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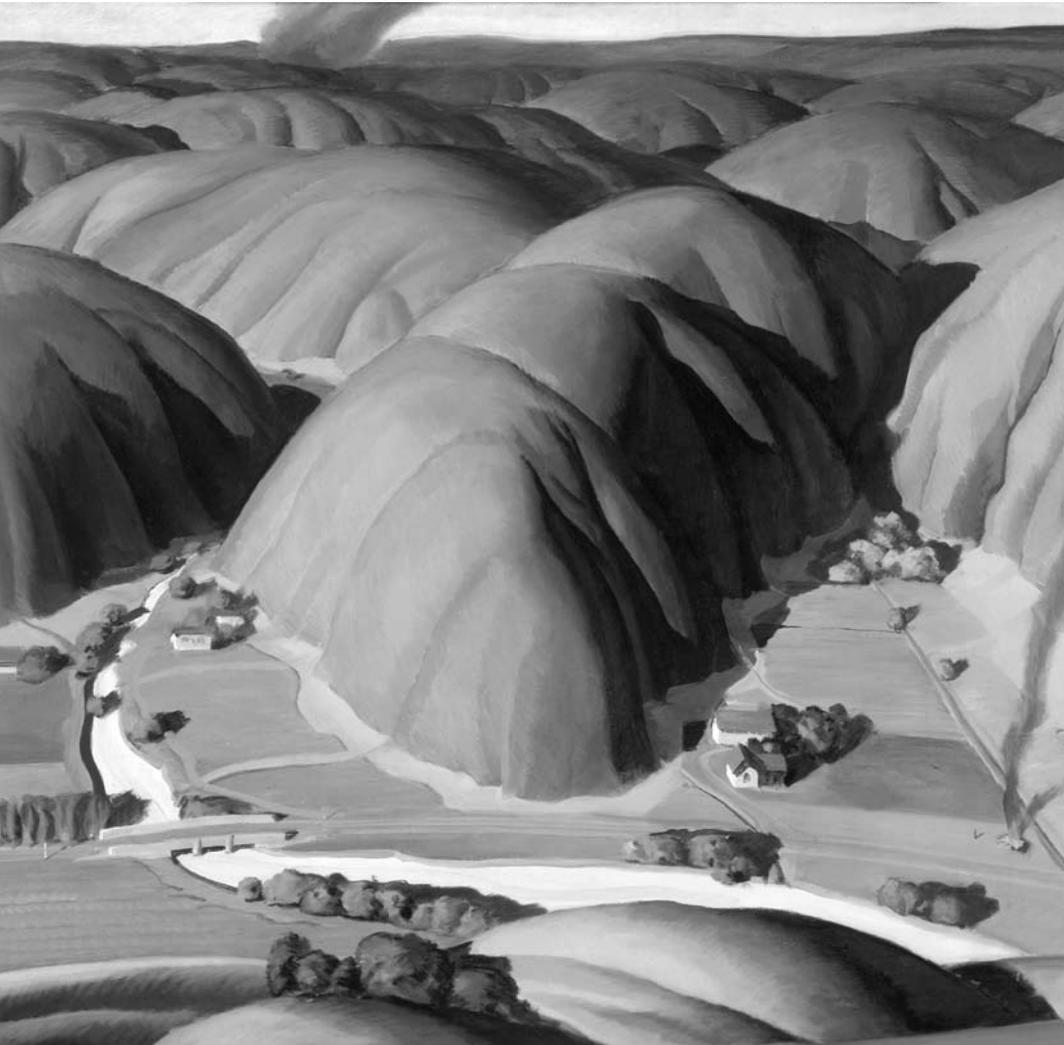
Rescuing Water Markets: Lessons from Owens Valley

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To the READER

In the early twentieth century, Los Angeles purchased water rights by buying up farmland in Owens Valley on the eastern side of California and conveying the water to Los Angeles. These purchases created a legacy of distrust and suspicion, as people over time began to view the trades as theft. Memorialized in the 1974 film *Chinatown*, the image of the Owens Valley trades has cast a shadow on water trading ever since—even when the goal of trades is environmental protection.

In “Rescuing Water Trades: Lessons from Owens Valley,” Gary D. Libecap takes a second look at the Los Angeles–Owens Valley transfers. He shows that the actual events have become distorted in the retelling, but also reveals the genuine problems that surrounded the negotiations. He applies the lessons to water trades today.

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This paper is part of the *PERC Policy Series*, which consists of short, readable essays on timely topics involving markets and environmental issues. PERC is a nonprofit institute dedicated to improving environmental quality through property rights and markets. “Rescuing Water Trades: Lessons from Owens Valley” is the first in PERC’s Dufresne Foundation series of essays, which will discuss ways to reconcile environmental and economic pressures in the West. We are grateful to the Dufresne Foundation for its support. Jane S. Shaw is the editor of the *PERC Policy Series*, Dianna Rienhart is the production manager, and Mandy-Scott Bachelier is in charge of design.

“And at last the drop that fell as a snowflake upon the Sierra’s crest and set out to find its home in the sea, shall be taken up from beneath the ground by a thirsty rootlet and distilled into the perfume of an orange blossom in a garden of the City of the Queen of the Angels.”

—Los Angeles Board of Public Service Commissioners (1916, 9)

“Do you have any idea what this land would be worth with a steady water supply? About 30 million more than they paid for it.”

—J. J. Gittes (Jack Nicholson), in the movie *Chinatown* (1974)

Rescuing Water Markets: Lessons from Owens Valley

GARY D. LIBECAP

INTRODUCTION

Early in the twentieth century, the city of Los Angeles began to grow rapidly, but with annual rainfall of only about 14 inches and no major rivers, it could not sustain this growth without more water. Under western water law, water rights are separable from the land. Los Angeles found that it could purchase land from the other side of the state and pipe it to Los Angeles.

So, between 1905 and 1935, the Los Angeles Board of Water and Power

Commissioners purchased land and water rights from some 869 farm and ranch owners and 825 town lot owners in California's Owens Valley. By 1935, the agency had acquired 95 percent of the agricultural acreage and 88 percent of the town properties in the valley.

This was the first example of a large-scale, market-based exchange of water rights in the American West—and also unquestionably the most notorious.¹ The negotiations, conducted over 35 years, were often acrimonious, occasionally violent, and the resulting publicity was extremely unfavorable to Los Angeles.² Owens Valley became a symbol of how big-city greed and power can overcome a defenseless rural sector. The bleak 1974 movie, *Chinatown*, starring Jack Nicholson and Faye Dunaway, emblazoned this image in the public mind. The entire experience—both fact and fiction—cast a pall on buying and selling water that remains today.

As efforts to trade water gain momentum in the twenty-first century, it is appropriate to take a second look at Owens Valley. We will see that the impressions the public holds of the Owens Valley trades are caricatures of what really happened. On the other hand, we will find that the difficulties that beset the negotiations were genuine and the animosity and frustrations real. They had their roots in problems that are likely to crop up again in natural resource negotiations, including the promising field of marketing water to protect environmental values.

WHY IT MATTERS TODAY

In semiarid western states, most water is used in agriculture, with irrigation withdrawals accounting for 70 to 80 percent of annual water use. In the past thirty years, western cities have boomed, fueled by expanding service industries, while rural agricultural areas have declined. Demand for water has grown in urban areas and for environmental uses such as keeping water in streams to maintain environmental quality. Because there are few options for increasing water supplies—no more dams are likely to be built—these growing demands must be satisfied by reallocating water from agriculture. Water markets to facilitate the voluntary transfer of water from

low to higher-valued uses would seem to be a logical option.³

Certainly, the price differences between water uses in agriculture and in urban uses appear to be large enough to promote water trades. For instance, groundwater for farming near Marana in Pima County, Arizona, costs approximately \$25 per acre-foot (a measure of water that equals approximately 325,000 gallons); for urban use, the same water costs \$200. Agricultural water prices are kept low due to Bureau of Reclamation policies and other federal and state government programs to subsidize farming. In recent efforts to secure Imperial Irrigation District water, San Diego offered \$225 per acre-foot for water that farmers were using for \$15.50. Even more dramatically, in 2001 a planned commercial development near the South Rim of Grand Canyon National Park, where water is extremely scarce, was prepared to spend \$20,000 per acre-foot to deliver the same Colorado River water (Glennon 2002).

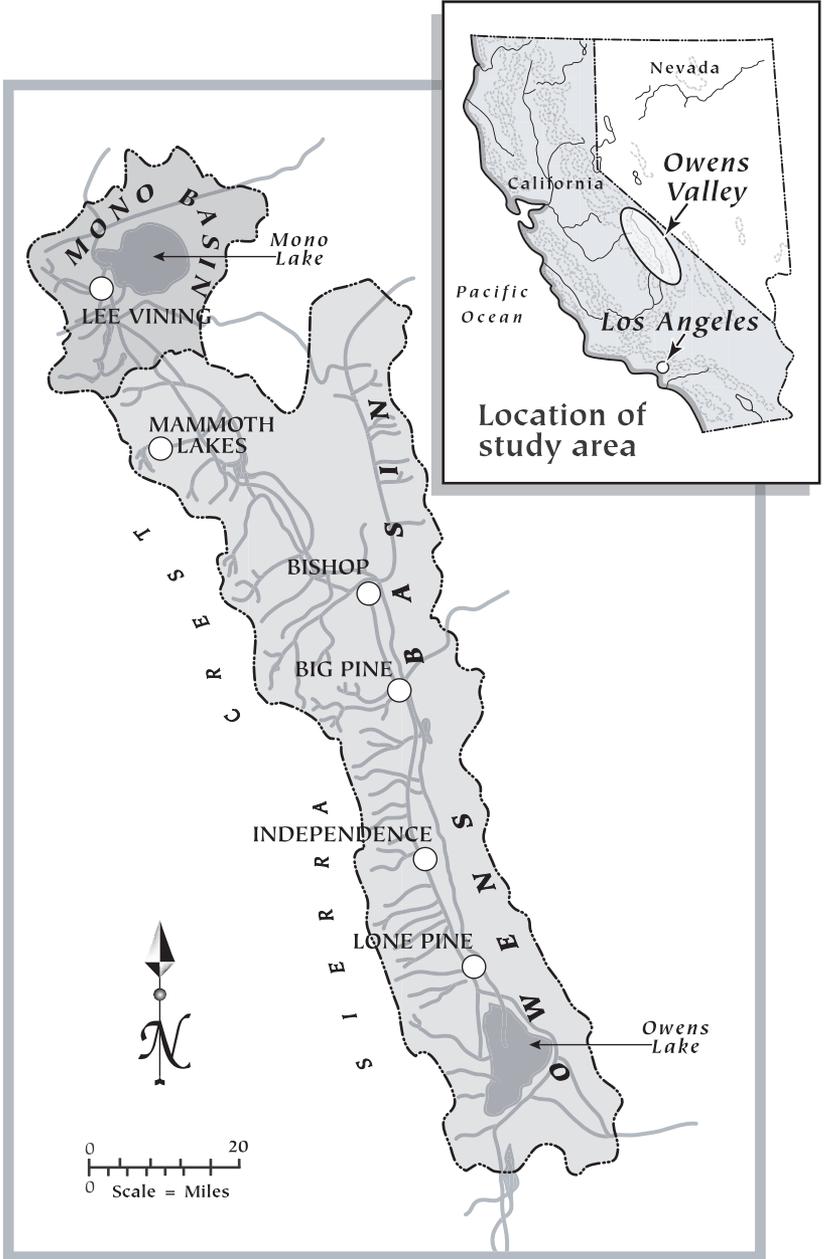
These extreme differences in price indicate that trades would make buyers and sellers better off. Urban buyers could get water more cheaply, and rural sellers could earn much more from their water than they do now in farming if more trade took place. But the development of water markets has been quite limited. The experience of the Los Angeles–Owens Valley water trades illustrates several reasons why.

THE OWENS VALLEY TRANSFERS

The Owens Valley is on the eastern side of the Sierra Nevada Mountains in California, close to Nevada. The valley has most of the population and farming activities in Inyo County. It is approximately 120 miles long and two to six miles wide, bisected by the Owens River, which historically dumped its water into a shallow, alkaline desert lake, Owens Lake.

OVERVIEW

In 1920, just before most of the major purchases by Los Angeles were made, slightly more than 7,000 people lived in the area, on farms and in five



MONO BASIN AND THE OWENS RIVER DRAINAGE

towns—Bishop, Big Pine, Laws, Independence, and Lone Pine. There were 140,000 acres of farm land in the valley, of which 65,163 acres were irrigated in 1920, including 20,906 acres in crops, mostly alfalfa, some grains, and small orchards (apple and pear).⁴ Livestock was the principal agricultural product. The relatively high elevation of the valley (ranging from 3,600 to 4,300 feet), the short growing season (150 days), the alkaline soil, and limited access to markets constrained its agricultural potential.

These characteristics made farming in the valley more like that of Nevada or elsewhere in the Great Basin than in the lush fruit groves and vegetable fields of southern California. But because of the Sierra snow packs that fed the Owens River and the valley's aquifer, there was a lot of water, a supply of some 37 million acre-feet. This was about the same as the volume of Lake Mead, the giant reservoir formed by Hoover Dam (Miller 1977, 49–50).

Los Angeles sought the water because its meager rainfall and limited local supplies from the Los Angeles River watershed were insufficient to accommodate the city's growth. Indeed, thanks to Owens Valley water, the city grew from 250,000 people in 1900 to 2,208,492 by 1930, and land values climbed in the semiarid San Fernando Valley just north of Los Angeles. Between 1900 and 1930, the value of agricultural land in Los Angeles County rose from an average of \$79 per acre to \$907 (Barnard and Jones 1987, 10–12). Because of favorable growing conditions for high-valued crops such as citrus and nuts, by 1920 Los Angeles County became the nation's largest agricultural county in terms of value of production. Los Angeles, in turn, became the largest city on the West Coast—in 1932, it hosted the tenth Olympic Games.

The water from Owens Valley was transported via the Los Angeles Aqueduct. Constructed between 1907 and 1913, the aqueduct was one of the nation's largest public works projects at the time, second only to the Panama Canal. In 1920, the aqueduct provided water to the city at a flow of 283 cubic feet per second, whereas the entire local Los Angeles basin water supply provided a flow of just 68 cubic feet per second (Ostrom 1953, 23).

Furthermore, because of Los Angeles' lower elevation, the gravity flow of water from the Owens Valley to Los Angeles in the aqueduct allowed for power generation, and the Los Angeles Department of Water and Power became the largest municipal electric utility in the country (Kahrl 1982, 230). Los Angeles

spent more than \$18,580,000 through 1934 for agricultural properties in the Owens Valley, and more than \$5,800,000 for town parcels.⁵

IMPACTS

As Owens Valley lands were purchased by the Water Board and their water was sent down the aqueduct to Los Angeles, livestock grazing replaced irrigated agriculture. Farms and ranches were leased from the Water Board and consolidated into larger ranches. This represented a major change, but not a decline in value. Census data reveal that through the period of negotiations land values in Owens Valley (Inyo County) rose by around a factor of 11, increasing from an average of \$13 per acre in 1900 to \$143 in 1930 (Barnard and Jones 1987, 10–12). By contrast, land values in Lassen County, another eastern-California Great Basin agricultural county, only doubled over the same thirty-year period, from an average of \$10 to \$21 per acre. These data suggest that most of the rise in land values in Owens Valley was due to land purchases by Los Angeles, not to changes in agricultural commodity and livestock prices.

Land values rose in Los Angeles County, too, of course. Between 1900, before the aqueduct was planned or had delivered any water, and 1930, when most of the real estate transactions had been completed, the value of agricultural land and buildings in Los Angeles County rose by \$407,051,000, an increase of nearly 600 percent, all due to the increased migration and development opportunities made possible by the arrival of Owens Valley water. During that same time period, the value of agricultural land and buildings in Inyo County rose by \$11,568,000. Although far smaller in absolute terms, this was also an increase of approximately 600 percent. By contrast, farm property values in Lassen County increased by \$6,306,000, or 172 percent from 1900 (Libecap 2004).

An alternative way of assessing the impact of Owens Valley land sales is to consider a counterfactual. If there had been no Los Angeles purchase or export of Owens Valley water, the expansion of farm acreage in Inyo County might have occurred at about the same rate as occurred in Lassen County. If land prices had increased in Inyo at the rate they did in Lassen, agricultural

land values would have been \$4,553,120 in Owens Valley in 1930 (Libecap 2004). But this value is \$7,000,000 *less* than the actual increase.

Using Lassen County as a baseline, then, it is clear that Owens Valley landowners did better by selling to Los Angeles than remaining in irrigated agriculture. Owens Valley landowners captured part of the aggregate gains of trade, just as property owners in Los Angeles did.

Even so, despite all of the apparent benefits of the transactions, historical and contemporary assessments of the Owens Valley exchange are almost uniformly harsh. The *Economist* (2003, 15) summarizes the standard view: “[F]armers remain suspicious of the ‘Owens valley syndrome’ . . . The ‘theft’ of its water . . . in the early 20th century has become the most notorious water grab by any city anywhere . . . The result was not only that the farmers of the Owens valley lost their water. Far more serious, the whole experience has poisoned subsequent attempts to persuade farmers to trade their water to thirsty cities.”

Vincent Ostrom (1971, 449) has pointed out that the experience in Owens Valley harmed subsequent efforts to reallocate water from the Feather River and other areas in Northern California to urban centers in the south. The 1974 movie *Chinatown* reinforced the image of conspiracies surrounding Owens Valley water. Brent Haddad (2000, xv) argued that the “Ghost of Owens Valley” inhibits *all* proposed water transfers from rural areas to cities in the West, and Ellen Hanak (2003, 5, 123) has cited the “devastation” to the Owens Valley economy as motivating county restrictions on water transfers in California.

This gloomy assessment of the Owens Valley transfers was not drawn from the initial negotiations between landowners and city officials. Rather, it developed during subsequent bargaining as farmers attempted to pressure Los Angeles to pay higher prices for their lands by embarrassing the city with negative press. Later in the twentieth century these charges were embellished by critics of Los Angeles who opposed its growth (it became a symbol of urban sprawl) as well as its political influence and the environmental damages to riparian areas in the Owens and Mono Valleys.

But in the 1920s, both farmers and city officials wanted the negotiations to succeed. After all, the city was dependent upon the region’s water, so the Water

Board was anxious to complete agreements as routinely and quickly as possible. Water from Hoover Dam and the Colorado River, the alternative source, did not arrive in Los Angeles until 1941 via the California Aqueduct.

Because Los Angeles generally paid above, and perhaps well above, the market value of the land in farming in Owens Valley, farmers were anxious to sell as well. Their farms were small (on average, 136 acres) and the agricultural potential of the valley was severely limited, especially in the 1920s and 1930s when much of national agriculture was depressed. Thus, most landowners wanted the city to buy all the lands of the valley—but they didn't necessarily want them to be sold right away, and they wanted higher prices.

Given all this, what *was* the problem with the Owens Valley transfer? Examination of the bargaining history between landowners and officials of the Water Board reveals that three key problems contributed to the contentiousness and outright hostility. The problems were especially prevalent after 1923, when the city decided to buy as much irrigated acreage as it could to fill the aqueduct in response to severe drought and unexpectedly rapid population growth. The three factors were disputes over valuation, bilateral monopoly, and third-party effects.

TRANSACTION COSTS OF WATER MARKETS

Markets do not always emerge spontaneously. Oliver Williamson (1975) described many of the transaction costs associated with market development and exchange. His insights are used here to highlight problems that emerged in the Owens Valley–Los Angeles negotiations and that can hinder other natural resource markets in the western United States.

First, the possibilities for market exchange can be limited if there are only a small number of potential traders who bargain infrequently (the market is thin), and/or if the asset is so unusual that there is little information about an asset's likely market value. Under these circumstances, it can be difficult for both sellers and buyers to know what prices to charge and what to offer, and the gap between the asked and offered prices may be very large.

These valuation problems can be an especially serious impediment to trade if the information held by the seller about the asset's value is private and cannot be easily or credibly conveyed to the buyer (Kennan and Wilson 1993). This may be the case, for example, when personal judgments are involved, where there are no standard reference points for evaluating opinions, and where information is so limited that the judgments cannot be easily verified.⁶

Trust can help buyers and sellers accept one another's valuations, but trust requires a history of interaction that is not always possible to assemble (Burt 1997; Coleman 1984; Glaser, Laibson, Scheinkman, and Soutter 2000; Williamson 1993). Generally accepted credentials or training requirements for specialists in determining valuation can also facilitate trades. For example, appraisers can assess the value of similar assets and translate that into value estimates for potential buyers and sellers who are seeking to trade. But these are imperfect instruments because no acceptable comparisons may be found.

Another problem is bilateral monopoly. When many potential buyers and sellers compete for an asset, an equilibrium market price will emerge eventually from the competitive bargaining process. But if there is just a single seller and buyer, agreement may not be reached. Both sides have an incentive to misrepresent the facts—the seller to overstate the value of the asset and what he or she is willing to accept and the buyer to understate his or her willingness to pay. Without competitive sellers and buyers, there is no one else to force revelation of more accurate information. Further, the outcome in bilateral monopoly cases is difficult to predict because it depends upon the relative bargaining power of the monopoly buyers and sellers. And if a trade does take place at a price that is subsequently revealed to be too high or too low (compared to more precise information that appears later), the disappointed party may demand renegotiation or renege on payments. Such actions damage the potential for further trade.

A final problem is the third-party effects of the transaction. These arise if parties who do not have a direct property right to the asset and hence are not directly involved in the trade are nevertheless affected by it. If they are harmed, they will seek to block what would otherwise be a welfare-enhancing exchange.

Compensation to third parties is a possible remedy, but negotiating such

compensation is complex. It requires determining who should pay (the buyer or seller), who has a legitimate claim, and the amount of the payment (based on estimates of the amount of damage). In addition, there is the problem of controlling the number of third-party claimants and the size of the payments. If the gains of the proposed trade are large, many parties beyond just the seller and buyer are likely to stake a claim to them.

In the case of water and other natural resource and environmental assets, all three of these sources of higher transaction costs—valuation, bilateral monopoly, and third-party effects—can impede the development of markets.

VALUATION DISPUTES

There were two sorts of valuation disputes between landowners in Owens Valley and representatives of the Los Angeles Water Board. One was over the value of land and water in agriculture in Owens Valley; the other, over the value of the water and land in Los Angeles. Each party wanted to direct negotiations to the values that were most advantageous. So the Water Board wanted to use Owens Valley agricultural values in determining the prices it would offer landowners, whereas landowners wanted to use Los Angeles land and water values in determining the prices they demanded for their properties.

Agricultural land values in Owens Valley (and indeed, throughout the Great Basin) typically were much lower than either urban or agricultural land values in Los Angeles. Water Board officials wanted to keep their expenditures as low as possible and it only seemed reasonable to compensate farmers for what they could earn in Owens Valley farming. But thousands of people were flocking to Los Angeles and land prices there were booming—all of this made possible by Owens Valley water. Farmers wanted a share of those riches.

The Los Angeles Approach

Although it sought to base its offer prices on farm values, the Los Angeles Water Board did not have accurate information about Owens Valley farm values. There were over 800 farm properties in the valley, which varied in value according to inherent land fertility, access to water, topography,

other growing conditions, and farm size. Each landowner had the most accurate understanding of the agricultural potential of his or her property. To determine market values, these owners could incorporate information from the sale of similar properties, adjusting it for specific characteristics of their farms. The Water Board considered the sale prices of other properties, but it did not have complete information on the specifics of the farms it was seeking to buy. Accordingly, there was potential for sharp disagreement over the values it calculated.

To assemble offer prices, the board relied upon a committee of expert appraisers. To reduce disputes with the landowners, the Water Board wanted a committee that would be viewed as credible and acceptable to both parties. In 1925, the Water Board assembled a special Appraisal Committee of “three of the leading citizens of Owens Valley”: George W. Naylor, chairman of the Board of Supervisors of Inyo County; V. L. Jones, Inyo assessor; and U. G. Clark, former county assessor. The committee determined “appraised values” for each property under consideration, and the board generally used a fixed multiple, usually 4.1 times appraisal, to determine its offer price (Libecap 2004).

Although the appraisal committee was composed of local people, landowners viewed it with suspicion because it was employed by the board. During negotiations with some farmers in 1926, the credibility of the committee’s prices was questioned: “You hired that committee; we had nothing to say about it . . . if you people hire these men, you expect them to go into the field and do as you tell them don’t you?” Both the appraisals and the committee often were rejected: “They have been your committee for a long time. Let us forget them.”⁷ Landowners who challenged the committee’s estimates during sales negotiations instead called for binding arbitration in price disputes, using arbitrators that both sides agreed upon. Calls for arbitration were raised periodically throughout the 1920s, but the board rejected them because arbitrator rulings could break the city’s general pricing rule.

Throughout the period, the board fixed its offer prices based “on the fair average prices which the city had paid for substantially similar property in that region.”⁸ It repeatedly resisted adjusting prices beyond what it had offered for comparable lands in an area. Had it shown itself willing to offer higher prices to others with similar properties, then completing negotiations with any farmer

would have been very difficult. For example, in 1926 in asking the Appraisal Committee to determine offer values for properties under consideration, one of the board's land agents stated: "It is also to be understood that these properties are to be appraised in the same manner and on the same basis that you have appraised other properties of substantially the same character and in accordance with previous values. . . ."⁹

Further, and importantly, the board did not want to reopen negotiations with those parties with whom it had already reached agreement. If it did so, it likely would have had to raise its past offers for land, both more quickly exhausting the bond revenues it used to purchase lands and opening itself to criticism from Los Angeles' taxpayers for mismanagement.

The Owens Valley Approach

Owens Valley property owners wanted to base their demand prices on water values in Los Angeles, since these were clearly very high. The landowners did not have direct information about the willingness to pay for water in Los Angeles, but they did observe the dramatic jump in land values in the San Fernando Valley when the aqueduct was completed, and they were aware of the size of the bond issues to finance the purchase of Owens Valley land, which were subject to voter approval. Landowners also observed the rapid increase in the population of the city and understood the dependence of this growth on Owens Valley water. Accordingly, they tried to get prices that were reflective of water values in Los Angeles. For example, before the board, one landowner claimed that she priced according to "the comparative value of what that water is worth to you . . . because we know you want water and not the land . . . that is what you want and all you want. . . ."¹⁰

Conflicts

Given these different pricing positions and the size of the gaps involved, there were bound to be disputes. But agreement on property valuation also was complicated by a lack of trust on both sides. Water Board officials viewed landowners as attempting to fleece taxpayers with exorbitant price demands.

Landowners viewed the board as attempting to undervalue their lands while property values in the San Fernando Valley skyrocketed. This limited trust meant that neither party considered the other's pricing claims as credible or honest, increasing the transaction costs of negotiation and lengthening the time necessary for agreement.

Agreement also was complicated by uncertainty about how much land and water Los Angeles would ultimately seek in the Owens Valley. On the one hand, the city's population growth was proceeding beyond expectations, and there were recurring unpredictable droughts in the region. These conditions encouraged farmers to hold out for higher prices. On the other hand, there was the possibility that the Water Board would eventually have enough land and water and would not need to buy more property. Both parties faced uncertainties. Landowners could not fully anticipate whether there would be additional land purchases, should current negotiations fail. Board officials did not know how much irrigated land they could leave unpurchased in Owens Valley and still have sufficient water if bargaining over specific properties reached an impasse.

Under these circumstances, the repeated conflicts over the appraisals offered by the appraisal committee should not be surprising. Because each property was unique, and because the committee based its appraisals on what it thought were comparable lands, there were complaints that either the properties chosen for comparison were the wrong ones or that appraisals based on those properties were incorrect. One owner, who had been offered \$3,100 for her property, complained that a neighbor had been offered \$10,500 even though he had 1.25 acres less than she did, with only 2 inches of water from the ditch, while she had 3 inches.¹¹ Another wanted her land appraised against a different group of properties, selecting five farms whose owners had received more than she had been offered.¹²

There is also evidence of concern in Los Angeles that the city was paying too much for land. For example, land buyer John Merrill asserted in 1927 that while the city had paid an average of \$200 per acre for Owens Valley lands thus far, the lands could have been secured for \$50 to \$75 per acre for a total expenditure of \$5 million rather than \$12 million.¹³ The *Hollywood Daily Citizen* ran an editorial objecting to any payment for town properties

beyond appraised values.¹⁴ These allegations were of concern to the Water Board because it was charged with providing the city with a sufficient water supply within a budget. Failure to do so would imply mismanagement and threaten the agency's ability to raise funds through additional bond issues.

BILATERAL MONOPOLY

Disputes over valuation took place, at least for some properties, within a bilateral monopoly context. On one side was the Los Angeles Water Board, generally the only purchaser of Owens Valley lands and water rights. On the other side were sellers' pools that colluded in their price negotiations with the Water Board. Although these pools never included all of the farmers in Owens Valley, they did include those with the most water. By the latter part of the 1920s, in the face of drought and continued population growth, Los Angeles was dependent upon securing those lands to fill the aqueduct.

While representatives of the Water Board could walk away from stalled negotiations with one landowner, they could not walk away from the pools as a whole. And landowners had few options for sale to others besides Los Angeles—at least at the prices the city was offering. Accordingly, bilateral monopoly conditions existed. These situations have indeterminate pricing outcomes because they depend upon the relative bargaining power of the parties involved. Further, negotiations often break down and/or take a long time to complete.

Sellers' pools acted as monopoly sellers to the Water Board, and in Owens Valley they were formed only by irrigation ditch companies. Each irrigation ditch company held the water rights of its members, who in turn owned shares in the company. These ditch companies provided a ready organizational tool by which farmers could collude in their negotiations with the Los Angeles Water Board. Each pool leader presented the demand prices for member properties to the Water Board and attempted to keep each farmer from accepting something less. In the valley the major ditch companies included the McNally Ditch, Big Pine Ditch, Bishop Creek Ditch, and the Owens River Canal. All farms on ditches were of interest to the board because they carried the most water. Once the Water Board completed purchase of a farm located

on a ditch, its water allocation could be released to flow down the river to the aqueduct.

Three sellers' pools were formed: the Keough pool on the Owens River Canal, with over 30 members and the most water in the valley; the Watterson pool of about 20 members on Bishop Creek Ditch; and the Cashbaugh pool of 48 members on Bishop Creek Ditch (Libecap 2004, table 2). These pools were loose negotiating groups dominated by the largest landowner, and some defection took place. Nevertheless, the parties in these pools were involved in the most contentious and drawn-out negotiations with the Water Board.

For example, the board paid \$1,389,364 to buy out the properties in the Cashbaugh pool between 1924 and 1927. The largest land and share owner in the pool, however, William Cashbaugh, held out through 1927, and received a 21 percent premium over the city's initial offer price of \$145,180 or \$174,680. The most successful pool was led by Karl Keough with 4,482 acres (60 percent) of the 7,862 acres on the Owens River Canal. In 1926, the Keough pool demanded \$2,100,000 for its properties, and the board first offered \$1,025,000 and then increased it to \$1,250,000. The pool countered with a price of \$1,600,000, which was rejected by the board.

Price negotiations for properties on Owens River Canal, both in and out of the pool, continued on between 1925 and 1931, and they were among the most rancorous in Owens Valley. By the end of 1927, 60 percent of the 4,837 shares in the canal company were acquired by the board, but the remaining 40 percent held by pool members were not secured until 1931. G. L. Wallace offered his lands in 1926 for \$417 per acre, while the city countered with \$254 per acre. Final agreement was not reached with him until 1931 at \$466 per acre (Libecap 2004).

When negotiations broke down, pool leaders resorted to violence to pressure the board to meet their price demands, even threatening the security of the city's water supply. Between 1924 and 1931 the aqueduct and city wells were periodically dynamited, although the aqueduct was never seriously damaged. The board viewed the dynamiting as a negotiating tactic, but was extremely worried about disruption of the aqueduct flow. These episodes of violence, labelled "California's little Civil War" by the press, attracted state and national attention.

THIRD-PARTY EFFECTS

As Los Angeles purchased properties in Owens Valley and took them out of irrigated agriculture, complaints arose that the sales were hurting the local economy and damaging property values within the five towns. The magnitudes of the effects were disputed. Merchants claimed to have lost a third of their trade due to the decline in the agricultural economy (Nadeau 1950, 96).

The general fall in agricultural commodity prices in the 1920s also hurt the community, and this effect is difficult to separate from those resulting from the Water Board's purchase of lands and export of water. For example, the value of Inyo County crops fell from \$1,503,195 to \$791,257 between 1920 and 1924, a fall of 47 percent. This decline, however, occurred prior to most of Los Angeles' property purchases in the valley. And during that same five-year period, the number of farms in the valley fell only 7.5 percent, from 521 to 482; this reduction in farmland was hardly enough to account for the observed fall in the value of agricultural production (Miller 1977, 164, n20).

Nevertheless, town property owners blamed the actions of the Water Board for the deterioration in economic conditions. The board countered by pointing to its investments in the valley to develop water and power sites and the growth of recreational activities by Angelenos who traveled north to the valley to fish, hunt, and camp. Indeed, automobile registration and bank deposits in the region increased.¹⁵

In 1925, a committee was formed in Owens Valley to demand either that the board pay \$5,500,000 in reparations as compensation for the loss in town lot value or that the city purchase the properties for \$12,000,000. Later in 1927, the reparation demand was reduced to \$2,813,355 (Hoffman 1981, 176–202; Ostrom 1953, 123–27). Not only were the prices demanded for town properties well above what Los Angeles had been paying for farm lands, but they carried few or no water rights. The board had only limited bond funds to secure water for the aqueduct and did not want to use them for properties that did not add to the city's water supply. Moreover, because the lands did not bring water, the board was uncertain that it had the legal authority under the city charter to purchase them.

Legislation was enacted by the California legislature in 1925, at the behest

of Inyo County and other rural legislators, requiring cities to compensate for damages to businesses and property owners when water was taken from the drainage area.¹⁶ The statute added pressure on the board to buy the town properties or be faced with hard-to-measure-and-agree-upon reparations demands. Board officials held off the purchase of town lots until a state Supreme Court ruling in 1929 authorized the purchase of the town properties by Los Angeles. After that, negotiations between the city and town lot owners were contentious, requiring various appraisals, offers, and counteroffers. Some negotiations that began in 1929 were not completed until 1935.

The Water Board was obligated to buy the properties, and town-lot owners knew that. The board, however, was constrained by available funds and taxpayer concerns about their effective management. At the same time, as with farm lands, there were sharp disagreements as to how to appropriately value the town lots. The town representatives rejected the property value appraisals prepared by the board's land agents. Negotiators for the towns offered counter appraisals that raised proposed values in the towns of Laws and Independence by 45 to 50 percent, in Bishop by 120 percent, and Big Pine by 60 percent. Members of the California legislature who owned properties in the towns threatened new investigations of the city's purchasing practices unless the new appraisals were accepted.

After rounds of negotiation that took three additional years or more to complete, ultimately a compromise was reached, and Los Angeles paid \$5,798,780 to 824 owners for 1,300 town parcels, most of which brought little or no additional water to the city (Libecap 2004; Ostrom 1953, 126). Funds to buy town lots and remaining agricultural properties in Owens Valley required a special 1930 bond election to raise \$38,800,000.

ASSESSING THE OWENS VALLEY EXCHANGE

Negotiations between the Los Angeles Water Board and landowners in Owens Valley were rancorous and lengthy because of the combined effects of disputes over property valuation, bilateral monopoly conditions, and third-party effects. Neither party could quit the process, but both

had sharply different values and prices in mind. The lands were heterogeneous, and information about their value was limited. Appraisals, even those by a seemingly credible appraisal committee, were disputed.

The disputes were also driven by the huge disparities in land values between Owens Valley and Los Angeles. As we have seen, the benefits to Los Angeles of the exchange included an increase in the value of agricultural land alone of over \$400 million, with aggregate urban land values likely rising several multiples of this amount. The benefits to Owens Valley landowners in terms of the increase in agricultural land values were approximately \$12 million, about \$7 million more than they likely would have received had the region stayed in irrigated agriculture. Although both sides gained, the vast increases in Los Angeles's land values compared with the increases in Owens Valley's are the origin of the notion of "water theft" that persists today.

Owners of the most valuable properties in Owens Valley, those carrying the most water, held out for as long as six years to get prices higher than those initially offered by the Water Board. The price gaps also were not easily narrowed because of information limits and uncertainties about the value of water in Owens Valley and Los Angeles, about the amount of water Los Angeles ultimately would require, and about how much irrigated agriculture could be retained in the valley. Further, the gaps could not be quickly narrowed because of a lack of trust between the parties that made them suspicious of one another, and there were few means of resolving the suspicion. The nature of the third-party effects on the towns, disagreement about their size, doubts about the legality of purchases of those properties by Los Angeles, and problems of determining compensation all added to the complications of buying the valley's water rights.

As we have seen, the land values in Inyo County increased as a result of the water purchases, but the water purchases had other impacts as well. Farming shifted from crop cultivation toward livestock and the economy became more diversified. The population of Inyo County fell only 6 percent between 1910 and 1930, to 6,555, and the value of agricultural production held generally constant in current dollars across that period. Although some other Great Basin agricultural counties did better, even during the agricultural depression, this is not the record of "economic devastation" that

is claimed throughout the literature on Owens Valley.¹⁷ Given the overall decline in agriculture in the Great Basin and elsewhere in the country in the 1920s and 1930s, as well as the offsetting effects of Los Angeles's investments in highways and recreation facilities, these third-party effects may have been comparatively small. They nevertheless played an important role in bargaining conflicts and in creating a negative legacy for the Owens Valley transfer.

The economic surpluses that new water generated in Los Angeles County were so large that the water board might have taken a more liberal approach in its pricing policies and allowed for more active use of binding arbitration. This action, of course, would have driven the agency from its strict pricing rules and required additional bond issues to purchase land and fill the aqueduct. Taxpayers in Los Angeles might not have accepted such policies.

Furthermore, an institutional mechanism would have been necessary, agreed to at the onset of negotiations, to evaluate and control third-party claims—determining who had legitimate standing and for how much. A neutral party with binding authority both to arbitrate disputes and to assess third-party claims might have been a useful option. But in 1905 when negotiations for Owens Valley lands began, there was neither an understanding of how much land and water would be purchased, nor any anticipation of just how difficult the bargaining ultimately would be.

Unfortunately, in the absence of such arrangements, the legacy of Owens Valley has been to make rural areas extremely wary of selling water to urban areas. Indeed, there have been only a handful of large voluntary rural-to-urban water transfers since 1930. Valuation disputes, bilateral monopoly, and third-party effects all raised the transaction costs of negotiating land and water exchanges.

APPLYING THE LESSONS

The lessons of the Owens Valley can be applied to attempts to increase voluntary water trades and, specifically, to the growing effort to protect instream flows in the West. As concern grows about protecting aquatic life, including endangered species, private groups and public agencies have begun

to purchase water rights, especially from agriculture, and to keep more water in streams and rivers to further environmental goals.

Because these trades are voluntarily negotiated, they avoid the political rancor associated with more arbitrary regulatory or judicial rulings over diversion, beneficial use, instream protection, and water transfers (Houston, Kline and Alig 2002, 19–21). Regulatory actions, in particular, are subject to competing political interests that can slow, modify, or block the process of reallocation, even if the parties directly involved favor it.¹⁸ Market exchanges can be timelier; they can more smoothly and accurately relocate the appropriate amounts of water; and if the property rights are fully specified, all parties can be made better off from the transactions.

Across the western states the primary approach varies. Market trades for instream flow rights involving private parties are more common in the Pacific Northwest (Washington, Oregon, Idaho, and Montana) than in other Rocky Mountain states, where there is more reliance upon state agency actions (Landry 1998, 4–5, 8).

Nevertheless, as the Owens Valley case makes clear, the development of instream flow trades will likely encounter the interrelated problems of valuation, bilateral monopoly, and third-party effects. These problems can reduce the ability of markets to accomplish welfare-improving water trades. Let us examine how each of these problems might affect instream flow exchanges.

VALUATION DISPUTES

Although there are established procedures for valuing water rights (Colby 1989), valuation of instream flows in any proposed exchange can be difficult because each trade is nonstandard or idiosyncratic. Water diversions for instream flow protection will have different sizes, characteristics, and effects, depending upon water rights seniority, flow, and location of the diversion on the stream. These factors make it difficult to make comparisons with other sales.

Furthermore, the information on price and water traded from private exchanges generally remains confidential, so it is difficult to know market prices. Professional appraisers may be of assistance, but given the limited

number of trades and the unique characteristics of each exchange, appraisers also face a challenge (Landry 1998, 18–19).

Because commodity prices and crop production are observable, the value of agricultural production lost when water is released for instream use is easier to estimate. But irrigators are also aware of the growing demand for instream flows and will want a price that is more reflective of the value of that demand. In the absence of easy reference points, both sellers and buyers will have trouble arriving at offer and demand prices and ultimately at a market-clearing price.

Breakdowns in negotiations can take place. For example, beginning in 1989 under new leasing legislation, the Montana Department of Fish, Wildlife, and Parks negotiated with a water right holder on Swamp Creek to lease just over 3 cubic feet per second to improve habitat for the Arctic grayling. The department estimated that the market value of the water in agriculture was less than \$10,000 annually, but negotiations collapsed when the owner demanded \$200,000 per year (McKinney 1991, 250).

BILATERAL MONOPOLY

Bilateral monopoly problems also are likely in negotiations over enhancing instream flows. The value of a water release back into a stream depends critically upon its location. To protect spawning fish habitats or to provide long courses for rafting, the release may have to be close to the stream source, for example. These locational requirements reduce the number of irrigators who are potential sellers and thus enhance their “monopoly” position.

At the same time, there often is only a single buyer of water rights for instream uses—a nonprofit trust, a state agency, or private recreation or conservation group. Accordingly, trading for instream flows will take place within a bilateral monopoly setting.

Under these circumstances, as the Owens Valley case reveals, it is much more difficult for the negotiating parties to reach agreement. Negotiations are apt to drag on because there are few options for either the buyer or the seller. When both parties have sharply differing views of the appropriate price, negotiations can break down.

THIRD-PARTY EFFECTS

Uncompensated third-party effects may be the largest impediments to water trades to enhance instream flows. They do not operate alone, but in conjunction with valuation disputes and bilateral monopoly problems. There can be both positive and negative third-party effects, and both have to be understood in order to promote valuable water exchanges.

On the positive side, greater instream flows may encourage more fishing, rafting, and other water activities, increasing commercial recreation in nearby communities. In this case, greater instream flow diversions create a public good that many benefit from. (Indeed, some people will benefit simply by seeing fast-flowing streams.) Farmers as water rights sellers will seek to price their water in such a way as to capture the value of as many of these aggregate benefits as possible. Because these benefits are generally hard to measure, valuation disputes may occur. And bilateral monopoly problems are possible if the farmers collude in negotiating sales or are the sole owners of key locations along the stream. In either case, they may demand prices beyond what buyers are willing to pay. As these examples indicate, even when there are positive third-party effects from water trades, negotiation problems may emerge.

The more standard concerns involve negative third-party effects when water is taken from agriculture and land is fallowed. If large amounts of water and fallowed lands are involved, the negative third-party effects may be substantial. Some argue that eventually much of the water in a particular basin could end up in instream rights. This would adversely affect the local agricultural economy and lifestyle, as well as suppliers of agricultural equipment or labor. Additionally, allowing private parties to acquire water for instream flows would drive up the price of water and make it difficult for small farmers to survive, especially if they have low-priority water rights and rely periodically on water exchanges with other farmers. In all of these cases, those who expect to be harmed will understandably resist trades.

As the Owens Valley case makes clear, third-party effects are difficult to quantify and the legitimacy of many claims is disputable. There are also questions of who should pay compensation—the irrigators who fallow their

land, and therefore reduce agricultural activity in the region, but receive direct benefits from the sale, or the stream water users, who buy the water rights.

Because of the problems of determining who has a legitimate claim for compensation and of assessing the amount of the damage, there will be considerable confusion and misinformation in negotiations over third-party disputes. That is one reason why they assume such notoriety. As occurred in Owens Valley, during these third-party disputes politicians may enter on behalf of certain constituents, but their efforts may not promote broader water exchanges.

In fact, the goal of avoiding political intrusion and its consequences can be an important motivation for voluntary water exchanges. During drought when critical fish habitats are at risk, regulatory or judicial intervention under the Endangered Species Act or similar legislation may occur. In these cases, however, landowners lose at least some control over their property rights, and they may not regain it even after the water shortage crisis has passed. Water trades offer a more flexible alternative.

Negative third-party effects and associated political intervention are more likely to be a problem in large water transfers than in small ones. In the Columbia River watershed, the Columbia Basin Water Transactions Program (in collaboration with the Oregon Water Trust, the Washington Water Trust, Montana Trout Unlimited, the Idaho Department of Water Resources, and the Bonneville Power Administration) have promoted voluntary water transfers for instream flows to rebuild spawning grounds for steelhead, salmon, and other species. Since many of these transactions involved relatively small amounts of water, the magnitude of valuation disputes and third-party effects was minimized, easing the trades.

CONCLUSION

The Owens Valley water transfer to Los Angeles took about thirty years, with hotly-contested negotiations, periodic episodes of violence, and occasional intervention by the California governor's office and the state legislature, all of which attracted national and international attention. Although both Los Angeles and Owens Valley benefited from the trades, the

imbalance in the distribution of the returns, \$12 million to \$400 million or more, have left a very negative legacy. Owens Valley has become a metaphor for opposing water markets, even though the farmers in a marginal Great Basin agricultural area were far better off (by a factor of 2 or more times) with the transactions than they would have been without them.

Owens Valley holds lessons for today. Given the booming cities in the semiarid West and the increased demands for water for wildlife and the environment, there is no doubt that water will be reallocated away from agriculture. The question is how to facilitate those transfers in the smoothest, least-costly, and most timely manner.

Water markets are an important option. But as the experience of Owens Valley shows, water markets do not develop seamlessly, even when the gains from trade are huge. Specifically, transaction costs stemming from valuation disputes, bilateral monopoly, and third-party effects can stymie trade.

When water trades take the form of small transfers to augment stream flows, these obstacles will be relatively small. The difficulty of valuing the water rights remains, but should decline as experience with trades for instream flows develops. Bilateral monopoly conditions may also persist, but they too should decline as buyers and sellers become more flexible in order to avoid regulatory intervention. For larger water trades, where significant quantities of agricultural water are to be transferred, the obstacles to water markets are more significant.

The benefits to the West from increased water trades are enormous, as indicated by the enormous variations in the price of water in urban and agricultural uses. The experience of Owens Valley lets us know what the obstacles are; the challenge is for entrepreneurs to come up with ways to overcome them.

NOTES

1. Much of this discussion of Owens Valley is drawn from Libecap (2004). Research on Owens Valley and western water markets is funded by NSF Grant 0317375, co-principal investigators Alan Ker and Robert Glennon; the Earhart

Foundation; and the Julian Simon Fellowship at PERC.

2. For example, see Reisner (1986, 60–107); Kahrl (1982, 38, 387); Ewan (2000, 42); and Wheeler (2002). Other authors have a less critical view; see Hoffman (1981, xviii–xiv); Nadeau (1950, 126–28); Sauder (1994, 124–34, 151–64); and Walton (1992).

3. For an overview see Anderson and Hill (1997); Anderson and Snyder (1997); Colby and Bush (1987).

4. 1925 U.S. Agricultural Census; Ostrom (1953, 118) for irrigation acreage in 1910. See also Walter Packard, “The Future Agricultural Development of Owens Valley,” January 22, 1925, Tape GX0004, Special Owens Valley File, Los Angeles Dept. of Water and Power (LADWP) Archives.

5. See Libecap (2004) for discussion of land purchases.

6. For example, see Libecap (1989) and Libecap and Smith (2001) for discussion of the problem of reaching agreement on oil field unitization shares when leases are very heterogeneous or when both oil and natural gas must be traded within the unit and there is little agreement on how to exchange one for the other.

7. Testimony from Mrs. G. L. Wallace, Transcript of Proceedings, August 13, 1926, Ladies Committee to Board of Water and Power Commissioners, Tape GX0003, Owens River and Big Pine Canal File, LADWP Archives.

8. Tape GX0004, Special Owens Valley Committee File, Memo July 21, 1926, Board of Water and Public Service Commissioners, LADWP Archives.

9. Tape GX0003, Owens River and Big Pine Canal File, letter to the Owens Valley Appraisal Committee from E. F. Leahey, September 10, 1926, LADWP Archives.

10. Tape GX0003, Owens River and Big Pine Canal File, Transcript of Proceedings, August 13, 1926, Ladies Committee to Board of Water and Power Commissioners, testimony by Mrs. Wallace. LADWP Archives.

11. Tape GX0003, Owens River and Big Pine Canal File, Transcript of Proceedings, August 13, 1926, Ladies Committee to Board of Water and Power Commissioners, testimony by Mrs. R. C. Clapp. LADWP Archives.

12. Tape GX0003, Owens River and Big Pine Canal File, Transcript of Proceedings, August 13, 1926 Ladies Committee to Board of Water and Power

Commissioners, testimony by Mrs. Wallace. LADWP Archives.

13. Tape EJ00086, Correspondence June to September 1927, letter John A Merrill to Board of Public Service Commissioners, August 15, 1927, LADWP Archives.

14. Tape GX0001, Clippings File, Hollywood Daily Citizen editorial, n.d., probably late 1929. LADWP Archives.

15. Kahrl (1982, 144, 297) claimed that the economy had been devastated, but presents the city's counterclaims.

16. Chapter 109, Statutes and Amendments to the Codes of California, 1925.

17. Census data analyzed in Libecap (2004). See Hanak (2003, 5) for the standard reference.

18. For example, see the discussion by McKinney (1991) in Montana about efforts to devise leasing legislation.

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