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**THE EVOLUTION AND PERFORMANCE OF GROUNDWATER MANAGEMENT
INSTITUTIONS IN SOUTHERN CALIFORNIA**

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**UNCOVERING THE HIDDEN RESOURCE:
GROUNDWATER LAW, HYDROLOGY AND POLICY LAW
IN THE 1990s**

**Natural Resources Law Center
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School of Law
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I. Introduction

- A. Various scholars and commentators either have raised the question of whether there is groundwater management in California, or have asserted that there is not. Their critique is based primarily on the absence of a statewide groundwater management statute or program.
- B. In fact, groundwater management does exist in California, but it occurs locally and therefore differs from one basin to another, and has not yet been implemented in many basins.
- C. Local basin management programs, and the basin governance institutions that design and implement them, have been developed over time by local water users as water problems have emerged and been understood. These efforts are not "comprehensive," but incremental and adaptive in keeping with the nature and limits of human problem-solving.
- D. This paper describes the development and analyzes the performance of groundwater management institutions in eight southern California basins. It raises and responds to the following key questions:
 1. How did these institutional arrangements come about?
 2. What are their characteristics and features?
 3. How well do they perform?
 - a. How well do they perform across several criteria?
 - b. Are they worth it (relative to letting the basins go)?
 - c. Does the single-agency, non-adjudicated basin work better than the multi-organizational, adjudicated basins?
 4. What can we learn from their relative successes and failures?

II. The Lay of the Land: The paper includes eight cases in four watersheds, underlying most of the Los Angeles-Orange County-San Bernardino metropolis. Four basins are in the San Gabriel River watershed in Los Angeles County: the Raymond, Main San Gabriel, Central, and West basins. One is in the Los Angeles River watershed in Los Angeles County: the Upper Los Angeles River Area (ULARA). Two are in the Santa Ana River watershed: the Orange County basin, and the Chino Basin in San Bernardino, Riverside, and Los Angeles counties. The remaining groundwater system is along the Mojave River in San Bernardino County.

III. The Evolution of Basin Governance and Management Arrangements

A. Groundwater problems emerged in these basins at different times and with differing degrees of severity, but three trends contributed to the supply problems and the need to control groundwater demand in all of them.

1. Development of lands for irrigated agriculture accounted for the growth in groundwater use throughout southern California, and several basins were at or near overdraft by the time they began to urbanize in earnest.
2. In most southern California basins, urbanization and population growth did not increase total water use, but did aggravate groundwater problems by reducing return flows and natural replenishment.
3. As large-scale water projects brought more expensive imported water to southern California, water users faced the problems of how to encourage pumpers to rely on imports to meet at least some of their needs, and who would pay for the imported supplies.

B. In the four groundwater basins of the San Gabriel River watershed, these groundwater problems were addressed through adjudication and limitation of rights to local water supplies, creation of districts to pay for supplemental water supplies, and (in three of the cases) imposition of a pump tax to purchase imported water for basin replenishment.

1. In the relatively small Raymond Basin, the city of Pasadena took all other pumpers to court to define their relative rights to the local groundwater supplies. The resulting judgment introduced the doctrine of "mutual prescription" into California groundwater law, defining all pumping rights as of equal priority and then reducing them in total to the basin safe yield.
2. West Basin water users faced problems of overdraft, loss of freshwater replenishment from Central Basin upstream, and saltwater intrusion from the ocean. They curtailed pumping with a "mutual prescription" type of adjudication of pumping rights. They acquired access to imported water supplies through the formation of the West Basin Municipal Water District and its annexation to MWD. They encouraged Central Basin pumpers to begin similar processes, and cooperated in the creation of the Central and West Basin Water Replenishment District to taxpumping and operate a basin replenishment program to benefit both basins. They developed an injection-well barrier to block saltwater intrusion.
3. Central Basin water users faced problems of overdraft, loss of freshwater inflow from the San Gabriel Valley upstream, and saltwater intrusion. They first acquired access to imported water supplies through the creation of the Central Basin Municipal Water District and its annexation to MWD. They then initiated a suit against upstream pumpers to guarantee flows of the San Gabriel River through Whittier Narrows to Central Basin. They cooperated with West Basin users in the creation of the Central and West Basin Water Replenishment District to operate a basin replenishment program and a saltwater intrusion barrier. Finally, they curtailed pumping within Central Basin with a "mutual prescription" type of adjudication.
4. Main San Gabriel Basin water users faced problems of overdraft, and pressure from downstream users to gain

access to imported water supplies and restrain their dependence on local water supplies. They responded by creating an Upper San Gabriel Valley Municipal Water District that annexed to MWD, then settling with the downstream users over rights to San Gabriel River flows through Whittier Narrows, and finally by adjudicating pumping rights among Main San Gabriel Basin users.

- C. The city of Los Angeles had asserted a "pueblo water right" to the water supplies of the Los Angeles River and to the groundwater supplies of the ULARA that feed the flows of the Los Angeles River. The growing San Fernando Valley cities of Burbank, Glendale, and San Fernando relied increasingly on the groundwater supplies of the valley. Eventually, the four cities were involved in an attempt to adjudicate pumping rights throughout the ULARA. The trial judge attempted to follow the "mutual prescription" approach of the San Gabriel River basins, but his decision was reversed by the California Supreme Court in 1975. The subsequent division of ULARA waters was finalized at the trial court level in 1979.
- D. In the Mojave River watershed, a water agency was formed in 1959 to acquire access to State Project water that was due to cross the region in 1972. The agency board, a group of upstream pumpers, and some water rights attorneys and engineers attempted to put together a "mutual prescription" type of adjudication of pumping rights along the river, in anticipation of the arrival of imported water supplies. The attempted adjudication failed after ten years, leaving much enmity among pumpers in the area and little prospect for fruitful cooperation.
- E. In the lower area of the Santa Ana River watershed, Orange County water users have been active in taking collective action to protect and enhance local water supplies since the 1930s. Upper area water users, such as those in the Chino Basin, did not organize basin governance and management arrangements until later, and to some degree at the stimulus of actions taken in Orange County.

1. Orange County water users created the Orange County Water District in 1933 to assist with litigation against some upstream water users. Since then, the district has been involved in two other adjudications against upstream users, but Orange County water users have never adjudicated and limited their own pumping rights. Instead, they innovated basinwide replenishment funded by a pump tax. Later, the Orange County Water District also constructed a saltwater intrusion barrier project based on a modification of the designs used in the Central and West basins.
2. Chino Basin pumpers did adjudicate pumping rights, but not until the California Supreme Court had ruled in the ULARA case in ways that cast serious doubt on the "mutual prescription" solutions devised in the San Gabriel River watershed. Accordingly, the Chino Basin allocation of pumping rights had to be tailored to fit the limitations of the Supreme Court decision, as well as the particular circumstances of the basin, which was just beginning a rapid transition from agricultural to urban land uses. The resulting institutional arrangements are among the most complicated in California and perhaps anywhere in the United States.

F. Institutional development in these basins can be viewed as an evolutionary process, not in the biological sense of random mutations, but in the cultural sense of "path-dependence" and adaptation. The institutional designs from one basin to the next built upon and were shaped by decisions taken in the previous basins, while at the same time considerable tailoring was involved in fitting the institutional arrangements to the particular circumstances of each basin and watershed.

IV. Summary of the Basin Governance and Management Arrangements: Before analyzing their performance on several criteria, we should briefly review the basin governance and management arrangements currently in place in the seven managed basins.

A. The San Gabriel River watershed features four adjudicated basins and an adjudicated river system.

1. Raymond Basin is governed by a management board composed of pumpers' representatives. Pumpers hold fixed, transferable rights under the provisions of the 1945 judgment. Rights total the basin safe yield, and there is no basin-wide replenishment program.
2. West Basin pumping rights are allocated under the 1961 judgment and are fixed and transferable. The Central and West Basin Water Replenishment District imposes a tax on all pumping and directs the basin replenishment and saltwater intrusion barrier programs.
3. Central Basin pumping rights are allocated under the 1965 judgment and are fixed and transferable. The Central and West Basin Water Replenishment District imposes a tax on all pumping and directs the basin replenishment and saltwater intrusion barrier programs.
4. Main San Gabriel Basin pumping rights were determined in the 1973 judgment, and are allocated as shares of the basin's operating safe yield. The operating safe yield is set each year by the Main San Gabriel Basin Watermaster, a 9-member board composed of pumpers' and districts' representatives which also regulates basin water storage and monitors compliance with the judgment.
5. The waters of the San Gabriel River are allocated between the upper and lower areas of the watershed by a formula established in a 1965 judgment. The upper area guarantees the lower area a minimum inflow of usable water each year. A 3-member San Gabriel River Watermaster, composed of upper area and lower area representatives, oversees operations under the judgment.

B. ULARA groundwater is divided among parties according to the provisions of a 1979 judgment. Those pumping rights are not transferable. The judgment is administered by an individual ULARA Watermaster appointed by the court, and assisted by a

Watermaster Advisory Committee composed of pumpers' representatives.

C. The Santa Ana River watershed contains some adjudicated and some nonadjudicated basins.

1. Orange County groundwater supplies have not been adjudicated. Pumpers do not have defined or transferable pumping rights. The Orange County Water District monitors basin water conditions and operates a basin replenishment program funded by pump taxes. The replenishment program replaces pumping in excess of the basin's safe yield with imported replenishment water. The district also operates the basin's saltwater intrusion barrier program.
2. Chino Basin pumpers are divided into pools according to whether their pumping is for overlying agricultural use, overlying nonagricultural use, or appropriative use under the terms of the 1978 judgment. Appropriators have transferable pumping rights defined as shares in the basin's operating safe yield. Overlying nonagricultural pumpers have fixed, nontransferable pumping rights. Overlying agricultural pumpers have aggregate nontransferable pumping rights. The Chino Basin Watermaster, assisted and advised by a Watermaster Advisory Committee composed of pumpers' representatives, sets the basin's operating safe yield and monitors compliance with the 1978 judgment.
3. The waters of the Santa Ana River are allocated between the upper and lower areas of the watershed by a formula established in a 1968 judgment. The upper area guarantees the lower area a minimum inflow of usable water each year. A 5-member Santa Ana River Watermaster, composed of upper area and lower area representatives, oversees operations under the judgment.

V. Institutional performance in the seven managed basins is compared using seven performance criteria.

A. The seven performance criteria are: compliance, effectiveness, efficiency in basin management costs, efficiency in resource use, equity in the allocation of costs to benefits, equity in the allocation of pumping rights, and adaptability.

B. Comparisons of the basins show high levels of performance on all criteria, with some differences in efficiency and equity.

1. Compliance rates have been so high that no water users has been sanctioned for violating rules, even in the basins where management has been in place for almost 50 years.
2. All basin management programs have been effective in halting depletion and further degradation of water supplies.
3. Basin management costs are low compared with the replacement cost of groundwater supplies. The lowest costs per acre-foot are in Raymond Basin, the highest in Orange County.
4. Basin management has preserved the groundwater basins, transferred their use from lower- to higher-valued uses, and taken advantage of their value as water storage and distribution facilities. Just replacing their storage capacity would be extraordinarily expensive. Basin preservation has been a good bargain for southern California.
5. For the most part, the pumpers are the greatest beneficiaries of the basin management programs, and they bear the costs of those programs. The basin management programs show little evidence of "rent-seeking" behavior or subsidization.
6. Adjudication drove out many small pumpers, but it impossible to say how many, because the urbanization processes that were simultaneously underway in the adjudicated basins were also reducing the number of small pumpers, and the number of small pumpers has

continued to decline since adjudication. Orange County, as the only nonadjudicated basin in this study, has the largest number of small pumpers. On the other hand, Orange County pumpers do not have defined, transferable pumping rights, so small pumpers also cannot exchange their pumping rights for anything of value.

7. All basin governance structures and management programs have proved adaptable to changed conditions and to new ideas about basin management. In some cases, basin governance structures or management programs have been modified in response to new ideas or developments. In most cases, adaptability was built into basin governance as a design element.

VI. Analysis and Discussion: Why do southern California water users prefer this "chaos"

- A. What can we learn from the failures and shortcomings? Most of the failures and shortcomings in these basins relate to either the attempt to impose an institutional "formula" for basin management or the attempt to move too fast toward basin management without building a consensus about the nature and severity of water supply problems. The biggest shortcomings of the basin management programs themselves are the failure in most instances to adequately define rights to basin storage, and in some cases to allocate transferable pumping rights.
- B. The basin governance and management arrangements work as well as they do because they exhibit the strengths of polycentric, self-governing systems. They take advantage of specialization and differences in the appropriate scale of organization for different tasks. They are regarded as fair and worthy of compliance because they were designed and implemented by the water users themselves. They are closely tailored to the individual physical, legal, and economic circumstances of each basin. And they have generated substantial amounts of innovation, experimentation, and learning about basin management.

C. These results reinforce the difficulties of approaching groundwater management through a single statewide, regulatory approach. No statewide management program could accommodate the differences among basins, but more importantly, the goal of a "comprehensive" program is unattainable: it presumes that human beings already know everything there is to know about groundwater basins and their management. What is needed instead is an institutionally-rich system that sets several minds to work on problems in several places, and allows good ideas to emerge even at the risk of allowing some bad ones to be tried as well.