Flowing Toward Markets: California Water in 2000

by Richard E. Howitt

In his novel *East of Eden*, set in the Salinas valley in the 1920s, John Steinbeck describes the essential nature of water in California before the development of reliable water supplies.

> *"I have spoken of the rich years when rainfall was plentiful. But there were dry years too, and they put a terror on the valley. There would be five or six wet and wonderful years when there might be nineteen or twenty-five inches of rain, and the land would shout with grass. Then would come six or seven pretty good years of twelve or sixteen inches of rain. And then the dry years would come. The land cracked and the springs dried up and the cattle listlessly nibbled dry twigs. Then the farmers and ranchers filled with disgust for the Salinas Valley. Some families would sell out for next to nothing and move away. And it never failed that during the dry years the people forgot about the rich years, and during the wet years they lost all memory of the dry years. It was always that way."*

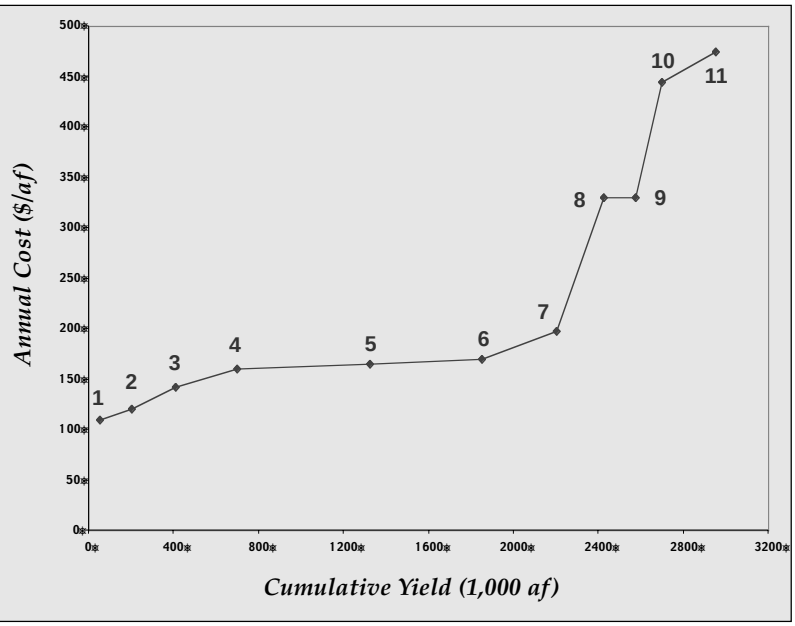
While our ability to control water supplies has greatly improved, our ability to remember the variations in California water is as shortsighted as ever. With the increase in water demand and political and economic restrictions on developing additional supplies in the traditional manner, the need for a more adaptable and responsive method of allocating water in the state is pressing. California's complex economy operates on flows of energy, information, and water. These industries are "network" industries because each requires a collectively supplied network to connect supplies and demands. Over the past fifteen years market innovations in the energy and information industries have made them more responsive to changing demands and technologies. Similar market innovations can be modified and applied to California's water industry where currently the main allocation mechanism is political pressure on the local, state, and federal levels. Politically allocated water resources tend to be rigid since they reflect preferences at the time the project was initiated, but do not adjust to the rapid changes that are an integral part of the California economy. California's water situation is similar to a person who, used to having substantial cash reserves in his checking account to pay off credit cards, suddenly finding that he has to juggle one credit card against the other to balance the cycle of expenditures. California has used up all the excess capacity developed in the water industry and now has to evolve a more flexible and responsive water allocation system to match the inevitable climate cycles described by Steinbeck. Market systems are the most promising allocation system for this purpose, but they have to be tailored to the idiosyncratic aspects of the existing water system.

Increasing Water Scarcity and Complexity

The scarcity value of water in California has increased over the past fifteen years. There has been a steady growth of urban and industrial demands and an additional new and significant environmental demand for water. Despite this growth in demand there have been no new physical sources of water supply constructed during the past sixteen years. Part of the reason for the halt in constructing water projects is that the lowest cost sources of water storage and transportation have been developed. Developing new supplies by building additional water projects would require substantial increases in water costs.

Figure 1. Options for Increasing Water Supply

1. Conjunctive Use - Developable Yield
2. Supplies from Local Water Projects
3. Land Fallowing - Level 1
4. Land Fallowing - Level 2
5. Conjunctive Use - Active Recharge
6. Land Fallowing - Level 3
7. Land Fallowing - Level 4
8. Urban Wastewater Reuse
9. Surface Storage
10. Urban Conservation
11. Agricultural Conservation



Source: Least-Cost CVP Yield Increase Plan, October 1995
US Dept. of Interior Bureau of Reclamation, Mid-Pacific Region, Fish and Wildlfe Service.

Figure 1 shows cost per unit of past water development and compares costs and quantities from alternative supply methods. The construction costs of traditional surface storage shown at point 9 in Figure 1 ($325-425/acre foot) are more than twice those for land fallowing or using underground aquifer capacity for storage ($175/acre foot). A more important reason for increased water scarcity is the growing political power of environmental water interests, which is based on public awareness and concern. Initially, environmental interests blocked development of new water projects. More recently, the major emphasis has shifted to developing alternative water allocation mechanisms. There is an interesting irony in that environmental groups that are largely concerned with issues outside the market system are among the strongest proponents of a shift to water markets.

A second force driving the flow to water markets is the growing complexity of water allocation in the state. The primary function of a market price is as a signal of relative value. Traditional water projects with fixed allocations had no need to measure the relative scarcity values of water, and used water pricing solely as a cost recovery mechanism. In the absence of a water market, this pricing approach has led to the current patchwork of water prices where the cost of water may vary tenfold between different providers. The future water industry will need to respond to changing technology, climate, and demands by reallocating the existing supplies in a way that does not penalize existing users or preempt their future development. In the allocation of all other resources, market systems have shown the ability to stimulate innovation and respond to complex and changing demands. This is not to say that water markets are a "magic bullet" that can be easily applied to California's complex and convoluted water system. However, water markets can be defined that will stimulate the efficient properties of market pricing while also considering the special third-party and environmental aspects that are important to water use.

Environmentalists advocate using market prices for water allocation because they believe that distorted pricing of a resource leads to bad environmental outcomes. Prices are a signal of the value and scarcity of a resource that is hard for most users to ignore. A correctly functioning market operates in a way that impersonally reflects the technology, scarcity, and values of those trading in the market or those who have the option to trade. A water market can adjust to changing climate, technology, and tastes by offering voluntary incentives and compensation to those who currently use water to adjust their use and values to the changed situation. In short, markets provide an alternative supply of water from the voluntary reallocation of the existing supplies. The operation of three Emergency Drought Water Banks by the State Department of Water Resources in 1991, 1992, and 1994 attest to the ability of market incentives to stimulate a supply of water even under severe drought conditions.

More recently, there have been sales agreements between water agencies and a pilot study of electronic water trades between groups of individual water users. As in energy, transportation and information industries, change cannot be directed from above by

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large agencies, but must be stimulated on the individual level. A market system that provides the individual incentives and financing for technical change and reallocation is the only mechanism able to efficiently motivate the individual water user.

Bay-Delta Sticker Shock

When you visit a car lot, the last thing the salesperson wants to discuss is the lump sum price of the car. This is to avoid "sticker shock" that can kill the deal if the customer actually knows what he/she is spending. Currently, the largest negotiations in the water industry are over the restoration of the San Francisco Bay-Delta region. Negotiators in the Cal-Fed process, as it is termed, have the difficult task of crafting a compromise between the main competing water interests of agriculture, urban areas, and the environment. While the final slate of alternative solutions have not yet been announced, current estimates of the cost of one of the three alternatives range between $10 and $14 billion. Depending on the level of federal funding, this translates into the substantial cost of $750-1100 per California family of four, a cost that will probably produce water project sticker shock. The main reason for these very high costs is that while the supply cost of water reflects market and construction realities, demands are still politically defined. The outcome of the resulting sticker shock will be in the form of demand modification by market prices.

Market Efficiency versus Local Equity

Market solutions should be as simple as possible. Additional restrictions or taxes on trades drive a wedge between supply and demand prices and reduce market efficiency. However, given the broad public interest in water rights and some projects, water market solutions cannot ignore the effect of trades on third parties. Reaction to the drought water banks of the early 1990s has taken the form of local ordinances restricting the extent and types of water transfers. Conversely, rigid ordinances impose a hardship on local individuals who can sell water without imposing costs on the community. A more flexible solution is to allow water sales and require a simple severance tax on sales to compensate for legitimate public third-party effects. Similar severance taxes on logging are levied by counties that contain public forests. There are precedents in the land market, which operates quite efficiently with similar third-party effects that are kept within socially acceptable levels by local zoning and compensation based on standard values. Local determination of third-party impacts without a veto power will lead to the gradual development of water trades. Studies show that the amount of water that needs to be traded to bring supplies and demands into balance for the next twenty years is quite modest. Trading 8-10 percent of the existing water at market prices will simultaneously satisfy current shortfalls and curb the growth in demand. There is a wide range of water rights and uses, and since only a small proportion need be traded it seems sensible to "do the easy ones first" and develop different procedures if the need to trade water grows.

Potential Market Solutions

Two types of adjustments are required to balance California's water supplies and demands: long-term shifts in average supply to address technological and demand changes, and short-term reallocations to minimize the social impacts of California's inevitable and recurring droughts. Long-term trades require investment in changed technology for water use and some permanent shifts in water use. Current studies emphasize using depleted ground water aquifers for storage and the voluntary fallowing of low-value agricultural crops to free up tradable water. In addition to these sources, considerable investment in water transportation facilities may be required to enable markets to function with greater reliability. Spot markets and market agreements that come into force only under dry or drought conditions can satisfy short-term drought demands. In addition, the three components of water supply—water rights, storage, and transfer—could be partially de-coupled to increase the flexibility of reallocations.

Given future changes in the California economy, including radical changes in agriculture due to biotechnology innovations, a requirement for California's continued development is to have a water allocation system that is as responsive and adaptive as energy and information systems. California water should become a market commodity, and as such be allocated by prices that reflect its current scarcity rather than recover the costs of past political allocations. The challenge to those involved in all aspects of the water industry is to adapt the current system to market efficiencies while acknowledging the potential for equity impacts.

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