Groundwater problems from a legal perspective

William R. Attwater

Historically, legislation concerning groundwater has been slow to develop. As a result, from a legal and institutional perspective, drainage and groundwater salinity problems today are addressed only in part.

In a 1913 report, the California Water Commission noted that a comprehensive regulatory scheme was just as necessary for groundwater as for surface water, but since then, the development of groundwater law has essentially been left to the courts. Under present law, any overlying landowner and any distributor of water may drill a well and take whatever amount is required, whether or not the groundwater basin is in a condition of overdraft or is highly saline, or whether or not such pumping will aggravate saline water intrusion. Public agencies and others may take surplus water from the basin and transport it away without any kind of permit. Overlying owners have priority over those who take groundwater for use outside the basin, but any conflict must be adjudicated in the courts, an expensive and time-consuming procedure. The last major adjudication (Los Angeles *v.* San Fernando) was in the courts for over 20 years.

Legislative interest in groundwater matters has been lacking, partly because of the enormity of the problem. Attempts to deal comprehensively with such major problems as overdraft, conjunctive use, salinity and poor drainage, saline intrusion along the coast, and pollution from various chemicals have failed. For example, in the late 1970s the Governor's Commission on Water Rights recommended a Groundwater Management Authority, which would have the power to levy pump taxes, collect data, regulate underground storage of water, issue licenses for new wells, regulate exports, and limit pumping where necessary. The Commission also recommended simplified procedures for basin adjudications to facilitate settlement and eliminate delay. Attempts to enact these recommendations failed, partly because they were complex, and partly because people thought they would hinder the development of new water supplies.

Groundwater has received some legislative attention recently, however. Spurred by what they perceived to be a threat of groundwater export to Nevada, the northern California counties of Plumas, Sierra, and Lassen supported legislation authorizing them to form joint management districts to control the use of groundwater. The law empowers the districts to carry out studies and investigations; register wells; store, purchase, import, and recapture water; buy, sell, and exchange water rights; regulate pumping; limit export of groundwater; and levy extraction and management charges.

This law is a significant first step toward local management of groundwater. Other local agencies may seek to get such powers through future legislation.

Institutions

In 1949, the California legislature passed the Dickey Water Pollution Control Act, which set up a State Water Pollution Control Board (later renamed the State Water Quality Board) and nine Regional Water Pollution Control Boards. Because water rights and water quality issues are inseparable, the legislature in 1967 merged the State Water Quality Board and State Water Rights Board into one agency, the State Water Resources Control Board. In 1969, the legislature modernized the water quality laws, giving the Regional Water Quality Control Boards more authority, but it essentially refused to address the groundwater salinity problem. The legislature's comments on the water quality legislation noted that it was not the general practice of the regional boards to issue waste discharge permits to agricultural operations. The push for modernization of local institutions has intensified and will probably continue in the future.

Water producers and users in a number of basins have made their own efforts to manage groundwater. Immediate problems of salt water intrusion, salinity buildup, lowered water tables, subsidence, and general groundwater decline have moved some basin users to give local districts sufficient power and funding to respond to such problems. The legislature has also passed bills recently in response to immediate local problems.

State and local laws and regulations partially alleviate salinity and drainage problems. For example, local agencies can influence demand through water management programs. Local and state institutions can provide new or expanded water supplies through local development projects or by importation of water, water reclamation, artificial recharge, and in some cases desalinization.

The State Water Resources Control Board has greater influence on some of these strategies than on others. For instance, under certain circumstances, the board has considerable authority to compel conservation but little direct authority to influence growth control programs or the development mix. With regard to supply strategies, the board's influence on water development is largely through limitations under the appropriative water right program or through an action under Water Code Section 2100, which is a procedure to protect groundwater quality. The board has no direct authority to influence the selection of water supply alternatives. It does have limited funds to facilitate water conservation and waste water reclamation efforts.

Under various sections of the Water Code, the state and regional boards have the following major legal means to affect supply and demand of water and regulate water quality.

Prevention of waste and unreasonable use. The board may initiate an action to prevent waste or unreasonable use of groundwater or to prevent actions that adversely affect ground water.

Protection of groundwater quality. To protect quality of groundwater from destruction or irreparable injury, the board may initiate judicial action to impose physical solutions, restrict pumping, or both. To take action, the board must: (1) recognize the threat of irreparable damage to groundwater; (2) determine, after a hearing, the need for pumping restrictions, physical solution, or both; (3) ascertain whether any local agency will initiate adjudication proceedings; and (4) if no local agency will act, file an action in the Superior Court.

Water rights. New applicants for water rights permits to use surface waters may be required to institute a water conservation program. The board may properly question whether an applicant needs the unappropriated water if every reasonable measure has not been taken to conserve water currently used. Also, the board may give favorable consideration to applications for unappropriated water that would be substituted for water pumped from the most critically degraded aquifers.

For many years, the board has issued permits for water appropriation based on a continuing authority to prevent waste or unreasonable use, method of use, or

method of diversion of water.

The board may exercise its continuing authority by imposing specific requirements over and above those normally contained in the water rights permit with a view to minimizing waste and to meeting the reasonable water requirements of the permittee without unreasonable draft on the source. Permittees may be required to implement such programs as: reusing or reclaiming the water allocated; using water reclaimed by another entity instead of all or part of the water allocated; restricting diversions so as to eliminate agricultural tail water to reduce return flow; suppressing evaporation losses from the water surface; controlling stream-side plant growth; and installing, maintaining, and operating efficient water measuring devices to ensure compliance with the quantity limitations of the permit and to accurately determine water use as against reasonable requirements for the authorized project. The board would not take such actions, however, before giving affected parties an opportunity for a hearing to verify that the requirements are physically and financially feasible and are appropriate to the situation.

Plans for the future

Because of the nature of the salinity/drainage problem, the regional water quality control boards are somewhat limited in their ability to protect surface and ground waters. New and more efficient institutional actions are needed.

The Central Valley Regional Water Quality Control Board basin plan for the Tulare Lake Basin was amended in 1975 with provisions to regulate discharges of agricultural waste water through the issuance of waste discharge orders. Recently, this board established a waiver policy for the Tulare Lake Basin, allowing agricultural subsurface drainage-water disposal activities, under specified conditions without formal adoption of state discharge requirements in every instance.

Long-term irrigation in these areas of low permeability has led to the development of perched saline groundwater above the clay layers, threatening productivity in the western and southern portions of the San Joaquin Valley. As rising water tables have impaired crop growth and growers in the basin's affected areas have installed subsurface drainage systems, the regional board has received an increasing number of applications for permits to discharge drainage waters into evaporation basins or surface watercourses.

Discharging agricultural subsurface drainage into surface waters affects both quality and quantity of the stream water; discharges into basins may degrade usable perched waters and can cause accumulated salts over time. Since 1975, the Central Valley regional board staff has gathered and analyzed agricultural research reports, results of state and federal investigations and data monitoring the effects of discharging drainage wastewater into such basins and stream channels.

The conclusion was that not all such discharges will need waste discharge requirements, because many disposal facilities will be located, designed, constructed, and operated to eliminate significant adverse effects on water quality. The facilities that meet all waiver conditions may operate without waste discharge requirements, as allowed by Water Code Section 13269.

The waiver conditions combine evaluation and performance criteria. Dischargers requesting a waiver must submit technical reports, including a Report of Waste Discharge and the appropriate filing fee. Follow-up activities include discharger compliance reports on a routine basis and regional board staff inspections. The staff will evaluate technical reports and data for each discharge to determine potential effects on water quality.

The facilities operating under the waiver will be fairly remote from human habitation and will overlie mostly shallow, unusable groundwater. Conditions other than these may result in waste discharge requirements written to control or mitigate adverse impacts.

The litigation trap

The development of groundwater law mainly through court action presents a problem to anyone wishing to invest in a groundwater extraction and drainage program. The constraints on the investment are unclear. Looking to the court decisions dealing with groundwater is like trying to figure out what a jigsaw puzzle looks like when most of the pieces are missing. At best, given the present state of groundwater law, uncertainty will surround the investment decision.

For example, dormant rights to groundwater may suddenly become active when an overlying user decides to use previously unextracted water, install new pumps, or deepen existing wells. In addition, the right to use groundwater applies not to a specific quantity of water but to reasonable use of the total shared amount. During the drought a few years ago, some users increased well extractions instead of using surface supplies. Extractors who deepened wells sometimes adversely affected adjacent pumpers with shallow wells. Sooner or later, the legislature will address this problem.

The uncertainty of legal rights may also inhibit choices of extraction methods and drainage. With certainty of rights, overlying owners would be able to make better choices among distribution and drainage alternatives. The outgrowth of uncertainty is litigation.

Legal liability

In July 1983, a California Court of Appeals overturned a lower court decision regarding an irrigation district's liability. The lower court had held that the district had a duty to protect an adjacent farmer's land from irrigation water that was flowing underground toward a river beyond the district's boundaries, raising the water table and adversely affecting the land. The Court of Appeals held that, under state statutes, the irrigation district could not be held responsible for protecting the farmer's land by paying a portion of the cost of draining the land, when the district did no more than supply the offending water to users within the district.

This decision should not be taken as a guidepost for the future. It was based on a rather narrow set of facts and the court's analysis of California Water Code Section 22098 mandating that an irrigation district provide drainage within district boundaries whenever necessary. Because the farmer's land being injured was outside district boundaries, the appeals court held that the district had no liability in this case.

In another part of the decision, the court said that case law imposing liability on an irrigation district primarily involves instances "where seepage from the district's canals results in damage to adjacent land because of negligent construction or maintenance of a canal, or a taking of property under the California Constitution."

Greater federal involvement

The Federal Clean Water Act (the water pollution control law administered by the U.S. Environmental Protection Agency) is limited to regulation of pollution affecting surface waters. The Act is also prohibited from interfering with a state's water rights process. However, because of the severity of groundwater problems throughout the United States, such as overdrafts in the Midwest and Texas and pollution resulting from improper storage of hazardous wastes, the Environmental Protection Agency has been formulating a groundwater policy. If the states do not move to solve their own groundwater problems, whether related to salinity and drainage or to pollution, it is likely that the U.S. Congress will eventually enact comprehensive laws

governing groundwater. Such congressional action has been the history of this country. If states fail to address problems that can have a long-term impact on the production and transportation of food and fiber, federal laws are inevitable. As of December, 1983, a congressional bill (H.R. 2867) proposes a "National Groundwater Commission" to investigate groundwater problems nationwide.

William R. Attwater is Chief Counsel/Deputy Executive Director of the California State Water Resources Control Board, Sacramento.

Economics of salinity management

Charles V. Moore **J. Herbert Snyder**

With future water supplies for agriculture likely to be increasingly limited, it is important to consider direct use of water of impaired quality — increasing use and resue over time of water with varying levels of total dissolved solids. Plant breeding will provide some salt-tolerant varieties that can produce yields nearly equivalent to those of crops traditionally produced in areas without salinity problems. Harmful physical and economic effects may thus be lessened, but farms in areas unaffected by salt buildup may still be able to produce better quality products at lower cost than those in salt-affected areas.

Irrigation scheduling and use of improved low-volume application technology can slow salt buildup and decrease its harmful effects in many irrigated areas. However, the capital cost of introducing this new technology may be beyond the repayment capacity of the more extensive agricultural crops. Improvements in plant breeding and irrigation management may ease short-run transition problems, but the extent of their efficacy over the long run is not certain.

Climate, soil permeability, drainage (natural or artificial), and the salt tolerance of crops adaptable to specific locations determine whether or not irrigation water of a given quality is usable. Crop, soil permeability, and drainage limitations are not absolute: some substitutions are possible among the physical conditions. Artificial tile drainage, for example, can be substituted for water quality through the use of a higher leaching fraction. Or, if economic factors permit their production, crops with higher salt tolerance can replace sensitive crops as water quality deteriorates. Using the concept of a long-term steady state, one can describe or define the limitations to a long-term irrigated agriculture, based on these physical factors. These factors thus determine the **necessary** conditions for a successful long-term irrigation agriculture, but they do not describe or define the **sufficient** conditions: these are found in economic factors influencing the choice of crop to be produced and the income it can generate.

Physical production response functions can be developed for most crops. These functions can be used to develop complex production response relations for numerous combinations of irrigation treatment, water quality level, and leaching fraction for various soil types and crops. From these, "efficiency frontier" functions are developed to show the tradeoff, or substitutability, among water quality, water quantity, and capital investment. The conclusion is that, to obtain the same yield of a particular crop as water quality declines (soil salinity increases), larger and larger volumes of water must be applied. A companion problem is salt accumulation: salinity of the drainage water or percolating water may increase, leading to degradation of groundwater or rising water tables that may hasten the increase in local soil salinity.

Extended economic analyses by the Department of Agricultural Economics at the University of California, Davis, of the effect of water quality on Imperial Valley farms served by Colorado River water predict 12 to 15 percent declines in income level over time as salinity of the water increases by a projected 33 percent by the year 2000. Alternatively, if by desalinization or dilution it were possible to reduce Colorado River salinity by 50 percent, net returns to agriculture would increase by 12 to 14 percent. These changes are explained by changes in total crop acreage, in the proportion of high-valued salt-sensitive crops, in the leaching fraction, and in the irrigation regime.

With increasing salinity levels, projected cropping changes include both reduced total acreage in crops and reduced double-crop acreages. Changes in crop mix, which have an important influence on net returns, include reduction of sensitive crops such as lettuce and alfalfa and an increase in fallowed land.

In all solutions to increasing salinity in irrigated agriculture, one overwhelming problem remains — the removal and disposal of accumulated salts away from the root zone. For an irrigation economy to be sustained, adequate drainage must either be available naturally or be supplied by installation of buried drains. The drainage outflow must be disposed of without creating problems in other areas of the environment.

According to one estimate, as much as 15 to 20 percent of the land now in irrigation would have to be removed from production to provide space for evaporation ponds in regions where remote disposal is impossible. With current values of even submarginal land in the range of $500 to $1,000 per acre, the potential regional investment in salt disposal is formidable. To this must be added costs of a collection-drain system and possible on-farm tilling. The investment will probably have to come from agricultural interests, but the long-term alternative may be even greater financial loss with land being abandoned as regional salinity builds up.

Even if geneticists are able to shift salinity tolerance of plants to permit using water with ever-increasing saline content, drainage requirements cannot be reduced to zero. The soil is a reservoir for holding moisture and nutrients and a repository of precipitated salts. If placed under stress by excess deposition of salts or inadequate drainage in relation to the quantity of water applied, the set of resources that make up the root zone can pass a critical level and become irretrievably salinized.

Given the level of irrigation technology, the optimum rate at which the absorptive capacity of the root zone is used (salt buildup) depends on the long-term interest rate and a positive net income in each planning period. Economic survival of irrigated agriculture requires that periods of low commodity prices in the future be more than offset by periods of positive net incomes sufficiently large to cover costs of drainage, collection, removal, and disposal of salts.

For land in which the salt level in the root zone is currently not in equilibrium (progressive salinization), increasing the salt tolerance of plants and improving irrigation management technologies merely postpone the time when capital investment for drainage and disposal must be made. The physical, economic, social, and institutional costs and feasibility requirements for salt disposal will have to be met as part of the necessary and sufficient conditions for a prosperous long-term agriculture.

Charles V. Moore is Agricultural Economist, Economic Research Service, U.S. Department of Agriculture, located at the University of California, Davis, and J. Herbert Snyder is Director, Water Resources Center, and Professor, Department of Agricultural Economics, UC Davis.