



Spring 1989

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Recommended Citation

Victor Brajer, Al Church, Ronald Cummings & Phillip Farah, *The Strengths and Weaknesses of Water Markets as They Affect Water Scarcity and Sovereignty Interests in the West*, 29 Nat. Resources J. 489 (1989).

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The Strengths and Weaknesses of Water Markets as They Affect Water Scarcity and Sovereignty Interests in the West

ABSTRACT

Primarily as a result of a landmark decision of the Supreme Court in the Sporhase case, the issue of water scarcity has reemerged over the last few years as a topic of practical and intellectual focus. This paper addresses the desirability of using the free market as a means for allocating scarce water resources. First, the potential strengths and weaknesses claimed for markets as a means for allocating scarce commodities are discussed. Next, the extent to which the market for water rights in New Mexico is a competitive, well-functioning one is examined. Concluding that this market is probably far from being "perfect," or well-functioning, the implications of allocating water within an imperfect market are then considered. Finally, some special problems are outlined that may arise for governments if major reliance is to be placed on markets.

I. INTRODUCTION

While water scarcity has presented problems in Western States since well before the settlement of this area by the United States,¹ it has reemerged over the last few years as a topic of practical and intellectual focus, primarily as a result of a landmark decision of the Supreme Court in the *Sporhase* case.² As is well-known today, the Court in *Sporhase* held that water (in this case, groundwater) was an article "in commerce" and was therefore subject to the Commerce Clause of the Constitution. Of the many potential effects of this decision, two are of primary importance for the purposes of this paper. First, regional markets are essentially established for unappropriated (and, for that matter, appropriated) water supplies, the bounds of which are simply set by acquisition and

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1. A. MASS & R. ANDERSON, *AND THE DESERT SHALL REJOICE: CONFLICT, GROWTH AND JUSTICE IN ARID ENVIRONMENTS* (1978).

2. *Sporhase v. Nebraska ex rel. Douglas*, 458 U.S. 941 (1982).

transportation costs.³ Second, western states, who have traditionally dealt with conflicts between scarce water supplies and growing water needs via water-use planning and regulation, now find the water management problem out of control—certainly, out of *their* control.⁴

There has been mixed reaction to this dramatic change in the decisionmaking environment for the control and allocation of water resources in the West.⁵ Some see the logic underlying the *Sporhase* decision as faulty per se,⁶ and point to the adverse, if not disastrous, effects of putting water resources in a state out of the control of the state and into the marketplace.⁷ These predicted negative effects include the distortion of longstanding water institutions,⁸ a failure to adequately provide for the water needs of future generations,⁹ and a loss of "social" values arising from common uses of water resources (such as instream flows).¹⁰ Others welcome the change, viewing the free market as offering a means for imposing discipline and flexibility on water rights institutions in the West. Advocates of this position argue that, as conditions relevant for the productivity of water change through time, the market provides a mechanism for shifting water use from low to high valued uses, with water use remaining *efficient* through time.¹¹

Legal scholars, debating points of law raised in the *Sporhase* case and later related cases,¹² may be puzzled at what might seem to be the in-

3. See N.M. WATER RESOURCES RESEARCH INST. & UNIV. OF N.M. SCHOOL OF LAW, STATE APPROPRIATION OF UNAPPROPRIATED GROUNDWATER: A STRATEGY FOR INSURING NEW MEXICO A WATER FUTURE (1986) [hereinafter WRR].

4. See *id.*; DuMars, *New Mexico Water Law: An Overview and Discussion of Current Issues*, 22 NAT. RES. J. 1045 (1982).

5. See the collection of papers which focus on this debate in 25 NAT. RES. J. 863-1024 (1985).

6. Utton, *The El Paso Case: Reconciling Sporhase and Vermejo*, 23 NAT. RES. J. ix (1983).

7. See WRR, *supra* note 3; K. Burke, R. Cummings & J. Mays, *Interstate Allocation and Management of Nontributary Groundwater* (1984) (discussion paper prepared for Western Governors Ass'n, available from Western Governors Policy Office, Denver, Colorado); DuMars, *The State as a Participant in Water Markets: Appropriate Roles for Congress and the Courts*, 21 WATER RESOURCES RES. 1771 (1985); Utton, *Alternatives and Uncertainties in Interstate Groundwater Law*, 21 WATER RESOURCES RES. 1767 (1985); Nunn, *The Political Economy of Institutional Change: A Distribution Criterion for Acceptance of Groundwater Rules*, 25 NAT. RES. J. 867 (1985); Utton, *In Search of an Integrating Principle for Interstate Water Law: Regulation versus the Market Place*, 25 NAT. RES. J. 985 (1985) [hereinafter Utton, *In Search of an Integrating Principle*].

8. Brown, McDonald, Tysseling & DuMars, *Water Reallocation, Market Proficiency and Conflicting Social Values*, in *WATER AND AGRICULTURE IN THE WESTERN U.S.: CONSERVATION, REALLOCATION, AND MARKETS* 191 (G. Weatherford, ed. 1982) [hereinafter *Water Reallocation*].

9. DuMars, *supra* note 7.

10. See Nunn, *supra* note 7.

11. For a collection of papers that are centered on this particular point of view, see *WATER RIGHTS: SCARCE RESOURCE ALLOCATION, BUREAUCRACY, AND THE ENVIRONMENT* (T. Anderson, ed. 1983). A much less elegant, and more advocative, exposition of this view is seen in Anderson, *The Market Alternative for Hawaiian Water*, 25 NAT. RES. J. 893 (1985).

12. *E.g.*, *City of El Paso v. Reynolds*, 597 F. Supp. 694, 700 (D.N.M. 1984). Some flavor for this debate is seen in Utton, *In Search of an Integrating Principle*, *supra* note 7.

tellectual disarray among economists over the desirability of markets as a means for allocating scarce water resources. This is particularly so, given the lawyers' penchant to occasionally view economics as being based on a relatively value-free, "objective" set of premises.¹³ After all, one might ask, Aren't "markets" what economics is all about? This is the issue which is addressed in this paper, an issue which involves the following inextricably related questions:

- a. If an economic or market solution is to be endorsed, what are the strengths claimed for markets as a means for allocating scarce commodities and what are their potential weaknesses?
- b. What are the requisites or conditions required for a "well-functioning" market? Do we now have any well-functioning markets for water in the West? If conditions for a "perfect" market described do not exist, what would be required to establish such conditions?
- c. If the above-described conditions for a perfect market cannot reasonably be established, what are the implications of allocating water within an "imperfect" market?
- d. Finally, what are the "special" advantages and problems for state and federal governments that may arise should major reliance be placed on markets as a means for allocating water resources?

The importance of these questions to the non-economist is the primary motivation for this paper. Questions (a) through (d) describe the essence of the discussions which will be given in sections II through V below. The paper closes with section VI wherein some concluding remarks are offered.

II. COMPETITIVE MARKETS AND THE "EFFICIENT" USE OF RESOURCES

A competitive market is a market in which the forces of demand and supply determine prices (a somewhat more rigorous treatment of this concept is used below in section III). Thus, for any scarce resources or commodities, individuals who want access to the resources must bid for them. Prices for the resources will be bid up until there is a match between the amount of resources that people want to buy (at the bid price) and the amount of resources that people will sell (at the bid price). If, at current prices, there are more resources than there are individuals who will buy them, the price would fall, of course. If there are more individuals

13. In this regard, see Burness, Cummings, Gorman & Lansford, *Practicably Irrigable Acreage and Economic Feasibility: The Role of Time, Ethics, and Discounting*, 23 NAT. RES. J. 289, 290-91 (1983).

who want to buy the resources than there are resources, the price would be bid up still further.

The process described above results in what economists refer to as an "efficient" allocation of the resources. It is important that one understand our use of the term "efficient." We *assume* that the price paid for the resource reflects the minimum value of the resource to the person who pays that price. We also assume that this price reflects the *social* value of the resource. After all, if the value of the resource to a person was less than the bid price, why would the person pay the price? Thus, for those who are *not* buying the resource, the value of the resource to them is taken to be less than the going price. Conversely, the price, to the people who *are* buying the resource, is generally less than the value of the resource to them. Simply put, if you are buying the resource at going prices and I am not, we presume that the resource is being put to a higher valued use by you (you are paying for it) than it would be put to if I were using it (I am not paying for it—presumably, because its value in use by me is less than the going price). We then say that the allocation of resources is efficient—"efficient" in the sense that the resources are being used in their highest-valued uses. Efficient resource allocation is the major strength claimed for the market system.

A moment's reflection is probably enough to suggest to the reader several sources of discomfort that one might have with the economist's "efficient" resource allocation. First, market allocations of resources would seem to presume that we are *indifferent* to the effects of the distribution of income. Thus, in our example given above, suppose that the commodity in question was milk. You are buying the milk at \$5.00 per gallon while I am not. The allocation of milk is "efficient" when I assume that, since you buy the milk and I do not, that the milk's use by you is higher-valued than my use of the milk. However, suppose that I am very poor, while you are very rich. The value of the \$5.00 that you spend for milk may be quite small—what's \$5.00 to a millionaire like you? To me, however, \$5.00 represents a large proportion of my income—relatively speaking, \$5.00 to me may be like \$5,000 to you. Under these circumstances, can you then conclude that the fact that you are buying the milk at \$5.00 implies that your use of the milk is a higher-valued use than my use of the milk? Obviously, you cannot. Thus, a major potential weakness (well-known to economists) of the market solution is that it ignores the implications of the existing distribution of income. One assumes that all dollar "votes" have equal weight. In terms of reflecting use value, a dollar spent by the poor man has the same weight as a dollar spent by the rich man.

Resource allocations based on market-determined values may be sub-

ject to a second, related criticism. Essentially, as implied above, market values result from individuals "voting" in the marketplace—their ballots are dollars. If there are more votes cast for the production of Cadillacs than for the production of milk, more Cadillacs and less milk will be produced. As noted above, such could result from circumstances wherein a very few, very rich people want Cadillacs and very many, but very poor people want milk, and the distribution of income is of no consequence in the market. The market reflects not needs, but *effective wants* (wants with dollars behind them).

Consider next the potential effects on future generations of today's resource allocation decisions. Suppose that you wish to buy resources from me in the market. You and others compete for resources held by me and others. By your offering of dollar votes, you will determine the allocation of resources held by you and by me. Think now of my progeny and suppose that they have an interest in an amount of resources held by me. If I sell my resource endowment to you and others, my heirs are then denied access to the resource. One may suppose that my actions—the price that I require for the resource—reflects my best efforts to protect their interests. Perhaps I'll not spend all of the money that I acquire from the sale of my resource endowment, thereby bequeathing to them a bank account, with accrued interest, in place of a bequeathal of resources. At issue, however, is the fact that only *today's* generation can vote in today's market which fixes the price of the resource. Future generations are denied a "vote" in actions which might have fundamental impacts on their well-being. Concern with the market's failure to reflect the wishes (votes) of future generations is more popularly seen in the non-economist's concern with the responsibility of *the State* (rather than the market) to protect the interests of future generations.¹⁴

Further, resource allocations based on the market and market prices may be criticized on grounds that market prices may fail to reflect many beneficial or costly effects of a given allocation of resources. Technically, we say that the market does not reflect "external" (external to the market) effects, sometimes simply called "externalities." Examples of externalities include: downstream saline pollution of river waters which can result from upstream irrigation; "well interference"—falling water tables, and therefore higher pumping costs (or less efficient pumping) at my well as a result of pumping at your well; and shoreline beautification efforts by one individual or unit.¹⁵ Thus, all else equal, part of the costs of irrigation

14. See WRR, *supra* note 3.

15. For a discussion of "internalizing" such external costs, see W. BAUMOL & W. OATES, *THE THEORY OF ENVIRONMENTAL POLICY* (1975).

may be borne by those other than the irrigators, because downstream users must pay the costs associated with having more saline water, even though the upstream irrigator caused the increased salt load. If the irrigator sells his water, the market price received by him will not reflect this cost borne by downstream water users. Market values for water pumped by my neighbor will generally not reflect effects on my well from well interference. Similarly, there are typically no market values that will capture the value to me of my enjoyment of your efforts to beautify the shoreline (efforts for which you alone pay the costs). Market values will not capture these external benefits and costs.

Finally, and related a bit to the notion of externalities, a market presupposes that property rights to any and all commodities to be traded are well defined. Markets do not perform well in valuing goods or services which are enjoyed, or which are costly, to groups of individuals in common. Examples of common property, or "fugitive" resources (or, with a bit more elaboration, "public" goods¹⁶), include groundwater, environmental quality (clean air, clean water), and parks-recreation facilities. In the case of a public good, the good's market price should theoretically reflect the collective willingness to pay of everyone who might wish to consume the good. Since no one can be effectively excluded from consuming the good (it is, after all, publicly available), though, people might have an incentive to underreport their desire for the good. They can thereby avoid having to pay for it, and still enjoy consuming it anyway. Such people are called "free riders," and if enough of them exist, the market essentially breaks down in terms of yielding efficient resource allocations.

To summarize, a well-functioning market can result in resources being allocated in an "efficient" manner, where "efficient" refers to an allocation of resources such that resources are in their highest *valued* uses. Problems can arise when *market values*, as opposed to other types of "values," such as social and/or group values,¹⁷ are used as a basis for resource allocation. Market values cannot reflect differences in incomes across participants in the market—the dollar vote of the poor man has the same weight as the dollar vote of the millionaire. Still another distributive issue may arise when allocations are based on market prices: preferences of future generations are without weight in the formation of a market price. Externalities, like benefits and costs which do not involve market transactions per se, are not reflected in market prices. Finally,

16. See R. CUMMINGS, D. BROOKSHIRE & W. SCHULZE, *VALUING PUBLIC GOODS* (1986).

17. For a discussion of the community value of water, see F. BROWN & H. INGRAM, *WATER AND POVERTY IN THE SOUTHWEST* (1986). See also Brajer & Martin, *Water Rights Markets: Social and Legal Considerations*, AM. J. ECON. & SOC. (forthcoming); *Water Reallocation*, *supra* note 8.

market prices (if they exist) may be poor indicators of value for commodities (such as public goods) for which property rights are not concisely defined.

III. CONDITIONS FOR A "PERFECT" MARKET

Setting aside for the moment questions related to the desirability of resource allocations based on markets, at this juncture we inquire as to how well presently-established markets for water rights in the West approximate a "perfect," or (at the very least) a "well-functioning" market. To this end, we begin by inquiring as to the basic requirements for a perfect market. We then briefly inquire as to the extent that these conditions are probably satisfied, using conditions in the State of New Mexico as an example. Finally, we speculate as to the likelihood that conditions for a perfect, or well-functioning, market might be established in western states.

There are four basic requirements for a well-functioning market. These requirements are as follows:

1. Goods/Services Exchanged in the Market Must Be Those for Which Property Rights are Well-Defined

In economics, the term *property right* refers to a bundle of entitlements defining the owner's rights, privileges, and limitations for use of a resource. The structure of property rights that can produce efficient allocations in a well-functioning market economy is generally considered as having four main characteristics.¹⁸

a. *Ownership*: Ownership is simply a legal device that assigns the right to use of a resource, subject to various possible restrictions, and is obviously necessary for a market transaction to take place. No one in his or her right mind would pay for, say, a water right without some assurance that he or she could then use that right.

b. *Specification of rights*: To facilitate the smooth functioning of a market, it is insufficient merely to declare that exclusive ownership exists. Property rights also must be completely specified; otherwise, individuals independently exercising their various ownership rights would have no means for resolving potential conflicts. In New Mexico, for example, the doctrine of prior appropriation establishes the superiority of various claims on water rights.

c. *Transferability*: All property rights should be transferable. A person

18. Two excellent discussions of property rights can be found in ch. 7 of A. RANDALL, *RESOURCE ECONOMICS* (1981), and in ch. 3 of T. TIETENBERG, *ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS* (2d ed. 1988). This short discussion draws from both sources.

who wishes to acquire a specific water right must be permitted to make an offer to its owner. Likewise, an owner willing to part with that right, in exchange for some consideration of greater value to him or her, must have the right to sell. In this manner, water rights can move to their highest-valued uses.

d. *Enforcement*: Property rights should be secure from involuntary seizure or encroachment by others. Obviously, an unenforced right is in effect no right at all. If I can simply “steal” your water right, why would I bother paying you a significant amount of money for it?

2. There Must Be Many Buyers and Sellers

For the market to work well, no one buyer or seller, or group of buyers or sellers, can have the power to fix the price of goods/services. If I am the only buyer for your water supplies, you and your neighbors have no recourse (other than not selling) from accepting whatever price I am willing to offer for your water rights. With many buyers, if you do not like the price that I offer, you can try other buyers. I must *compete* with other buyers in order to acquire water rights. If you are the only seller of water, then potential water rights buyers and I have no recourse from accepting the price that you place on your water rights. With many sellers, of course, you cannot fix prices at “high” levels because no one will buy from you—we all buy from other sellers. The definition of “many” is not given precisely in economics. “Many” simply means *enough* buyers and sellers so that no one alone can affect prices.

3. Resources Must Be Mobile

“Mobility” in this context refers to the ease by which resources can move from one user to all other users. Markets will not work well in instances where it is difficult to change the site and character of the circumstances in which the resource is used. An example of something which has the effect of placing “barriers” to the mobility of resources is as follows. High costs imposed on altering ownership of resources (referred to as “transaction costs”) can reduce the mobility of resources. For example, pension plans which have the effect of penalizing workers for changing jobs can, obviously, reduce the mobility of labor resources.

The rationale for mobility being a basic requirement for a well-functioning market relates to requirement number two discussed above and is immediately apparent after a moments reflection. If it is difficult to move the resource from one use to another, then there would normally be correspondingly fewer potential buyers and sellers for the good/service in question. If it is very expensive to affect the transfer of, for example, a water right, then only those uses which can generate the income and/

or benefits necessary to justify high transaction costs will be in the market for the resource. We may well be reduced to "few," as opposed to "many," buyers and sellers.

4. Good Information Systems Are Required

The availability of information is most important for a well-functioning market. For example, the fact that there are many potential sellers of water rights is immaterial to me *if I am unaware of their existence, and/or if it is inordinately costly for me to learn of their existence*. Similarly, and obviously, it is of little consequence to a farmer holding water rights that there are many potential buyers of such rights if he or she is unaware of their existence. Buyers and sellers must have easy, and relatively costless, access to information about "many" existing buyers and sellers for the market to work well.

To what extent are the four conditions described above satisfied in western water markets? At simply an intuitive level, we can respond to this question by examining each of the requirements in turn.

Requirement number one stipulates that property rights for the goods to be exchanged must be well-defined. What is observed to exist in many western states, however, is an incomplete definition and assignment of ownership (property) rights to use of water. This is particularly true for groundwater. In New Mexico, for example, early descriptions of aquifers by the courts reflected the view that the state owned the water in the ground.¹⁹ In the 1982 *Sporhase v. Nebraska ex rel. Douglas* case,²⁰ however, the Supreme Court rejected the view that the public trust doctrine created a proprietary interest for the state in its water supplies, concluding that the notion of state ownership was merely a "legal fiction." The *Sporhase* decision held that simply leaving water in the ground does not make the state the owner of its resources in any proprietary sense, and that storage alone does not generally constitute a use of water because there is no actual application to beneficial use. In addition, a second 1982 Supreme Court decision, *Colorado v. New Mexico*,²¹ injected more uncertainty into state water allocation decisions. In that decision, the Court suggested that water rights long-established under prior appropriation might not be totally protected from claims for new, more efficient uses in another state (subject to the provision that benefits attributable to the new uses would more than offset the losses, or costs, to the state losing the water). This denial of state ownership of water as expressed in *Spor-*

19. See WRR, *supra* note 3, at 92.

20. 458 U.S. 941 (1982).

21. 459 U.S. 176 (1982).

hase and *Colorado v. New Mexico*, along with the long-standing recognition of proprietary federal reserve rights as decided in *Winters v. United States*,²² have introduced considerable uncertainty into the water rights market and the water allocation process.

The property rights questions associated with one dimension of federal reserve rights—Indian water rights—are of particular concern to many. Disputes over Indian water rights currently affect the availability of water for urban use in Tucson, Phoenix, Albuquerque, and Salt Lake City; for energy development in the San Juan, Powder River, and Uintah basins; for the expansion of hydro-power sources for Seattle and Tucson; and for the maintenance of non-Indian agricultural development in Arizona, Nevada, and Washington.²³ Myriad lawsuits involving water rights are pending in state and federal courts as tribes seek fulfillment of the original government promises made to them to make their reservations “livable, viable, self-sustaining communities.”²⁴ Until the extent of the Indians’ water rights are determined by the courts, it will prove difficult to determine whether water is available for appropriation, and the sale and transfer of existing rights will be impeded, since prospective buyers cannot be certain they are receiving secure rights.

Requirement number two stipulates that many buyers and sellers are required for the existence of a well-functioning market. While we do not have data which would allow even speculation as to the number of *potential* buyers and sellers of water rights in New Mexico’s water basins, we do know that the number of water rights transfers each year in New Mexico is relatively small. For example, only forty-eight commercial water rights transfers took place in the Middle Rio Grande Area (MRGA) during the 1982-1987 period, involving rights to about 1870 acre feet of consumptive use per annum (hereinafter, “af CU”).²⁵ The City of Albuquerque alone made 16 purchases totalling 719 af CU, or 38 percent of all commercially transferred water rights during 1982-1987. The second and third largest purchasers bought 491 af CU in two transfers and 311

22. 207 U.S. 564 (1908).

23. K. Burke, R. Cummings, & J. Mays, *supra* note 7, at 16.

24. *Id.* at 17.

25. A recent study by P. Farah evaluates water rights trades in two urban areas and one rural area in the northern portion of the Rio Grande basin against the idealized standards of the competitive market, and provides the information on buyers and sellers, and on transaction costs, for the ensuing discussions of this section. The three study areas are designated as follows: 1) the Middle Rio Grande Area, comprising the Middle Rio Grande Conservancy District, the Albuquerque metropolitan area, and the Sandia Mountains; 2) the Santa Fe Area, stretching from the Pojoaque/Tesuque/Nambe tributary system to La Cienega area, and including the City of Santa Fe and its environs; and 3) the Galisteo Creek Area, comprising the remainder of Santa Fe County southeast of the Santa Fe Area. See P. Farah, *An Evaluation of Market Performance in New Mexico Water Rights Transfers* (1988) (unpublished Ph.D. dissertation, Univ. of N.M.).

af CU in six transfers, respectively, while the fourth lagged far behind, with only 58 af CU in one transfer. During the 1982-1987 period in the MRGA, the market shares of the largest four and the largest eight buyers, respectively, were 84 percent and 93 percent. Both of these concentration measures are considerably higher than any commonly accepted criterion for distinguishing between competitive and non-competitive industries.²⁶ It is clear that this high concentration on the buyers' side of the water market has resulted in a non-competitive situation: the City of Albuquerque exercises great influence on market price, which has hovered around the City's standing offer of \$1,000 per af CU established in 1982.

Analyses of other areas in New Mexico reveal similarly high levels of concentration on the buyers' and sellers' sides.²⁷ In the Santa Fe area, the largest four buyers during the 1976-1987 period accounted for 77 percent of the total amount of traded water rights, with the largest eight accounting for 92 percent. In the Galisteo Creek area, the top four and top eight concentration ratios were 86 percent and 95 percent, respectively, on the buyers' side of the market. Further, in this latter area, there has been only one actual seller of water rights, implying a concentration measure on the sellers' side of 100 percent! While, as noted above, there is no objective criterion established for defining the minimum number of buyers and sellers that would satisfy the "many" requirement, the few transactions observed each year in New Mexico would likely not preclude the possibility of buyers and/or sellers exerting some influence on price. We thus suggest that the "many buyers and sellers" criterion for a well-functioning market is not satisfied in many areas of the State's water markets.

Turning next to Requirement number three—resources must be "mobile"—there are two major facets of the water market in New Mexico that may be seen as substantially limiting the mobility of water resources. First, referring to the Rio Grande basin, it seems to be the case that the Rio Grande Compact represents a strong institutional constraint limiting the geographical extent of water rights markets.²⁸ The Compact has, in effect, prohibited water rights transfers outside the Rio Grande basin portion which is bounded by Otowi Bridge in the north (the Upper Colo-

26. In fact, these concentration measures are quite close to those of several industries which clearly exhibit a high degree of concentration: the primary aluminum (SIC Code 3341), turbines and turbine generators (SIC Code 3511), and motor vehicles and car bodies industries (SIC Code 3711). See UNITED STATES DEPARTMENT OF COMMERCE, BUREAU OF THE CENSUS, *Share of Value of Shipments Accounted for by the 4, 8, 20, and 50 Biggest Companies in Each Manufacturing Industry: 1982 and Earlier Years*, in 1982 CENSUS OF MANUFACTURE: CONCENTRATION RATIOS IN MANUFACTURING (1986).

27. P. Farah, *supra* note 25.

28. See *Rio Grande Compact*, art. II, N.M. STAT. ANN. § 72-15-23 (Repl. Pamph. 1985).

rado basin) and Elephant Butte Dam to the south (the Lower Colorado basin). Likewise, the Compact appears to preclude water rights transfers across "accounting points" which are further to the north, namely El Vado Reservoir on the Rio Chama and Lobatos on the Rio Grande.²⁹ Interstate water compacts may supersede even state law, so state water administrators have generally been careful to ensure compliance. This has certainly been the case in New Mexico, where the State Engineer has clearly accorded the Rio Grande Compact the highest priority. Given this interpretation of the Compact, potential sellers of water holding rights in the Upper Colorado would be prohibited from selling to buyers wishing to use the water in the Middle or Lower Rio Grande basins. That this rule could be most effective in limiting the mobility of water resources in the State is seen in the fact that water demands are growing most rapidly in the Middle and, to a lesser extent, Lower Rio Grande areas, while water supplies from the Rio Grande are relatively concentrated in the Upper Rio Grande basin.

The second impediment to the mobility of water resources in New Mexico results from high transaction costs. Such costs include the following: 1) costs of identifying trading partners; 2) costs associated with the verification of ownership and the physical description of the water right for purposes of the proposed transfer associated with the trade; 3) administrative costs associated with the State Engineer's permitting of the transfer and recording the change of ownership; and 4) any costs resulting from a protest hearing or litigation associated with the proposed transfer. Each type of cost is briefly considered below.

First, the majority of water rights trades in the state have involved the services of an intermediary, who typically brings trading partners together by finding water rights for a buyer or vice versa. He or she may also assist the parties in securing the State Engineer's permission for a transfer, and may give advice on the terms of purchase agreements. Attendant costs may be in the form of consulting fees assessed on an hourly basis, or they may be a percentage of the total value of the transaction. A leading expert in water rights transfers in New Mexico reported that his charges for a complicated transfer did not exceed a total of \$2,000.³⁰ When the fees are assessed in the form of a percentage of the value of the transaction, this percentage is comparable to what is common among real estate brokers, namely between six and ten percent.

Second, some purchasers require verification of ownership of the water

29. *Id.*

30. Interview with Jim Williams, former Albuquerque District Supervisor of the State Engineer's Office (Jan. 25, 1988). Others who have acted as intermediaries in water rights trades charge similar fees.

rights before they apply for a transfer. For example, the City of Albuquerque requires the prospective seller of the water right to submit a complete abstract of the title to the land to which the right appertains and any documents indicating that there is indeed an appurtenant water right which has not been severed from the land or assigned to any other owners. In some cases, the process of verification might throw serious doubt on the correctness of an alleged owner's claims to water rights, in which case the purchase agreement may be cancelled or modified.³¹ While a title search may cost over \$1,000, typically the cost is about \$300, paid by the seller.³²

Third, most water rights trades involve a change in point of diversion or place or purpose of use which must be permitted by the State Engineer's Office.³³ Often an application for a water rights transfer in the Middle Rio Grande area is preceded by a "declaration of ownership" of the water rights in question. In the absence of an adjudication decree for the waters of the Rio Grande, a "declaration" of water rights ownership is a means of making public a claim to pre-1907 water rights in the MRGA.³⁴ Such a "declaration" requires the submission of a survey map of the land to which the water right appertains, and such a survey can cost as much as \$1,000, depending on the size and shape of the tract(s) of land.³⁵

Finally, water rights trades can involve an attorney whose role may include any combination of the following: title search, examining State Engineer files, resolving possible disagreements and conflicts among trading partners, drawing up a purchase agreement, and "walking the application through" the State Engineer's Office. The cost of an attorney's services may vary considerably. One lawyer, who has been involved in over 10 water rights transfers in the Middle Rio Grande and Santa Fe areas, estimated that the cost of hiring an attorney to assist in a fairly simple water rights transfer was between \$3,000 and \$4,000. He reported charging about \$6,000 for a rather complicated transfer involving 160 af CU.³⁶

Legal fees can be much higher in cases which involve a protest of the

31. At the time of writing, the City of Albuquerque was negotiating its largest purchase of water rights. The sellers had originally claimed over 1,000 af CU. After considerable research, however, the amount of water rights proposed for transfer was quantified at about 470 af CU. Interview with Gary Daves, City of Albuquerque water rights purchases officer (May 27, 1988) [hereinafter Interview].

32. The officer in charge of water rights purchases at the City of Albuquerque has said that he maintains the option of having the City pay for title search as part of his negotiations with a prospective seller. For example, one title search cost about \$1,200, which the City agreed to split evenly with the seller. Interview, *supra* note 31.

33. See P. Farah, *supra* note 25.

34. *Id.*

35. *Id.*

36. Interview, *supra* note 31.

State Engineer's decision on a water rights transfer, particularly if the protest goes beyond a State Engineer's hearing and on to the courts. As one example in this regard, promoters of the Campbell Ranch project in New Mexico's Bernalillo County have spent well in excess of \$400,000 in efforts to effect a transfer of some 900 acre feet of water, and the issue remains in litigation after more than three years.³⁷ Equally important, when comparing *expected* gains against these costs, recent examples of efforts to transfer water rights may suggest low probabilities of success.³⁸ High transaction costs, coupled with what may appear as large uncertainties as to the success of attempts to transfer water rights, imply substantial impediments to the mobility of water resources in New Mexico's water market.

Finally, requirement number four for a well-functioning market relates to the availability of information. In our discussion of the property rights requirement, we noted the impact of the lack of information regarding ownership rights on the potential reallocation of water. Even after such disputes are resolved, though, problems still exist which relate to the availability of information—information as to who is offering the resource for sale, who is a potential buyer, and information as to the quality of the resource (in the case of water, water quality *per se* and, perhaps equally important, the priority date of the water right). In certain cases, further information may even be necessary for successful participation in water rights trades. For example, hydrologic conditions in a given location may be such that certain types of water rights transfers will cause third party impairments. These, in turn, may precipitate protests and possibly lengthy and expensive litigation. Anticipation of hydrologic and legal outcomes may be essential, therefore, to efficient economic outcomes in such cases.

Unfortunately, there is no established institution which acts as a clearing house for information concerning suppliers and demanders of water rights in the State, nor of potential protestants to a transfer. An individual with water rights who has an interest in selling them, or an individual looking

37. Personal communication, Stan Strickman, Senior Vice President of AmeriWest Corporation, to Professor Church (Mar. 11, 1987). In support of these data, however, see Bohannon-Huston, Inc., *Campbell Ranch Master Plan* (Feb. 1987) (report prepared for the AmeriWest Corp., available at 7500 Jefferson NE, Albuquerque, NM 87109). See also Bullock, *Octillo Golf Club—A New Town*, 3 ARIZ. GOLF J. 56-58, Nov.-Dec. 1986.

38. Two recent examples involved water rights in the La Madera area on the eastern slopes of the Sandia Mountains. The first, a proposed purchase by a real estate developer, AmeriWest, of about 26 af CU was blocked altogether, and the second involved the proposed transfer of water rights to the community of La Madera for municipal purposes. This second transfer was finally allowed in full, but only after about \$40,000 in litigation costs amounting to approximately \$3,650 per af CU. See P. Farah, *supra* note 25, at 43.

to buy water rights, can advertise in the newspaper³⁹ or, more generally, will advise a real estate broker of his or her interest. Few brokers have expertise in the exchange of water rights and, therefore, offer little in terms of a conduit for information.⁴⁰ Individual buyers or sellers of water rights in the State must thus be prepared to incur substantial "search costs" if they wish to be well informed as to options regarding such rights.

The incentive to incur such search costs may be low, however. It is reasonable to assume that market information is, among other things, a function of the frequency with which buyers and sellers participate in the market. Most likely, the higher the number of transactions in water rights by a market participant, the better his or her knowledge of: the identity of actual and potential sellers and buyers and their expected bids and offers; the identity of market intermediaries and the fees which they charge; and the procedures required by the State Engineer before a water rights transfer is approved. In the Albuquerque area, the average number of purchases of water rights per buyer over the period 1982-1987 has been about 2.3 (48 transactions divided by 21 buyers).⁴¹ With the City of Albuquerque alone making 16 purchases, and the Valley Improvement Association making six, 16 other purchasers made only *one* purchase over the entire six year period. The probability that a party who has actually participated in a water purchase will soon participate again in another purchase seems to be very low. On the sellers' side, the average number of transactions for the same period was less than 1.3 (48 transactions over 32 sellers), with the largest number of transactions per seller being six. The majority of sellers—over 25—were involved in, again, only *one* sale each over the entire period. Here again, the likelihood that a seller would soon participate in the marketplace again seems very small. Clearly, the rate of buyer and seller participation in the water rights market is very low.

Our discussions above suggest that water "markets" in New Mexico are most likely far from being "perfect," or well-functioning. Available evidence suggests that there are not *many* buyers and/or sellers of water rights in the State.⁴² There are effective impediments to the mobility of

39. See, for example, the Menaul School's advertisement for the sale of 102.2 acre feet of water at at least \$1,000/a.f.y., *Albuquerque Journal*, Mar. 2-4, 1987. Only three bids were received for a total of but 12 a.f.y.

40. Personal communication, *supra* note 37.

41. Again, information has been drawn from P. Farah, *supra* note 25, at 24-25.

42. Viewing this assertion in the light of the recent El Paso controversy, one should not confuse the many applicants for *free* groundwater resources in the Mesilla Bolson with many potential *buyers* for rights to such water. There is no evidence that the applicants for rights to pump water from the Mesilla Bolson are prepared to pay nontrivial amounts for such rights, with the possible exception of El Paso.

resources in the form of high transaction costs coupled with substantial uncertainties surrounding successful applications for water transfers and legal and administrative barriers to the transfer of water rights throughout the course of rivers (the Rio Grande, in particular). Moreover, the quality and availability of information concerning potential buyers and sellers of water rights are quite limited. Setting aside for consideration in the following section the implications of a less-than "perfect," or well-functioning, market for water rights in the State, we conclude the discussions of this section by inquiring as to possible actions the State might undertake if it wished to improve the structure of its water rights market.

As is surely obvious from the above, the functioning of New Mexico's water market would be improved by better satisfying the requirements for a well-functioning market as given by requirements one, two, three, and four. Given at least the possibility that failure in number two—the lack of *many* buyers and sellers—may in fact be related to failures in numbers one, three, and four (incomplete assignment of ownership rights, high transaction costs, great uncertainty and immobile resources discouraging potential entrants to the water rights market), we focus on numbers one, three, and four, preferring to postpone considerations related to number two.

Considering first the issue of incomplete property rights assignments, we note that many Western state water-study groups have already recognized the importance of this issue and are recommending some form of state appropriation as the best action available to make the most efficient use of their water resources.⁴³ In the case of New Mexico, for example, state participation in some sort of water market is seen to be the best alternative to the institutional mechanisms that currently exist. Through such participation, the state could capture the equity interest in water resources that it has carefully created through water regulation and investment of its taxpayers' capital.⁴⁴

Many other states are also currently engaged in water resources planning. For example, the Arizona legislature passed the Groundwater Management Act of 1980, a comprehensive law for statewide management and conservation of groundwater.⁴⁵ California is also currently reviewing and debating more integrative approaches to surface and ground water

43. See DuMars, Brown & Cummings, *The States' Role in Managing and Conserving Groundwater: The Case for Establishing State Proprietary Interests in State Resources*, in PROCEEDINGS: WESTERN STATES WATER COUNCIL, WATER MANAGEMENT SYMPOSIUM (1984) (Salt Lake City, Sept. 13-14).

44. WRR, *supra* note 3.

45. Arizona Groundwater Management Act, 1980 Ariz. Sess. Laws, ch. 1, § 86 (codified as amended at ARIZ. REV. STAT. ANN. Ch. 2 (1987 & Cumm. 1988)).

management.⁴⁶ In addition, Montana, Texas, and Colorado all have acquired proprietary interests in their water resources, and are preparing to market water, while at the same time maintaining their authority to plan for and manage use.⁴⁷

The advantages of state control are numerous. In arguing for state, as opposed to federal or local, control of water resources, Hrezo and Hrezo⁴⁸ contend that states possess three advantages in the formulation of distributive policies: 1) state governments are close enough to affected groups to accommodate competing interests and develop and enforce statewide policy goals; 2) states can provide the basin-wide perspective essential to recognizing the water resource as a hydrologic unit; and 3) states can integrate water policy goals and processes with other important state aims such as economic development, land management, or coastal zone management.

Turning now to the issues concerning the mobility of water resources in the state, it would seem that improvements in this regard would require critical changes in water rights/management/allocation institutions in the state. Given the requirements of the Rio Grande Compact, a change in the compact, or in its interpretation, would be required to permit, for example, water in the Upper Basin to be sold and transferred for uses in the Middle and/or Lower Basins. Reducing transaction costs now required for water rights transfers, and removing or mitigating the uncertainties associated with applications for such transfers, would entail a restructuring of the present hearing process which was established by legislation. However, any effort to reduce transaction costs and/or to mitigate uncertainties would almost certainly weaken the protection of third-party rights—private or social (as in, for example, conservation-related water-use effects)—which may be asserted as relevant to any proposed water-rights transfer. It is therefore most difficult (at least for these authors) to imagine the source of political support which would be required to bring about the legislative changes required for such changes in the present hearing processes.

Finally, in regard to requirement number four, we observe that while there is currently no established institution which acts as a clearing house for information, the administrative costs of instituting viable water marketing systems may not be completely prohibitive, as evidenced by the marketing networks which have recently begun to emerge. For example, in the Colorado Front Range city of Fort Collins, an investment orga-

46. WRR, *supra* note 3, at 253-54.

47. *Id.* at 246-56.

48. Hrezo & Hrezo, *From Antagonistic to Cooperative Federalism on Water Resources Development*, 44 AM. J. ECON. & SOC. 191 (1985).

nization named Western Water Rights Limited Partnership Fund I has been formed. "Primary institutions" have put up \$35 million to have the Fund buy, sell, and manage water rights properties.⁴⁹ An awareness of the dollar value of water is emerging even within the Wall Street investment community. On all of the principle stock exchanges, shares of publicly-owned water companies are beginning to be recognized as attractive acquisition properties for investors.⁵⁰ Further, the emerging water market seems to be developing in inventive and interesting ways. As one example, a new Washington-based company, International Water Resources, has been formed and plans to get the jump on brokering fresh water. The company, which has been formed by two former oil industry executives, plans to transfer water by using oil tankers to ship water from areas of surplus to areas with a desperate need.⁵¹

Although the evidence from New Mexico indicates that the involvement of middlemen in water rights trades is modest, the state does have a considerable number of professionals who are qualified to act as middlemen in water rights trades. A number of New Mexico attorneys advertise their specialty in handling water rights cases,⁵² and many real estate agents also promote expertise in water rights. These professionals can play an important role in bringing buyers and sellers together and generally profit from their knowledge of "market" conditions.

In addition, there are a number of specialized publications dealing with water resources in the western United States. These provide technical, institutional, and increasingly commercial information to those who are willing to pay. *Water Market Update* is a monthly bulletin published by a water resources consulting group based in Santa Fe. The publication specializes in issues relating to water rights trades and transfers in the western states. It provides detailed information on "business activities and transactions" in water rights, including prices; legal and institutional developments; meetings, publications, and research; and other areas relating to water rights trades and transfers. Although this publication obviously does not cover all the transactions which take place in New Mexico, it is a reliable source of information of some aspects of water rights trading in the state, particularly prices and the identity of purchasers.

49. *Rights Fund is Formed*, U.S. WATER NEWS, Mar. 1986, at 1, col. 1.

50. *Water is Becoming a Dollar-and-Cents Business*, U.S. WATER NEWS, Aug. 1985, at 11, col. 1.

51. *Marketing Liquid Assets*, U.S. WATER NEWS, May 1986, at 6, col. 1.

52. See U.S. WEST DIRECT, THE YELLOW PAGES, ALBUQUERQUE AND SURROUNDING AREA 866 (1987). Eight law firms advertise specialties in water law.

IV. IMPLICATIONS OF AN "IMPERFECT" MARKET FOR THE ALLOCATION OF RESOURCES

We have thus far argued that the major benefit from a market allocation of resources is efficiency—"efficiency" as indicated by an allocation of resources to, effectively, the highest number of dollar votes ("highest-valued uses"). Potential problems from such an allocative system may arise from: the fact that income distributions are irrelevant for the allocation of resources; the effects of a distribution on future generations are ignored; and non-market, external considerations are typically ignored. Further, we have argued that available evidence, however anecdotal in nature, suggests that the basic requirements for a well-functioning, "perfect" market do not exist—at least, not in the State of New Mexico. There appear to be few, as opposed to "many," buyers and/or sellers. There are substantial impediments to the mobility of resources in terms of shifts in their use from one use/location to another. And, the availability of information about buyers, sellers and qualities of water rights is, at best, limited. Finally, we have suggested that there seem to be no compelling reasons for one to expect that these conditions could be changed so as to better approximate those required for a perfect market.

The obvious remaining question is, So what? Given that markets for water are not perfect, or may not function according to the economist's ideal, how are the strengths and weaknesses of markets affected by such "imperfections" (what might "*not* a well-functioning market" mean)? An adequate response to this question is made difficult by two considerations. First, a much more technical aspect of efficiency, described below, is involved. This aspect was not touched upon in our earlier efforts to describe the efficiency issue as simply as possible. Second, strengths and weaknesses, discussed separately above in section II, become inextricably related when discussing an imperfect market. In what follows, we do our best to sort through these issues while placing a minimum burden on the reader.

An imperfect market will still allocate resources to their highest valued uses in the sense that dollar votes are still determinants in the ultimate allocation. Another dimension of efficiency is missing, however. In the most basic terms, in a perfectly competitive market, the ultimate price which is determined in the market is one which just covers costs of producing the resource in question. Thus, the (highest) value of the resource in question just equals the value of all other resources used in its production. Essentially, we're saying that the owner of the resource isn't making huge, excess profits from his or her sale of the resource. In an imperfect market, "excess" profits is the rule. If there are few sellers, one expects prices to be held artificially high and larger profits accrue to

the seller. If there are few buyers, prices are set artificially low (relative to perfect market prices) and excess profits accrue to the buyers. The bottom line is that, in a perfect market, society, as well as the direct participants in market transactions, are made better off, distributive and externality questions aside. With an imperfect market, buyers and/or sellers can be expected to accrue profits at the expense of society as a whole—the efficiency fabric of market allocations of resources is badly torn with less than perfect competition.

As one might expect, not only are efficiency gains lost with markets which function less than well, but at least one of the major problems with market systems noted above—income distribution—may become more severe. As is obvious from the above, with dollar votes directing the allocation of resources, artificially high prices can impose still higher costs on the poor.

V. SPECIAL PROBLEMS FOR STATE AND FEDERAL GOVERNMENTS WHICH MAY ATTEND FURTHER RELIANCE ON MARKET ALLOCATIONS OF WATER

A move towards placing greater reliance on markets as a means for allocating water resources in the West could pose a number of perplexing problems for state and federal governments. In terms of state governments, the fact that water markets ignore state lines poses obvious problems for states with citizens who feel obligations to future generations. Water *planning*, as it has been known in the past, would have no real role with water markets.⁵³ The tax base of states becomes vulnerable, of course, to shifts in economic activity from one state to another as a result of market transfers of water.⁵⁴

Finally, a number of particularly thorny problems would be encountered by the federal government if it should attempt to eliminate appurtenance requirements⁵⁵ in federal water projects, thereby allowing such waters to

53. DuMars, Brown & Cummings, *supra* note 43. We must note that it is possible for entities that, in some sense, acquire water rights for future generations as market participants to perform water planning for such future generations.

54. K. Burke, R. Cummings & J. Mays, *supra* note 7; see also WRR, *supra* note 3.

55. Historically, federal water projects have played a crucial role in the economic and demographic growth of the western states. Today, the U.S. Bureau of Reclamation still provides at least 20 percent of the water in the West, most of it for agricultural purposes. However, there have been considerable impediments to the transfer or marketing of project waters. The Reclamation Act of 1902 stated that "the right to the use of water acquired under the provisions of this Act shall be *appurtenant* to the land irrigated," and that project water can be delivered only to "bona fide residents on such land." Today, while pronouncements and actions by Bureau administrators have indicated a willingness to accommodate transfers of project waters from agriculture to other uses within the benefited areas, uncertainty continues to linger regarding the potential implications of the original residency and appurtenance requirements.

be sold in markets. The first of these problems concerns the effects of such actions on existing property rights. Present holders of non-federal water rights have the current value of such rights capitalized in the value of their land/property. The entry of federal water would result in the virtual collapse of water rights values in many, if not most, basins—that is, the effect of the action would be that of taking property from individuals, or certainly reducing the value of their property.

Second, the bulk of water in federal projects is used by agricultural users. As such, the public in general, and urban users of hydroelectric power in particular, have then subsidized the costs of making federal water available to the agricultural users.⁵⁶ The federal government would face the following dilemma. On one hand, serious equity considerations may be relevant for a situation where farmers have water supplies made available to them at highly subsidized rates and then are allowed to sell such water and keep the proceeds—the farmers are thus the recipients of large “rent” payments. This may be particularly troublesome when the entity to whom the farmers will be selling the water—urban centers—are the same entities who subsidized the farmer in the first place. On the other hand, if farmers are not allowed to profit from the sale of their federal water, *they then have no incentive* to sell their rights in the market, and the efficiency gains sought by the releasing of federal water may then be lost. We feel that this “rent distribution” issue, which has not been addressed at any length thus far in the economics literature, could soon become an increasingly important component of the water allocation debate.

VI. CONCLUSION

The central issue addressed in this study is the extent to which the market for water rights in New Mexico is a competitive, well-functioning one. Our discussions indicate that the water “market” is probably far from being “perfect,” or well-functioning. Uncertainties regarding property rights, few market participants, potentially high transactions costs, and inadequate information all seem to characterize the market for water rights in the state. Further, there seem to be no compelling reasons to expect that these conditions will soon be changed so as to better approximate those required for a competitive market. One consequence of all this is the possibility of buyers and sellers in imperfect markets accruing profits at the expense of society as a whole. Finally, we note that greater reliance on markets could actually pose some perplexing equity-related problems for state and federal governments.

56. Burness, Cummings, Gorman & Lansford, *supra* note 13.