

INTEGRATING MANAGEMENT OF GROUND AND IMPORTED WATER IN LOS ANGELES COUNTY

As the demand for water grows in southern California, more distant sources of surface water must be utilized (at increasing costs per unit), and it becomes increasingly essential that the management of imported supplies and local groundwater basins be closely integrated. The recent Supreme Court decision on the Colorado River jeopardizes the area's future supply of water from the river and intensifies the importance of making full use of southern California's quota while it is still available. For at least a few years following completion of the proposed aqueduct from northern California, import capacity will likely exceed that needed for current use. Construction of facilities for importing surface water is only one step toward stopping the overdraft of groundwater basins in Los Angeles County. An opportunity exists for building up groundwater levels while excess import capacity is available. Major institutional changes are necessary, however, for efficient joint utilization of local groundwater and imported supplies of surface water needed to accomplish this objective.

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GROUNDWATER BASINS in Los Angeles County have been overdrawn in the past and valuable underground storage space has been destroyed by sea water intrusion. This overdraft could have been prevented if additional Colorado River water had been imported to the county either for direct use in place of pumping groundwater or for groundwater replenishment. Between 1941 and June 30, 1961, 5,000,000 acre-feet of additional water could have been imported through installed facilities. Filling the basins during the 1940's and the early 1950's and keeping them full as long as water was available would have postponed the necessity of importing far more expensive water from northern California. Meanwhile, the higher groundwater levels would have reduced pumping lifts and prevented salt water intrusion. Viewed in terms of either the variable costs to the Metropolitan Water District or the prices at which the District was selling water, keeping the basins full would have been a good investment for the area as a whole.

The economic situation facing the individual pumper was entirely different,

however. Each of the major groundwater basins was shared by several municipalities, water companies, and numerous persons and corporations pumping for their own use. Each pumper realized that decreasing his own extractions would only have left more water for the others. Thus, for the individual pumper, groundwater was more economical—as long as the variable costs of pumping did not exceed the price of imported water.

After costly delays, considerable progress has been made in some areas toward coordinating the interest of individual pumpers and integrating the management of local and imported supplies. Two approaches have contributed to the needed integration of management: (1) the adjudication of individual pumping rights, and (2) the replenishment of overdrawn basins with imported water purchased by a local public district.

An adjudication of individual pumping rights, accompanied by the formation of a water rights exchange pool—through which those with no facilities for receiving imported surface water can purchase pumping rights—has been successful in

the relatively small Raymond Basin. Adjudication in another area—the West Coast Basin—has been less successful, due to the great number of parties involved and to the fact that the flow into the basin depends on the hydraulic gradient from the adjacent Central Basin where water levels also were falling. In an effort to prevent the West Coast Basin from being completely destroyed by sea water intrusion during litigation, an interim agreement to restrict pumping and form a water rights exchange pool was signed by 46 parties having over 70% of the Basin's total pumping rights. An adjudication subsequently has been initiated in Central Basin and a similar interim agreement has been formed. Central Basin pumpers have also filed suit to limit extractions from the upstream San Gabriel Valley.

Purchases of Colorado River water for groundwater replenishment purposes were first made by the Orange County Water District. The replenishment program was originally financed by an ad valorem tax on real property. In 1953 the District's enabling act was amended

to permit an assessment based on extracted groundwater in order to finance the purchase of imported water to replace the annual overdraft.

The Los Angeles County Flood Control District began utilizing Colorado River water for replenishment purposes in 1954. Purchases were financed through property taxes levied in two special assessment zones. Since its formation in 1959, the Central and West Basin Water Replenishment District has been active in coordinating the use of imported and local groundwater supplies. The Replenishment District has been levying an assessment on groundwater extractions to pay for purchase of Colorado River water, which is then spread to replenish groundwater and to form a fresh water "barrier" to prevent further salt water intrusion. The surface-water spreading and injecting operations are performed by the Los Angeles County Flood Control District without charge to the Replenishment District.

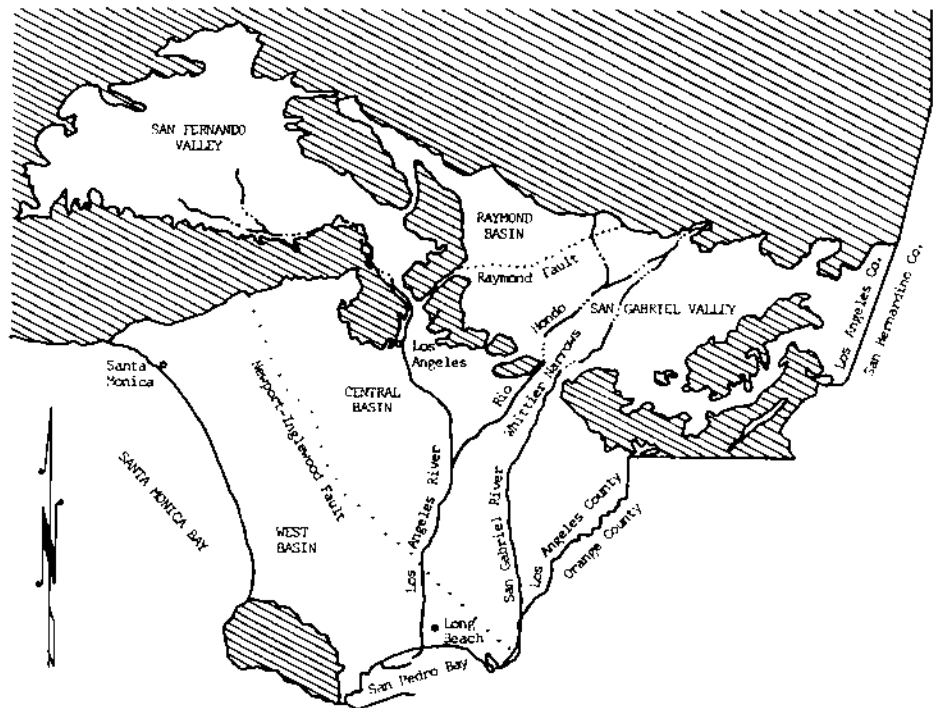
Smoothing fluctuations

When used in conjunction with imported surface water supplies, groundwater basins have great potential for supplying seasonal peaks in demand, for smoothing out seasonal and cyclical fluctuations in local supply, and for making possible an economical staging of expansions of import capacity. As water use increases in the Los Angeles area, local groundwater basins are becoming relatively less important as natural water sources for overlying land owners and more important as regulating reservoirs. This storage space can be effectively utilized only if the management of ground- and surface water resources is closely integrated.

Some form of group control over groundwater extractions is essential for integrating ground- and surface water management. This control can be accomplished by making imported water economically competitive with groundwater for the individual user or through an adjudication of pumping rights.

Groundwater extractions can be controlled by equalizing the costs of ground- and surface water only if there is no incentive to use groundwater to maintain or build up groundwater rights. Allocating rights on the basis of prescription as exemplified in the Raymond Basin adjudication, has encouraged those pumping from other overdrawn basins to continue using groundwater in order to maintain or increase their prescriptive base. Legislation intended to protect the rights of

GROUND WATER BASINS IN LOS ANGELES COUNTY



those using imported water, in lieu of pumping from an overdrawn basin, is not quite adequate. A guarantee that those shifting to imported water will not be disadvantaged in the future is essential for successful control over extractions through equalizing the variable costs of ground- and surface water.

In addition, the assessment of groundwater extractions may be necessary for limiting draft through economic incentives where importation is expensive—as it is in Los Angeles County. In the absence of such assessments, pricing imported water so that it is competitive with the variable costs of pumped groundwater would leave a large portion of the importation cost to be met by general property taxation. External pressures to keep property tax rates low would probably prevent maintenance of a sufficiently low price for imported water. Furthermore, balancing the costs of ground- and imported water without an assessment on extractions would not encourage conservation in water use commensurate with actual importation costs.

Success in controlling draft through an adjudication of pumping rights has been highly variable. Although the Raymond Basin case was eventually settled despite the persistent opposition of one contesting party, progress has been extremely slow in the absence of agreement among most of the large pumpers. Agreement cannot be expected in every

situation. For example, with the City of Los Angeles claiming a first right to all the natural yield of the San Fernando Valley, there is no basis for an agreement. Those pumping from a basin which is replenished by drainage from an upstream basin cannot protect their share of the natural yield without an effective procedure for adjudicating rights.

There appear to be at least a few possibilities for improving adjudication procedure. The number of parties can be greatly reduced without significantly affecting the results by excluding those pumping small quantities (less than 10 acre-feet per year, for example). In the case of the West Coast Basin adjudication, exempting those with prescriptive rights of less than 10 acre-feet would have reduced the number of parties from 472 to 151. The 321 parties with rights of less than 10 acre-feet have a total right of only 528 feet or less than 1% of the Basin total. The problem of identifying parties can be solved by amending the Water Recordation Act to require reports of extractions from all those pumping enough to be included in an adjudication. To permit interim control over extractions when an agreement cannot be reached, the Water Code could be amended to allow unvalidated reports filed under the Water Recordation Act to be used in a preliminary judgment, provided supplemental water is available and provisions are made for injured parties

to be reimbursed after a final judgment is made based on validated records.

The choice between adjudication and economic control over pumping can be made separately for each basin and should be a matter of local option. With regard to convenience in integrating management and to efficiency of resource allocation, there appears to be no significant difference between the two approaches. There is a difference in the distribution of the basin's natural yield, or more accurately the benefits from the natural yield. With adjudication these benefits are distributed among pumpers in proportion to the established prescriptive base of each pumper. If extractions are controlled by equalizing the costs of ground- and surface water, benefits from the basin's natural yield are distributed among water users in proportion to the current rate of water consumption or usage.

Financing replenishment

An adjudication of rights does not preclude the use of an assessment on extractions to finance a replenishment program. There are a variety of possible programs involving both adjudication and assessment of extractions. For example, rights to a basin's natural yield could be adjudicated and exempt from assessment. Additional pumping could be allowed subject to an assessment to finance the replacement of the water from an imported supply.

A public district (overlying an entire basin) is needed for purchasing imported water for replenishment, coordinating management with that of related basins, and coordinating the management of the basin with expansions in import facilities. In the Raymond Basin, considerable progress in coordinating the management of ground- and surface water has been made without forming a basin-wide district. However, in most cases, an overlying district probably will be necessary for fully integrated management even where rights have been adjudicated. Successful integration of management without an adjudication of rights is entirely dependent on the formation of an appropriate overlying district. Such a district should be authorized to buy and sell water and water rights, to spread water for replenishment purposes and to levy assessments on both groundwater extractions and real property values. Broad powers are essential for a coordinating agency; however, care should be taken to avoid unnecessary duplication of existing facilities and services.

Areas beginning to import water in the future will probably encounter management problems similar to those which have plagued Southern California for almost 20 years. Much can be learned from this experience.

Considering the time required to make institutional changes, those planning to import water under the State Water Plan should begin immediately to make the institutional modifications needed to integrate the management of local groundwater basins with the imported supply. Arousing public interest previous to the actual existence of the problem will not be easy. The need for integrated management was recognized in Southern California before the first deliveries of Colorado River water. It is imperative that community leaders inform the public of the advantages of jointly utilizing local groundwater basins and imported sup-

plies. The length of time required for making institutional changes and the potential loss if the changes are not made by the time the imported water becomes available should be stressed. Examples from past experience in Los Angeles and Orange counties will be helpful.

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FACTORS AFFECTING FLOWERING OF BOUGAINVILLEA

DIFFICULTY IS USUALLY encountered in promoting flowering of bougainvillea in the nursery. Several reports suggest that some species are short-day plants, yet flowering in the coastal southern California landscape commonly occurs during the spring and summer months when days are long. Some environmental factors other than daylength apparently affect flowering in bougainvillea.

Results of University of California research with the San Diego Red variety have shown that temperature, light intensity, and age of the plant, as well as daylength, interact in determining both the speed and intensity of bloom. Optimal conditions for rapid and heavy flowering include a short day (eight to nine hours), moderate day and night temperatures (70° to 75°F), and relatively high light intensity (greater than 2,500 foot candle).

Branches developing from newly rooted cuttings require 70 to 80 days (flower inflorescence between 30 to 40 nodes, about 60 to 70 cm stem length under favorable temperatures) to bear full-blooming inflorescences; whereas branches developing from older crowns (¾-inch and greater stump diameter) reach anthesis after 50 days (inflorescences from the first to fifteenth nodes, stem length 30 cm) under the same conditions.

Some of the important factors for nurserymen to consider in growing procedures to obtain increased flowering include: (1) increased light intensity through improved plant spacing; training and tying of individual branches are also recommended to prevent mutual shading; (2) propagation of bougainvillea as far in advance of scheduled sale as possible; (3) ventilation and heating of plastic greenhouses to maintain temperatures about 60°F at night and 80°F during the day; and (4) use of black cloth for daylength control for scheduling flowering of relatively mature plants.

Research workers in Florida have reported that high levels of nitrogen nutrition (equivalent to 300 pounds per acre per year) also promote heavy flowering. Nurserymen using plastic structures to achieve frost protection only, and not contemplating use of black cloth for daylength control, should move bougainvillea plants out of plastic houses as soon as all danger of frost has passed. Plants in plastic houses receive higher temperatures and lower light intensities than are favorable for optimal flowering.—*W. P. Hackett, Department of Agricultural Sciences, University of California, Los Angeles; and R. M. Sachs, Department of Landscape Horticulture, U. C., Davis.*