Reallocating Water: Evolving Markets, Values and Prices in the Western United States

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Introduction

This article briefly reviews the development of markets for water in the western United States and the emerging role of environmental considerations in water reallocation. Price trends in several regional markets are reviewed, followed by a discussion of the factors that affect the market value of water rights and of the role that water reallocation plays in resolving conflicts over scarce water supplies.

Background on Water Market Development

Historically, new water users in the West appropriated water rights to which no previous claims had been established, and constructed water development projects to capture, store and transport water to areas where local supplies were perceived as inadequate. The federal government subsidized these projects heavily, and direct beneficiaries of projects constructed in the 1950s and 1960s typically bore only a fraction of project costs (Reisner, 1986). During this era, there was little incentive to bid water rights away from existing users because appropriation of unclaimed water and subsidized development provided an attractive alternative to market acquisition.

Market transactions involving water rights now are increasingly common in regions where existing water supplies are fully appropriated and development of new supplies is costly. Urban growth, environmental disputes and Native American water claims all create incentives for acquisition of water supplies. Over the last decade, state and federal policies in many regions have begun to encourage voluntary transfers of water supplies as a cost effective means of satisfying demand for additional supplies. The Reclamation Projects Act (House Resolution 429) passed by Congress in 1992 is a recent example of federal legislation that facilitates market reallocation of water supplies in California and in other areas of the West.

Water rights acquisitions often are the subject of controversy, and water marketing is debated in state legislatures, Congress, tribal councils and resource management agencies. While market reallocation is being cautiously encouraged, water transactions are highly regulated in most western states. Within this conflicting environment, a more sophisticated understanding of market values is important to market participants and to third parties who may be affected by a transfer of water rights. As water conflicts intensify in regions of emerging water scarcity, information on water values also is essential to policymakers and courts who reallocate public project water among user groups, evaluate the impacts of alternative water allocations, and award compensation for damages to water supplies and water rights.

The degree of market activity varies among and within the western states. Some areas have well-developed water markets with many transactions occurring every year. In these areas, professional water brokers, with ready access to information on recent prices and water fights availability, facilitate transactions. In other areas, however, sales of water rights historically have been confined to water exchanges among neighboring farmers. In these areas, transactions occur sporadically and information on quantities and prices of water sold can be difficult to obtain. MacDonnell et al. collected information on applications filed under state law to change the place and purpose of use of water rights in several southwestern states. Utah, New Mexico and Colorado had the highest numbers of applications filed, averaging 385, 113 and 86 per year, respectively, over the period 1975-1985 (MacDonnell, 1990). Arizona and Wyoming had relatively few applications filed, only 30 and 40, respectively, over the entire ten year period. There is no way of knowing how many of these applications represented arms-length transactions involving water rights purchases. Some of them undoubtedly were transfers within a family or business, or were changes in water use that did not involve purchase of a water right. While similar studies on the frequency of applications filed to change the use of a water right have not been conducted for other western states, the Southwest generally is perceived to be the most active region of the U.S. with respect to market activity.

Investment groups and individual investors have been actively buying and reselling water rights in several western states. Over the period 1987-1990, thousands of acre feet of water and millions of dollars changed hands as investors acquired water rights, and resold them to municipal water providers and to developers. For instance, in Arizona, investors have purchased large parcels of irrigated lands to acquire the water rights for use in their own development projects and for resale to municipal water providers or developers. Such purchases, termed "water ranches," have been concentrated in La Paz County in western Arizona, but some are located closer to the Phoenix metropolitan area where the water will eventually be used. The Central Arizona Project aqueduct is the anticipated means of conveying water supplies to the urban area.

Environmental Considerations

Initially fueled by urban growth, water markets now are being stimulated by a new array of forces. Throughout the West, water reallocation is beginning to reflect environmental benefits alongside the traditional uses for water in irrigation, cities, and industry. Some reallocations have involved market transfers of water arranged through voluntary negotiations; others have involved involuntary reallocations prompted by court rulings. These involuntary reallocations create pressure for market transactions as parties seek to replace supplies no longer available due to court rulings.

A wide array of reallocations have been implemented, or are being considered, in response to environmental concerns. Environmental values also are influencing new water allocations and water project development. A 1983 California Supreme Court decision requested the City of Los Angeles to decrease its diversions from the Mono Lake area for the sake of birds, wildlife, and a unique ecosystem, despite the fact that the diversions were based on long-standing rights to divert water from this area (National Audubon Society, 1983). Southern California interests are examining market transactions as a means to replace supplies from the Mono Lake area. The Northwest Power Planning Council frequently must consider the growing impact that environmental considerations have on water allocation. Hydroelectric dam construction in the Northwest has diminished the once vibrant steelhead and salmon runs that are vital to the region's economy, ecology, and indigenous peoples. The Council has broadened the array of interests that participate in power planning and river management decisions so that its decision processes explicitly incorporate trade-offs between power, fish, and wildlife. Consideration of such trade-offs has been prompted, thus far, by voluntary negotiations among affected parties. However, as specific anadromous fish runs become listed as endangered by the federal government, water reallocations may become necessary to comply with the Endangered Species Act.

As environmental values make their way into the western water arena, the transactions costs of implementing water transfers rise. Transactions costs are the costs of making a market system work—defining property rights unambiguously enough so that sales can take place, generating information about commodities available, searching for trading partners, negotiating terms of exchange and contract provisions, and enforcing both property rights and contracts to buy and sell (Coase, 1960; Cheung, 1975; Demsetz, 1964). In western U.S. water markets, parties incur transactions costs in searching for water supplies and willing buyers and sellers, ascertaining the characteristics of water rights, negotiating price and other terms of transfer, and obtaining legal approval for the proposed change in water use. Transfer applicants and objectors incur this latter category of transactions costs as they seek to obtain state approval to transfer a water right to a new place and purpose of use. These costs may include attorney's fees, engineering and hydrologic studies, court costs, and fees paid to state agencies. State procedures to evaluate proposed water transfers become more complex and costly when the processes must address environmental impacts along with the traditional assessment of transfer impacts on other water right holders.

Transactions costs are an important issue in western water reallocation. If the costs of implementing a voluntary water transfer become too high, many beneficial transfers will not take place and water supplies will remain locked into suboptimal use pattern. On the other hand, the ability to impose transactions costs on those proposing to transfer water, an ability conferred by state laws governing who may effectively object to a transfer, represents bargaining power in the water allocation process. Parties undertake market transactions for economic gain, based on the perception that water supplies will generate higher returns in their new use than in their former use. The power to erode this expected gain by imposing transactions costs gives third parties leverage with transfer proponents, forces transfer proponents to internalize some external costs of transfers, and gives environmental values a role in the water reallocation process. In this light, some transactions costs may be necessary and are justified by the need to better account for externalities and public values when water transfers are evaluated. Water reallocation policies must balance the transactions costs necessary to insure that third party impacts are addressed adequately when water is transferred, with the goal of facilitating transfers for which the net benefits are genuinely positive (see National Research Council, 1992, for a detailed discussion of balancing transactions costs and consideration of third party impacts).

Water Price Trends

Water markets tend to be somewhat localized due to the high costs of transporting water over long distances. Four market areas are briefly described below to give a flavor of the diverse characteristics of markets and of price trends. Figures 1-4 present prices per acre foot of water rights acquired for four different areas of the Southwest, each with an active water market. All prices are reported in 1987 dollars per acre foot of water transferable to the buyer. The use of real (constant dollar) prices removes the impact of general inflation from the price trends shown. Additional information on these four illustrative market regions can be found in Colby, 1991.

The City of Tucson's acquisitions of irrigated farmland in the Avra Valley are one of the earliest examples of market activity in Arizona. The city of Tucson began purchasing and retiring farmland in the Avra Valley, located about 15 miles northwest of Tucson, in 1971. Between 1971

and 1979, 21 properties were purchased. Purchases were halted in 1979 due to ongoing negotiations that led to Arizona's 1980 Ground Water Management Act. After a five-year hiatus between 1979 and 1984, 12 additional purchases were made through 1986. The 33 purchases total nearly 22,518 acres for a total purchase price of $24.7 million over a fifteen year period.

Real prices during the 1970s ranged between $450 and $650 per acre foot, while real prices in the mid-1980s ranged between $650 and $1,100 per acre foot (1987 dollars). Prices paid for water rights in the Avra Valley are within the range of prices that were paid for surface water and groundwater rights elsewhere in the state during the mid 1980s. A plot of Avra Valley water prices over time is shown in Figure 1. The historic trend indicates average annual real price increases of about 3 percent. This example of market activity is only one of several varied forms of water marketing in Arizona.

Another active regional market is located in western Nevada's Truckee-Carson river basin, where water rights acquisitions have been motivated by urban growth, endangered species and tribal litigation and by environmental demands for water to support wetlands and wildlife. Figure 2 shows prices paid per acre-foot of transferable water rights in Nevada's Truckee-Carson Basin, in 1987 dollars. Prior to 1980, this market was characterized by one large buyer, the regional water utility, and many sellers who farmed irrigated land in the Reno area. As a result of this market structure, prices stayed fairly level over the first twenty years of market activity. In the 1980s, prices rose over ten-fold in just a few years as developers and local governments sought water rights to accommodate new growth. In the late 1980s, a severe drought nearly drained area reservoirs, precipitating a new rush for senior surface water rights held by farmers. Continuing negotiations and litigation with Indian tribes and with environmental groups seeking to protect fisheries and wetlands exerts an upward pressure on local water rights prices that will continue into the 1990s. Overall Figure 2 indicates a long term real price increase of 11 percent per year over the entire period 1961-1990 and an increase of 35 percent over the period 1979-1990, when prices were driven upwards by the factors described above.

Figure 3 shows price trends in a third active regional water market, located along the front range of the Colorado Rockies. Prices are for shares in the Colorado Big-Thompson Project which provides water to farms, cities and businesses located north of Denver along the east slope of the Rockies. These water rights provide highly reliable supplies as they are supported not only by native flows on the east slope but also by substantial pipelines and reservoirs that store and convey water from the rural western side of the Rockies to the rapidly growing east slope. A development boom in the mid-1970s drove real prices for water rights to unprecedented levels by the early 1980s. Water rights prices in this market fell in the 1980s at least partially in response to the completion of a major new water importation project, declining interest rates and a faltering farm economy which made farmers willing to sell at lower prices than previously. Figure 3 indicates a long-term average annual increase of 18 percent over the years 1961 to 1980 (the market peak), and a much more modest increase of 8 percent over the longer 1961 to 1990 period.

Figure 4 summarizes price trends over the last twenty-five years in the Upper Gila Basin of New Mexico. This market region is different from the previous three discussed in that it is not influenced by a major metropolitan area seeking additional water supplies. The important buyers in this market have been copper mining companies, a small city, and developers seeking water for vacation homes and retirement developments. The area was adjudicated under *Arizona v. California* in the 1960s, and the total amount of water that can be used (both surface water and groundwater) was fixed. Consequently, the only means for those who need additional supplies to get them is acquisition of existing water rights. The copper industry was volatile during the 1970s and experienced a dramatic downturn in the early 1980s with several mines in the area closing down operations. Since this industry was the dominant water buyer, its peaks and slumps are reflected in water rights values in this Basin. Overall, Figure 4 indicates a very small (less than one percent) price increase per year over the period 1966 to 1990.

Factors Affecting Water Values

The water value data summarized in Figures 1-4 provides some insights about water values in general. First the trend is clearly a long-term rise in real water values over the past decades. Second, as in any investment activity, timing of acquisitions is crucial. Average annual returns vary considerably depending on which segment of a given market's price history one analyzes, as illustrated by the four cases analyzed here. Third, in areas where there are buyers seeking water for several different economic sectors (such as recreation, agriculture and urban growth in Nevada and Colorado), the market is less volatile than in areas where there is one dominant buyer (such as mining companies in the Upper Gila Basin). The value of water rights which are attractive to several different types of buyers is less volatile than values for those rights which attract only one type of buyer.

Risks that affect the value of water rights holdings originate from a number of sources. Water source contamination can have a dramatic effect on water values, as many southern California right holders have learned. Those who hold rights to the contaminated source experience a decline in the value of their holdings, and those who own water that could be made available as a substitute for contaminated supplies may experience increased values. Also, changes in regional economies, such as a decline in mining activities or the construction of a new power plant needing cooling water,

directly affect values.

Water rights that need to be conveyed to distant locations for end use are subject to value fluctuations related to shifting energy prices which affect conveyance costs, to environmental considerations (such as the presence of an endangered species) that may delay construction of conveyance facilities and to a changing regulatory framework governing water transfers.

New policies for marketing Bureau of Reclamation project water or tribal water rights, both of which are now difficult to market, could bring significant new supplies onto regional markets and depress water rights values. Changes in technology that make currently expensive water sources (such as sea water and treated effluent) less costly also could bring new low cost supplies into a regional market, dampening water values.

Despite these risks, water rights in strategic locations are likely to appreciate in value over the long term. The Southwest is projected to have significant gain in population and jobs over the next few decades. In addition to the general positive impact of regional economic growth on water values, there are several specific factors which will exert significant upward pressure on water values during the 1990s.

First, there is growing demand for water in recreational and environmental uses (boating, snowmaking for ski resorts, preserving wetlands) and this will keep demand high for the foreseeable future. Urban growth in the West not only creates demand for water in the urban area, it also generates pressure to acquire water for maintaining stream and lake levels for fishing, boating and other water-related recreation. There are numerous examples of water acquisitions by private sporting organizations and by state agencies for these purposes. Moreover, environmental concerns have prompted acquisitions of water to preserve flows and habitat for threatened and endangered species in many western states. The U.S. Congress, several states and environmental organizations have allocated funds to acquire water for environmental needs (Colby, 1990). Recreational and environmental demands for water will continue to increase in the 1990s.

Voluntary water transfers are playing an important role in incorporating instream flow and wetlands preservation into a legal and institutional structure that initially evolved to serve irrigators, mines, and power companies. Market negotiations among interested parties are proving to be an effective conflict resolution mechanism, reallocating water to satisfy environmental concerns and paving the way for more cooperative approaches to regional water management.

Voluntary transactions to reallocate water from consumptive uses to wetlands and wildlife often are preceded by decades of litigation. For instance, without litigation based on the Endangered Species Act, the Pyramid Lake Paiute Tribe located in Nevada's Truckee River Basin could not have as effectively influenced water policy in the basin. However, armed with successes in court, the Tribe was able to negotiate changes in river management that provide water to maintain Truckee River fisheries and the ecosystem surrounding Pyramid Lake, both of which are vital to the Tribe.

The complementarity between court and administrative rulings and voluntary transfers is not limited to the Truckee River Basin. The threat of involuntary water reallocation, based on court rulings, is important in stimulating voluntary transfers elsewhere in the West. The much publicized transfer agreement between Metropolitan Water District of Southern California and Imperial Irrigation District might never have been reached if the State Water Resources Control Board had not threatened to involuntarily reallocate irrigation water based on a finding of wasteful use (Imperial Irrigation District, 1990). The National Audobon case (1983) stimulated increased interest in voluntary reallocations to provide the City of Los Angeles with water supplies to replace the water they can no longer take from the Mono Lake area. A lawsuit filed by the Environmental Defense Fund and other parties in the 1970s resulted in a 1989 California ruling requiring a large municipal water provider to divert less than its full entitlement from the American River during dry years to provide flows for salmon and recreation (Environmental Defense Fund, 1989). This decision has prompted attempts to acquire water supplies from other water users through market transfers. In Texas, groundwater pumping from the Edwards Underground Aquifer is being regulated to mitigate effects of pumping on springs and on endangered species that rely on the springs. Market purchases of water rights may be an important means of replacing pumping that is being curtailed under new regulations.

Although a voluntary, market-oriented approach to resolving water conflicts is becoming more common, litigation undoubtedly will continue to be an important tool for environmental, tribal, and wildlife organizations seeking to protect and enhance wetlands and streams. Litigation has the drawbacks of being costly and protracted. Further, litigation evokes a sense of antagonism among those whose interests are at stake and this can be detrimental to future cooperative resource management efforts once the immediate conflict has been addressed by a court ruling. On the other hand, the threat of an unfavorable court ruling is a powerful incentive for successful negotiations and resolution of conflicts. From this perspective, litigation can stimulate negotiations, and complement a market-based approach to obtaining water for environmental purposes. The costliness and uncertainty of litigation encourages parties with diverse interests to consider negotiations and

market transactions as a lower-cost means to resolve conflicts.

In addition to the effect that environmental conflicts have on water values, lawsuits and negotiations involving tribal water rights are underway in nearly every western state, and these provide stimulus for voluntary reallocation. Tribal water claims are particularly important in the state of Arizona, which includes nineteen Indian reservations comprising 26.8 percent of the state's land base. Arizona water values have already been affected by prior court decisions involving Indian rights. A substantial portion of Arizona's Colorado River entitlements (and the highest priority portions of that entitlement) was reserved for use by Arizona tribes along the mainstream of the river, as a part of the *Arizona v. California* litigation. Moreover, the Secretary of the Interior has the power to allocate Central Arizona Project water and conveyance facilities to satisfy Indian claims. Some CAP allocations to tribes already have been made through negotiated settlements that have been ratified by Congress. The federal government and state and local water interests within Arizona are actively seeking water rights and water sources that could be used to resolve tribal water claims with minimal adverse impacts on non-Indian water users.

The droughts of the 1980s have influenced water values by heightening water providers' awareness of the need for more reliable supplies. Reliability can be enhanced by acquiring more senior water rights or by constructing increased storage facilities to boost the reliability of junior water rights. New reservoir development is expensive and difficult to implement where environmental considerations are affected. Cities generally hold rights that are junior to those held by irrigators, whose predecessors first diverted water for beneficial use decades ago. The increased emphasis on increasing supply reliability during drought years places a premium on senior agricultural rights.

The vulnerability of southwestern urban areas to dry-year supply shortfalls makes senior water rights a valuable asset. Under the doctrine of prior appropriation, which governs water allocation in most of the West, senior rights receive their full entitlement before junior right holders can receive water. The Central Arizona Project (CAP) relies on a relatively junior right to take water from the Colorado River. During drought, senior tribal entitlements and senior rights to divert water for southern California cities and agriculture would take precedence over CAP water. In a similar manner, the water rights of southern California urban areas are junior to many rights used for agricultural water deliveries in California. Drought has brought strong pressure to transfer some agricultural water to cities, either through voluntary leases or through emergency regulatory measures. Senior rights to surface water that can be conveyed to metropolitan areas are highly valued for improving the dry year reliability of urban water supplies.

Conclusions

Data on market transactions for water rights indicate significant upward trends in real prices over the past several decades in four illustrative regional markets. A number of factors present important risks to those investing in water rights, but drought planning by cities and growing tribal, environmental and recreational demand for water indicate that senior water rights will continue to be a highly valued asset through the 1990s.

Information on water transactions is useful in valuing water supplies that are being reallocated among irrigators, cities, and wetlands, and between tribes and non-Indian water right holders. Such reallocations are occurring in the western states as a response to drought, endangered species protection needs, water quality concerns, and negotiations over Indian water rights. State and federal agencies and courts frequently must make decisions which affect the sources of water and types of water rights available for different uses. There are multiple ongoing conflicts over water in the western United States involving cities, rural counties, tribes, states, wildlife managers, dam operators, recreationists, and environmentalists. Market reallocations, along with involuntary reallocations by courts and administrators, are becoming a principal means to address these conflicts and to accommodate new demand for water supplies.

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Figures 1-4 follow.

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Figure 1. Water Rights Prices, City of Tucson Acquisitions in Avra Valley

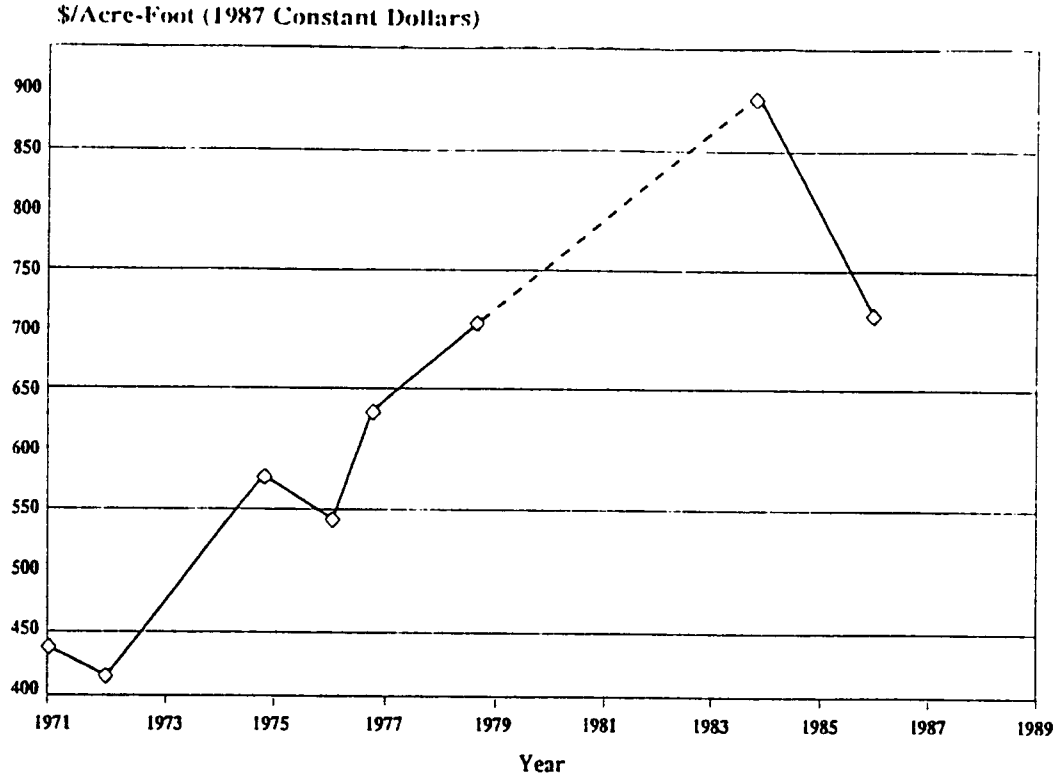

Figure 2. Water Rights Prices: *Truckee River, Nevada*

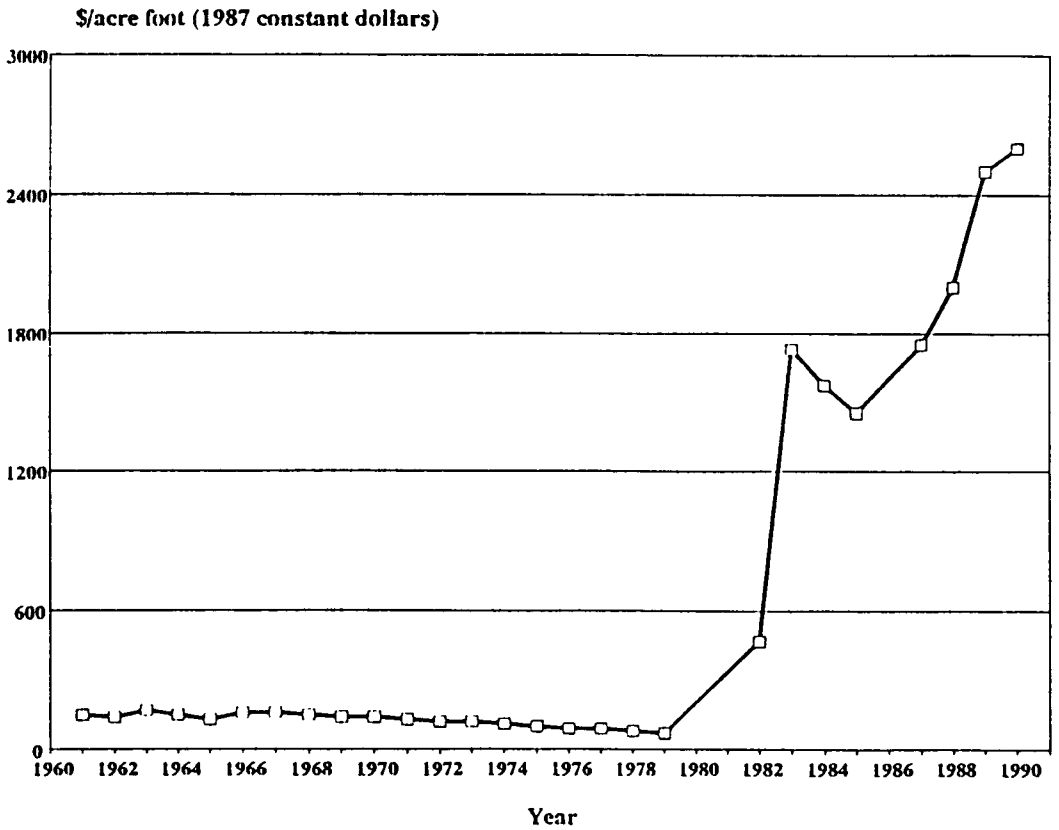

Figure 3. Water Rights Prices: Colorado Big-Thompson

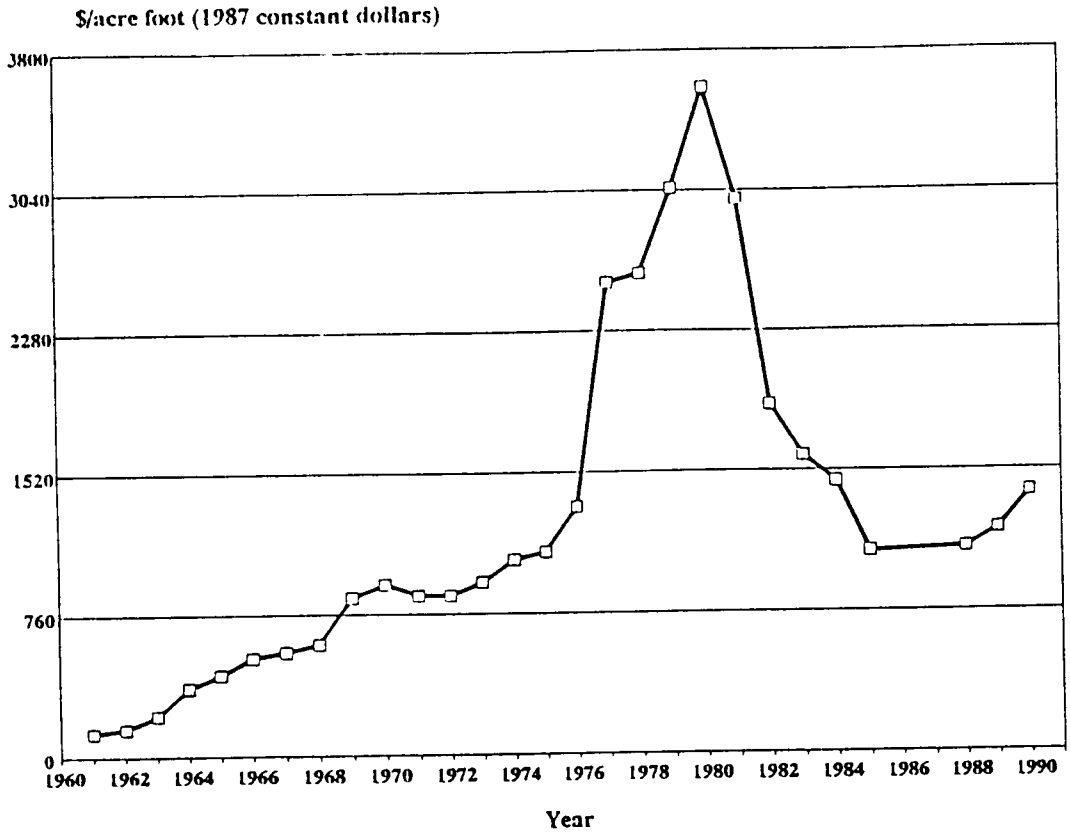

Figure 4. Water Rights Prices: Upper Gila Basin, New Mexico