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SOURCES OF WATER I: AGRICULTURE - THE DEEP POOL?

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**MOVING THE WEST'S WATER TO NEW USES:
WINNERS & LOSERS**

Natural Resources Law Center
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School of Law
Boulder, Colorado

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I. Introduction

Agricultural water supplies historically have been the primary source from which water is transferred for new uses. In many western states, transfers out of agriculture to municipal and industrial uses have been occurring for decades. (Brown et al. 1982, Saliba and Bush, 1987, Shupe et al, 1989)

Individual irrigators and irrigation districts hold substantial senior water rights in the major river systems and groundwater basins of the West. These senior rights were developed under federally sponsored projects to help settle the West and through local cooperative efforts among neighboring irrigators. The early contributions of private water development are often overlooked as current policy discussion revolves around the use and transfer of

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water in Bureau of Reclamation projects. By 1910 over 13 million acres of land were being irrigated through privately developed water supplies (Anderson, 1983). Federal assistance came in the 20th century to undertake larger, more capital-intensive projects than private entrepreneurs were able to undertake. Approximately 20 percent of the irrigation water used in the West now comes from federal water projects and the remaining proportion is provided by private, local and state water resource development. (Wahl, 1989).

The vast pool of senior water supplies developed to irrigate the arid West is a valuable regional asset. Senior water rights are highly prized not only by the farmers who hold them, but also by cities and industries seeking to insulate themselves against the drought year shortfalls to which more junior water holdings are vulnerable. Acquisition of senior rights to support urban growth and for drought protection has been the key force behind water transfers, and these factors will continue to be important in the 1990s. In addition, environmental and recreational demands for water are becoming an important consideration in many areas. Over the next decade, Indian water rights settlements are also likely to influence the movement of water from agriculture to other uses.

Economic factors affect how readily, and at what price, farmers will agree to sell or lease water they have used for agricultural purposes. Legal factors affect the hurdles that must be overcome in getting state approval for transfers and in addressing questions raised by other water users in the hydrologic areas affected by transfers. Political and legal factors also affect the degree to which rural communities and environmental interests can affect the outcome of a transfer proposal. Federal and state policies related to agriculture, water quality and the environment also play a key role in determining how much agricultural water is likely to be available for other uses.

and at what costs to the new users. This paper outlines and analyzes the key factors that will affect the cost and quantity of water transferred out of western irrigated agriculture in the 1990s.

II. An Overview of Agriculture's Role in Water Transfers

A. Water Markets--What Are They and Why Do They Develop?

The term "water markets," as used in this discussion, refers to transactions which satisfy three conditions:

1. Water's value is recognized as distinct from the value of land and improvements. Water is bought and sold for its own sake, not merely as an incidental part of a land transfer.
2. Buyers and sellers agree to reallocation voluntarily.
3. Prices are negotiable by the buyer and seller, not constrained to be "not for profit" or "at cost."

Transfers may include sale or lease of fee titles, water use permits, conservancy district shares and project contract rights; conditional water leases for drought year use; exchanges of water rights with varying priority dates and arrangements to use conserved water. Water resources which have been involved in market transactions include groundwater, native and imported surface water, artificially recharged and recovered water, effluent and conserved water.

The motivating force behind market transfers is the perception that economic gains may be captured by transferring water to a location or purpose of use in which it generates higher net returns than under existing use patterns. Three conditions must be satisfied for a buyer and seller to consummate a water transfer:

1. The seller must receive a price offer that equals or exceeds the economic benefits sacrificed in transferring water. A farmer,

for instance, must consider the net returns to water in irrigation, any decreases in the value of land, improvements and equipment due to reduced water availability and expected appreciation in the value of the water right over time.

2. The buyer must expect the economic returns from the water right purchase (which may be contributions to a manufacturing process, investment returns or profits from real estate development) to exceed the costs associated with the purchase.
3. The buyer must view market acquisition of water rights as an economically attractive method of obtaining water, relative to other possibilities--such as new supply development contracting with an existing water service organization.

Recent studies in the western states suggest that more water transfers occurred, and in more areas, in the 1980s than occurred in the 1970s or 1960s. Data on applications filed for water rights transfers in seventeen western states over the years 1963 to 1982 indicate a substantial increase in transfer applications over that twenty year period (Higginson-Barnett, 1984). Given the conditions necessary for a market transaction, there are several reasons why the level of market activity may be increasing.

The southwestern states have experienced rapid rates of population and economic growth since the Second World War. Concurrent with this growth, there has also been significant structural change in regional economies. While irrigated agriculture remains the predominant water use in the Southwest, the nonagricultural sectors of the economy now employ all but a fraction of the work force and generate a large proportion of income. The construction, manufacturing, service, and government sectors of the economy are competing successfully for land and water resources once devoted to agriculture. These economic trends make it more

probable that the first condition for a market transaction will be satisfied that there are net benefits to be gained in transferring water to a new use.

Historically, water for new users in the West has been provided through appropriating water rights and through constructing water development projects. The costs of such projects were subsidized heavily by the federal government. During this era, there was little incentive to purchase water rights from existing users. Appropriation of unclaimed water and inexpensive supply development were attractive alternatives to market transfers. However, surface water supplies are now fully appropriated in many areas and some states have set limits on groundwater pumping, so that it is no longer an inexpensive and easy matter to appropriate new water rights. Local supply development costs have risen for several reasons: the best reservoir sites have already been used, environmental considerations and conflicting water claims result in project delays and costly impact studies, and the federal government is less willing to subsidize project costs. Together, these changes make it more likely that the second condition for a market transaction will be satisfied--that market transfers will be an attractive means of obtaining water supplies relative to other alternatives.

While market transactions are primarily a response to economic incentives, legal arrangements play a central role in market development. State policies define the conditions under which transfers may occur and affect the transaction costs incurred by market participants in transferring water. Transaction costs are incurred in searching for trading partners; in identifying legal and hydrologic characteristics of water rights (priority date, return flow obligations, etc.); in negotiating price and other terms of transfer; in dealing with third parties who object to the proposed transfer; and in

satisfying applicable state and federal laws. Transaction costs influence the profitability of a given transfer and can, therefore, affect the level of market activity. (Colby et al, 1989b)

B. An Overview of Previous Transfers Out of Agriculture

Several regional markets which have had a series of transfers out of agriculture are briefly described. Prices are reported here in 1989 dollar values. Unless otherwise noted, transactions described are sales rather than leases. Descriptions of transfers refer to the quantity of water that may be diverted for use by the buyer, in acre feet per year of long term average yield. This quantity usually differs from the diversion right held by the seller because most states allow only the consumptive use portion of the right to be transferred.

Truckee Basin, Nevada

The Truckee River flows from Lake Tahoe in the Sierra Nevada Mountains into Pyramid Lake in the northwest Nevada desert. The Carson River flows just south of the Truckee Basin. Water from both river systems is used in the Truckee-Carson Irrigation District (TCID), located downstream and about 50 miles to the east of the cities of Reno and Sparks, which form the core of a rapidly expanding regional population. (Saliba and Bush, 1987)

The majority of water used in the area is primary flow and storage from the Truckee and Carson Rivers. Rights to the Truckee River were adjudicated under the Orr Ditch Decree of 1944. The Carson River was adjudicated under the Alpine Decree of 1980. (United States v. Orr Water Ditch Co. et al., Final Decree, U.S. District Court Nevada Equity No. A-3, 1944 (D. Nev. 1944); U.S. v. Alpine Land and Reservoir Co. et al., Nos. 87-1746 and 87-1747).

Reno and Sparks receive water from Sierra Pacific Power Company, a privately owned utility. Irrigators are supplied with Truckee River water delivered by private ditch companies. Lake Tahoe, Stampede Reservoir and Boca Reservoir serve as area-wide regulatory and storage facilities for the Truckee River.

About 50,000 acre feet of Truckee River surface water rights are used by Sierra Pacific to serve urban areas and 300,000 are used for irrigation annually. Up to 300,000 acre feet per year of Truckee River water flows into Pyramid Lake. The Pyramid Lake Indian Reservation and the Truckee-Carson Irrigation District are the major Truckee River water users located outside the Reno-Sparks area. Indian, irrigators, and municipal users of the Truckee River have been locked in continuing litigation over water resources since the early twentieth century. Growth of the Reno-Sparks area has brought increasing numbers of nonagricultural enterprises with a high willingness-to-pay for water. Institutional barriers have precluded the transfer of water rights from TCID to the Reno-Sparks area, forcing these communities to support growth by water resources elsewhere.

Until the late 1970s, almost all transfers of surface water rights involved the sale of irrigation rights to Sierra Pacific. In the late 1970's, Sierra Pacific became aware that it was not acquiring water rights fast enough to keep up with the growing demand for its services. Further, the Pyramid Lake Paiute Tribe succeeded in having a major storage reservoir designated for fisheries enhancement, rather than municipal supply. Increasing awareness of the scarcity of water has driven prices up more than twenty-fold since 1979 and has brought many new actors into the market. In the late 1980s, prices in this area were around \$2,000 per acre foot.

In addition to the active acquisition of irrigated land and water rights to support urban growth, water transfers are occurring to enhance wetlands and wildlife habitat. In 1990, the Nevada State Engineer approved several transfers of water out of irrigation to provide increased flows into the Stillwater Wildlife Management Area, a key link on the Pacific flyway for migratory birds. Transfers for environmental purposes will be an important market force here in the 1990s, as private and public entities continue to acquire water for wildlife and wetland enhancement. (Water Market Update, 1989-90)

Lower Sevier Basin, Utah

The Sevier River flows north from the high plateaus of southwestern Utah, terminating in the Sevier Desert one hundred and forty miles southwest of Salt Lake City. Four mutual stock irrigation companies -- Delta, Melville, Abraham and Desert (the DMAD companies), control virtually all surface flow rights on the lower stretch of the river. Until recently, water delivered by DMAD was used exclusively for irrigation. In 1980, the Intermountain Power Project (IPP) bought twenty percent of DMAD company stocks, thousands of acre feet of privately held groundwater rights, and eighty percent of the water stock in another ditch company upstream of DMAD. The total package of water rights, with a yield of 45,000 acre feet per year, cost approximately \$2,550 per acre foot. The water was acquired for cooling a new coal-fired power plant. The projected size of the power plant operation was reduced after IPP purchased the water rights. Consequently, about half the water rights owned by IPP are not needed for power plant operations and are rented back to irrigators.

Sales of mutual water company stocks and groundwater rights purchases have generated prices ranging from \$320 to over \$2,550 per acre foot since 1978. Prices rose sharply in the period preceding

and immediately after IPP's purchases in 1980, but leveled off to between \$320 and \$530 per acre foot in 1984 and 1985.

Northern Colorado Water Conservancy District, Colorado

The Northern Colorado Water Conservancy District (NCWCD) lies north of Denver and east of the Rocky Mountains. Urban centers include Boulder, Fort Collins, Loveland, Longmont and Greeley. Irrigated agriculture traditionally has been the major water use in the area, but growing demand by industry, power generation, and rapidly expanding cities characterizes a significant shift in water use. Urban growth and land acquisition since the late 1950s have converted increasing quantities of irrigation water rights to municipal uses. Cities obtain water rights through purchase of water company stock, dedication of water rights by developers in exchange for water service, and wholesale acquisition of water service organizations, especially irrigation companies whose service areas became urbanized.

The Colorado-Big Thompson (C-BT) project is the largest single supplier in the area, delivering an average of 225,000 acre feet of water annually from mountain reservoirs on the west slope of the continental divide to the NCWCD on the eastern slope. Although the C-BT project originally was developed as a supplementary water supply for irrigation, approximately one-third of C-BT allotments now are in municipal or industrial ownership. C-BT water is used to offset fluctuations in natural surface water flows on the eastern slopes. C-BT annual releases may range from 155,000 to 310,000 acre feet.

Water rights transfers in Colorado must be approved by a state water court, but this procedure generally is unnecessary when shares in a water district are transferred within that district's service area.

The larger the company service area, the larger the area over which the water may be marketed without water court proceedings. The high value attached to C-BT water lies in the fact that the project functions as a mutual stock water company, with the largest service area of any such organization in Colorado. Water rights controlled by the Colorado Big Thompson project (represented by shares, or "units," each one entitling the holder to 1/310,000 of the water delivered by the project in a given year) may be used or transferred anywhere within the NCWCD. The market price of a unit of C-BT water serves as a benchmark against which all other water rights and water rights prices in northeastern Colorado are evaluated. Real prices rose steadily through the 1960s and 1970s peaking at about \$3,800 per acre foot (in 1989 dollars, assuming a long term average yield of 0.75 acre feet per unit) in 1980. Prices dropped sharply in the 1980s and stood at about \$1,600 per acre foot in early 1990.

Southern Arizona

In Arizona, several distinct types of agricultural water holdings have been purchased by urban interests in the Tucson and Phoenix Active Management Areas (AMAs). AMAs were designated in the 1980 Groundwater Management Act as areas in which groundwater use is closely regulated in order to reduce groundwater overdraft. (A.R.S. 45 Sec. 461-577)

No irrigation rights in Arizona can be purchased without purchase of the land to which they are appurtenant. Purchasers of irrigated farmland located within an AMA may convert the groundwater rights on the land to "Type I" nonirrigation groundwater rights. Type I rights are limited to a maximum rate of withdrawal of three acre feet per irrigated acre per year, or the quantity which had been used for irrigation, whichever is less. There are no specific quantity limitations on groundwater pumped from lands located

outside of AMA's. Pumping from outside of AMA's is limited only to quantities of water that can be put to "beneficial use."

Within the Tucson AMA, the market for Type I rights is dominated by the city of Tucson. Tucson has been purchasing and retiring irrigated farmland in the neighboring Avra Valley since the early 1970s. By the end of 1986 over 20,000 acres of land had been acquired, with an annual total exportable yield of approximately 55,000 acre feet.

Numerous purchases of water rights and farmland have occurred in the Pinal and Phoenix AMA's. In 1985 the city of Mesa, located in the Phoenix AMA, purchased over 11,000 acres of irrigated farmland, located in the Pinal AMA to obtain about 30,000 acre feet. Average prices paid per acre foot were about \$1,100 per acre foot. In 1985, a Phoenix-area investment group purchased a farm in the Phoenix AMA with 2,240 irrigated acres. The irrigation water rights are convertible to municipal uses with a yield of 6,180 acre feet per year. The purchase price averaged slightly under \$1,400 per acre foot. In 1986, the same investment group purchased another farm in the Phoenix AMA with 6,070 irrigated acres and a yield of 15,340 acre feet in Type I nonirrigation rights, for approximately \$1,100 per acre foot. These purchases have given rise to numerous concerns about the local economic impact of farmland sales. Of primary concern are the effects of farmland retirement on the local and county tax base, secondary impacts of reduced farming activity on other local businesses, and the loss of water rights for future economic development.

Numerous other purchases of groundwater and surface water rights have taken place in Arizona outside of the Active Management Areas, mostly in La Paz County in western Arizona. In 1984 the city

of Scottsdale purchased the 8,400 acre Planet Ranch, with an estimated yield of 13,500 acre feet of surface water rights, for about \$950 per acre foot. The city hopes to transport water from out of the Bill Williams River to the CAP aqueduct, which would then carry the water to Scottsdale. The Crowder-Weiser Ranch was purchased by a real estate development company in 1985 to support projects in the Phoenix Area. The total yield of transportable water rights from the Crowder-Weiser Ranch is estimated to be 51,140 acre feet of groundwater per year. In 1986, the city of Phoenix purchased 16,000 acres in the McMullen Valley of eastern La Paz County, for slightly over \$32 million (in 1989 dollars). The city estimates that between six and seven million acre feet of recoverable groundwater are in storage in the aquifer underlying the lands.

Most of these "water ranch" acquisitions lie outside any Active Management Area and so, legally the new owners are free to pump as much as they want, so long as the water is being put to "beneficial use." However, groundwater exporters can be held liable to pay damages to local water users who can demonstrate that the export of the water is causing them harm. (A.R.S. 45-544 and -545)

Gila-San Francisco Basin, New Mexico

The Gila and San Francisco Rivers drain the southwestern corner of New Mexico. The Gila-San Francisco Basin is sparsely populated, but Silver City, a town of about 20,000 people, is located nearby. The Gila-San Francisco Basin has been closed to additional appropriations since the 1960s. New groundwater wells may still be developed, however, by converting a surface water right to a groundwater right and changing the point of diversion to the desired well location. Since the 1960s, as changes in land use have created demands for water distant from old irrigation ditches, many surface

water rights have been retired and exchanged for groundwater rights. (Saliba and Bush, 1987)

Rights to the Gila and San Francisco river systems were adjudicated in the early and mid-1960s as a result of Arizona v. California. Approximately 30,000 acre feet of Gila and San Francisco River water may be used in New Mexico's Gila-San Francisco Basin.

Until the mid-1960s, agriculture was the major user of water in the Gila-San Francisco Basin. The pattern of water use changed substantially in 1968, when Phelps Dodge acquired approximately two thirds of all the water rights appurtenant to lands in the Gila portion of the basin. Other nonagricultural commercial and household water users have since entered the market to acquire water rights. Water rights purchases by area mines have constituted the largest volumes of water transferred over the past fifteen years, though they represent only a small number of transactions. Most transactions took place during the 1970s and 1980s and involved small quantities of water rights, frequently involving an acre foot of water or less. Since all outdoor water use requires a water right (even domestic gardens and lawns), there is an active market for small quantities of water to support residential development. Also, the town of Silver City acquires water rights from irrigators in this basin, which it pipes over the Continental Divide for municipal uses. Prices ranged between \$1,600 and \$1,700 per acre foot in 1970s and then rose sharply to around \$3,200 an acre foot in 1979. Prices declined again in the 1980s to around \$1,800 per acre foot. In 1990, water demand by new residential development and renewed mining activity is pushing prices back up to around \$3,000 per acre foot.

Comparison Of Prices Across Market Areas

Water rights prices are a function of the interaction between demand and supply-side forces in any given market area. Demand side forces reflect expansion and contraction of water-using activities, which in turn depend on the vitality of the regional economy, price levels for energy, minerals and agricultural commodities, population and income trends and other factors. Supply-side forces reflect changes in water availability and in the costs of pumping groundwater, developing new surface water supplies, contracting for public project water and pursuing other alternatives to market acquisition of water rights. Differing demand side forces were dominant in the study areas over various periods of time--energy development in the Lower Sevier Basin in the late 1970s, rapid urbanization in Central Arizona and Colorado's front range during the 1960s and 1970s and mining expansion in the Gila-San Francisco Basin during the 1960s and 1970s. On the supply-side, Arizona, Colorado and Utah water prices are affected by new water supplies from the Central Arizona Project, the Windy Gap Project, and the Central Utah Project, respectively. Anticipation of new water supplies can decrease incentives to bid water away from existing rights holders, especially if the new water is federally subsidized.

Shifts in demand for water rights and new perceptions regarding water scarcity led to rapid price increases in the Northeastern Colorado and Truckee Carson market areas. The impact of a large new water buyer can be observed in Utah as prices increased sharply when Intermountain Power Project entered the Lower Sevier Basin market in the late-1970s. Prices in the Gila-San Francisco Basin, which had been stable for a number of years, took a sudden turn upwards in the late-1970s when the Exxon Corporation began to acquire water rights for its new mining operation.

It is instructive to consider not only what forces drive water rights prices up, but also what forces allow them to fall. Water rights prices in northeastern Colorado fell in the 1980s at least partially in response to the impending completion of the Windy Gap Project, declining interest rates, and a faltering farm economy. In addition, some observers believe that cities began to recognize they had acquired water rights to meet foreseeable needs, and that continued acquisition of agricultural water rights might have undesirable effects on the regional economy and on the maintenance of attractive agricultural greenbelts around urban communities. In Utah, the scaling back of the IPP to one-half its planned size was followed by a drop in prices. The stabilization of water rights prices in Nevada's Truckee Meadows, following price escalation in the early 1980s, may be a signal that panic buying of water rights has slowed since private and government organizations agreed upon a system to facilitate an orderly transition of water rights from agricultural to municipal use.

III. The Costs Of Transferring Water Out Of Agriculture

An organization seeking to transfer water out of agriculture has a number of costs to consider. Negotiating a price acceptable to the current water right holder; an irrigator, ditch company or irrigation district, is only one of many possible expenses. Others may include legal fees, fees paid to the state administrative agency, hydrologic and engineering studies, compensation to other water users who may be impaired, and mitigation of environmental impacts.

A. What Affects The Prices Farmers Are Willing To Accept?

How much an irrigator can reasonably accept for water rights depends on several factors:

- 1. The value of water in irrigation**, which in turn depends on both crop revenues and production costs.

Crop revenues are a function of crop prices, and are also

heavily influenced by federal commodity programs. Federal crop price support programs make farm revenues much higher than they would be otherwise. These additional receipts make water more valuable to the farmer and thus make it more expensive to bid water out of agriculture.

Production costs have many components. Those most relevant for this discussion are the costs of irrigation water and of energy. Increases in the cost of irrigation water from federal projects will increase farmers' production costs and reduce the net value of water in agriculture. The cost of energy is an important component of the costs of irrigating -- both for farmers who pump groundwater and farmers who use surface water that must be pumped and conveyed from the river to their fields. Renegotiation of energy contracts and declining groundwater tables are two factors that can significantly affect irrigation costs and thus influence farmers' incentives to sell or lease their water.

2. Returns to farmland and assets without water

The economic benefits are farmers really giving up when they sell water rights are the differences between economic returns with and without water rights. If farmland is not transferred when water is sold, the land may have value for dryland crop production or grazing. Revenues, production costs and risks will each be quite different in these alternative uses, if they are practicable at all, than they were for irrigated crop production.

3. Expectations regarding future water values.

A key question in any irrigators mind involves the timing of a water transfer. "Should I accept an offer for my water rights this year or hold onto them hoping for higher prices?" The value of water in farming is based on the expected present value of the periodic receipts to which the water right entitles its owner. Because the value of a water right is based on a stream

of returns over time, it is sensitive to the time rate of discount and the expected change in relative price of water rights in the future. Because the expectations that affect prices for water rights are uncertain, willingness to sell is also influenced by the risk-aversion of the farmer, and his willingness to hold on to his water, taking the chance that the value of his right may fall rather than rise.

4. Value of rural, agricultural lifestyle.

Sociological and economic studies indicate rural households are not in farming primarily for its income potential. In fact, many farmers are living on less income than they could earn in other jobs requiring comparable skills because they value the independent, rural lifestyle that goes with farming. Where the family has been established in farming for several generations and has close cultural and historic ties to the land, these lifestyle values may be quite important. While not confined to religious or ethnic minorities, these values are particularly evident in the pueblos and acequias of the Rio Grande Valley and the Mormon farming communities of the Great Basin.

All of the factors described play a role in determining the price at which farmers may be willing to sell or lease water. Where water rights are obviously quite valuable in non-agricultural uses, farmers may hold out for prices that far exceed the value of water in irrigation. For instance, Gardner and Miller (1983) suggest that prices in Colorado's Front Range peaked at values equal to the capitalized marginal demand for water by municipal users in the late 1970s. As urban growth accelerated, agricultural right holders believed that they each had a high probability of being able to transfer their water rights to municipal or industrial water users and were no longer willing to sell at prices that reflected only water's value

in irrigation. For a brief period of time, the value of the water in urban uses was fully capitalized into market prices.

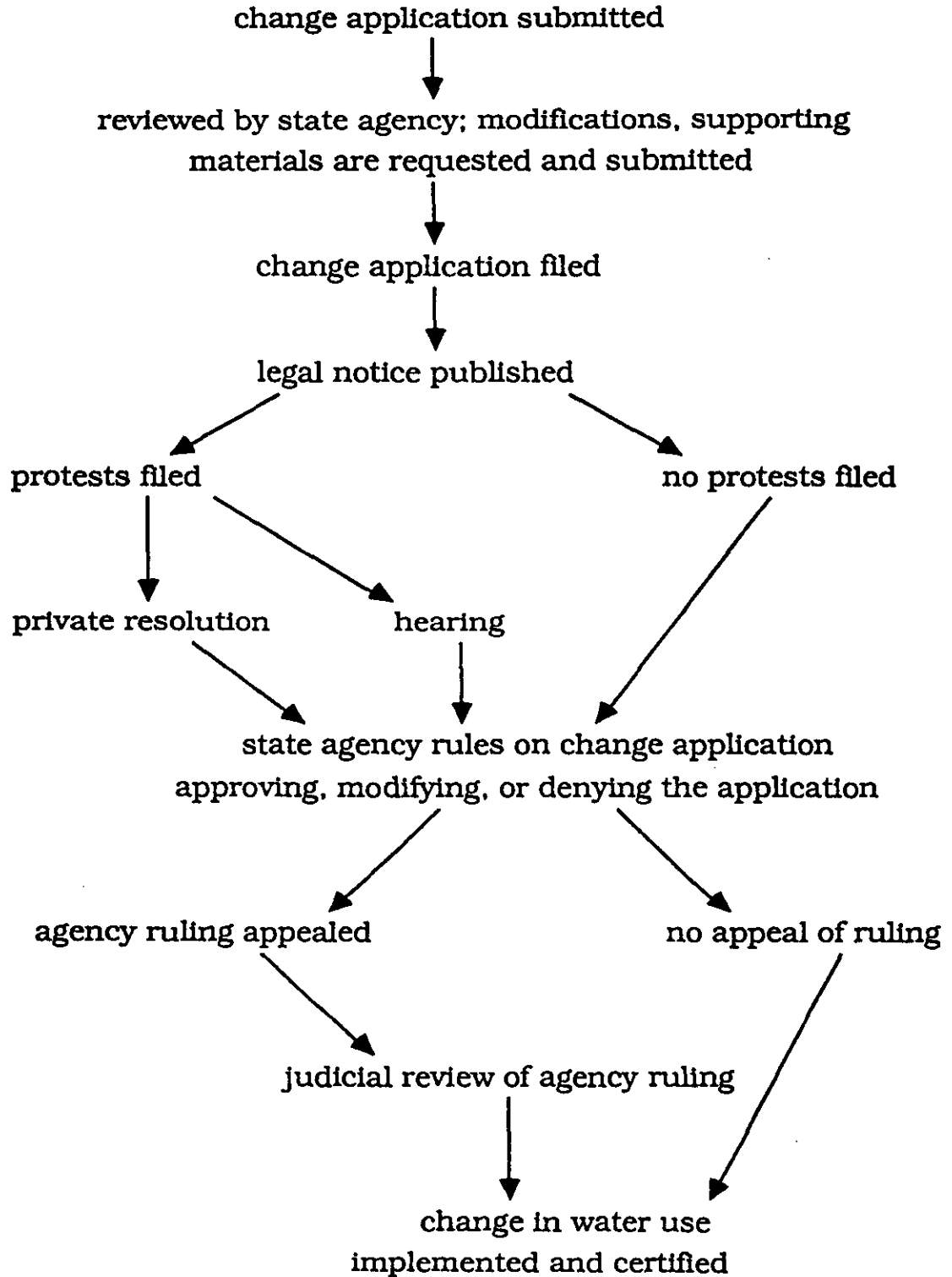
B. Satisfying State Transfer Approval Processes

After a satisfactory price has been negotiated, water buyers face other costs in transferring water out of agriculture, including the costs of satisfying state transfer processes. Most of the western states have developed a process and criteria for evaluating applications to change the place and/or purpose of use for water rights. (Colby et al, 1989a) Although each state process has unique features, they follow the general outline illustrated in Figure 1.

The procedures to gain approval for changes in the place or purpose of use of water rights can be complicated. The complexity of these procedures and uncertainty regarding whether a transfer will be approved can prove costly for those seeking to transfer water and can discourage water reallocation. At the same time, formal approval processes provide an arena in which concerns regarding proposed transfers can be addressed. State statutes and case law provide criteria by which transfers are evaluated. Foremost among the transfer impacts considered is impairment of other water right holders. In some states, transfer approval procedures provide a forum where other concerns can be expressed -- such as impact on local economies, recreation, fish and wildlife.

The complexity of each state's approval process affects the amount of documentation and the need for professional consultants -- such as attorneys, engineers, and surveyors. Changes of use in Colorado's most active water court divisions are often heavily contested. The large number of Statements of Opposition typically filed, the judicial nature of the procedures, and the de novo appeal process are some of the factors which combine to make the Colorado

Figure 1. Change of Water Right Process



system highly litigious. Therefore, attorneys and technical consultants are typically retained at an early stage (Colby et al, 1989b). In contrast, the change of use process in Idaho and Wyoming is much less formal and complicated, partly because there has been less controversy over water transfers in these states. In areas where there is less competition for existing water sources, changes in use generate less conflict among water users and legal counsel and technical consultants are less frequently required.

There are often parties who believe their interests are adversely affected by the proposed change in water use and who object to its approval. Formal objections to change applications are allowed in all of the western states. These objections are the primary means for water rights holders to express their concerns and, in some states, for the public interest to be protected. The most common basis for filing a protest is impairment of existing water rights.

The requirements for standing to file a protest vary considerably. In Montana, objections are limited to downstream water rights holders. (M.C.A. Sec 85-2-308, 1987) Colorado opposers need not be water rights holders, but statements of opposition can be filed only on the basis of injury to water rights. (C.R.S. Sec 37-92-305(3), 1973) Wyoming, Nevada, Utah, and Arizona have no statutory requirement that protestants must hold water rights, but in practice give less credence to protestants who do not hold water rights that could be affected by the change. (Colby et al, 1989a) A recent Utah Supreme Court decision ruled that a protestant's claim may not be dismissed simply because the protestant does not hold water rights, and that any interested party has standing to protest a change in water right application. (Bonham v. Morgan, No. 880143, 1989) New Mexico statutes outline the basis on which protests can be filed. (N.M.S. Sec 72-12-3(D), -7(A), 1985 and Groundwater Rules and

Regs. Art. 2-8, 1966) These include: (1) impairment of the protestant's own water rights, (2) detriment to the public welfare, or (3) detriment to water conservation in the state.

Resolution of filed protests is often a critical and costly part of the transfer process. Progress on the application can be significantly delayed during this stage. Although there are some innovative approaches to resolving disputes between applicants and protestants, there are two primary alternatives: private resolution among the parties or a hearing by the state agency. Informal private resolution of conflicts between applicant and protestants is usually the least expensive and swiftest alternative for resolving protests. A hearing by the state agency is the alternative to failed negotiation.

Agency hearings can be as informal as a meeting between a state agency staffperson, the applicant and protestants, or as formal as a judicial proceeding in which all parties are represented by counsel and witnesses are under oath. The location, formality, and timeliness of the hearing can greatly affect the cost of the hearing for applicants, protestants and the state.

Following the conclusion of the hearing, or a privately negotiated resolution of objections to the proposed change, the state agency must make a decision on the transfer application. Some states' define specific criteria upon which the ruling must be based. Substantive criteria for approval of a change in water use application are desirable because they provide guidelines to potential applicants and reduce uncertainty regarding approval. Non-impairment of other water rights, and non-enlargement of the subject water rights are statutory criteria in Arizona, Idaho, Montana, Nevada and Wyoming. Protection of the "public interest" or "public welfare" is a basis for denying an application in Idaho and has been utilized in New Mexico.

(Idaho Code Sec 42-203A, Supp. 1989, N.M.S. Sec. 72-5-7, 1985)
Bonham v. Morgan recently extended Utah criteria for applications to appropriate water to water right change applications.

Parties who are dissatisfied with the decision of the state agency may appeal the ruling. Typically, these appeals are handled by the district or appellate levels of the state court system, but sometimes they must be addressed within the administrative agency prior to using the judicial system. The highest level of appeal for state agency rulings is usually the state supreme court.

Political and economic pressures to incorporate broader interests and more flexibility in water transfer processes are intensifying. Environmental organizations increasingly scrutinize the effects that water transfers may have on fish, wildlife, recreation, and the riparian environment. In some states, these effects can be considered when a transfer proposal is evaluated. In many states, however, there is no provision in the administrative process for addressing potential environmental concerns. Rural areas are concerned that state water transfer procedures do not address the economic and social impacts on the area from which water is transferred. Rural interests in several states are lobbying for policies that routinely consider area-of-origin concerns when a change in water use application involves the export of water from one basin to another.

C. The Role of Transactions Costs in Water Transfer Policy

The ability to impose transactions costs on those proposing to transfer water represents power and voice in the water allocation process. Parties who can gain standing to formally object to a transfer have the power to increase the costs that must be borne by transfer proponents, provided that they themselves are also willing to

expend time and money. Water transfers are generally undertaken 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 through imposing transactions costs gives bargaining power over the conditions of the transfer and an entree' into the decision process.

It is not surprising that the category of persons who have a legal basis for filing protests has expanded as public interests in water allocation has been more widely recognized and appreciation of the diverse benefits generated by water resources has broadened. (Colby, 1989a; Johnson and Dumars, 1989) The earliest, and still the most common, basis for protesting a proposed transfer is impairment of existing water rights, based on the notion that rights must be secure, protected against arbitrary infringements, for water users to make the long term investments and commitments necessary to settle the West. Other concerns which provide a valid basis for objecting to a transfer vary considerably among the western states. These concerns include local economic impacts, impacts on recreation, fish and wildlife, and impacts on water conservation. Colby et al (1989a) and Johnson and Dumars (1990) summarize recent changes in the criteria considered when evaluating a transfer.

A recently completed study provides some interesting information on the costs of satisfying state criteria and procedures in four western states. These costs are one important consideration in evaluating future transfers of water out of agriculture. Colby et al, (1989b) found that, in many areas, the costs of going through transfer approval procedures is insignificant compared to prices paid to acquire water rights. However, for water transfers occurring in areas where transfers tend to be controversial and heavily opposed the legal and engineering costs of getting a transfer approved were about 20-

30% of the cost of acquiring the rights. Unopposed transfer applications were, of course, less costly for the applicant than those which were opposed. The greatest expenses arose when public interest issues were raised as a part of objections to the transfer. The relative novelty of public interest provisions in western state water transfer law means that state agencies have little experience in interpreting and administering public interest criteria. For transfers that were opposed, opponents usually incurred some legal costs and in some cases with multiple protestants, the protestants cumulatively spent as much as the applicants for the transfer. While the study analyzed transfers in only four southwestern states (Colorado, Utah, New Mexico and Nevada), the results provide some insights on the importance of transactions costs in transferring water out of agriculture.

IV. Innovative Transfer Arrangements

Innovative transfer arrangements promote efficient and flexible water use, as do traditional purchases, but often have a less severe impact on rural communities and riparian environments. Thus they may incite fewer objections and be more easily negotiated. The following paragraphs describe a number of different types of voluntary transfers which can move water to new uses and provide drought supplies for urban and environmental needs.

Dry year options and conditional lease-backs, negotiated in anticipation of drought, are two ways to ensure that water quickly could become flexible if it were needed elsewhere. The difference between these two approaches is the degree of security and long-term control over water provided by each. Under a dry year option, ownership of the water right remains with the original water user. The new water user, who might be a municipal water provider or a state agency, enters into an agreement with an irrigator allowing them to

use water under specific conditions. For water users who need highly reliable supplies, this type of arrangement provides a back-up source of water for dry years. In one instance, a central Utah city paid a nearby farmer \$25,000 up front for a 25-year dry year option and agreed to provide, in any year the option was exercised, \$1,000 and 300 tons of hay to maintain the farmer's livestock. The option was exercised three out of the first 25 years the Option was in place (Clyde, 1986)

Though promising, dry year options can be unattractive to farmers who desire more certainty when planning their farming operations. The following example illustrates this point. In 1987 the Metropolitan Water District (MWD) of Southern California attempted to negotiate a dry year option with the Palo Verde Irrigation District (PVID). Under the proposed arrangement, MWD offered Palo Verde farmers a payment up front at the time they register acreage in the dry year option from irrigation and additional payments during years the option would be exercised. (Water Market Update, 1987). MWD expected to call that acreage into retirement once about every seven years in order to firm up municipal supplies. Farmers rejected the proposal for a number of reasons, including its effect on their ability to make long-range farming plans. Under such arrangements, farmers face substantial uncertainty in planning their crop rotations, their marketing strategies, equipment leases, and purchases of inputs.

A number of other issues need to be addressed when dry-year options are considered. One of these involves defining the conditions under which the option will be exercised. Reservoir and stream flow levels can be specified as a basis for activating the option. Additionally, it is necessary to ensure that farmers be compensated for lost crop revenues when the option is exercised, for disruption of

farm planning and land use patterns and for any production and marketing expenses incurred prior to being notified that land would be dried up for that season. The terms and timing for notification are important issues to irrigators.

Under conditional lease-backs, land and water are purchased by the entity desiring long-term control of the water, most often a municipality or an industry, and are leased back to the farmer so that farming can continue except when the water is needed to replace drought short falls. The new water right holder could be a state agency, and the lease back conditioned on the need for water to support instream flows for recreation, fish and wildlife during dry seasons and years. Conditional lease-backs are attractive to growing cities because they assure a supply of water that can be reserved either during droughts or for water demand generated by new growth.

There have been several lease-back arrangements implemented in Arizona. In 1985, the city of Mesa purchased 11,606 acres of farmland in Pinal County, planning eventually to use the water in the city's expanding service area. Meanwhile the city is leasing the land back to farmers and the land continues to be irrigated. (Kolhoff, 1988). The city of Phoenix purchased 14,000 acres of farmland in western Arizona's McMullen Valley in 1986. The city plans to retire the land and transfer the associated groundwater to urban uses. Phoenix is keeping the farmland in production, employing local farmers and postponing some of the economic impacts of the eventual retirement of that acreage.

Exchanges among water sources are one way to promote water use flexibility and to encourage use of surface water in years it is available, saving non-renewable groundwater supplies for times when streamflow is low.

In 1989, Metropolitan Water District and Arvin Edison Water Storage District, an agricultural water provider in the southern San Joaquin Valley, agreed on an innovative water exchange to firm up MWD's dry year supplies. In wet years MWD will store unneeded State Water Project entitlements in the aquifer underlying Arvin-Edison. In dry years, the irrigators will pump the stored water to irrigate crops and allow MWD the use of about 100,000 acre-feet of federal project water that would have otherwise been used for irrigation. The farmers benefit because the stored water raises the groundwater level and reduces their pumping costs. MWD receives reliable supplies that cushion it against drought. Before being implemented, the exchange must be approved by the California Department of Water Resources and the Bureau of Reclamation. (Quinn, 1989)

In a number of areas, policymakers are encouraging farmers to use treated effluent to irrigate so that higher quality water supplies normally used for irrigation can be available for uses requiring higher quality water. For instance, farmers in the Tucson area receive treated effluent from Municipal treatment plants and this enables them to cut back on groundwater pumping. (Lieuwen, 1989)

Exchanging priority can help certain water users, especially cities and industries, to secure highly reliable supplies in drought years. Such exchanges of priority have substantial potential with Indian reserved rights, since the priority date of most tribal rights goes back to the date the reservation was established. There have been some agreements to defer tribal seniority in drought years so that junior right holders have more reliable water supplies. One arrangement involves the Navajo Nation, which has a senior claim on the San Juan River. In exchange for congressional approval of the Navajo Indian Irrigation Project, the Nation agreed to defer its

seniority during dry years and to share water shortages proportionately with non-Indians. This gives downstream users in the Rio Grande Basin, including the City of Albuquerque, more reliable supplies during drought. (Back and Taylor, 1980).

Possibilities also exist for exchanging priorities in the Colorado River Basin where several Indian tribes have very high priority rights to the Colorado River. Phoenix area municipalities, the Metropolitan Water District of Southern California, and the city of San Diego all have considered negotiating with tribes located along the Colorado River to obtain more reliable dry year supplies. Discussions are still in the early exploratory stages (Water Market Update, 1987-89).

Another policy approach that could allow irrigation water to move to new uses while minimizing impacts on the area of origin, involves incentives for water conservation, salvage and reduced consumptive use. Most western states historically have taken a hard line against new uses and transfer of conserved water, arguing that the portions of a water right "salvaged" through conservation measures become available to new or junior appropriators, rather than to those taking the conserving action. California and Oregon are exceptions, having passed statutes encouraging transfer of conserved water. There are a number of steps a state can take to facilitate the transfer of conserved water. A first step is to provide the statutory incentive and authority by explicitly allowing transfer of conserved water and by protecting water rights not being exercised due to conservation from loss through forfeiture and abandonment proceedings.

Even after enabling statutes are in place, a number of difficult technical and hydrologic issues remain in determining the quantity of salvaged water that actually can be transferred. 1987 Oregon

legislation states that the only salvaged water that may be transferred is that which in the absence of the conservation measure otherwise would have been irretrievably lost to the system and thus unavailable to other water users. (State of Oregon, Senate Bill 24, 1987) Capture of substantial irretrievable losses probably will not come from improvements in irrigation efficiency, however, since most salvaged water previously re-entered the system as return flows. Transferrable water could potentially come from switching from a higher to a lower consumptive use crop. Other measures which decrease the amount of water irretrievably lost through evaporation and deep percolation include lining earthen canals, better field drainage, and improved on-field water management. Allowing farmers who reduce consumptive use, perhaps through new crop rotations, to use the additional water on other land, or to sell or lease the water can provide strong conservation incentives. Laws in the western states on use and transfer of salvaged or conserved water vary considerably, with protection of other right holders being the primary constraint on new uses and transfers. (Colby, 1989a)

There are few examples to date of successful transfers of conserved irrigation water. The city of Casper, Wyoming is paying for canal lining on over 200 miles of the nearby Casper-Alcova Irrigation District's conveyance system. This arrangement is expected to provide the city with about 7,000 acre-feet of water per year, (Wahl, 1989). In California, MWD and Imperial Irrigation District have reached a preliminary agreement after years of negotiation. MWD will pay for conservation measures within the district that are intended to salvage about 100,000 acre-feet per year, that can then be transferred to MWD's service area. (Water Market Update, 1989) Interestingly, both examples involve water provided under Bureau of Reclamation projects rather than water rights held under state law by individual appropriators.

Innovative transfer arrangements, structured to meet dry year needs of growing cities, critical fisheries or environmentally sensitive wetlands, can accomplish many of the objectives that outright purchase of water rights accomplishes. Water becomes more flexible, more responsive to changing needs and values, and yet is not permanently removed from its original place and purpose of use. The 1990s will no doubt provide new examples of the advantages and complexities of conditional water use contracts, exchanges of water sources and water right priorities, and of transfers involving salvaged and conserved water.

IV. Summary

Agriculture will continue to be a key source of water for new uses during the 1990s. The prices at which farmers are willing to sell or lease their water will depend on crop prices, federal agricultural commodity programs, pricing policies for federally supplied water and the cost of energy. Transactions costs to satisfy transfer procedures and criteria, and to resolve conflicts with third parties who object to a proposed transfer will be an important component of overall transfer costs. These transactions costs are likely to be higher in the 1990s than previously, as a more diverse set of interests are influencing western water decisions and broader concerns must be addressed when contemplating a transfer. Environmental, recreational, rural community and tribal considerations each have an increased role in water policy and allocation. In many areas of the West, the water that can be taken out of agriculture at low cost and with little controversy has already been transferred. In the 1990s, transfer arrangements that do not permanently dry up irrigated lands and remove water from the area of origin will need to be pursued in order to make agricultural water available for new uses. Agricultural water supplies may represent the "deepest pool" in the West, but tapping that pool will involve higher costs and more complex negotiations with farmers and third parties than ever before.

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