HEARING POLICIES

STATE:	NEW MEXICO	UTAH	NEVADA	COLORADO	ARIZONA	ARIZONA	MONTANA	IDAHO	WYOMING
						Groundwater (1) Surface Water (2)			
Standard form for protests?	No, usually letter	Yes, but not required	Yes, but not required	Yes	No protest process	None required	No	No	No, written or verbal
Time limit to file protests from last date of publication?	10 days	30 days	30 days	30 days	N/A	None	2 weeks	10 days	Specified in public notice
Must protesters be right holder?	No	Yes	No	No	N/A	No	Yes	No	No
Methods of resolution available	Private resolution or hearing	Private resolution, field investigation, or hearing	Private resolution, field investigation, or hearing	Private resolution or hearing	N/A	Private resolution or hearing	Private resolution or hearing	Conferees or hearing	Private resolution or hearing
Must applicant respond?	Yes, within 30 days of hearing	No	No	Yes, within 20 days of protest	N/A	No	Yes, within 30 days of Statement of Opinion	No	No
Hearing deposit required?	Yes, \$500	No	No	No	N/A	No	No	No	No
Typical length of hearing:	1 day-8 weeks	1-2 hours	1-6 days	1 day to a few weeks	N/A	2-4 hours	3-4 hours	4 hrs-3 days	2 hrs-6 days
Attorneys usually present?	Yes	Yes	Yes	Yes	N/A	No	Yes	Yes	Yes

NOTES:
 (1) Groundwater data for Arizona reflects a conversion of IOWRs to Type I rights.
 (2) Surface water data for Arizona reflects a conversion and transfer.

Source: Colby et al., Transferring Water Rights in the Western States--A Comparison of Policies and Procedures (Table 2).

TABLE 3.2.3

POLICIES REGARDING APPEALS AND CERTIFICATION OF WATER RIGHT CHANGES

STATE:	NEW MEXICO	UTAH	NEVADA	COLORADO	ARIZONA Groundwater (1)	ARIZONA Surface Water (2)	MONTANA	IDAHO	WYOMING
Time limit to appeal ruling:	30 days	30 days	30 days	20 days	15 days	15 days (3) 35 days (4)	--	30 days	30 days
Forum for Appeal:	State District Court	State District Court	State District Court; appeals involving Carson and Truckee Rivers go to Federal District Court	Division Water Court or State District Court upon request	administrative review of law or rehearing on facts	administrative review of law or rehearing on facts	State District Court	petition for rehearing or State District Court	State District Court
Typical time period to demonstrate implementation of approved change:	6 mos - 2 yrs	6 mos - 2 yrs	6 mos - 1 yr	6 mos - 1 yr	6 months or less	6 mos - 1 yr	6 mos - 1 yr	6 months	6-8 months
Entireness available on this time period?	yes; 1 year	yes; up to 50 years	yes; 1 year	not applicable	not applicable	not applicable	up to 10 years	not applicable	variable up to 5 years
Entireness available on this time period?	yes; 1 year	yes; up to 50 years	yes; 1 year	not applicable	not applicable	not applicable	up to 10 years	not applicable	variable up to 5 years
Time period for applicant to demonstrate implementation of approved change:	4 years	3 years	variable, but less than 5 years	court decree is evidence; subject to abandonment	no process	no process; subject to forfeiture and abandonment statute	variable	no process	up to 5 years

NOTES:
 (1) Groundwater data for Arizona reflects a conversion of KCRBs to Type I rights.
 (2) Surface water data for Arizona reflects a conversion and transfer.
 (3) For administrative appeal.
 (4) For judicial appeal.

Source: Colby et al., Transferring Water Rights in the Western States--A Comparison of Policies and Procedures (Table 4).

of water transferred may not exceed the amount of water historically diverted; the proposed new use may not divert water at a rate higher than the historical rate of diversion; the proposed new use may not consume more water than was historically consumed by the existing use; and the proposed new use may not cause a change in the quantity or timing of return flows to the injury of another water user.⁴⁷

As mentioned earlier, additional requirements have been added in several of the states. Wyoming authorizes the Board of Control to consider possible economic costs and benefits and even to evaluate the availability of alternative sources of water supply.⁴⁸ New Mexico now requires that transfers not be contrary to water conservation or detrimental to the public welfare.⁴⁹ California subjects transfers to review for possible adverse effects on fish, wildlife, or other instream beneficial uses.⁵⁰ Review also must consider adverse effects on the local economy from which the water is to be transferred.⁵¹ Transfers in Utah now must pass a public interest review.⁵² To date, there is little experience with these added considerations. Consequently, no clear guidelines presently exist concerning their meaning.

Even the no injury requirement can raise formidable problems of proof. In New Mexico, protection of existing rights is facilitated by limiting the number of water rights in watersheds to those that generally can be satisfied by available flows of water. Rights are defined in volumetric terms rather than just in rates of flow. Transfers usually are defined in consumptive use terms so that historically available supplies of water are not affected. This approach greatly reduces the likelihood of injury when rights are transferred.

Colorado, New Mexico, and Utah

facilitate transfers by allowing injury to be remedied through the addition of terms and conditions or by compensation. In Colorado, the water court may deny a water right change only if it is unable to impose modifications to the proposed change that will offset any injury.⁵³ In New Mexico, the state engineer may impose conditions upon his approval of a water right change where necessary to prevent impairment of existing rights.⁵⁴ Utah law provides that the holder of a water right is entitled to make a change of use and that "just compensation" may be made to eliminate impairment of existing rights.⁵⁵ Moreover, changes are not to be denied because of impairment if impairment can be eliminated either by reducing the amount of water transferred or by acquiring the impaired water rights.⁵⁶

Temporary transfers

All study states except Arizona authorize temporary changes of water rights. Utah, for example, authorizes temporary changes of a water right for a period not to exceed one year⁵⁷ and provides for an expedited review process.⁵⁸ California also authorizes temporary changes for up to one year.⁵⁹ Such transfers are specifically limited to the amount of water that would have been consumptively used under the right.⁶⁰ The State Water Resources Control Board may approve the change without a public hearing.⁶¹ Wyoming allows temporary changes of water rights for up to two years.⁶² Approval is by the state engineer rather than the Board of Control. By statute, return flows (or conversely, consumptive use) are assumed to be 50 percent of direct flow irrigation rights unless this assumption is found to be "significantly in error."⁶³ Temporary rights, however, are always deemed subordinate to even junior permanent rights.⁶⁴

Exchanges

Exchange agreements allow a user to divert water under someone else's entitlement in return for providing an equivalent amount of water in another location satisfactory to the other user. Ownership of the basic water rights does not change but the use of the water under the right does change. All study states except Arizona authorize exchanges of water. Colorado law, originally enacted in 1897, authorizes the owner of a reservoir to deliver stored water into a ditch or stream in exchange for an equal amount of water, less reasonable deduction for transport losses.⁶⁵ Involuntary exchanges through substitution of other water supplies also are authorized in Colorado.⁶⁶ Exchanges and substituted supplies are administered through the state engineer's office. A court decree for exchanges may be sought. The usual no injury standard has been statutorily amended to require that exchanged water be "of a quality and quantity so as to meet the requirements for which the water of the senior appropriator has normally been used,...."⁶⁷ In Wyoming, exchanges need be approved only by the state engineer rather than by the Board of Control.⁶⁸ Exchanges are subject to the requirements of beneficial use and equality of water exchanged as well as the no injury standard.⁶⁹

Groundwater transfers

Transferability of rights to use groundwater varies considerably among the study states. Generally, where rights to groundwater are based on appropriation as in Utah and New Mexico, transfers and changes are governed by the same rules as for surface water. At least in Wyoming, however, a partial transfer of groundwater rights from one well location to another is not permitted.⁷⁰

Colorado has created several legally

distinctive categories of groundwater. Rights to groundwater directly tributary to surface flows are based on appropriation, and the transferability of these rights follows the same rules as surface appropriative rights. Groundwater in designated basins is allocated under a modified appropriation system. Groundwater management districts within designated basins may prohibit use of groundwater outside district boundaries if the use would injure other users within the district.⁷¹ Nontributary groundwater, essentially groundwater only very remotely connected to surface flows, is allocated on the basis of overlying land ownership.⁷² Since this water effectively is owned by the landowner, and its withdrawal is managed to minimize impacts on adjacent landowners, nontributary groundwater in Colorado appears to be highly transferable.⁷³

Groundwater transfers in Arizona are subject to a very complex legal framework. The transferability of a groundwater right within Active Management Areas (AMAs) varies according to whether it is an irrigation grandfathered right, a Type 1 non-irrigation grandfathered right, or a Type 2 non-irrigation grandfathered right.⁷⁴ Irrigation rights are appurtenant to the land on which they have been used. To change the use of water it is necessary to convert this right to a Type 1 right. Type 1 rights can only be acquired with the land to which they are appurtenant. Under certain circumstances, the water under a Type 1 right can be used in another location. Type 2 rights are not appurtenant to land. Their use may be changed and the water may be withdrawn anywhere within the AMA, providing neighboring pumpers are not harmed.

Outside of AMAs, withdrawals of groundwater are essentially unregulated. The only limitation on these withdrawals is that they be for a reasonable and beneficial use. The place or manner of use of this

groundwater is not restricted. Transportation of this water outside the area of origin may require payment of damages to other groundwater users in the area. The relatively unrestricted availability of groundwater outside of AMAs has prompted the purchase of large tracts of land for "water farms."

Water Districts

Special districts organized to supply water primarily for irrigation purposes exist in all of the study states. These districts are quasi-governmental entities authorized by state law.⁷⁵ They are tax exempt and are given special taxing and bonding authority to help fund the development of water collection and distribution facilities. Typically the district itself holds the underlying appropriative water rights. In irrigation districts, water commonly is distributed according to provisions established in the state authorizing statutes.⁷⁶ In conservancy districts, the board is given broad authority to allocate water supplies. Generally, allocation is based on water supply contracts.

The ability to transfer the use of water-district water varies by state and by type of district. Arizona law appears to be most restrictive. There is no provision whatsoever in Arizona irrigation district law concerning sale, lease, or transfer of water. However, the statute generally providing for transfers of surface water requires the consent of the board of an irrigation district, agricultural improvement district, or water users association for transfers of water rights from lands within their boundaries or from the watershed from which they derive any of their water supplies.⁷⁷ Consent apparently may be withheld for any reason, not just because of injury to water rights.

By comparison, Utah law appears to be most supportive of transfers involving water districts. Irrigation districts can rent or

lease water "not needed" by landowners in the district to other users either within or outside of the district for up to five year terms.⁷⁸ Conservancy districts can sell or lease water for use within or outside of district boundaries.⁷⁹

California has attempted to encourage transfers of district water. Changes to the law in 1982 authorized water agencies to "sell, lease, exchange, or otherwise transfer water that is surplus to the needs of the agency's water users for use outside the agency."⁸⁰ This provision specifically overrides any preexisting limitations on these transfers.⁸¹

California law clearly specifies that, subject to the approval of the State Water Resources Control Board, the agency has primary authority concerning any transfers.⁸² The individual user may negotiate a transfer of water surplus to the user's needs but the agency may veto the transfer. If the agency agrees to the transfer, it is to "act as agent for the water user to effect the transfer."⁸³

Unlike mutual ditch companies where decisions about transfers are made by shareholders, water district boards generally appear to have control of transfers.⁸⁴ Water district transfers are more likely to be administrative reallocation of water effected through a limited term lease or contract. There are no limitations in the laws of the study states on the uses to which the transferred water may be put. Wyoming does restrict transfers to users within the conservancy district.⁸⁵

Comparison of the State Transfer Review Processes

Changes of appropriative water rights within the state review process occurred in all of the study states during the ten-year study period. Table 3.2.4 shows the total number

**TABLE 3.2.4
TOTAL NUMBER OF CHANGE OF WATER RIGHT APPLICATIONS
BY STUDY STATE, 1975-1984**

	<u>Number of Change Applications Filed</u>
Arizona ¹	30
California ²	3
Colorado ³	858
New Mexico	1133
Utah	3853
Wyoming	40

- 1 These are sever and transfer proceedings involving a change of purpose and/or place of use.
- 2 No applications were filed in California until 1982.
- 3 Applications filed in Colorado, New Mexico, and Wyoming may include more than one water right.

of change requests by state during this period. The number of applications ranged from a high of 3853 in Utah to only 3 in California.

Figure 3.2.1 shows the disposition of the applications for changes in purpose and/or place of use filed in the states during the study period.³⁴ More than 94 percent of the applications filed were approved in New Mexico. More than 93 percent of the sever and transfer applications filed in Arizona were approved. Wyoming showed the lowest rate of approval with about 75 percent. Moreover, in Colorado and New Mexico only 1.3 percent of the requests were denied, though the withdrawal/pending rate in Colorado is considerably higher.

Figure 3.2.2 shows the average number of months required for cases that were approved in the study states. The time period ranges from 5.8 months on average in New Mexico to 19.5 months in Colorado. The average time increases somewhat if withdrawn and denied cases are included since these applications tend to require considerably longer to dispose of.

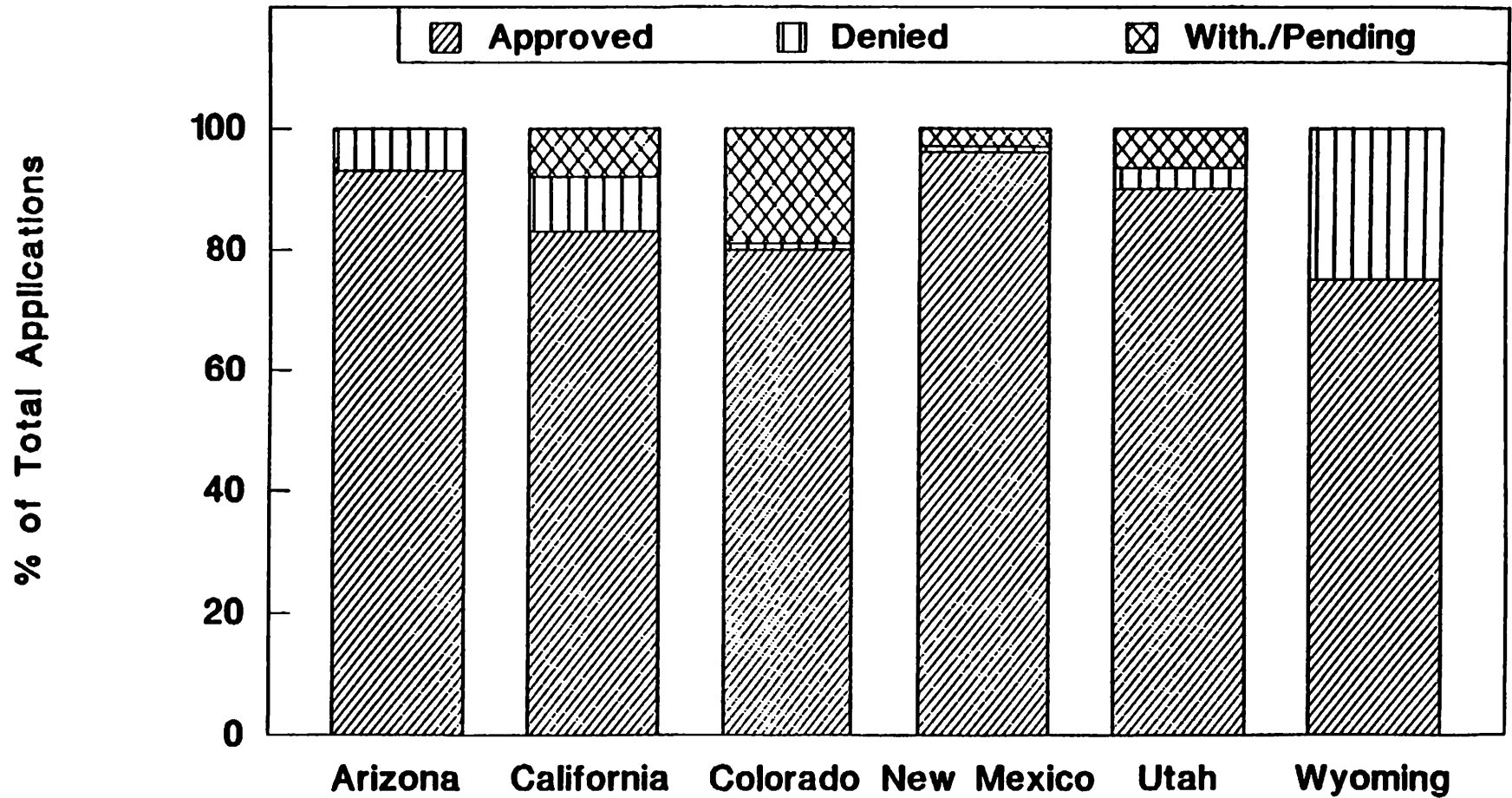
Figure 3.2.3 shows the percentage of applications filed during the study period that

were formally protested or opposed. In Colorado, about 60 percent of all change applications were opposed during the study period. By comparison, only about six percent of the change applications filed in New Mexico during this same period were protested and only about nine percent in Utah were protested.

In several states there is a strong correlation between time to decision and whether the application was protested. Figure 3.2.4 compares the average length of time to reach a decision in four states by cases that were and were not protested. In Colorado, New Mexico, and Utah the protested cases required considerably longer to decide than those that were not protested. Figure 3.2.5 breaks down the time period required for cases approved into intervals of months for Colorado, New Mexico, and Wyoming and shows the percentage of protested cases within these time intervals. Again it can be seen that protested cases generally take longer to decide.

Several general points should be made concerning these findings. First, most applications to change the purpose or place of use filed in the study states during the

Figure 3.2.1. Disposition of Applications Filed Between 1975 and 1984, By Study State *



* California data reflect cases filed between 1982 and 1989

**Figure 3.2.2. Average Months to Decision,
Approved Cases, By State**

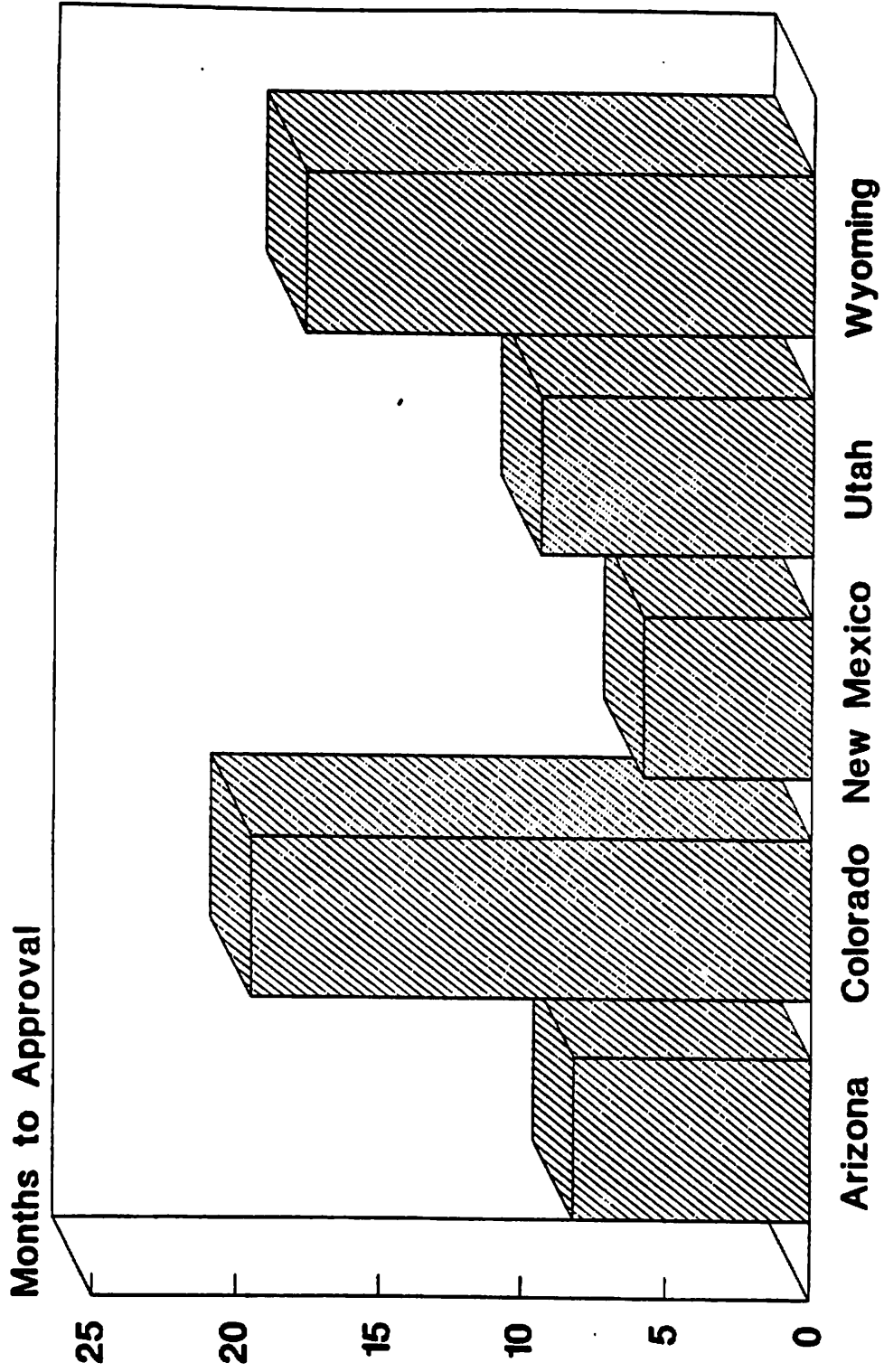
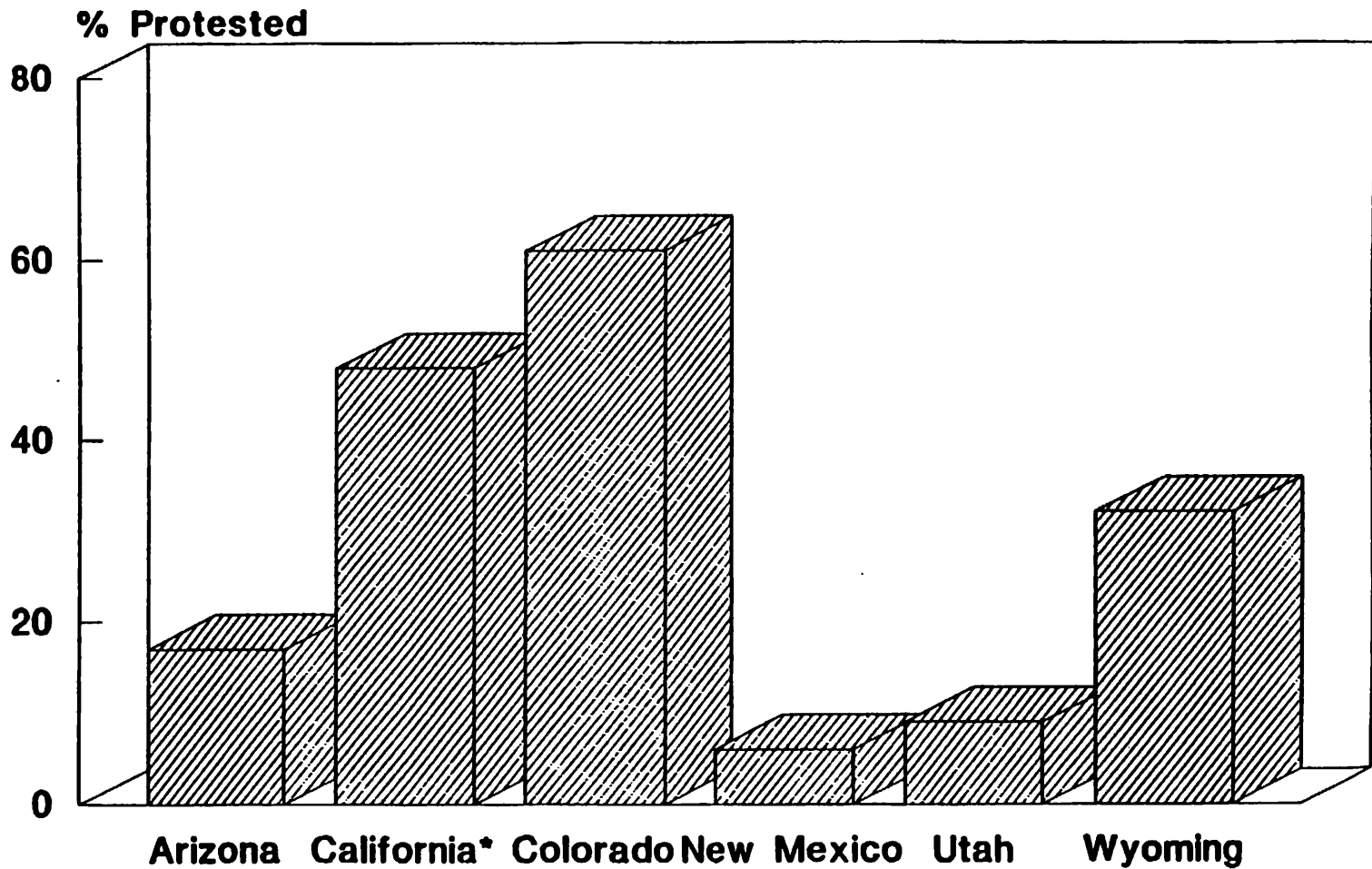


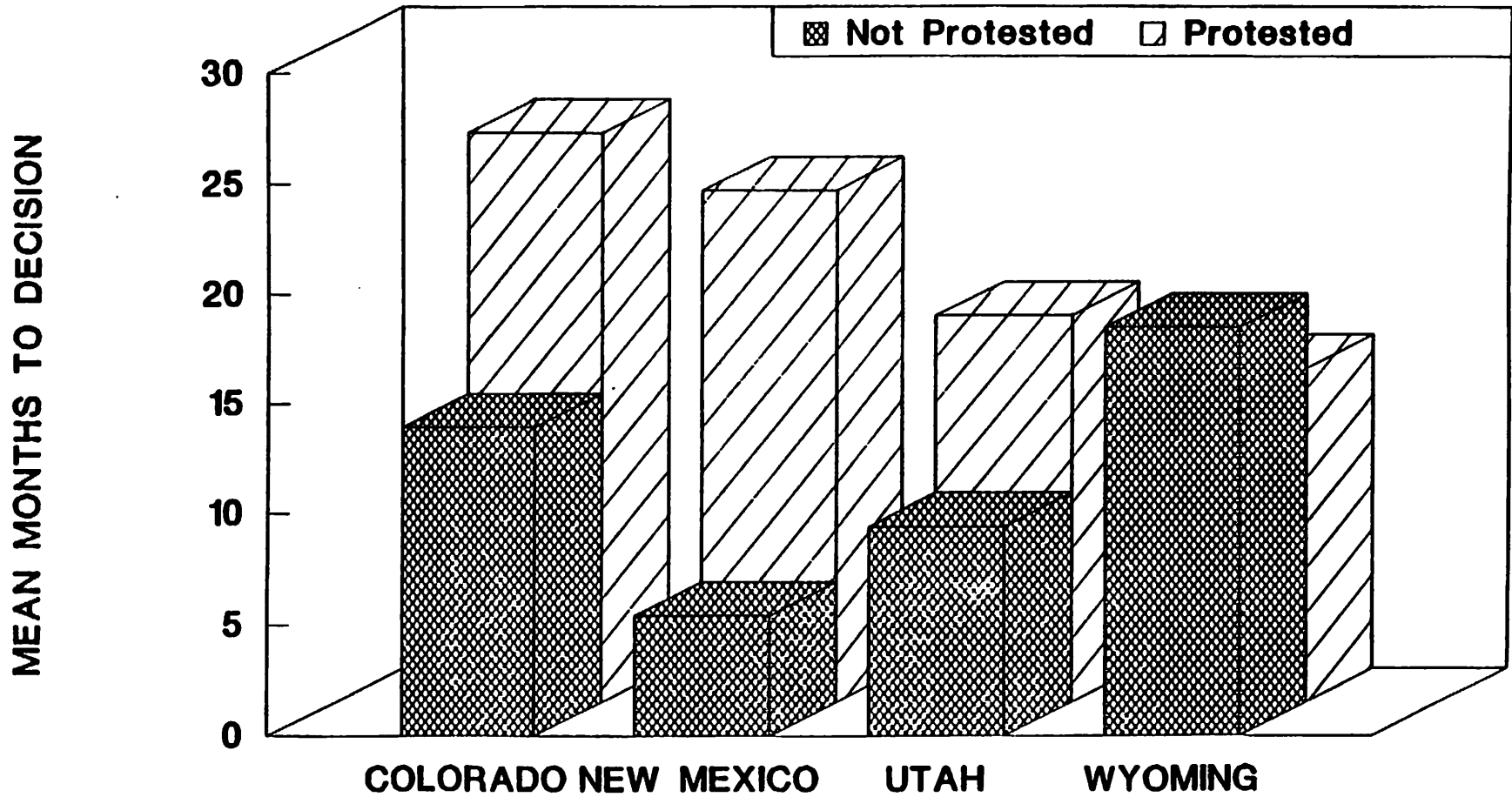
Figure 3.2.3. Percentage of All Applications Formally Protested or Opposed, By Study State



* For applications filed between 1982 and 1989

Figure 3.2.4. **MEAN MONTHS TO DECISION
VS. PROTESTED OR NOT PROTESTED
BY STATE**

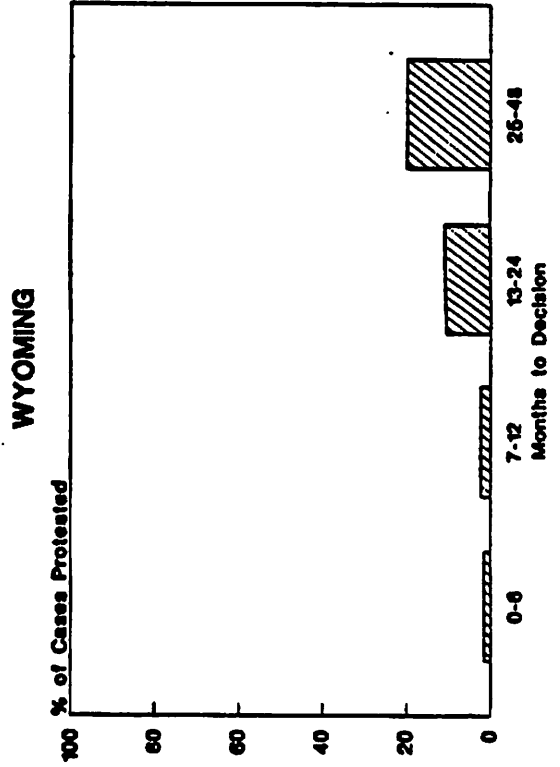
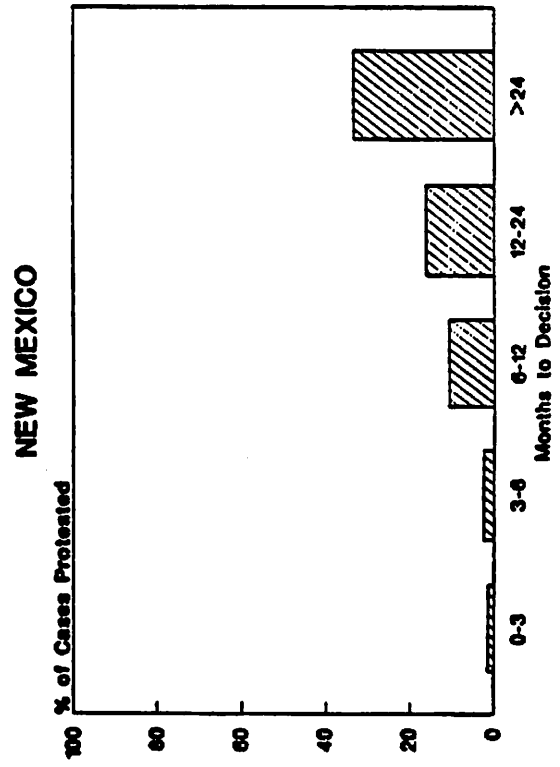
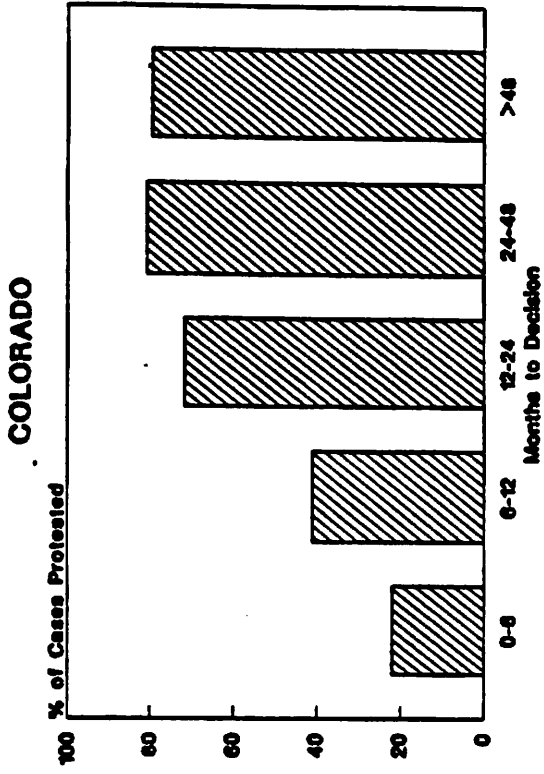
1975-1984



FOR ALL CASES

Figure 3.2.5. PERCENT PROTESTED OF APPROVED CASES VERSUS MONTHS TO DECISION BY STATE

1975-1984



study period were approved. *The generally very high approval rates belie the common perception that water right changes are exceptionally difficult to make.* Second, the approval period in all states except Colorado averaged less than one year. Given the potentially contentious issues involved in changing water rights, the average decision period found in most states during the study period does not seem unreasonable. Third, the striking difference in the average decision period between New Mexico and Colorado raises interesting questions about the possible factors involved. One obvious contrast is the fraction of cases that are protested or opposed.⁶⁷

Section 3: Characteristics of Transfers

This study focused on transfers involving a state-approved change in the purpose and/or place of use of a water right. A primary objective was to examine long-term shifts in water use patterns in the study states. The differences in transfer approaches among the states frustrated efforts to develop a uniformly comparable data set. This section provides direct comparisons among the study states where possible. The transfers analyzed are those that were requested between 1975 and 1984.

All of the study states provide a means for changing the purpose and/or place of use of a water right. The use of these processes varies widely across the study states. Between 1975 and 1984, 3853 applications requesting a change in the purpose or place of use of a water right were filed in Utah, 1133 in New Mexico, and 858 in Colorado.⁶⁸ Transfer of water right activity in Arizona, California, and Wyoming was much lower during this period. In Arizona, 30 sever and transfer requests involving a change in the purpose or place of water use were filed compared to 40 applications in Wyoming and

only 3 in California.

Figures 3.3.1 and 3.3.2 show the number of applications filed by year in the six states. There is considerable variability on a year-to-year basis with little evidence of any trends. The very high number of applications in Utah in 1977 may be related to the drought in that year. In New Mexico, applications peaked in 1981. The absence of applications in California prior to 1982 probably relates to the changes in the law instituted in 1980.

To analyze these data properly it is first necessary to make several observations and then to point out relevant differences among the states. First, the applications reported here involve changes in the purpose or place of use. They do not include changes in the point of diversion only. Second, they report only changes in appropriative water rights—not all types of water transfers. Third, they report only changes of water rights subject to state review which, in some states, excludes very senior water rights established before the state administrative system was instituted.

Not all water uses in the study states are based on appropriative water rights. In California, riparian rights remain important in some locations. Groundwater development in California is not subject to the state appropriation system. Much of the water use in that state is directly based on contractual supplies. As long as there is no change in the underlying appropriative water right, changes in contracted uses are not subject to state review. In Arizona, much of the water is supplied by groundwater development which was essentially unregulated until 1980. In Colorado, nontributary groundwater is not subject to appropriation.

Not all appropriative rights are subject to review by the state before changes can be

made. The primary example is California where the State Water Resources Control Board has jurisdiction only over water rights issued since 1914. In Colorado, rights to use designated groundwater and changes in those rights are governed by the Ground Water Commission rather than the water courts. In Arizona, changes in the purpose of use of a surface water right apparently may be made without state review so long as the use stays with the land.

Finally, the states differ somewhat in what is involved in a change application. In Arizona, New Mexico, and Wyoming each application represents a separate water right. In Colorado, an application may include several water rights. Utah allows the filing of a "segregation application" under which a water right may be subdivided into pieces and the individual pieces may be changed in use. In California, the applications have generally involved the change of use of a portion of the water available under the right and, in all cases, the change has been short-term.

Given the types of transfer activity occurring in other states without state review, it appears that only in New Mexico, Utah, and Wyoming do the data reflect the actual amount of permanent water transfer activity in the state. Most water uses in these states are directly tied to an appropriative water right and changes in the purpose and/or place of use must go through state review. The Colorado data also is likely to reflect the degree of water transfer activity in that state net of some groundwater transfers and transfers of water allotments within conservancy districts.

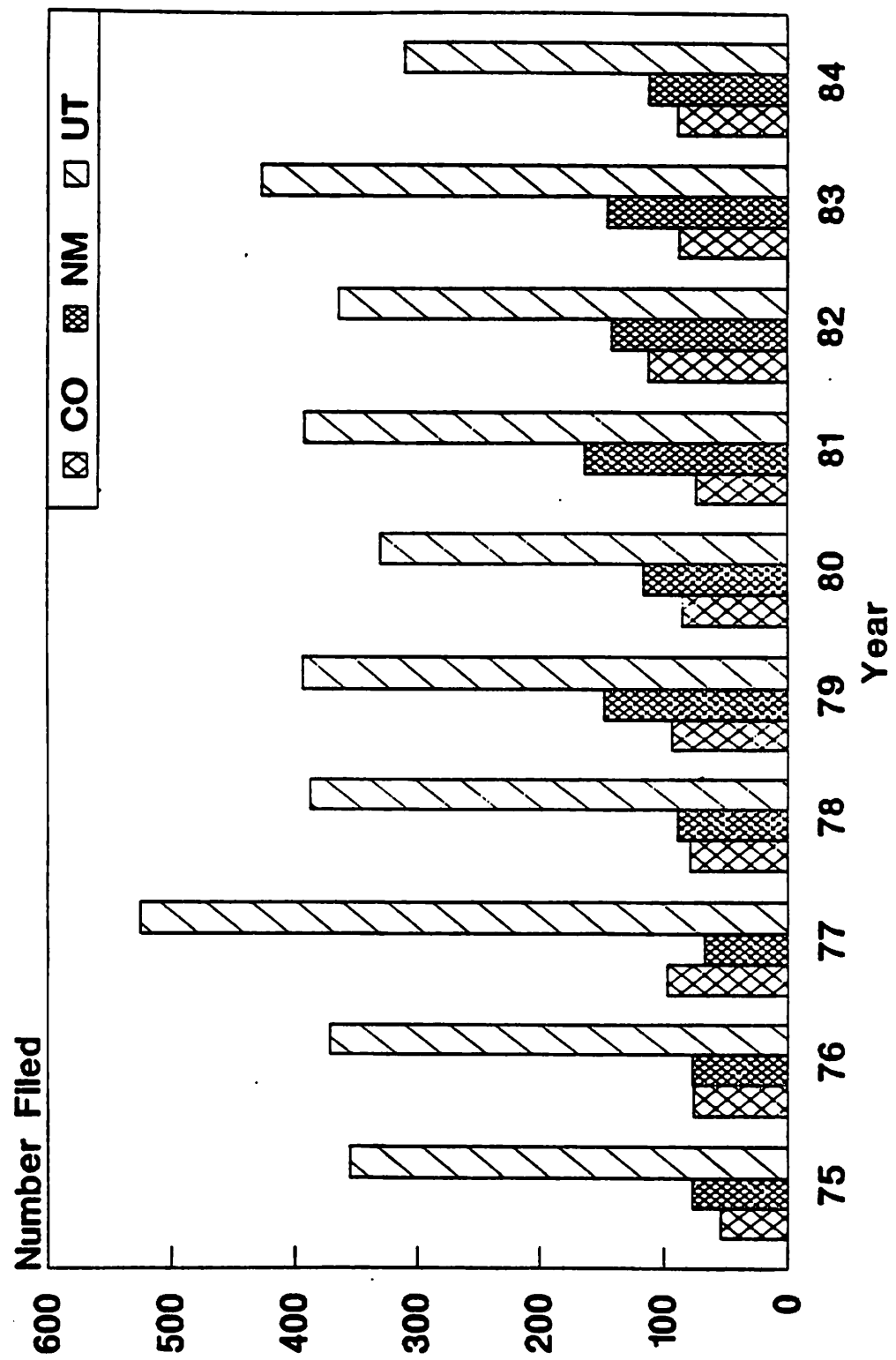
The level of transfer activity in Utah is strikingly high. Several factors may help to explain this activity. First, Utah law and procedure are very supportive of water transfers. Second, areas of the state are urbanizing rapidly and there is very little

additional developable water. New uses are being met by transfers of existing rights. Except for the Utah share of the upper Colorado River and a small share of water in the Bear River drainage, the state essentially is closed to new appropriations of both surface and groundwater. Third, the Utah provision allowing water rights to be segregated or subdivided into smaller pieces which may be sold and changed in use increases the number of applications. For example, an irrigation water right with 50 acre-feet of annual consumptive use can be segregated into 50 separate rights to one acre-foot of water use per year for domestic use associated with a new housing development. Under the Utah system each of these 50 rights would have a separate application.

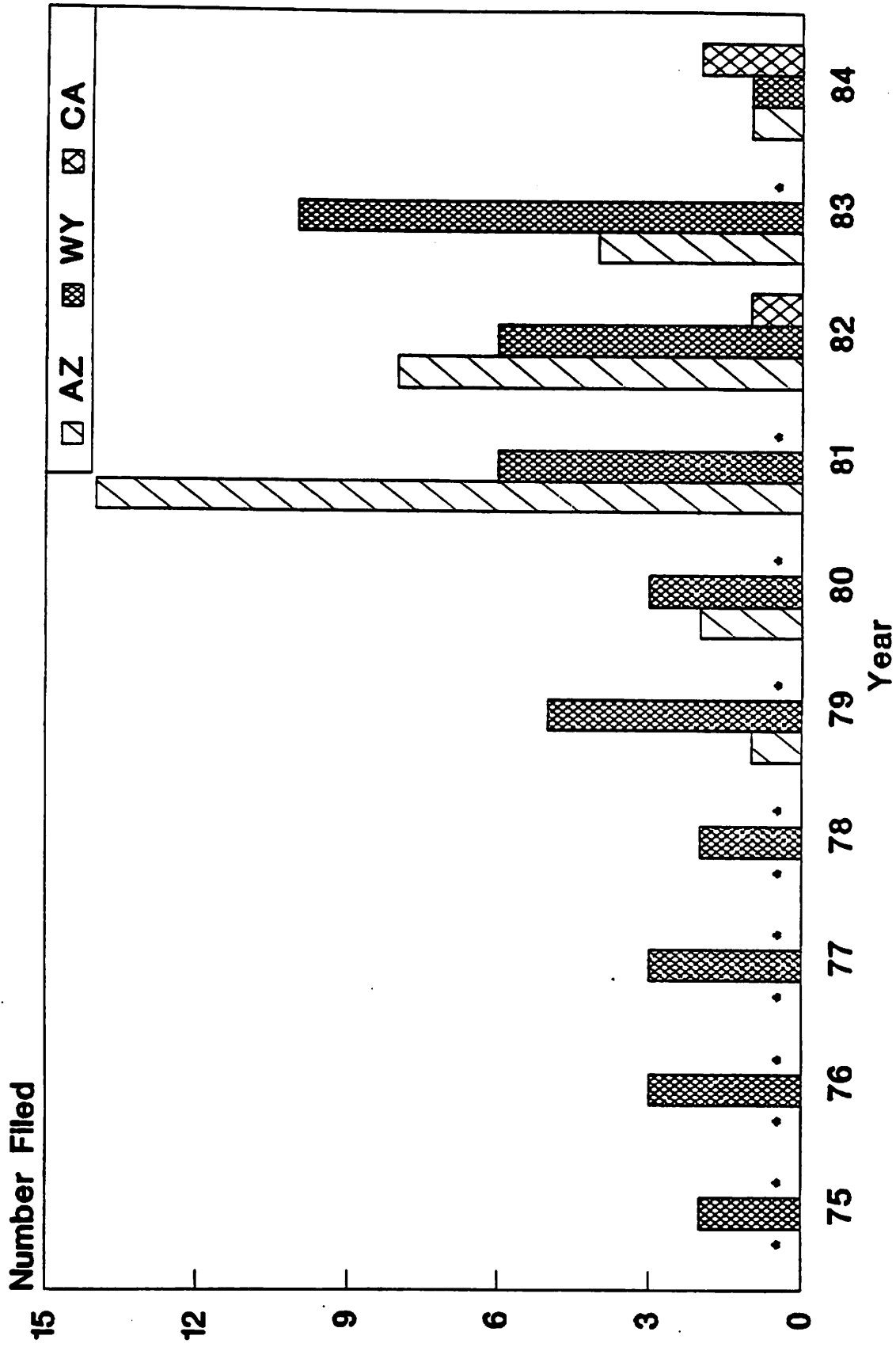
By comparison, there appears to be very little transfer activity in Wyoming. Unlike the other study states, Wyoming is not showing marked economic and demographic changes. Moreover, there is considerable surface water still available for development. Finally, state law and administration have been generally conservative regarding water transfers.

The Arizona and California data are particularly misleading in terms of transfer activity in those states. In Arizona, only those surface appropriative water rights that are being severed from the original place of use go through state review. Until 1962, severance was possible only if the right no longer could be used on this land. While this severe restriction was removed, in its place the legislature granted absolute veto authority to boards of potentially affected irrigation districts. The relatively limited number of surface water rights going through the sever and transfer proceeding likely can be explained in substantial part by the strong appurtenancy tradition in Arizona.

**Figure 3.3.1. Applications Filed By Year, 1975-1984,
in Colorado, New Mexico, and Utah**



**Figure 3.3.2. Applications Filed By Year, 1975-1984,
in Arizona, Wyoming, and California**



• No applications filed in that year

As land uses have changed in Arizona, surface water uses also have changed. No state review appears to be involved so long as the water use continues on the same land. A major example is provided by the shifts in water uses in the Salt River Project (SRP). SRP originally was an irrigation district supplied with water by a Bureau of Reclamation project. As shown in Table 3.3.1 and Figures 3.3.3 and 3.3.4, between 1950 and 1988 land use within the project changed from about 86 percent agricultural to about 70 percent urban. During the same period water use shifted from about 92 percent agricultural to about 57 percent urban. These changes occurred entirely within the SRP boundaries and were not subject to state review.

Much of the water supply in Arizona is groundwater. Until 1980 groundwater pumping in Arizona was essentially unregulated. Since then, groundwater development within active management areas has come under a somewhat complicated system of administrative control. Under certain circumstances transfers of several classes of these rights are permitted. And, in fact, transfers are occurring.

These transfers have involved either converted Irrigation Grandfathered rights (IGR), original Type I grandfathered rights or Type II grandfathered rights. IGRs are quantified by historic use and are appurtenant to the land. They must be converted to a new Type I right in order to be applied to a non-irrigation use. There have been 50 IGR conversions between 1980 and 1989, resulting in 69 Type I rights. Original Type I rights are non-irrigation rights that allow an owner of land retired from agriculture to retain a right to use the water for a non-irrigation purpose. There are 123 original Type I rights. Type II rights are based on historical groundwater withdrawals for uses other than crop irrigation. These rights may be sold

separately from the land or well, and may be withdrawn from a new location within the same Active Management Area with approval from the Arizona Department of Water Resources. There have been 252 transactions involving Type II rights between 1983 and 1989. Most of these involved a change in ownership only. Fifteen were a change in the purpose of use and a few involved a change in the place of use or point of diversion (see Table 3.3.2). There may be rules and regulations that limit the use of Type I and Type II rights.

Groundwater development outside active management areas remains essentially unregulated. Cities and developers within active management areas required by Arizona law to demonstrate a 100 year water supply have been securing control over this source of supply by purchasing so-called water farms in these unregulated areas. Some of these purchases contain significant amounts of irrigated farmland, which eventually will be retired. Other purchases consist entirely of underdeveloped land overlying untapped aquifers. In either case, to this point there has been a transfer in ownership only--not a transfer in the purpose or place of use of the water.

California's water transfer picture is considerably different from the other states. During the study period, no transfer applications were filed with the State Water Resources Control Board until 1982--following two years after major revisions in state law actively encouraging water transfers. Since 1982, all applications filed have been to make a short-term change in the use of water available under a Board-issued water permit. No permanent changes of water rights have been requested.

As mentioned, pre-1914 water rights in California are not subject to the Board's jurisdiction. Therefore changes of use

involving these rights may be made outside the Board's review process. Moreover, riparian rights exist in California and changes in water use associated with changes in riparian land use are not subject to state review.

Many of the existing water uses associated with either of these types of rights apparently have been subsumed within the several major water projects that have been developed in California. For example, when Los Angeles sought to bring water from the Owens Valley in the early 1900s, it purchased both existing appropriative rights and riparian lands to secure its supply. In the Central Valley, the Bureau of Reclamation entered into arrangements with a number of existing riparian and appropriative water users under which their rights were exchanged for a supply from the Central Valley Project.

The dominance of the federal Central Valley Project, the State Water Project, and several other large water supply activities satisfying the water needs of the state distinguishes California from the other states. The major water rights are held by a relatively few entities which in turn supply water to agencies and water users on the basis of contracts. The agencies in turn supply subagencies as well as water users. Changes in use in such a system generally do not involve a change in the basic appropriative water right. Rather, they involve administrative reallocation actions and assignments of contracts. In some cases, exchanges of rights to take and use water occur between agencies.

Groundwater development and use in California occur without state supervision.²⁰ The overlying landowner has a correlative right to use groundwater for any reasonable and beneficial use on the overlying land. Nonoverlying uses are permitted so long as "surplus" groundwater is available. Changes in either of these uses need not pass through

state review.

In summary, water transfers are occurring in all six study states. This study documents changes in the purpose and/or place of use of an appropriative water right subject to state review that occurred between 1975 and 1984. Utah, where surface water resources are nearly fully appropriated and groundwater is managed to minimize mining of the aquifers, shows the highest level of activity. Wyoming, which has had less growth than the other study states and has considerable undeveloped surface water, shows a low level of activity. Arizona has relatively little surface water transfer activity subject to state review but a considerable amount of change of use occurring on the same property or within the boundaries of a water district. Groundwater rights transfers now are occurring under the terms of the 1980 Groundwater Management Act. There is little evidence of any permanent water transfers occurring in California though there are some long-term agreements involving exchanges and conserved water. The major reason for this situation appears to be the approach to water supply in the state that emphasizes large-scale development by a few entities which have been able to provide water to meet most new needs.

Data gathered in each of the states help to characterize the nature of the change of water right activity in these states. Included is information about the change in the purpose of use, the quantity of water involved, and whether surface or groundwater is involved. A summary and comparison of these findings are presented here. Because so few cases were filed in California during the study period of 1975 to 1984, the data from that state shown here reflect applications filed between 1982 and 1989.

Figure 3.3.5 shows the general change in purpose of use for the states. In Colorado

TABLE 3.3.1

CONVERSION OF AGRICULTURAL ACREAGE AND WATER TO URBAN USES

Salt River Project, Arizona 1950-1988¹

<u>Year</u>	<u>Project Acreage</u>	<u>Agricul. Acreage</u>	<u>Urban Acreage</u>	<u>Agricul. Land(a)</u>	<u>Urban Land(a)</u>	<u>Agricul.² Water(a-f)</u>	<u>Urban³ Water(a-f)</u>
1950	240,999	207,779	33,220	86.2	13.8	935,006	79,728
1951	240,904	205,727	35,177	85.4	14.6	925,772	84,425
1952	240,661	201,259	39,402	83.6	16.4	905,666	94,565
1953	240,388	197,798	42,590	82.3	17.7	890,091	102,216
1954	240,261	195,435	44,826	81.3	18.7	879,458	107,582
1955	239,908	192,825	47,083	80.4	19.6	867,712	112,999
1956	239,645	190,597	49,048	79.5	20.5	857,686	117,715
1957	239,289	188,354	50,935	78.7	21.3	847,593	122,244
1958	238,787	185,920	52,867	77.9	22.1	836,640	126,881
1959	238,582	181,136	57,446	75.9	24.1	815,112	137,870
1960	238,342	176,712	61,630	74.1	25.9	795,204	147,912
1961	238,191	173,839	64,352	73.0	27.0	782,276	154,445
1962	238,082	171,262	66,820	71.9	28.1	770,679	160,368
1963	238,252	169,834	68,418	71.3	28.7	764,253	164,203
1964	238,252	167,922	70,330	70.5	29.5	755,649	168,792
1965	238,252	167,120	71,132	70.1	29.9	752,040	170,717
1966	238,252	165,276	72,976	69.4	30.6	743,742	175,142
1967	238,252	164,495	73,757	69.0	31.0	740,228	177,017
1968	238,252	162,514	75,738	68.2	31.8	731,313	181,771
1969	238,262	162,874	75,388	68.4	31.6	732,933	180,931
1970	238,264	158,136	80,128	66.4	33.6	711,612	192,307
1971	238,264	153,558	84,706	64.4	35.6	691,011	203,294
1972	238,264	148,128	90,136	62.2	37.8	666,576	216,326
1973	238,264	142,931	95,333	60.0	40.0	643,190	228,799
1974	238,264	125,741	112,523	52.8	47.2	565,834	270,055
1975	238,264	124,452	113,812	52.2	47.8	560,034	273,149
1976	238,266	121,761	116,505	51.1	48.9	547,924	279,612
1977	238,220	118,951	119,269	49.9	50.1	535,280	286,246
1978	238,220	114,392	123,828	48.0	52.0	514,764	297,187
1979	238,221	109,223	128,998	45.8	54.2	491,504	309,595
1980	238,221	105,771	132,450	44.4	55.6	475,970	317,880
1981	238,221	102,105	136,116	42.9	57.1	459,472	326,678
1982	238,172	98,546	139,626	41.4	58.6	443,457	335,102
1983	238,172	95,292	142,880	40.0	60.0	428,814	342,912
1984	238,171	89,268	148,903	37.5	62.5	401,706	357,367
1985	238,170	81,911	156,259	34.4	65.6	368,600	375,022
1986	238,170	74,746	163,424	31.4	68.6	336,357	392,218
1987	238,170	71,245	166,925	29.9	70.1	320,602	400,620
1988	238,266	69,271	168,995	29.1	70.9	311,720	405,588

¹ Sources: Various SRP reports from 1977 and 1988.

² Assumes 4.5 acre-feet per acre, which is the 1980 agricultural use rate.

³ Assumes 2.4 acre-feet per acre, which is the 1980 urban use rate.

TABLE 3.3.2

TRANSFERS OF WATER RIGHTS IN ARIZONA

Type I Rights (through 1989)

Total number of original and new Type I rights	192 ¹
Total acre-feet involved	129,310
Total acres of land retired ²	42,127

Type II Rights (1983-1989)

Number of changes in type of use (non-ag to non-ag)	15
Acre-feet tied to changes in type of use	8,210
Total number of transactions excluding changes in type of use ³	237
Acre-feet tied to transactions other than changes in type of use	147,752

Source: Information provided by Herb Dishlip and Tricia McCraw, Arizona Department of Water Resources, March-April 1990

¹ This figure includes 123 original Type I rights and 69 new Type I rights. The 69 new Type I rights are the result of the conversion of 50 Irrigation Grandfathered rights, 19 of which were divided into multiple Type I rights after conversion.

² Acres figure not available for three of the conversions involving about 1,079 acre-feet of water.

³ These other transactions consist primarily of changes in ownership but also include changes in place of use and the addition of alternative wells.

Figure 3.3.3. Conversion of SRP Land from Agricultural to Urban Uses

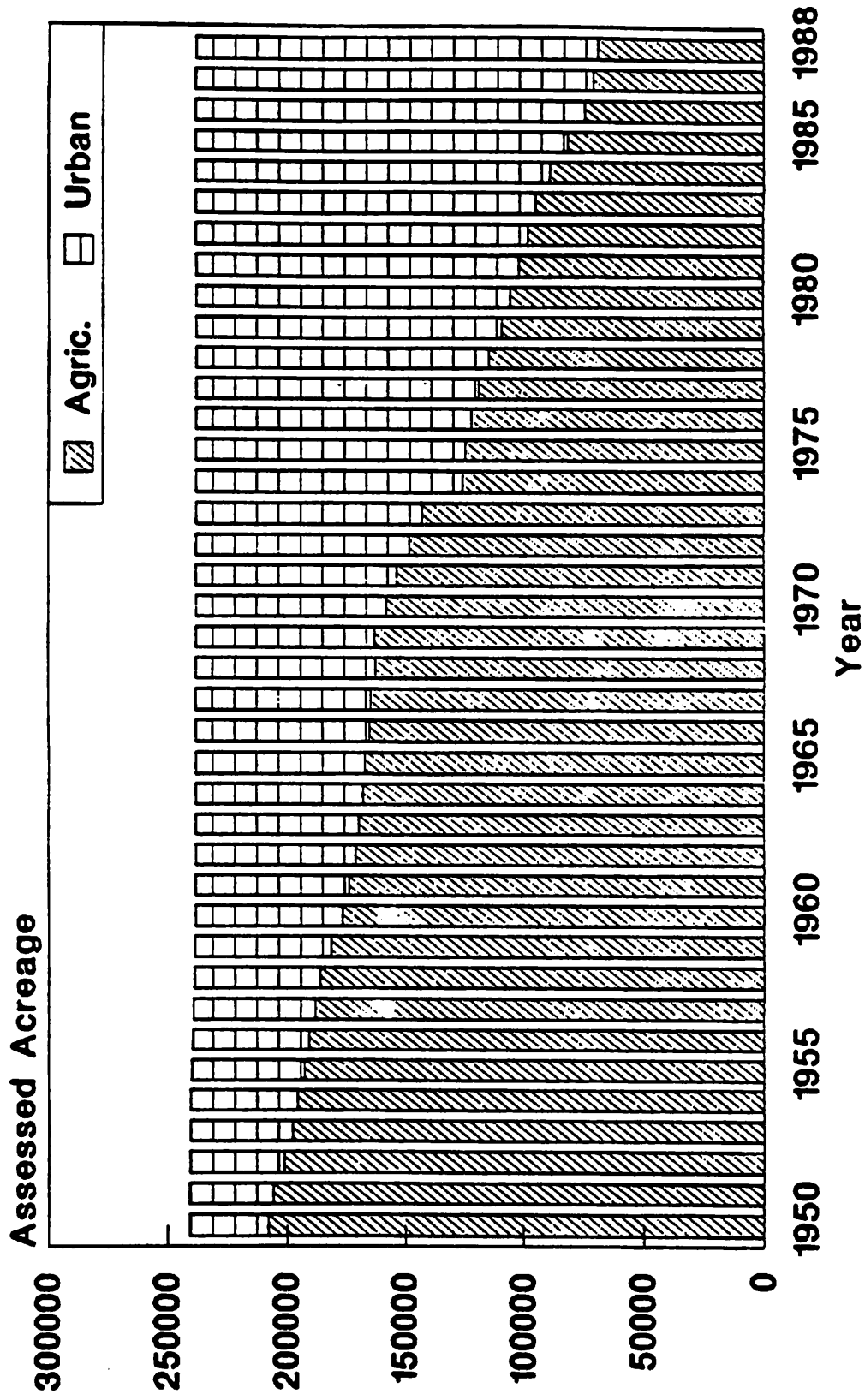
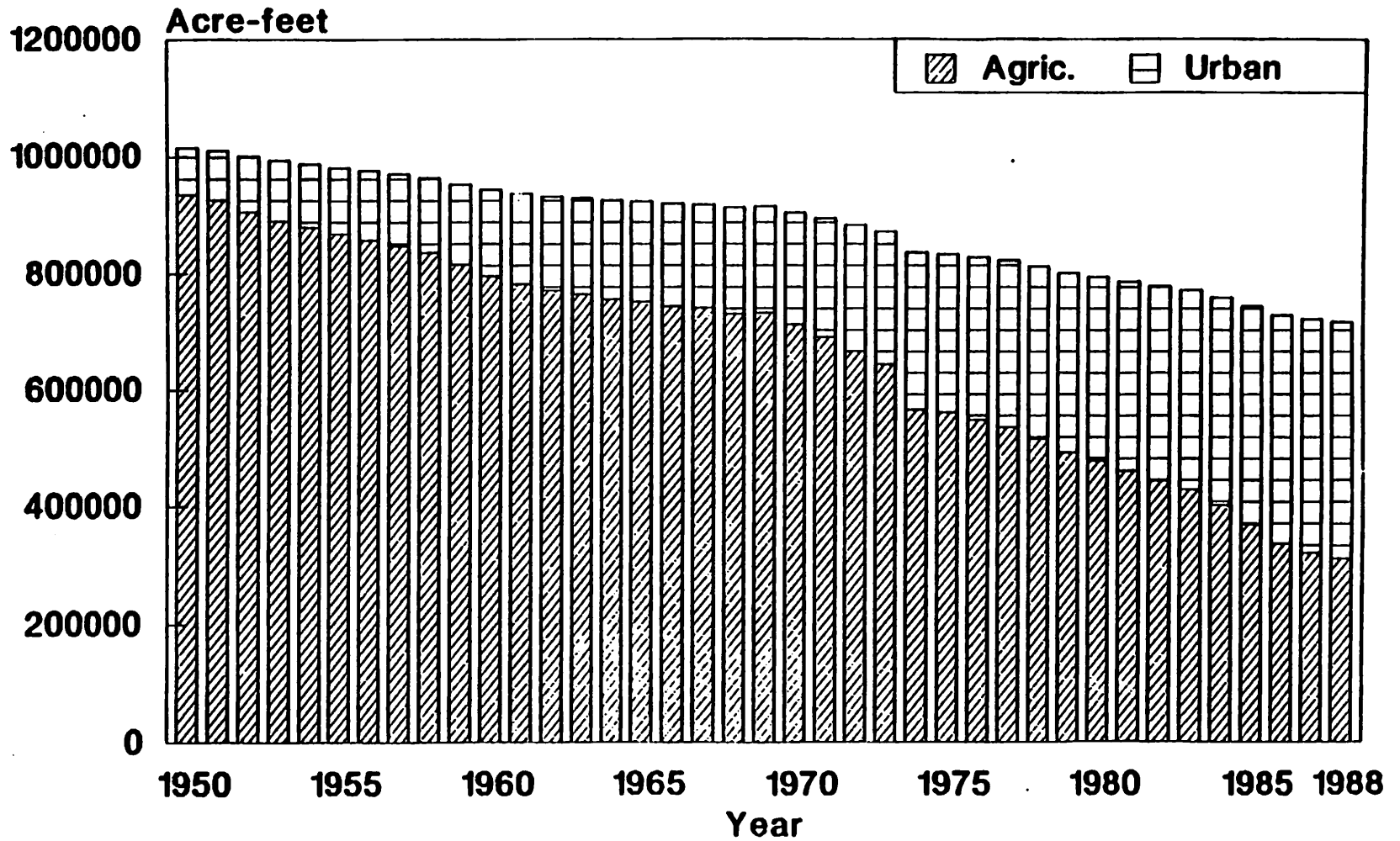
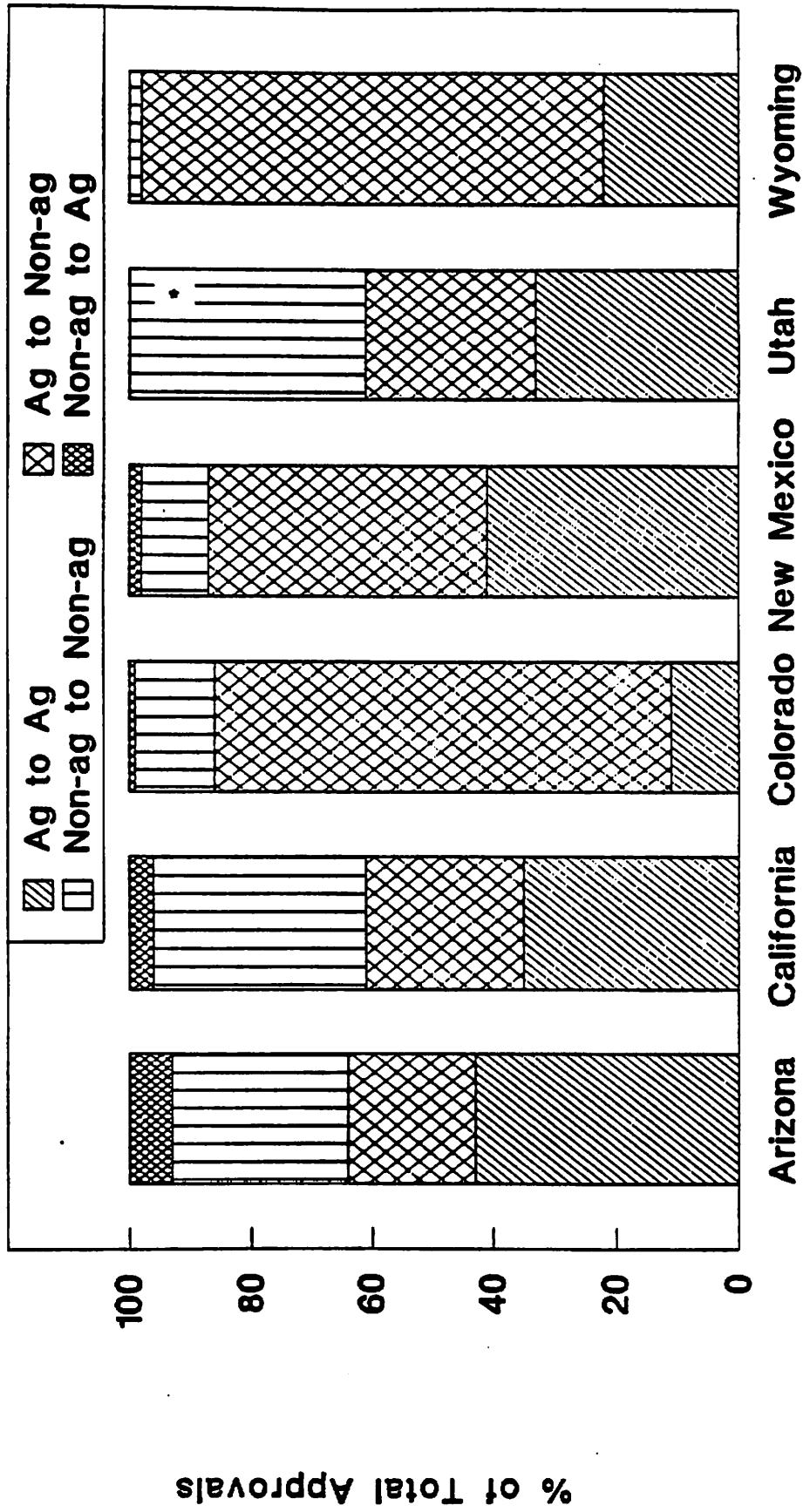


Figure 3.3.4. **Estimated SRP Water Deliveries for Agricultural and Urban Uses**



Assumes 4.5 a-f/acre for agriculture and 2.4 a-f/acre for urban land

Figure 3.3.5. Approved Changes of Water Rights By Purpose of Use, By Study State (Percent of Total Approvals)



* From non-ag but new use could be for any use

and Wyoming, the majority of transfers involved a shift from predominantly agricultural to predominantly nonagricultural purposes. The picture in the other study states is much more mixed. In New Mexico, transfers occurred between agricultural uses nearly as often as from agricultural to non-agricultural uses. In Utah, transfer activity was roughly split among agricultural to non-agricultural transfers, agricultural to agricultural transfers, and non-agricultural to non-agricultural transfers. In Arizona, the sever and transfer proceeding most often was used for changes of use within the agricultural sector. The short-term transfers in California generally involved drought-related needs.

Table 3.3.3 shows the median quantity of water sought to be transferred in the cases examined. In Arizona, California, and New Mexico, all applications are expressed in acre-feet. In Colorado, Utah, and Wyoming, storage rights are presented in acre-feet while direct flow rights are described in cubic feet per second (cfs). One striking fact is the relatively small quantities of water involved in most cases. Only in California, where the transactions are temporary, are large quantities of water commonly involved. In Arizona and Wyoming, where relatively few transfers occur, the quantities of water involved tend to be larger than in the states with a relatively high number of transfers. The generally small quantities in Colorado,

New Mexico, and Utah probably reflect the nature of many water rights in those states originally established by small individual water users. The very small median quantities of water in the Utah transactions also may result from the segregation rule allowing water rights to be subdivided and transferred.

Figure 3.3.6 shows whether the transfer involved surface or groundwater or involved a shift between the two. In Arizona and California, the transfers all involved surface water since state review does not extend to groundwater transfers. Transfers in Colorado and Wyoming predominantly involved surface water, reflecting the predominance of surface water supplies in those states. In New Mexico, the transfers were about evenly split between surface water and groundwater as is the water use in that state. In Utah, 71 percent of the transfers involved only groundwater. This finding is somewhat surprising since groundwater supplies only about 22 percent of the water uses in that state,²⁰ but may be explained by the fact that much of the new demand is for domestic use which often can be directly supplied from wells.

In summary, the data show that transfers are somewhat different than is often assumed. For example, it is commonly presumed that transfers involve shifting the use of water from agricultural to urban uses.

TABLE 3.3.3
MEDIAN QUANTITY OF WATER SOUGHT TO BE TRANSFERRED, BY STUDY STATE

	<u>Arizona</u>	<u>California*</u>	<u>Colorado</u>	<u>New Mexico</u>	<u>Utah</u>	<u>Wyoming</u>
Acre-feet	65	5,000	11.5	9.6	6.3	877.5
Cubic feet per second	-	-	.60	-	.10	.87

* For applications filed between 1982 and 1989

In fact, the patterns in the states are much more complex and varied than this general presumption would suggest. A surprising amount of transfer activity occurs within the agricultural sector. Only in Colorado and Wyoming is the agricultural to non-agricultural shift the dominant pattern.

Another common perception is that transfers involve large quantities of water. The data show that, with the exception of the temporary transfers in California, most transfers involve small quantities of water. Finally, it is commonly assumed that transfers involve surface water, but in two study states groundwater transfers constitute a significant share of the transfer activity.

Section 4: Transactions Costs

An additional objective of this study has been to see the extent to which transactions costs differ among the various state water transfer systems. Transactions costs comprise a large set of costs that are incurred during a water transfer and are borne either by the buyer, the seller, state agencies, third parties, or in part by all of these parties. They include the following:

1. search costs incurred by buyers or sellers;
2. brokerage fees;
3. public agency review, hearing and administrative costs;
4. application and publication fees;
5. costs incurred by the buyer, seller, and objectors for legal help;
6. costs incurred by all of these parties for technical studies of hydrology and consumptive use;
7. positive or negative externalities imposed on third parties even after the precautions taken by the water authority to avoid third party damage.

It is clear that transactions costs, along with physical transfer costs create a "wedge" or separation between the buyer's willingness to pay for water at the intended point of use and the seller's reservation price or willingness to accept compensation for the water being sold from an existing use. Thus the lower transactions costs per acre-foot transferred, the greater will be the opportunities for beneficial transfers. This is shown in the attached Figure 3.4.1.

Figure 3.4.1 illustrates the relationship between a buyer's marginal willingness-to-pay (WTP) for different quantities of water (which falls as quantity increases) and a seller's willingness-to-accept compensation (WTA) for different quantities (which rises because the seller must give up increasingly valuable uses of the water). WTP must exceed WTA by enough to cover the intervening physical transfer costs and transactions costs.

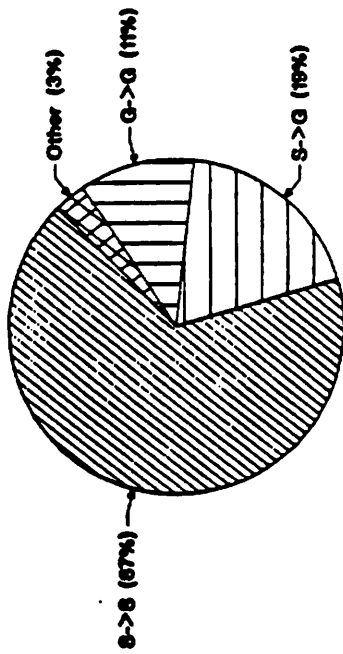
Who bears the transactions costs? A glance at the list above makes it clear that the buyer, the seller, opponents of the transfer who intervene in the case, public agencies, and other parties who incur remaining externalities all bear part of the transactions costs. All transactions costs regardless of bearer, are relevant to the social evaluation of water transfers and to the comparative efficiency of different administrative systems. If our objective is to understand the private motivation for transfers, only the privately borne costs are relevant.

Factors Affecting the Size of Transactions Costs

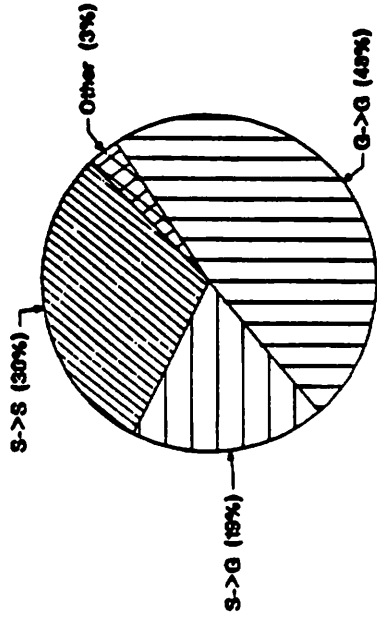
Transactions costs are most usefully measured in dollars per acre-foot transferred. What factors can be expected to affect the size of these costs?

Figure 3.3.6. Source of Water Involved in Proposed Changes, By State

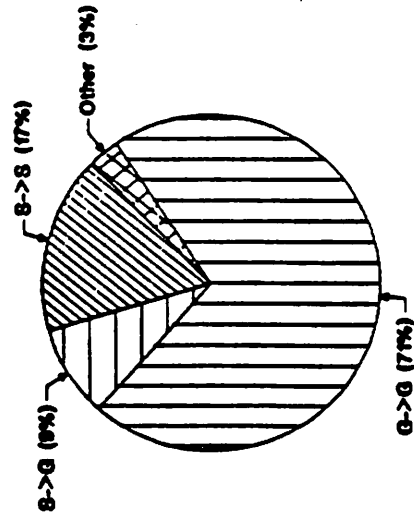
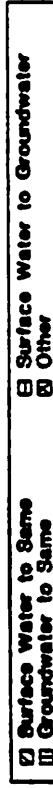
COLORADO



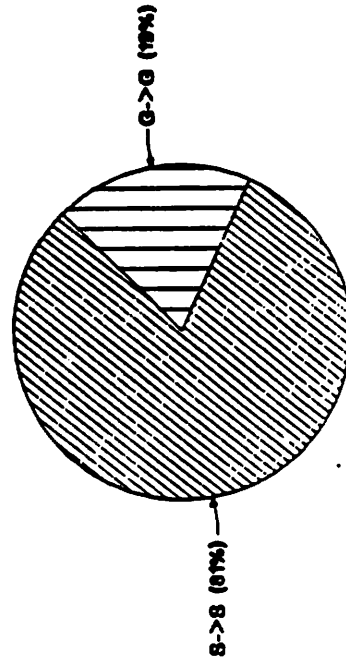
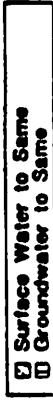
NEW MEXICO



UTAH

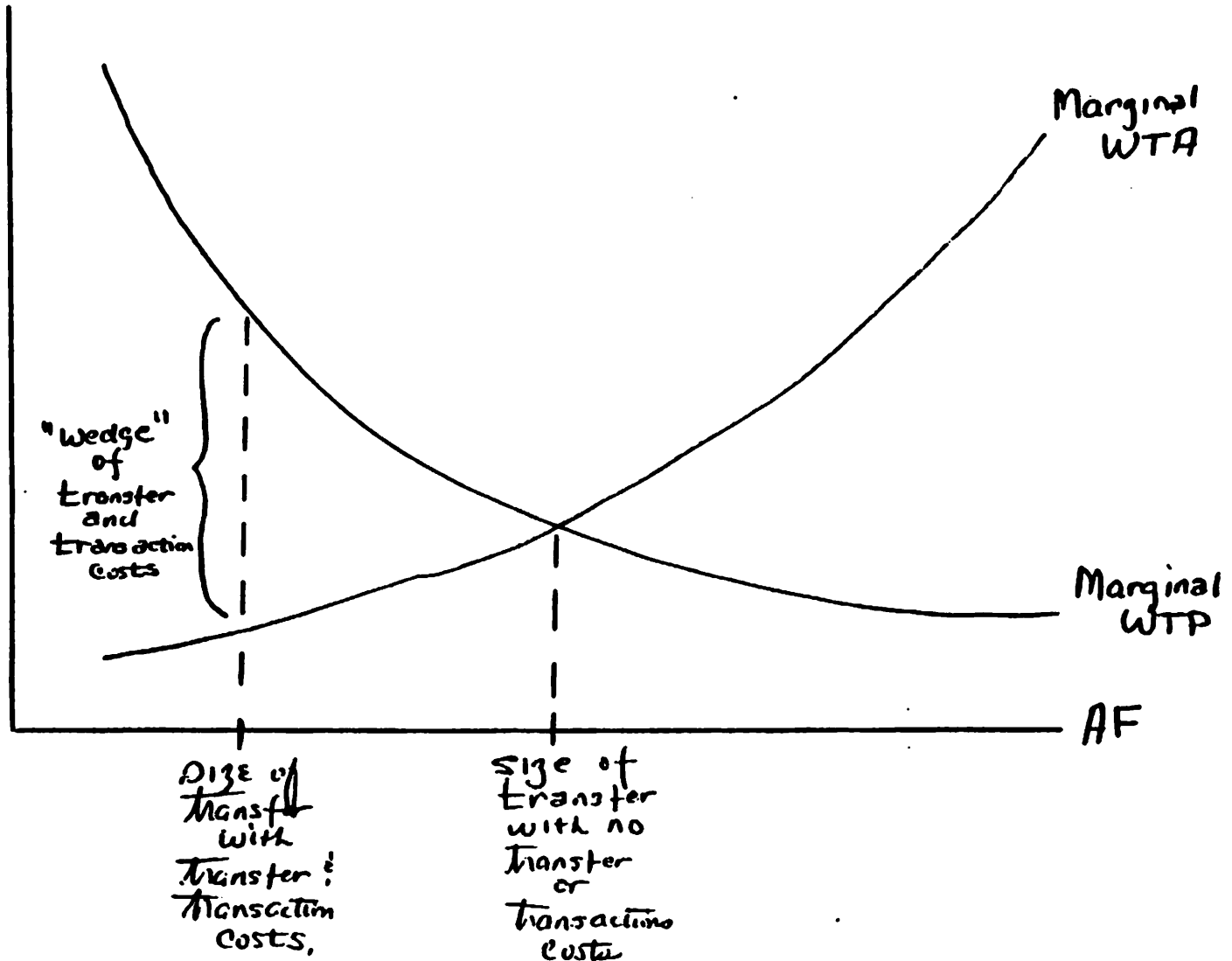


WYOMING



The change of water right processes in Arizona and California apply only to surface water

Figure 3.4.1. Relationship Between a Buyer's WTP and a Seller's WTA for Different Quantities of Water



The most obvious factor is the size of the individual transfer. Since many of the administrative steps such as application, publication, etc. must be taken regardless of the size of the proposed transfer, one can expect to see some spreading of these costs as the transfer gets larger, i.e. there will be "economies of scale" in some components of transactions costs. On the other hand, as transfers get larger, they may attract more attention and threaten a larger number of water users, thus attracting more opposition and increasing costs. While expert opinion seems to favor the scale economies or decreasing costs per acre-foot hypothesis, there is at least the possibility of increasing costs beyond some size.

The entire institutional setting in which privately proposed transfers are evaluated and permitted will affect transfer costs. For example, Colorado's water court utilizes a legal proceeding where all parties may feel the need for legal representation and independent hydrologic studies. The burden of protecting rights falls primarily on other water right holders. In New Mexico the State Engineer's Office evaluates a proposed transfer and makes recommendations found necessary to protect other water rights. The parties to the transfer generally accept those recommendations without the need for formal hearings, independent studies, and extensive legal representation. Thus transactions costs are likely to be lower under this approach.

An important difference among states is found in the set of criteria used by the relevant water authority in approving, amending, or denying a transfer. The more extensive the list of criteria, the more studies will have to be carried out, and the greater the room for disagreement.²¹

What set of hypotheses can we then formulate regarding factors that will affect the

level of transactions costs? The following hypotheses are the most obvious:

- H1: There are scale economies in transactions costs, i.e. transactions costs per acre-foot (ATRC) should decrease with the number of acre-feet being transferred;
- H2: The presence of opposition to the transfer will increase ATRC;
- H3: Transactions costs have risen over time;
- H4: The more senior the rights being transferred, the more likely there will be opposition;
- H5: The larger the transfer, the more likely is opposition;
- H6: Opposition is more likely if the stream is frequently administered.

Hypothesis H4 was suggested by water lawyers who felt that transfers of senior rights usually met with greater opposition than the transfer of junior rights. Hypothesis 6 relates to the pressure of water demands on available supply and the consequently greater interdependence of users.

Testing the Hypotheses

We propose the following simple model for relating ATRC to the variables mentioned in the hypotheses above:

$$(1) \text{ ATRC} = f(\text{size, decree date, opposition}) \\ = f(\text{AF, T, ONO})$$

where AF is in acre-feet, T is decree date (e.g. 1980), and ONO represents the presence of opposition. In experimenting with Colorado data, we first let ONO be the total number of opponents (i.e. the number of statements of opposition), but found that the only significant feature was whether or not

there was opposition. Thus we can let ONO be 1 if there is opposition and zero otherwise.

The factors affecting opposition can be represented as

$$(2) \text{ ONO} = g(\text{AF}, \text{T}, \text{ADM})$$

where ADM represents whether or not the stream involved is frequently under administration.

What specific form should the relationship (1) have? Again, experimentation with Colorado data has indicated that the following mathematical form performs well:

$$(1a) \text{ ATRC} = a + b \ln \text{AF} + c \text{ ONO} + d \text{ T}$$

The use of the logarithm of AF allows for diminishing effectiveness of size in reducing $ATRC$ and prevents results such as $ATRC$ becoming negative for large transactions.

If a relationship like (1a) could be estimated by regression analysis from data from a sample of transactions in each state, then the individual states' performance could be compared, at least in part, by comparing the constants $a, b, c,$ and d among the states. From the hypotheses above, we would expect that $a > 0, b < 0, c > 0, d > 0$.

Case Study No. 1: Colorado

This section analyzes data from a stratified random sample of cases drawn from the State Engineer's list of all approved water transfers (except simple changes in points of diversion) for cases filed between 1975 and 1984.²³ The project's initial goal was to obtain twenty complete cases. This meant that complete cost information would need to be obtained from the applicants, opponents, courts, etc.

for each case drawn. Only nine cases were completed.²⁴

Transactions costs among the nine Colorado cases ranged from \$0.37 per acre-foot to \$1702 per acre-foot. The average among the nine cases was \$380. These transactions costs included only those costs involved in changing the purpose or place of use of a water right or rights. They do not include costs involved in purchasing the water rights.

The regression estimate of equation (1a), estimated from the Colorado sample data, is shown below.

$$(1b) \text{ ATRC} = 799 - 148 \ln \text{AF} + 660 \text{ ONO} \\ (3.48) \quad (3.35) \quad (2.48)$$

The t -statistics are given beneath each coefficient, the adjusted $R^2 = 0.61$, and the F statistic is 7.14. All expectations are borne out: there appear to be very significant scale economies associated with transactions costs; and opposition increases costs sharply. The following table gives illustrative values of $ATRC$ from this equation.

Equation (2) was estimated from the Colorado data, using PROBIT procedures appropriate for a (0,1) variable like ONO . While there was a positive association between transfer size and the occurrence of opposition, none of the coefficients was statistically significant.

Case Study No. 2: New Mexico

In New Mexico, Brown *et al*, were able to gather data on the costs incurred by applicants in 201 transfers (omitting costs incurred by opponents and the Office of the State Engineer).²⁵ The transactions costs in these cases ranged from \$0.06 per acre-foot to \$1100 per acre-foot of consumptive use,

**TABLE 3.4.1
ESTIMATED ATRC VALUES FROM EQUATION (1b)**

<u>Size of Transfer (AF)</u>	<u>Transaction Costs</u>	
	<u>Unopposed</u>	<u>Opposed</u>
10	\$458	\$1118
100	117	777
200	15	675

with an average of \$135 per acre-foot.³³ Colby *et al.*³⁴ studied the relationship between New Mexico applicant costs and State Engineer costs for eight transfer cases, finding that the (unweighted) average ratio of State Engineer to applicant costs was 36 percent. In the same study, two transfers showed an average percentage of protestant to applicant costs about 50 percent.³⁷ We know, however, that protests are infrequent in New Mexico. Adding 36 percent to the \$135 yields an estimate of average transactions costs of \$184 per acre-foot. This indicates average transactions costs considerably less than those of Colorado.

The attempt was made to estimate an equation like (1b) from the New Mexico data. Naturally, the equations would not be directly comparable since the New Mexico data incorporate only the costs incurred by applicants. The estimated equation is:

$$(1c) \text{ ATRC} = 311 - 63 \ln \text{ AF} - 0.009 \text{ ONO}$$

(.925) (4.24) (.093)

where the "t" statistics are given in parentheses. The adjusted R-squared was only 0.076 and the F value 6.48.

There clearly exist economies of scale in applicants' costs in New Mexico, but other factors do not appear significantly to affect

costs. This may result from the incomplete cost measure used and from the fact that few cases are opposed in New Mexico.

Other Studies: Colby *et al.*

Colby *et al.* studied transaction costs

associated with changes of water rights in Colorado, Nevada, New Mexico, and Utah. The conclusion of their report is reproduced below.

This study finds that the costs incurred by the applicant for the change vary tremendously within states, depending on the characteristics of the proposed transfer, particularly the degree to which it is opposed by other water right holders and by other parties who believe their interests are affected. While protestants and state agencies sometimes incur substantial costs in the course of the change of use process, the applicant's costs typically outweigh expenses incurred by other parties. Fees collected by state agencies cover only a fraction of the costs of agency staff time expended in evaluating change applications. In general, transactions costs associated with the change of use process are small relative to applicant's costs of

acquiring water rights and probably do not affect the attractiveness of water transfers as a less costly alternative to new supply development.²⁸

In the light of the Colorado and New Mexico studies reported above, we cannot agree with this conclusion. Transactions costs are significant, the average being \$380 per acre-foot in the Colorado sample and \$184 in the New Mexico sample. With water rights selling in the \$300 to \$1500 per acre-foot range in most cases (higher near metropolitan areas), transactions costs add significantly to the overall cost of acquiring water through transfers.

ENDNOTES TO CHAPTER THREE

1. In addition to the legal discussion contained in Volume II of this report, detailed analysis of the water transfer laws in the six study states can be found in 31 *Ariz. L. Rev.* 721-904 (1989).
2. 7 *Cal.* 261 (1857).
3. *Maeris v. Bicknell*, 7 *Cal.* 261, 263 (1857).
4. 15 *Cal.* 161 (1860).
5. *Id.* at 181.
6. *Id.*
7. 32 *Cal.* 26 (1867).
8. *Id.* at 34.
9. *Id.*
10. Curiously, the no injury requirement was not mentioned in *Davis v. Gale* but had been followed in *Butte v. Morgan*, 19 *Cal.* 609 (1862).
11. *Davis v. Gale*, 32 *Cal.* 26, 34 (1867).
12. See, e.g., *Fuller v. Swan River Placer Mining Co.*, 12 *Colo.* 12, 19 P. 836 (1889) (quoting with approval from *Kidd v. Laird* and *David v. Gale*); *Frank v. Hicks*, 4 *Wyo.* 502, 35 P. 475 (1894); *Trumbley v. Luterman*, 6 *N.M.* 15, 27 P. 312 (1891); *Hague v. Nephli Irr. Co.*, 16 *Utah* 421, 52 P. 765 (1898); *Biggs v. Utah Irr. Ditch Co.*, 7 *Ariz.* 331, 64 P. 494 (1901).
13. Early western state statutes providing for changes of water rights are summarized in 2 C. Kinney, *Law of Irrigation* §857 at 1501-04, n.3 (2d ed. 1912).
14. Maass and Anderson report from a study of six irrigation communities in the U.S. and Spain that farmers generally believed that water "should be removed from ordinary market transactions so that [they] can control conflict, maintain popular influence and control, and realize equity and social justice." A. Maass and R. Anderson, *And the Desert Shall Rejoice: Conflict, Growth, and Justice in Arid Environments* 5 (1978).
15. *Slosser v. Salt Lake River Valley Canal Co.*, 7 *Ariz.* 376, 65 P. 332 (1901).
16. In a subsequent decision the Arizona Supreme Court provided this explanation:

[E]ventually various men who possessed surplus funds, but neither owned and farmed land themselves nor desired to do so, concluded that it would be a profitable investment for them to buy from more or less needy stockholders in the various canals their shares of stock, and the situation developed until in many of the canal companies of the state the ownership of the stock, and presumably the right to the use of the water, was in a group of men who had no interest whatever in the farming of land lying along the canal, except to obtain the highest possible rental for the use of their stock.
- In re: Determination of Relative Rights to Use of Waters of Pantano Creek in Pima County, 45 *Ariz.* 156, 167, 41 P.2d 228,233 (1935).

17. *Slosser*, 65 P. at 334.
18. 1919 Ariz. Sess. Laws, ch. 164, §48.
19. 1909 Wyo. Sess. Laws, ch. 68, §1. See Trelease & Lee, *Priority and Progress—Case Studies in the Transfer of Water Rights*, 1 *Land & Water L. Rev.* 1 (1966) (discussion of subsequent interpretation of this statute).
20. *Frank v. Hicks*, 4 Wyo. 502, 35 P. 475 (1894); *Johnston v. Little Horse Creek Irrigating Co.*, 13 Wyo. 208, 79 P. 22 (1904).
21. Mead noted the practice in Colorado of selling water rights in excess of those actually used. E. Mead, *Irrigation Institutions* 174 (1903). Earlier in the book Mead had described examples of excessive claims to water. *Id.* at 76-77, 150-51. He was concerned that the purchasers of these previously unused water rights would begin taking water to the injury of appropriators with more senior actual uses but more junior legal priorities. This problem has been addressed in Colorado and other states by limiting the quantity of water that is transferable under a water right to that which has been historically diverted and used.
22. In the case of many old rights this lack of definition traces largely to the lax manner in which rights were allocated. All water rights, however, are imprecise in the sense that they simply provide the outline of an authorized use of water. For example, many states describe water rights in terms of a maximum rate of flow of water that may be diverted at a point of diversion. There is no volumetric description providing a total quantity of water divertible under the right. Often, there is no fixed period of diversion. An irrigation right is usable during the irrigation season which varies from place to place and year to year. The actual amounts of water taken may vary according to the weather and other factors.
23. Concerns about the interdependence of water users and the difficulties of making changes in flow regimes without impairment to some of the users cause some commentators to argue that privately initiated water transfers are not desirable. See, e.g., Freyfogle, *Water Justice*, 1986 U. Ill. L. Rev. 481, 510-14. A useful discussion of these issues is contained in Gould, *Water Rights Transfers and Third-Party Effects*, 23 *Land & Water L. Rev.* 1 (1988).
24. Out of 860 applications filed between 1975 and 1984 in Colorado requesting a transfer of water use, only 12 were denied.
25. For a thoughtful critique of the commodity orientation see Dunning, *Reflections on the Transfer of Water Rights*, 4 *J. Contemp. L.* 109 (1977).
26. E. Mead, *Irrigation Institutions* 86-87 (1903). An eminent commentator from the eastern United States, Roscoe Pound, noted a trend in this direction in western water law in 1914. Pound, *The End of Law As Developed in Legal Rules and Doctrines*, 27 *Harv. L. Rev.* 195, 234 (1914).
27. See A. Maass & R. Anderson, *supra* note 14; L. Brown & H. Ingram, *Water and Poverty in the Southwest* (1987).
28. See Benson, *Desert Survival: The Evolving Western Irrigation District*, 1982 Ariz. St. L. J. 377, 412-14.
29. MacDonnell & Howe, *Area-of-Origin Protection in Transbasin Water Diversions: An Evaluation of Alternative Approaches*, 57 *U. Colo. L. Rev.* 522 (1986).
30. The Environmental Defense Fund has been a leader in this area. See, e.g., Stavins, *Trading Conservation Investments for Water* (Environmental Defense Fund 1983). The Nature Conservancy has taken its market-oriented land protection strategy and applied it to water. The Conservancy purchases water rights and transfers their use to instream flow protection purposes. See Harrison & Wigington, *Water Rights: A Protection Tool for the West*, *The Nature Conservancy News* (Aug. - Sept. 1987). In 1989, Montana initiated

a trial program for leasing water needed to maintain fisheries during low-flow periods. H.B. 707, 1989 Mont. Sess. Laws. The U.S. Fish and Wildlife Service has begun purchasing irrigation water rights from users in the Newlands District in Nevada. The use of this water will be transferred to the maintenance of wetlands in the Stillwater Wildlife Refuge. 3 Water Market Update 5 (Sept. 1989).

31. See, e.g., T. Anderson, *Water Crisis: Ending the Policy Drought* (1983).
32. 1962 Ariz. Sess. Laws, ch. 113, §5 (codified at Ariz. Rev. Stat. §45-172 (1987)).
33. Wyo. Stat. §41-3-104 (1977). Curiously, the Wyoming legislature did not repeal the 1909 statute restricting water right changes.
34. Cal. Water Code §109(a) (West Supp. 1989).
35. Utah Code Ann. §73-9-13(3) (Supp. 1989).
36. H.B. 1112, 1989 Colo. Sess. Laws (codified at Colo. Rev. Stat. §37-83-106).
37. See, e.g., 1981 Neb. Sess. Laws ch. 252, §8 (codified at Neb. Rev. Stat. §46-289 (1984) (authorizing interbasin transfers of water); S.B. 178, 1989 S.D. Sess. Laws (amending S.D. Codified Laws Ann. §46-5-34.1) (authorizing transfer of irrigation rights to domestic uses on other lands).
38. Ariz. Rev. Stat. §45-172 (4) & (5) (1987). Approval must be obtained if the water is to be transferred from lands within these entities or from the watersheds supplying water for their use.
39. Wyo. Stat. §41-3-104(a) (1977).
40. Cal. Water Code §386 (West Supp. 1989).
41. N.M. Stat. Ann. §72-5-23 (1978).
42. *Bonham v. Morgan*, 102 Utah Adv. Rep. 8 (Utah 1989), vacated and reinstated, Case no. 880143 (Feb. 23, 1989).
43. For a discussion of compensation principles, see MacDonnell & Howe, *supra* note 29.
44. Ariz. Rev. Stat. Ann. §45-172 (1987); Cal. Water Code §1701 (West 1971); Colo. Rev. Stat. §37-92-302(1)(a)(Supp. 1989); N.M. Stat. Ann. §72-5-24 (1978); Utah Code Ann. §73-3-3(2)(a)(1953); Wyo. Stat. §41-3-104(a)(1977).
45. Colby, McGinnis, Rait, & Wahl, *Transferring Water Rights in the Western States – A Comparison of Policies and Procedures* (Natural Resources Law Center Occasional Paper, Feb. 1989) (hereafter Colby). All of the study states except California are discussed in this report.
46. Ariz. Rev. Stat. Ann. §45-172(2)(1987); Cal. Water Code §1702 (West 1971); Colo. Rev. Stat. §37-92-305(3)(Supp. 1989); N.M. Stat. Ann. §72-5-23 (1978); Utah Code Ann. §73-3-8 (1953); Wyo. Stat. §41-3-104(a) (1977).
47. Wyo. Stat. §41-3-104(a)(1977).
48. Wyo. Stat. §41-3-104(c)(1977).
49. N.M. Stat. Ann. §72-5-23 (1978).

50. Cal. Water Code §386 (West Supp. 1969).
51. *Id.*
52. Bonham v. Morgan, 102 Utah Adv. Rep. 8 (Utah 1969), vacated and reinstated, Case no. 880143 (Feb. 23, 1969).
53. Colo. Rev. Stat. §37-92-305(3)(1973).
54. City of Roswell v. Reynolds, 86 N.M. 249, 522 P.2d 798 (1974).
55. Utah Code Ann. §73-3-3 (Supp. 1969).
56. *Id.*
57. *Id.*
58. Application must be made to the state engineer who may authorize the change if his investigation indicates that there will be no impairment of existing rights. If he believes that impairment might result, he must notify affected parties and allow a hearing.
59. Cal. Water Code §1728 (West Supp. 1969).
60. Cal. Water Code §1725 (West Supp. 1969).
61. The Board must conclude that no injury will result to other water users and that there will not be unreasonable effects on fish, wildlife, or other instream beneficial uses. Cal. Water Code §1727(a)(West Supp. 1969).
62. Wyo. Stat. §41-3-110 (1977 & Supp. 1988).
63. *Id.* at §41-3-110(c).
64. *Id.* at §41-3-110(b).
65. Colo. Rev. Stat. §37-82-104(1973).
66. Colo. Rev. Stat. §37-80-120(1973).
67. Colo. Rev. Stat. §37-92-305(5)(1973).
68. Wyo. Stat. §41-3-106(c)(1977 & Supp. 1988).
69. *Id.* at §41-3-106(d).
70. Town of Pine Bluff v. State Board of Control, 647 P.2d 1365 (Wyo. 1982).
71. Colo. Rev. Stat. §37-90-130(f)(1973).
72. The statutory definition is: "that groundwater, located outside the boundaries of any designated groundwater basins in existence on January 1, 1985, the withdrawal of which will not, within 100 years, deplete the flow of a natural stream ... at an annual rate greater than one-tenth of one percent of the annual rate of withdrawal." Colo. Rev. Stat. §37-90-103(10.5)(Supp. 1988).

73. Before issuing permits for the withdrawal of nontributary groundwater, the state engineer determines the recoverable water in the aquifer and apportions the water among overlying landowners. Withdrawals are limited to one percent of the total recoverable water per year. Since this water never was subject to appropriation, nontributary groundwater may be used without regard for the return flow obligations normally attaching to native water supplies.

74. Ariz. Rev. Stat. §§45-461 to -482 (1987).

75. See generally, *Special Water Districts: Challenges for the Future* (J. Corbridge ed. 1984) and Leshy, *Special Project: Irrigation Districts*, 1982 Ariz. St. L.J. 345.

76. See Benson, *Desert Survival: The Evolving Western Irrigation District*, 1982 Ariz. St. L.J. 377, 411.

77. Ariz. Rev. Stat. §§45-173(4) & (5) (1987).

78. Utah Code Ann. §73-7-11 (1977).

79. *Id.* at §73-9-13.1(1)(Supp. 1989).

80. Cal. Water Code §382 (West Supp. 1989).

81. *Id.* at §381.

82. *Id.* at §383.

83. *Id.* at §383(c).

84. A well-known exception is the Northern Colorado Water Conservancy District which has allocated rights to water through permanent allotments. See Howe, Schumeler & Shaw, *Innovation in Water Management: Lessons from the Colorado Big Thompson Project and Northern Colorado Water Conservancy District*, in *Scarce Water and Institutional Change* (K. Frederick ed. 1986). These allotments can be freely traded within district boundaries with only minimal review by the district itself.

85. Wyo. Stat. §41-3-749 (1977). Utah and Colorado have recently amended their laws to allow conservancy districts to lease water outside district boundaries. Utah. Code Ann. §73-9-13.1(1)(Supp. 1989); Colo. Rev. Stat. §37-83-106 (Supp. 1989).

86. Because so few cases were filed in California during the study period the data reflected here are based on cases filed between 1982 and 1989.

87. An analysis of some possible factors is provided in the Colorado chapter in Volume II of this report.

88. Applications in Colorado and Wyoming may involve several water rights while, in New Mexico and Utah, applications concern only a single water right.

89. See Schneider, *Groundwater Rights in California*, Staff Paper No. 2, Governor's Commission to Review California Water Rights Law (1977).

90. Z. Smith, *Groundwater in the West* 4 (1989).

91. At the same time, a greater set of values is being safeguarded from damage by the transfer. We cannot, therefore, judge the desirability of alternative administrative systems simply by monetary transactions costs per acre-foot transferred, but must include in the assessment the range of public values being protected by the system.

92. The description of the sampling process and details of data gathering are taken from Boggs, *Analysis of Transactions Costs Associated with Water Transfers in Colorado*, University of Colorado (Masters Thesis in Economics 1989).

93. See Section 3 of the Colorado Report for complete details on the Colorado case study, including the data gathered.

94. The New Mexico data base analyzed here is larger than that reported in the New Mexico state study. Continued work by Nunn and Urban resulted in an expansion of the data.

95. The average cited here differs from the average cited in the New Mexico report because the New Mexico figure is a weighted average and because the sample used here was larger than the sample used in the New Mexico report.

96. B.G. Colby, K.A. Rait, T. Sargent, and M.A. McGinnis, *Water Transfers and Transaction Costs: Case Studies in Colorado, New Mexico, Utah, and Nevada*, Dept. of Ag. Econ., Univ. of Ariz., July 1989, Figure 16.

97. *Id.*, Figure 15.

98. *Id.* at 54.

Chapter 4

Summary and Conclusions

1. Additional development of water supplies in the six study states will be increasingly difficult for physical, economic, and environmental reasons. Yet the water demands in these states are changing and increasing as the population increases and becomes more urbanized. An important means of satisfying these demands is to reallocate a portion of the developed water supply from existing uses to new uses.

2. Water transfers, defined as the permanent or temporary change in the existing purpose and/or place of use of water under an established legal entitlement, are occurring in all of the study states. The manner in which these transfers occur varies within and among the study states. In all states, informal trading of irrigation water occurs on a seasonal basis. In Colorado, New Mexico, Utah, and Wyoming, water transfers commonly involve the permanent change of use of an existing appropriative water right.

In Arizona, permanent transfers of surface water rights may take place through a sever and transfer proceeding. Since 1980, certain groundwater rights within active management areas have become transferable. Historically, most water transfers in Arizona have resulted from changes in the use of land because water rights are considered permanently appurtenant to the land.

In California, only temporary water transfers (less than one year) have occurred to date through the state review process. Several long-term exchanges have been made between large water supply agencies.

Transfers also may be occurring as a consequence of land use changes because riparian water rights exist in California and groundwater development rights are based on overlying land ownership rather than appropriation.

3. A primary purpose of the study was to determine the effect of state law and institutions on the transferability of water from existing uses to new uses. Therefore, the study concentrated on water transfers subject to the state review process. We were interested in characterizing the nature of these transfers and examining the manner in which they were handled by the state review process. We also were primarily interested in the pattern of long-term changes in water use. Consequently, the report does not address the considerable volume of informal trading of water that occurs on a seasonal basis. Nor does it systematically analyze other water transfers that occur outside the state review process.

4. Study team researchers in Colorado, New Mexico, Utah and Wyoming examined permanent changes in water rights involving a change in the purpose and/or place of use of water during the period 1975 to 1984. Characteristics of the changes requested vary from state to state as does the level of change activity.

During the 10 year study period, there were 3,853 transfer applications in Utah, 1,133 in New Mexico, 858 in Colorado and 42 in Wyoming. Although there were substantial year-to-year fluctuations in transfers activity,

there were no statistically significant trends in the number of applications filed over the study period. Also, no significant correlations in levels of transfer activity between states were found.

The quantity of water typically involved in the transfers was less than expected. Median amounts transferred range from roughly 6 acre-feet in Utah to 10 acre-feet in New Mexico and 11.5 acre-feet in Colorado. By contrast, Wyoming's few transfers tended to involve substantially larger quantities of water, with a median amount of nearly 900 acre-feet.

Statistically significant declines over time in the typical quantity of water proposed for transfer were found in Utah and Colorado, with statistically insignificant but negative trends found in New Mexico. When only agriculture to non-agriculture transfers were considered in New Mexico, a downward trend was evident there as well.

Most transfers in Colorado and Wyoming involved surface water. In New Mexico, transfers were about equally divided between surface water and groundwater. In Utah, most transfers involved groundwater.

In Colorado and Wyoming, the majority of transfers involved a shift from agricultural to non-agricultural uses. In New Mexico, transfers occurred between agricultural uses nearly as often as from agricultural to non-agricultural uses. In Utah, activity was roughly split among agricultural to non-agricultural transfers, agricultural to agricultural transfers, and non-agricultural to non-agricultural transfers.

In these four states, it appears that most or all permanent water transfers involve a change of a water right and are subject to state review. Thus, our analysis of these cases generally provides a picture of all

permanent water transfer activity in these states. Utah shows considerably more transfers than the other states. This very high level of activity appears to reflect the full use of available water supplies in that state, the general support of transfers found in state law and procedure, and the segregation rule allowing water rights to be subdivided and transferred. By comparison, there were very few water transfers in Wyoming during the study period, although the amount of water involved in these cases typically was much larger than in the other three states. Transfer activity in Colorado and New Mexico was comparable but the shift in use from agricultural to non-agricultural purposes was much more pronounced in Colorado.

5. In Arizona, the sever and transfer procedure was used 30 times between 1975 and 1984 to permanently change the place and/or purpose of use of a surface water right, with changes in place of use being the norm. In addition, since 1980 there have been 50 conversions of Irrigation Grandfathered groundwater rights to 69 Type I Non-irrigation Grandfathered rights. These transfers involve a change in use from agricultural to non-agricultural purposes. However, the right remains appurtenant to the land and in point of fact, most of these converted rights are not being exercised. In addition, 15 transfers of non-appurtenant Type II rights, all involving changes in the purpose of use within the non-agricultural sector, have occurred.

These statistics considerably understate the amount of water transfer activity occurring in Arizona since much of this activity occurs outside of the state review process. A major example is the transfer of surface water from irrigation to non-irrigation uses within the rapidly urbanizing Salt River Project. Much of the water supply in Arizona is groundwater, the withdrawal of

which was not regulated by the state prior to 1980. Under present law, groundwater withdrawals outside active management areas remain essentially unregulated. Cities and developers have purchased large tracts of rural land ("water farms") to secure rights to pump groundwater from underlying aquifers and divert surface water for future urban uses. These large purchases, which average 24,000 acre-feet on an annualized basis, will result in future transfers of water uses and represent a current shift in the control of the water resource.

6. The California State Water Resources Control Board received 24 applications to transfer water between 1981 and 1989. All but one were for short-term transfers and generally aimed at addressing drought-related needs. The quantities of water involved ranged from 18 acre-feet to 125,000 acre-feet and generally were larger than those in the other states.

Perhaps even more than in Arizona, this information understates water transfer activity in California. First, the Board has jurisdiction only over transfers of appropriative water rights issued since 1914. The very substantial number of pre-1914 surface rights are not included. Groundwater development is completely outside this system. Riparian water rights which are still important in areas of California are not included. Only limited state jurisdiction applies to water supplied from the Colorado River.

Second, water supply in California is dominated by a relatively few large water supply agencies. There appears to be considerable administrative and contractual reallocation of water uses within the boundaries of these agencies that occurs without state supervision. Exchanges of water between these agencies, sometimes on a long-term basis, also occur outside the water control board review process.

7. There has been a long-standing concern in the West regarding private reallocation of water, particularly where the seller profits from the transaction. In recent years there has been widespread acceptance of "water marketing" as a means of making water transfers. In essence, this simply means allowing the primary reallocation decision to be made by the holder of the existing water entitlement. The role of state government is not to prohibit transfers or to make the reallocation decision but to set the terms and conditions under which transfers may occur.

Law and policy in all six states now generally support water transfers, though in varying degrees. The major barriers such as the Arizona and Wyoming laws that restricted water rights to their original place of use have been removed. In place of these major restrictions, states are imposing broad-based review requirements aimed at ensuring adequate consideration of interests that may be adversely affected by water transfers.

In part, these changes probably reflect a maturing of the water allocation institutions in the West. Selective protections now can be built into the system in place of unnecessarily broad prohibitions. These changes may also reflect the growing recognition of the value of water transfers.

We identified a few remaining examples of state laws that are highly restrictive of water transfers. These include the Utah constitutional provision banning sales of water rights by municipalities in that state, the Wyoming statutory provision prohibiting transfers of conservancy district water outside district boundaries, and the Arizona statutory provision giving unlimited veto power over many surface water transfers to irrigation district boards. Whatever justification originally may have existed for these provisions, they no longer appear

necessary.

8. Appropriative rights to use most of the available surface water and much of the groundwater in the study states were established many years ago. Changes in the point of diversion, purpose of use, or place of use under an existing appropriative water right may be made in each of the study states without loss of priority subject to certain conditions.

The bulk of water transfers in the West likely will occur through the change of water right process. Commonly, the states require that the water right be a valid existing right, that the quantity of water to be transferred not exceed that historically diverted or withdrawn, and that the change not unreasonably impair other water rights. The no impairment standard has been the most difficult to implement.

The imprecise nature of water rights contributes to the difficulties of assessing the injury associated with making a change. Many senior water rights were established prior to the institution of a state permit system. Unless there has been a full stream adjudication, the relative priorities of these rights and the legally authorized divertible quantities of water may not be clear. Moreover, water rights are by their nature imprecise in some respects. For example, an irrigation right is used in a variable way from year to year depending on factors such as weather, crops grown, and water availability.

The change of water right process provides a good opportunity to clarify and quantify the water rights involved. An analysis of diversion records or of the water requirements associated with crops grown can establish the historical use of water. In this way a paper water claim can be converted into a legal right based on historical use. Wasteful use of water should be excluded

from this legal right since only beneficial uses are recognized.

Where necessary to avoid injury, water rights also may be defined in terms of their historical consumptive use. As western streams reach full appropriation it makes increasing sense to define water use in terms of its consumptive or depletive effects. The analytical techniques for determining consumptive use are now well developed. New Mexico facilitates this process by limiting initial appropriations within a basin and by protecting water rights through expert state review aided by hydrographic studies, by knowledge and experience with the area, and by use of standardized assumptions in some cases.

Colorado and Utah explicitly establish a presumption that changes of water rights may occur so long as means can be found to offset injury to other water rights holders. The effect is to encourage the applicant for a change to come forward with a proposal that meets objections. The decision maker is affirmatively encouraged to devise terms and conditions that will prevent impairment. The retained jurisdiction requirement in Colorado is one way to allow the change to occur while assuring a later review if evidence of injury appears.

9. Most applications for changes of water rights are approved. The approval rate during the study period ranged from over 94 percent in New Mexico to about 74 percent in Wyoming. Moreover, actual denials were quite rare in Colorado, New Mexico, and Utah.

The length of time to reach a final decision varies considerably among the states. In New Mexico, the average time was 6.3 months. Colorado required more than 21 months on average. It appears that whether a case is protested affects the time required

for a decision. In New Mexico, less than six percent of the applications were protested. By comparison, in Colorado 60 percent of the proposed changes were opposed.

This information helps to dispel the notion that water transfers do not occur because approval cannot be obtained. Clearly, that is not true in most cases. However, these data do appear to show that Wyoming is more conservative about changes of water rights than the other states. Moreover, the considerably longer time to decision in Colorado and Wyoming raises questions about the review processes in these states.

10. The case studies of transactions costs in Colorado and New Mexico suggest average costs in the range of \$200 to \$380 per acre-foot of water transferred. There appear to be significant scale economies so that the transfer of larger amounts of water results in lower per-acre-foot costs. The data also show that third party opposition to the transfer increased the acre-foot costs. The average transactions costs found in the Colorado sample of cases were considerably higher than those in New Mexico. This finding corresponds to the findings that the decision time in New Mexico is markedly less than in Colorado and that many fewer cases are protested in New Mexico than in Colorado. However, the average transactions costs in New Mexico appear to have increased dramatically from 1975 to 1987.

Additional study is necessary to determine the effect of these costs on water rights transfer activity. The New Mexico data show that most applications incur relatively low transactions costs. Moreover, although transactions costs in that state appear to be increasing, so too is the sales price of the water right itself. The New Mexico data show an average transactions cost of about \$290 per consumptive acre-foot of water

transferred and an average price of a water right of \$2167. Only about half of the applications involved a newly purchased water right. Price data for water rights was not collected in Colorado.

11. Water transfers also are occurring through other means. Short and long-term exchanges of water long have been used in the West to permit more efficient use of water supplies. In Utah, cities have arranged exchanges with agricultural water users so that higher quality water can go to urban use. In California, water exchanges are used to enable transfers of water between water supply agencies.

Involuntary exchanges and substituted supplies also are used in several of the study states. In general, these transactions allow a new use of water to occur so long as the water requirements of existing users are satisfied. In California, this approach is referred to as a "physical solution." In Colorado, plans for augmentation are used for this purpose. Involuntary exchanges introduce the possibility for more flexible and efficient use of water resources but they also increase the complexity of system administration.

Temporary transfers and leases of water also are used to address short-term needs. In California, all changes of water rights reviewed by the State Water Resources Control Board involved short-term needs for water, often drought-related. In recent years there has been considerable discussion of the "dry year option" approach under which users needing only supplemental supplies in dry years could make arrangements with senior irrigation water users to forego their use during these years.

Water salvage efforts are being made to allow a shift in the use of the water saved. For example, in Wyoming the city of Casper

has been meeting its new water requirements from water saved by making improvements to the irrigation system of the nearby Casper-Alcova Irrigation District. The Metropolitan Water District of Southern California has finalized an agreement with the Imperial Irrigation District under which as much as 100,000 acre-feet of water will be conserved and made available for use in the MWD area.

The laws in some of the study states regarding these options are unclear (see the state reports in volume II). Yet such approaches appear to provide beneficial opportunities to meet new water demands. Properly designed and implemented, these approaches enable the transfer of water without impairment to other water users. We believe that states should encourage such transactions subject only to the no injury standard.

12. In addition to the importance of the type of water entitlement involved, transferability also depends on the type of legal entity holding the entitlement. The Utah provision preventing municipalities from transferring water rights already has been mentioned. Even more significant are the various rules applying to the transferability of water controlled by irrigation water supply organizations. These entities control the use of significant quantities of water in the study states and throughout the West. Generally, state laws do not prevent the transferability of water held by these entities but neither do they facilitate transfers. For example, Wyoming law prohibits transfers outside the boundaries of a conservancy district. In Colorado, water may only be leased for use outside the boundaries of a conservancy district. Arizona gives irrigation districts an absolute veto over any surface water transfer involving water rights within their boundaries or from anywhere in the watershed from which the district derives its water supply.

The missions and structures of water supply organizations in the West need to be revisited in light of the many changes that have occurred since they were established. In some rapidly growing urban areas, the water supply systems are fragmented and inefficient. In some irrigation districts, transformation of land uses away from agriculture has altered the original irrigation purposes for which the districts were established. In other districts there are opportunities for making water available for new uses through system improvements, changes in cropping patterns, retirement of acreage, and other means. The legal framework governing these water supply organizations was established for a different set of conditions. Changed conditions suggest the need for changed approaches.

13. Perhaps the major policy challenge facing the western states in this area is how to address the third party effects associated with the reallocation of western water. Protection of other water rights long has been recognized as a limitation on changing a water right. In recent years, states have begun to acknowledge other potential adverse effects. These include potential effects on instream values such as fisheries, recreation, and water quality. Wetlands may be adversely affected by water transfers. Groundwater recharge also may be affected by water transfers. Impacts on the local economy from which the water is transferred are of concern in some instances. As transferrors reach farther away for supplies of water, the effects on the area of origin are likely to be more pronounced.

Because of these kinds of concerns, states have been broadening the "considerations" in reviewing applications for changes of water rights. California law requires that transfers not have an unreasonable effect on fish, wildlife, or other beneficial instream uses or on the economy of the area from which the water is transferred.

Wyoming law allows consideration of the economic losses to the local community and to the state that may result from a transfer. New Mexico law now subjects water transfers to a public welfare review and the Utah Supreme Court has ruled that transfers in that state are subject to a public interest standard.

While there appears to be increasing acceptance of the need to address these kinds of issues there is little agreement yet concerning how this is to be done. Traditionally, state review has been limited to analyzing impairment to other water rights associated with a water right change. These issues, however, go well beyond the usual no impairment review. Broader standards for the evaluation of the effects of a transfer

need to be developed. Additional kinds of technical expertise will have to be included. The decision-making process itself may well have to be altered to handle the broader range of issues that will be considered.

Whatever the approaches taken, it will be important to clarify the requirements a transferrer must meet and to be sure that mechanisms are in place that adequately protect the range of public as well as private interests that are implicated. Legitimate and important interests are affected by water transfers. The West will not benefit if transfers are made at the expense of those interests. The challenge is to find ways to address these interests while facilitating valuable water transfers.