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WATER TRANSFERS AND THE IMPERFECT WATER INDUSTRY IN CALIFORNIA

Tim Stroshane

Abstract

Market ideology often obscures public choices about reasonable and beneficial uses of water. Current debates in California water policy reflect the tug of war between the potential efficiency and flexibility of water transfers (often called "water marketing") and the desire for a stable and reliable California water system. The water industry's paramount concern remains the protection of the reliability and stability of operations of its complex socio-technical systems for delivering water, particularly at a time when environmental concerns over instream uses of water are increasing. Loosening restrictions on water transfers while protecting appropriate rights is a flexible approach to meeting long-term water demand. But given such market imperfections as oligopoly and redistributive land rents, state regulation of transfers of California's most political natural resource—for example, through a drought water bank—remains likely in the future.

Since California voters defeated the Peripheral Canal in 1982, many water policy observers have believed the era of capital-intensive, large-scale water projects is over. With a liberal admixture of market economics and good old-fashioned Western boosterism, many of these observers, some of them market-oriented resource economists, some of them dyed-in-the-wool environmentalists argue that creating a free market for water would help achieve greater efficiency by reallocating water to the highest bidder and, therefore, its most economically beneficial use. This would postpone the day, perhaps indefinitely, when new capital facilities would be needed to meet the water demands of California's growing economy.

This scenario may be too good to be clearly understood. Market ideology often obscures public choices about reasonable and beneficial uses of water. Market-induced uncertainties make the California water industry nervous because they put the water system's reliability at risk (Curie 1983, Gottlieb and FitzSimmons 1992). Current debates in California water policy reflect the tug of war between the potential efficiency and flexibility of water transfers (often called "water marketing") and the California water system's stability and reliability. This essay reviews claims justifying a free market in water and focuses on oligopoly and land rent as significant market imperfections that make state intervention necessary, rendering these claims moot.

Oligopoly and Prior Appropriation

Water is a "limiting factor" in human development of the American West (Powell 1962 [1879], Worster 1985). Over 34 million acre-feet¹ of precipitation in the form of rain and snow fall in a "normal" year in northern California, about two-thirds of the state's total water endowment. Most of it is collected and stored in reservoirs in the north, transported in canals to farms, and delivered through water mains to urban users, most of whom reside south of the Sacramento-San Joaquin Delta. In California's valleys, runoff percolates into groundwater basins, from which it is eventually pumped for domestic, industrial, or irrigation use. There are almost no unclaimed water rights left in California. Surface water is regulated by the State Water Resources Control Board both in quality and in quantity, but groundwater is nearly unregulated by the state.

The California water industry is rooted in the state's hydrologic regime. This regime is a highly political ecosystem consisting of the state's endowment of rainfall, its geologic structure, its legal traditions and administrative structures, as well as its hydraulic systems for storage, transport, and delivery to water users throughout the state. These facilities are owned and operated by public water agencies at all levels of government. Private water companies account for only a small fraction of water "developed" by the state's water industry. Rights to surface water (that is not already diverted under riparian rights) are granted under the state's water law doctrine of prior appropriation, in which water rights may be granted by the state if the water is put to some type of reasonable and beneficial (*i.e.*, economic) use. The 20th Century history of California water is the history of projects whose basis is the acquisition of appropriative rights to California water by local, state, and federal governments. Fully 70 percent of the appropriated surface water in California is controlled and allocated by federal, state and local governments (Table 1).

Under the California Constitution, waters arising in California are owned by the State of California. It is the legal right to beneficial use of water, not the water itself, that is at stake in water allocation. Bain *et al.* (1966) found intensive public control of water rights in every sub-basin of the Central Valley, except that of the Kaweah and Tule Rivers. Only a few entities diverting water were found to be private or mutual water companies. Most public agencies "individually have very large service areas and . . . divert correspondingly large absolute amounts of river water," a pattern still true today (Bain *et al.* 1966: 159). In essence, these agencies create an oligopolistic structure for the distribution and control of appropriative water rights in California.

Oligopoly control of water rights and large scale of service are rooted in the high fixed costs of water supply facilities (Bain *et al.* 1966).² These high fixed costs induce water agencies to form coalitions

Table 1

Reservoir Storage of Public and Utility Agencies in California

Entity	Storage	Percent of Total
State of California ^a	6,362,000 a.f.	18.1%
Federal Government ^b	18,404,000	52.3
Local Districts ^c	8,839,000	25.1
Private Utilities ^d	1,578,000	4.5
Total Storage	35,183,000 a.f.	100.0%

^aPrimarily storage in the State Water Project.

^bPrimarily storage in the Central Valley Project, but includes Army Corps of Engineers projects.

^cStorage of local irrigation districts, water districts, and county water agencies.

^dIncludes PG&E, Southern California Edison, and Pacific Power and Light.

Source: California Department of Water Resources (1987).

tions to carry out functions involving major scale economies (Bain et al. 1966). In addition, as large-scale water systems become more tightly linked between areas of origin and ultimate users, the more water agencies need to create secure, long-term demand for "their" water. This is done through rigid contractual arrangements (discussed below for the State Water Project) which heretofore have been unresponsive to changing economic, regulatory, and environmental conditions. These industry imperatives defend against "revenue instability that would threaten the payment of high fixed costs," including the financial obligations agencies have to bondholders (Bain et al. 1966: 192).³ Transfers of water outside agency service areas have long been considered by water industry leaders as risky, since any uncertainty over rights could threaten a project's capacity to pay debt service.

Capital-intensive water facilities are not only expensive, they are durable. Consequently, the "short run" for these facilities is in fact a long time, on the order of human longevity, and thus economic misallocations may persist. Persistent misallocations may include: haphazard application of water rights; legal restrictions preventing separation of water sales from land sales; and "weak and inadequate" protection of instream uses such as recreation and fish and wildlife values are heavily subordinated to commercial values of water use.

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Larger, fully integrated agencies (*i.e.*, those whose functions span diversion, storage, transport, and wholesaling) are more responsible for such misallocations than the local water-producing agencies. Bain *et al.* (1966) also identified an oligopolistic tendency in local water agencies, many of which are dominated by corporate landowners:

The legal characteristics and responsibilities of local water agencies, public and private, are such that they may be viewed broadly as users' cooperatives, which exhibit economic behavior that is more attributable to such cooperatives rather than behavior characteristic of profit-seeking producer-sellers (p. 124).

Until the 1980s, the rigidity of the California water industry was further reinforced by its definition of water demand. In determining demand for water from the California State Water Project, water agencies, including the California Department of Water Resources (DWR), used only the engineering concept of need (that is, if there's a need, build more dams), not the economic concept of "need revealed by price." When the Brown Administration advocated the Peripheral Canal and some large reservoirs in northern California, DWR continued to justify these projects by appeal to a rigid legalism and an engineering bias (Dennis 1981). The "needs" embodied in contracts the state had at that time with its customers were thought immutable.

This rigidity softened, however, beginning with the defeat of the Peripheral Canal in 1982 (Gottlieb 1988). Due to events beyond its control, the water industry, particularly urban water agencies, with corporate and industry support, has moved to greater activity in water transfers or other market-like water transactions. These events are summarized elsewhere (Gottlieb 1988, Hundley 1992, Reisner and Bates 1990). The National Environmental Policy Act and the California Environmental Quality Act, the federal Wild and Scenic Rivers Act, the Clean Water Act, and judicial cases affecting Mono Lake and the Bay-Delta Estuary also irrevocably changed the regulatory environment of the water industry. Water rights decisions, like water contracts, are no longer thought immutable, and the State Water Resources Control Board, which adjudicates water rights in California, has emerged as the administrative focal point for struggles over water (such as with the Bay-Delta Estuary and Mono Lake). Instream uses (*e.g.*, fish, plants, and wildlife, as well as recreational uses) gained importance in water law for protection of aesthetic and ecological values.

Projected Demand for Water

On the demand side, the water industry supplies the state's agricultural industry and its urban regions with a total of about 34.2 million acre-feet of water (Table 2). In 1985, agriculture consumed about 79 percent of the state's net water use (factoring in evapotranspiration, water losses, and outflow from an area that is used elsewhere). Urban

net water use was 16 percent of the state's water demand, while other uses accounted for the remaining five percent (California Department of Water Resources [DWR] 1987).

Table 2*Net Water Use by Sector in California*

User	1985		2010	
	Acre-feet (000)	Share	Acre-feet (000)	Share
Agriculture	26,950	78.8%	26,750	75.1%
Urban	5,590	16.3	7,190	20.2
Other	1,680	4.9	1,680	4.7
Total	34,220	100.0%	35,620	100.0%

Note: Net water use is computed by adding evapotranspiration (the amount of water taken up by plants, transpired by them, and evaporated from the soil), the losses from a water distribution system that cannot be recovered, and outflow leaving an area. This estimate is essential in determining whether an area needs more water.

Source: California Department of Water Resources (1987, 1993).

Over the next 20 years or so, the surface supply of water is not expected to increase significantly. Even if major reservoir projects are completed in the near future, the overall water system in California is not expected to expand significantly, partly because of court decisions regarding Mono Lake and the Bay-Delta Estuary that will likely reduce exports from these sources.

But overall demand for water is not growing as rapidly as it once did, according to the California DWR. Projected net water use is expected to increase by only 1.4 million acre-feet from 1985 to 2010 (DWR 1987; DWR 1993: 164). This increase represents only 3.9 percent of the total projected water demand, and moderate conservation efforts could eliminate the need for additional capital facilities. One measure for achieving this reduction is promotion of water transfers.

Water Transfers and Economic Theory

Phrases like "water transfers" and "free water markets" and "water trades" are often used interchangeably, and without definition can lead to confusion (Saliba and Bush 1987). "Markets" consist of the interactions of actual or potential buyers and sellers of one or more interrelated water commodities. Negotiated transactions generate prices and conditions of sale and use for each commodity. "Markets" represent transactions taking place continuously over time. When relatively few

transactions take place, the market is considered thin, and a key feature of a market—the establishment of a going price—is lacking (Saliba and Bush 1987: 1, note 6), a condition that describes California water transfers, notwithstanding the Drought Water Bank (discussed below).⁴

Some transfers are voluntary; some are involuntary. Involuntary transfers may occur through forfeitures and abandonment, eminent domain, litigation, and legislative settlements of conflicting claims. Involuntary transfers are not the subject of this paper.⁵ Voluntary transfers typically include at-cost administrative transfers and market transfers (Saliba and Bush 1987).

Separating water rights market transfers from non-market transfers are three attributes of market transactions. First, the money value of the water rights is recognized as distinct from land value and the value of improvements to land. Second, buyers and sellers each agree to the reallocation voluntarily. Third, price and other terms are negotiable by buyer and seller and are not constrained to be “not for profit” or “at cost” (Saliba and Bush 1987: 3-4).

Market transfers occur when three conditions hold true:

1. a mutual perception by potential buyers and sellers of the capture of net economic gains by transferring water to take advantage of place, season, or purpose over current use patterns;
2. returns to buyers outweigh the transaction costs of the water market purchase; and
3. the economic return from the water market purchase exceeds the opportunity cost of achieving water supply objectives through other means (including new capital facilities) (Saliba and Bush 1987: 5-6).

In theory, a free water market establishes economically efficient allocation, use, and supply of water when all economic agents behave as price takers, and all economic agents have complete legal and hydrologic information on water rights and opportunity costs of supplying water through other means. In addition, water rights must be: completely specified and enforceable; exclusive, so that no third-party effects occur; comprehensive, so that all attributes (e.g., water quality) and uses of water that generate value can be represented by water rights; and transferable, so that water rights holders can transfer rights in response to an attractive offer and water can thus flow to the highest bidder (Saliba and Bush 1987: 21-23, 25).

Markets are seldom free, though, for the world does not conform to these assumptions underlying theoretical market behavior. Because of market imperfections, transaction costs may arise, including costs incurred in identifying potential transfer partners, verification of ownership and physical description of water rights associated with the proposed trade, administrative costs associated with obtaining state

permits for the trade, and costs associated with litigation or protest hearings regarding the proposed transfer (Brajer et al. 1989: 500).

A good water deal is difficult to come by for other reasons, too. These include "externalities" (such as environmental impacts and third-party effects); the public goods characteristics of water (nonrivalry—or joint consumption—and nonexclusion of people from receiving water benefits such as from instream uses); imperfect competition among buyers and sellers (larger agencies undercutting prices that smaller ones cannot match, or the monopoly features of territory-based water agencies); imperfect information increasing risk and uncertainty; and equity issues (Saliba and Bush 1987: 24-26).

The presence of oligopoly also creates market imperfections that are usually the object of governmental regulation (Bain et al. 1966, Gottlieb 1988, Gottlieb and FitzSimmons 1992, Kahrl 1982, Liebman 1983, McWilliams 1949, Villarejo 1981, Worster 1985). In water market transfers, we will likely see larger agencies be better able to command prices, while smaller agencies may be coerced into taking them. Whatever else may be said about the virtues of water markets or water transfers, we are speaking of neither a small town's City Hall nor of Jefferson's yeoman farmers when we speak of trading water in modern-day California (McWilliams 1949, Villarejo 1981, Worster 1985).

Water, Rent, and the "Compensation Problem"

Because of imperfections, water markets will not necessarily ensure efficient use and transfer of water (Saliba and Bush 1987: 27). Writing about New Mexico, which has a longer historical experience with water transfers, Brajer et al. (1989) contend that "the basic requirements for a well-functioning, 'perfect' market do not exist," that there "appear to be few, as opposed to 'many,' buyers and/or sellers," and that "the availability of information about buyers, sellers and qualities of water rights is, at best, limited" (p. 507). Thus, economic theory applied to water markets shows that while water transfers may well occur in a liberalized regulatory environment, they will not necessarily be economically efficient.

Brajer et al. also point out a "special problem"—a dilemma that government faces if it wishes to develop markets for water further. On one hand, "serious equity considerations" arise when farmers have received federally-subsidized water for perhaps several generations, "and then are allowed to sell the water and keep the proceeds—the farmers are thus the recipients of large 'rent' payments" (Brajer et al. 1989). Ironically, the most likely buyers of water from these farmers are urban water agencies representing millions of taxpayers whose taxes could end up paying farmers for water for which the farmers previously received tremendous subsidies from the selfsame taxpayers.

On the other hand, say Brajer et al., “if the 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*” (Brajer et al. 1989: 509, italics in original).⁶

A point of clarification is in order about farmers selling their “rights.” California irrigation district enabling law bestows on farmers “implicit rights in the district’s water supply” (Smith 1989). These are rights to equitable and beneficial use of the district’s water. However, they are not formal appropriative rights; the board of the district holds these rights in trust for landowners within the district (Smith 1989).

Smith (1989) calls this dilemma “the compensation problem.” Solving the dilemma for landowners means structuring disbursement of water transfer proceeds as a negotiated corporate tender offer, or NCTO. First, the district board negotiates a water deal with a buyer. Second, the board then implements “a trading scheme in certificates that quantifies the equitable and beneficial interests of landowners” in the district’s water supply. The board then repurchases certificates in the amount needed to fulfill the terms of the deal (Smith 1989).⁷ The water gets delivered to the buyer, the district does not lose its appropriative water rights, and landowners get a rent payment for having received subsidized water for so long, now enshrined in water law as a tradable water right.⁸

In terms of economic theory, the NCTO distributes the rent payment for water (*i.e.*, the return on land and water rights) equitably among the landowners who “tender their certificates” for water to the district. Politically, the district board gets respect from the landowners for engaging in the trade; legally, such an approach both conforms with existing law and prevents legal change that would lead to conflict and uncertainty over the district’s appropriative rights (Smith 1989: 453).⁹

Concepts of Rent

However, landowner behavior is more complex than is allowed for in the NCTO model. Landowners’ behavior regarding “the compensation problem” must be viewed through the prism of economic rent to make sense of their motivations regarding water transfers. Gardner (1983) defines rent as the incremental return resulting from the value in use of water, less its cost once other factors of production have been paid (p. 84, note 36). Water price changes have two main implications for the distribution of rents:

1. the magnitude of the rent will have positive effects on annual net farm income; and
2. the rent will enter asset wealth over time, depending on the type of water right held (Gardner 1983: 103-4).

The value of a riparian right will be capitalized into the land value itself, because this right runs with the land and is therefore the most secure water right. The value of an equitable interest in a water district's appropriative rights or a water contract would be the present value of the discounted flow of water rents over the contract term.

Pivo (1984) and Walker (1974) distinguish two main kinds of rent. Differential rents accrue to landowners in part because of location, and are not a significant source of the "compensation problem" in water transfers. However, landowners may capture redistributive rents through their collective efforts in land markets and in the political arena. Unlike differential rents, redistributive rents are very much at issue in water transfer and merit closer examination.

Redistributive rents can be divided into three subclasses—oligopoly/monopoly, absolute, and transfer rents—based on their source. In many water districts, particularly in the Central Valley (noted above), land is owned in large parcels by relatively few owners. These landowners receive water for use in proportion to their acreage and their cropping plans. When land is sold under these conditions, it may yield a value that reflects the oligopoly or monopoly rents that drive land values above the increment attributable to differential rent. In land markets, as potentially with water markets, few sellers means higher prices can be charged. Values can thus be realized in excess of differential returns to the resource—especially if made workable by paper schemes such as negotiated corporate tender offers in local water districts. Oligopoly or monopoly rents redistribute rent payments according to the exercise of economic or strategic power in a land or water market.

Absolute rent is the increment of economic return to land obtained through the collective efforts of Central Valley landowners to expand their access to water rights. Absolute rent in water transfers could develop if landowners (as holders of the beneficial and equitable interests in a district's water supply) collude to use a land rush to convert the district into a water ranch. Landowners will only tender their certificates to the district board if they "get their price" for district water. If they cannot expand their holdings, they would hold out for the highest bid (their oligopoly rent) (Pivo 1984, Walker 1974).

Finally, an additional category of rent bears consideration: transfer rent,¹⁰ or a transfer payment in the form of a subsidy, *i.e.*, a redistributive rent, to water users. Transfer rents are creatures of public policy, often resulting from society's desire to achieve some public purpose through an income transfer, and are particularly common in federal water project service areas. Water subsidies have long been an income policy for rural America. Their original purpose was to lower artificially the private costs of developing the American West (Worster 1985, Rucker and Fishback 1983). The federal government provided

water as a public good, nearly free of charge in some regions (Reisner 1986). The transfer payment continues through the use of long-term contracts, with political support provided by the landowners. The value of this transfer rent increased over time (Rucker and Fishback 1983: 53).

Landowner Behavior and Economic Rent

Policy on water transfers affecting agricultural producers in California must account for several behavioral adjustments growers may make with respect to changes in prices for water. Growers may conserve water on a given crop; they may change to a different irrigation technology when it becomes cost-effective; they may shift to a water-saving crop; or they may shift to higher-value crops to absorb the increase in water price (Gardner 1983: 83-84).

The Bay Area Economic Forum (BAEF 1991), a partnership of Bay Area government and corporate officials, argues that

faced with the market value of the resource, farmers would have the proper incentives to economize on their use. That would mean adjusting their crop mix, acreage in production, or number of plantings to match water availability But most importantly, [through market transfers] they would be given the incentive to innovate. Indeed, much of the irrigated farmland in the state faces reduced future yields without changes in water practices. Many farms need to make large capital improvements in order to avoid salinization of soils and high water tables. The best potential source of that capital would be the sale of some portion of their water (p. 10, note 17).

Most proponents of market-type water transfers do not acknowledge that the grower can refuse to plant as well, which could lead to an unsavory trend toward water ranching. If farms go without water, or with less water, fields may lie fallow and farmworkers go without employment, swelling local unemployment and welfare rolls. Businesses serving farmers and farm workers would suffer, and additional layoffs could multiply if water is transferred from rural agricultural areas. In the absence of restrictions on the use of rent proceeds from an NCTO, producers could shift to crops or production techniques that may reduce the demand for agricultural labor and business services in communities from which water is transferred.

A Free Market Or A Regulated Industry?

Yet despite these well-known market imperfections involving water allocation, enthusiasm grew during the 1980s among urban water agencies, environmentalists, and business for creating active water markets. Perhaps the clearest statement of the ideal of an efficient market for water in California was made by Smith (1989):

Economists and lawyers argue that water markets can help water users adapt to this era of expensive water. Voluntary negotiations among buyers and sellers would establish prices that provide current users with incentives to conserve water and reallocate a portion of their supplies to new uses. As a result, existing supplies would be stretched to serve more uses and economic growth would be supported by the transfer of water from low-valued to high-valued uses (Smith 1989: 446).

Environmental writer Marc Reisner and water lawyer Sarah Bates voiced similar appreciation for using the free market system to achieve environmental benefits:

Advocating the free market system as a cure for environmental ills is always a risky proposition; it is easy to find a thousand instances where unfettered capitalism has created environmental harm. But in the case of western water (at least for now) the transfer of water rights shows great promise as a means of achieving several important goals at once: supplying water-short urban areas while alleviating the drainage and salinity crisis while reducing surplus crop payments while promoting ecological health—all at a reasonable cost without new dams (Reisner and Bates 1990: 59).

The idea of water markets is receiving growing governmental support. The U.S. Supreme Court, in the 1982 case *Sporhase v. Nebraska*, declared that water is an “article of commerce” that need not know state boundaries (*Sporhase v. Nebraska*, 458 U.S. 941, 1982). The Department of Interior adopted policies that accommodate trades of federal project water (Reisner and Bates 1990: Appendix A). And the California legislature removed legal impediments to water transfers (Smith 1989: 447). Many water transfers are documented in the literature, but it is arguable whether they really constitute a continuous market (Gottlieb and FitzSimmons 1992, Reisner and Bates 1990, Saliba and Bush 1987).

Alternatively, the BAEF urges creation of a “market-based” approach to reforming the control and allocation of water in California based on the experiences of regulated oil, natural gas, and electric power industries (BAEF 1991). One virtue of this approach, at least, is that it would retain the “natural monopoly” characteristics of the water industry as an object of governmental intervention (BAEF 1991: i). In these industries, the obligation to serve and the reliability of these utility systems help shape regulatory policy debates. The regulatory process itself is intended to balance these socio-technical requirements with the public interest. Public trust consideration and public choices may be possible if the water “market” is subject to regulation. To major corporations and government, water (like power) is too important to leave to free market fluctuations in an arid region.

System Reliability and the State Water Project

In the debate about the control and allocation of water rights, the 1980s and early 1990s saw free market advocates gain the upper hand in the California Legislature and the U.S. Congress. Several laws passed in Sacramento that, in a piecemeal fashion, removed many barriers to water transfers in California. President Bush signed H.R. 429 in October 1992, a bill providing sweeping reforms to Central Valley Project operations, including provisions allowing and restricting water transfers. The effect of these legislative changes, however, has been not only to relax constraints on water transfers, but to force the water industry to find ways of assuring the integrity of the state's water system by restricting the conditions under which water transfers can occur.

Water agencies facing broad mandates to allow transfers must balance this new objective for the state's plumbing system with the need to keep the system reliable and functional. The next section examines concerns about maintaining the reliability and fiscal integrity of the State Water Project, and then examines legislative remedies for these concerns.

Curie (1983) studied necessary economic conditions for market formation and market activity in water transfers for the State Water Project. Developed surface water is allocated by means of long-term contracts by the California DWR among 30 contractors. Most contracts concluded by 1965 run for 75 years, and contain clauses which specify:

- entitlement water to be delivered, including the means of repayment;
- means of repaying costs of power generation associated with delivery;
- conditions for changes in entitlement levels;
- allocation during dry or drought years;
- allocation of surplus water when available (which only includes the variable, "south of the Delta" charge in its price); and
- rules for pricing State Water Project water—entitlement water charge is based on SWP production costs (including a fixed water charge, typically north of the Delta; and a variable charge for delivery costs of export from the Delta).

Curie believes that these rigid contracts preclude timely responses to changing relative economic values of State Water Project (SWP) water. SWP contracts also require that contractors obtain the prior written consent of the State before engaging in a water transfer, and they include a restrictive policy on transfers limiting water trades to "short-term emergencies." Curie offers three reasons for this restrictive policy: first, DWR fears market activity would reduce management control

over water allocation and development of the SWP. Second, DWR fears the lack of reliability in the system if a general water transfer program operated in a drought period. Third, DWR fears market activity would threaten the SWP's financial integrity for bond repayment (Curie 1983: 7-9).

Curie concludes there are no legal obstacles to market formation among SWP contractors. Only the matter of assuring that bond holders get repaid is at issue. For contractors, the problem of a water market is different: market transfers do not occur because of the risk associated with the potential for "delivery security loss" of priority entitlement water due to market activity. The flexibility of water rights transfers (even if temporary and legal) creates uncertainty that is at odds with the law of prior appropriation (i.e., the appropriative right) in which you must exercise your water right, or lose it. Curie suggests several "transfer criteria" for the SWP's review of potential water rights transfers, including:

- Fixed water charges of customers must be paid regardless of their market activity;
- Quantity, delivery point, and date of a proposed transaction must be submitted to the SWP for a "delivery feasibility check";
- Market-transacted water will not be included in any definition of a "threatened permanent shortage," effectively exempting this water from legal challenge as a lapsed right;
- Market-participating customers pay all market-induced production costs of the SWP; and
- No capital expansion of the SWP will occur because of market activity (Curie, 1983: 281 ff.).

Curie's "transfer criteria" seek to reduce uncertainty about water rights as well as shore up DWR's legitimate concerns about the SWP's financial obligations, but her proposal does not motivate landowners to support water marketing because it is not clear "what's in it for them." Until the reward in this system is more evident to water users, and not just to district contractors, the risks appeared to Curie in 1983 too great to engage in voluntary water market transfers.

During the mid-1980s, the California Legislature established broad state policies to facilitate voluntary transfers of water, including policy assurances that water rights of those transferring water would not be impaired or forfeited as a result of water transfers (California Water Code, Sections 109, 475, 1011, 1244, and 11961; DWR 1993; DWR 1989: 10-11). These changes give new flexibility to the once rigid prior appropriation doctrine, and they incorporate many of Curie's initial suggestions.

Then, on October 31, 1992, President George Bush signed into law major reforms of the Central Valley Project (CVP) (U.S. Congress 1991). The bill, H.R. 429, included provisions for planning and funding of wetlands and fisheries restoration projects, along with release of 800,000 AF to assist with protection of drought-stressed Delta ecosystems.

Section 3405, Title 34, of the bill authorizes any individual or district receiving CVP water "to transfer all or a portion of the water" to any other California water use or water agency, State or Federal agency, Indian tribe, or private non-profit organization "for project purposes or any purpose recognized as beneficial under applicable State law" (U.S. Congress 1991). This section also sets forth detailed requirements for water transfers: limits on total transferable quantity, averaged over three years; repayment at full cost rates; voluntary participation in transfers; consistency with the California Environmental Quality Act; a right of first refusal by other CVP water users; no adverse effects on the CVP's obligation and ability to serve its customers; and no significant long-term impacts on groundwater conditions in the seller's service area (U.S. Congress 1991, DWR 1993).

In addition, the Secretary of the Interior "shall not approve a transfer" if the Secretary determines a transfer "would result in a significant reduction in the quantity or decrease in the quality of water supplies currently used for fish and wildlife purposes" unless it is determined that such adverse effects "would be more than offset" by the benefits of the proposed transfer. Adverse impacts must be mitigated (U.S. Congress 1991). The bill does not require that impacts of transfers on communities be addressed, however. A third approach to water transfers, however, holds out hope that transfers may occur while community and environmental impacts are considered simultaneously. This approach is called a "drought water bank."

The Emergency Drought Water Bank

In February 1991, after four drought years and three winter months of meager precipitation, DWR announced that the SWP would deliver only 10 percent of the requests by urban water agencies and no water to agricultural customers. Drought of this magnitude had not occurred in California in 60 years, since the drought of 1928-34. Governor Wilson established a Drought Action Team which recommended creation of an emergency drought water bank to allocate reduced supplies in the State Water Project to four critical needs: municipal and industrial use, agricultural use, protection of fish and wildlife, and carryover storage for 1992 (DWR 1992).

The Drought Water Bank (DWB) operates as follows: DWR purchases water from willing sellers (typically farmers willing to fallow their lands or substitute groundwater for surface deliveries; or local

agencies with surplus storage to sell), keeps their entitlement water in storage, and then sells the water to agencies with critical needs. Within one month, according to DWR, 300 contracts were hastily concluded (DWR 1992). "This was a program that was implemented and then conceived," according to one staff member of the DWB (Aldridge 1992). Most sales went to southern California districts.

Despite being rushed into operation, the DWB intervened effectively to prevent price gouging and bidding wars during the 1991 Bank program. Governor Wilson required that all entities needing to transfer water from the Sacramento Valley (north of the Delta) to south of the Delta work through the Water Bank. This requirement was relaxed in the 1992 Bank, but DWR notes that few independent cross-Delta transfers occurred:

Several purchasers tried to arrange their own transfers but finally went to the Bank to meet their needs. Several sellers negotiated with the Bank and with independent purchasers and decided to contract with the Bank. These sellers preferred the institutional certainty that came with working through the Bank (DWR 1993: 178).

The State found the DWB worked well enough that it will become a permanent program to be activated during drought emergencies (DWR 1993). An Environmental Impact Report on the DWB program compared the drought water bank to a free-market alternative approach, revealing that the bank is superior from several standpoints. First, a "free market" approach in water transfers includes detailed involvement by a number of governmental agencies not directly involved as parties in the transfer. The DWB would represent a "one-stop shop" where buyers and sellers would have a streamlined process run by the DWR for trading water. Second, the Drought Water Bank program enhances the possibility that the public interest will be served through water transfers during drought conditions. During droughts, water supplies are limited, and bidders with the most money may buy all the water they need. Bidders with less financial power, on the other hand, may get little or no water. The DWB would offer one base price (a "going" price established administratively) north of the Delta and then add variable charges associated with pumping and transporting it south of the Delta. The Bank's ability to hold the base price down also enables it to safeguard the public interest by offering cheap water to such state agencies as the California Department of Fish and Game, which is responsible for protecting instream uses. In the absence of such an approach, it is possible that instream uses would be un- or underserved (DWR 1993).

Third, a drought water bank offers a better opportunity for public choice concerning the least environmentally sensitive transfers (*i.e.*, the ones that do the least harm) and to minimize local community economic impacts of transfers. A water bank can avoid buying from

the same area too many years in a row to minimize ongoing wildlife, groundwater, and farm employment impacts (DWR 1993).

A free market approach to water transfers would likely be socially and economically costly because of the coordination efforts (*i.e.*, transaction costs) that individual buyers and sellers would have to undertake to deliver a desired quantity of water from one end of the state to another, with scheduling that is consistent with environmental constraints and hydrologic availability. There would be little protection in a free market against "paper water," except for *caveat emptor*. Government's coordinating role, brokering water transfers and operating the California water system, is as indispensable to the success of water transfers as it is unrecognized in free water market rhetoric.

Transfers Do Not a Free Market Make

The justification for market-type transfers is economic efficiency; but economic efficiency is not readily observable since there are too few water market-type transactions to determine the presence of an equilibrium price of water in the marketplace. Buyer and seller may be better off as a result of a trade, but this does not mean that a water market exists or that economic efficiency has been achieved. Water markets fitting Saliba and Bush's description of market transactions, *i.e.*, continuous trading activity expressing a "going price" are not yet organized or institutionalized in California because individual users still cannot unilaterally seek a buyer for "their" water. The local water agency, the California DWR, and the Secretary of the Interior may still control the fate of any given water transfer.

Moreover, a case can be made that the water industry already is and will probably always remain a regulated industry, though not perhaps like the oil, natural gas, or electric industries. Water law is already known for its convolutions and complexities, which rival corporate tax law, or utility regulation. Should California ever regulate groundwater pumping, this complexity will only increase. Yet at precisely the same time that water transfers are looked on more favorably by the California Legislature and the U.S. Congress, environmental restrictions constrain potential for market actions.

A water market analogous to a capital market or a futures market may never really develop; as one official with the California DWR states: "You have to get specific. Water transfers have to be worked out on a case-by-case basis" (Western Water Education Foundation 1989). Some of the deals may be market-type transfers, while others may be more like administrative trades where no element of rent-making for either party is to be had. A drought water bank program holds hope that the state will be able to manage its water system flexibly and equitably during supply emergencies. In so doing, it will help to curb the excesses of a highly imperfect marketplace for water.

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NOTES

¹An acre-foot of water is the volume of water on an acre of land one foot deep, about 326,000 gallons of water, or approximately the consumption of a family of four in one year.

²It is also a function of land holding patterns in the Central Valley throughout the last 120 years. See Liebman (1983), Chapters 2 through 5; and McWilliams (1949).

³This is essentially the thrust of Williamson's argument (1975) that markets and firms are alternative instruments for completing a related set of transactions. He contends that the relative efficiency of markets versus firms (or bureaucracies) and costs of contracting vary with the human characteristics and the environmental factors involved.

⁴This point is also reinforced by Curie (1983: 5).

⁵It is important to mention involuntary transfers because they represent what every water rights holder seeks to avoid in negotiating voluntary transfers, because appropriate water rights call for holders of such rights to use water beneficially—or lose it.

⁶The authors add that "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."

⁷This has two facets: the board allocates certificates to all landowners according to the landowner's fractional claim to the district water supply based on taxable assessed valuation. Second, the board then repurchases certificates from landowners at the price of proceeds distributed to the "compensation fund" which the board sets up as part of the NCTO. The proceeds are divided only among landowners tendering certificates, which helps to ensure universal participation in the scheme.

⁸Smith is unconcerned about a land rush resulting from the water certificates scheme. "The anticipated value of certificates represents an implicit land subsidy as farmers demand more land to receive larger certificate allocations." This would create no inefficiencies nor inequities, Smith claims. "The land rush," he writes, implying that one would occur, "will not distort the relative use of different land qualities" (Smith, 1989: 457). He thus seems to acknowledge that it encourages corporations to get out of farming and into water ranching.

⁹Upon concluding the trade, the district board, according to Smith, would establish several accounts into which trade proceeds would be disbursed. These funds include: a compensation fund for the landowners; project accounts for environmental mitigation, lost return flows, groundwater recharge,

or hydropower losses; and a "community redevelopment agency" fund to promote local growth and diversification through non-water investments. These funds represent Smith's acknowledgment of the need to internalize injury claims or other third-party effects of water transfers into these deals (Smith 1989: 453).

¹⁰What I call transfer rent was originally described by Richard Walker as redistributive rent (Walker 1974).

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