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By Ella Foley-Gannon◔

I. Introduction

The history of California in the twentieth century is the story of a state inventing itself with water.[1]

The creation of California's water resources system has not been an easy task given the state's hydrology and demographics. California's water problem is not so much a lack of precipitation as it is an uneven, and highly variable, distribution of its water resources. More than seventy percent of California's water supply originates north of San Francisco, principally in the Sacramento River basin and in the North Coast. Yet, approximately seventy-five percent of the demand for water is to the south of this hydrological divide. On average, seventy-five percent of California's annual precipitation falls between November and March, with fifty percent occurring between November and February. California's hydrological cycle is not synchronized, however, with the seasonal demand for water. Urban and agricultural water use is relatively low during the period of abundant supply and peaks in the summer and late fall months when precipitation is usually non-existent.

Moreover, to compound these disparities, water supplies vary dramatically from year-to-year. Annual water run-off in the state is approximately 71 million acre-feet. But this average includes a record low of 15 million acre-feet in 1977, which was the second year of the worst acute drought on record, and the historic high of 135 million acre-feet in 1983, an El Niño year. During the twentieth century, California has suffered serious droughts in 1912-13, 1918-20, 1922-24, 1929-34, 1947-50, 1959-61, 1976-77, and 1987-92.[2]

These variations render water resources management highly uncertain. To address

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1. William L. Kahrl, Water and Power: The Conflict over Los Angeles' Water Supply in Owens Valley 1 (1982).

2. All data are taken from Cal. Dep't of Water Resources, Bull. 160-98, California Water Plan Update, Vol. 1, at 3-2 to 3-11 (1998) [hereinafter California Water Plan Update].

these variations and uncertainties, California water managers have had to create systems to store water during times of abundance and to transport the water from areas of surplus to areas of need. California's monumental and complex array of reservoirs and conveyance facilities stands as testament to the ingenuity and resourcefulness of these leaders.

As the demand for water continues to increase, further innovations in water resources management will be imperative. The California Department of Water Resources ("DWR") projects that California's population will grow to 47.5 million by the year 2020, up from 32.1 million in 1995. Accompanying this growth will be an increase in the demand for water by municipal and industrial users from approximately 8.8 million acre-feet in 1995 to 12 million acre-feet in the year 2020.[3] Based on the capacity of existing water supply facilities and water management programs, DWR predicts that there will be an annual water shortage of 2.4 million acre-feet in normal years and 6.2 million acre-feet during periods of drought.[4]

The extent of California's vulnerability both to cycles of shortage and to long-term distributional disparities is highlighted by the most recent drought in California, which lasted from 1987 to 1992. During this period, farmers and municipalities suffered from severe water shortages and were forced to ration water and fallow land.[5] The drought also contributed to a panoply of environmental problems, including damage to vulnerable fish populations, significant loss of timber in the Sierra Nevada, and increased fire hazards.[6] Moreover, many water users relied heavily on groundwater to compensate for deficits in surface water supplies.[7] This increase in groundwater pumping caused the overdraft of many of California's groundwater basins.[8] Prolonged overdraft can cause a number of long-term, detrimental economic and environmental effects.[9] When a groundwater basin is in overdraft, groundwater users often must deepen wells and install more powerful pumps to extract a sufficient supply of water from ever greater depths.[10] Overdraft also can result in subsidence of overlying land,[11] loss of surface vegetation and wetlands habitat,[12] depletion of water flow in hydrologically-connected surface water systems, and degradation of groundwater quality.[13] Moreover, extended periods of overdraft can cause the water-bearing rock or

3. *See id*. at 4-2. According to DWR's projections, agricultural water use will decline slightly from 33.8 million acre-feet in 1995 to 31.5 million acre-feet in 2020. *See id*.

4. *See* CALIFORNIA WATER PLAN UPDATE Vol. 2, *supra* note 2, at 6-2.

5. The economic effects of farmers fallowing land are not limited to the farmers themselves. When water shortages force local farming operations to go out of operation, agricultural suppliers and farm workers can experience unemployment, local businesses may lose revenue and rural communities can suffer decreased public resources. *See, e.g.*, Barton H. Thompson, Jr., *Institutional Perspectives on Water Policy and Markets*, 81 CAL. L. REV. 673, 733-35 (1993); Charles V. Moore, *Discussion, in* WATER SCARCITY: IMPACTS ON WESTERN AGRICULTURE 266, 268-69 (Ernest A. Engelbert & Ann Foley Scheuring eds., 1984); Deborah Moore & Zach Willey, *Water in the American West: Institutional Evolution and Environmental Restoration in the 21st Century*, 62 U. COLO. L. REV. 775, 793-94 (1991).

6. *See* Brian E. Gray, *The Market and The Community Lessons from California's Drought Water Bank*, 1 HASTINGS WEST-NORTHWEST J. OF ENVTL. L. & POL'Y 17, 18-20 (1994).

7. For example, in 1990 there were 24,000 new wells drilled in California, the highest number of wells drilled in a single year. *See id*. at 19.

8. For example, groundwater depletion in the eastern San Joaquin Valley and the Tulare Basin exceeded eleven million acre-feet during the most recent drought. *See* Gray, *supra* note 6, at 19 (citing CAL. DEP'T OF WATER RESOURCES, THE 1991 DROUGHT WATER BANK 16 (1992)).

9. *See* Gregory S. Weber, *Twenty Years of Local Groundwater Export Legislation in California: Lessons from a Patchwork Quilt*, 34 NAT. RESOURCES J. 657, 660 (1994).

10. *See id*.

11. "When water is withdrawn from a groundwater basin, the underground pressure is sometimes reduced enough to cause compaction of the water-bearing strata. When that happens, the overlying land subsides, losing elevation. Land subsidence can submerge once-dry land, adversely affect drainage patterns by changing the slope of the land, and damage surface structures such as highways, buildings, pipelines, and water distribution systems." Susan Batty Peterson, *The Designation and Protection of Critical Groundwater Areas*, 1991 BYU L. REV. 1393, 1395 (1991).

12. The loss of wetlands can have a devastating effect on wildlife populations. Wetlands provide critical habitat for approximately one-third of the nation's endangered and threatened species. Since 1850, ninety-six percent of California's Central Valley wetlands has been lost. *See, e.g.*, Moore & Willey, *supra* note 5, at 776-78.

13. *See* Zachary Smith, *Rewriting California Groundwater Law: Past Attempts and Prerequisites to Reform*, 20 CAL. W. L. REV. 223, 225 (1984); Allison Mylander Gregory, *Groundwater and Its Future: Competing Interests and Burgeoning Markets*, 11 STAN. ENVTL. L. J. 229, 232-33 (1992).

soil in a basin to compact permanently and, thereby, reduce the amount of storage space available in the basin for use in the future.[14] Unless new ways are discovered to satisfy the state's burgeoning water demand, California can expect to encounter similar problems during future droughts.

In the past, when demand for water outpaced supply, California responded by developing new surface water resources. Today, however, political, fiscal and environmental considerations render the construction of additional surface water facilities less likely.[15] Therefore, to meet the challenge of ensuring that California's limited water supply can be stretched to meet the demands of the twenty-first century, the state needs to develop management procedures to provide for optimal utilization of its developed water resources.

One of the least expensive and environmentally safest ways of stretching available water supplies is through the development of conjunctive use programs.[16] Under such programs, surplus surface water is banked in underground aquifers during wet periods and is extracted for use in times of scarcity. Groundwater basins are used both to augment the storage capacity of surface reservoirs and to allow for the capture of a larger percentage of annual runoff for beneficial use.[17] In 1992, the California legislature recognized that conjunctive use programs could play a vital role in California's efforts to use water more efficiently by adding section 1011.5 to the California Water Code. This law declares that "it is the policy of this state to encourage conjunctive use of surface water and groundwater supplies and to make surface water available for other beneficial uses."[18]

Under a conjunctive use program, surface water and groundwater supplies commingle, and the legally distinct water rights of various users are melded together. Many different private parties and public agencies may claim a right to use, or to regulate the use of, the water found within the groundwater basin. Conjunctive use arrangements have worked well in adjudicated groundwater basins in Southern California because the various rights to surface and groundwater are quantified and the management agencies have the legal authority to enforce the pricing and other rules that govern groundwater and surface water use.[19] Most groundwater basins in California are unadjudicated, however, and the feasibility of conjunctive management in these areas is consequently far less certain. This is particularly true in basins in which a portion of the surface water is imported, stored as groundwater, and then later withdrawn for uses outside the groundwater basin. In these situations, there exist an array of legal and institutional uncertainties that render conjunctive management difficult, if not impossible. These uncertainties include questions about the ownership of the imported water, liability for displacement of in-basin recharge capacity, regulation of groundwater users who are not parties to the conjunctive management agreement, the authority of local water agencies over the importation and exportation of surface water, and liability for changes in water quality.

This article analyzes the legal and institutional opportunities and constraints on conjunctive management of groundwater and surface water in California. Part II presents a theoretical model for a statewide conjunctive use program. Part III analyzes the current legal and

14. *See* Peterson, *supra* note 11, at 1395.

15. *See* Brian E. Gray, *The Modern Era in California Water Law*, 45 HASTINGS L. J. 249, 278 (1994).

16. Despite the advantages of conjunctive water management, there remain a variety of legal uncertainties and institutional impediments to the creation of large-scale conjunctive use programs, particularly in unadjudicated basins. California has a dual system of water rights. There is one set of rules to apportion surface water and separate rules for groundwater. *See Generally* ARTHUR L. LITTLEWORTH & ERIC L. GARNER, CALIFORNIA WATER 27-70 (1995). While the legislature has extensively regulated surface water diversions, it has exerted only minimal control over groundwater extractions. The State Water Resources Control Board ("SWRCB") regulates the appropriation and use of much of the state's surface water. In contrast, groundwater basins are managed, if at all, by local institutions.

17. *See, e.g.*, Linton A. Brown, *Conjunctive Use: Problems and Advantages, in* BIENNIAL CONFERENCE ON GROUND WATER 25 (1994); James A. Anderson, *Some Thoughts on Conjunctive Use of Groundwater in California*, 16 W. ST. L. REV. 559 (1989) (on file with author).

18. CAL. WATER CODE § 1011.5 (West 1992 & Supp. 1993).

19. These conjunctive management programs have been studied and well-documented in WILLIAM A. BLOMQUIST, DIVIDING THE WATERS: GOVERNING GROUNDWATER IN SOUTHERN CALIFORNIA (1992).

institutional framework for regulating the State's groundwater resources. The legal uncertainties created by the present legal system are described in Part IV. Part V explains how a conjunctive management scheme can be created under the current legal and institutional regime. Part VI concludes with an evaluation of various legal reforms that could be implemented to encourage and facilitate conjunctive water management in California.

II. A Model Conjunctive Use Program

A. Conceptual Framework

Conjunctive use programs are designed to coordinate the management of surface water supplies and storage with the management of groundwater. The concept of conjunctive management is not new. Individual water users with access to both types of supplies have long coordinated their own use. They have relied on surface water when there is ample supply and increased their use of groundwater in times of scarcity.[20] Many water agencies also have engaged in small scale, intra-regional transfers of groundwater both to help meet their members' and customers' needs in times of shortage and to protect groundwater quality.[21] Moreover, a number of agencies and water users with access to groundwater participated in the 1991 California Drought Water Bank. Approximately 260,000 acre-feet of surface water was purchased from Northern California water users and sold to users throughout the state. The sellers then substituted groundwater for the surface water that they transferred. These transfers effectively increased the total quantity of water available to all users by increasing the use of groundwater in the areas with access to both types of supplies, while moving surface water to areas in which additional groundwater was not available.[22]

Although conjunctive management is not new, the potential of California's groundwater basins to serve as subterranean reservoirs has not been approached. There are 450 identified groundwater basins in California that contain about 850 million acre-feet of water.[23] On average, approximately 12.5 million acre-feet of groundwater is pumped each year, with extractions rising to 15.8 million acre-feet during periods of drought.[24] Hydrologists estimate that, in light of current levels of extraction and recharge, 143 million acre-feet of storage capacity within these groundwater basins is close enough to the surface, and has sufficient permeability, to be used as temporary storage space.[25] This potential storage capacity vastly exceeds the total capacity of California's surface reservoirs, which are capable of storing approximately 42 million acre-feet of water.[26] If this space were fully utilized, California could significantly increase the yield of its available water resources.

Conjunctive use programs involve the movement of water captured in surface water facilities through conveyance facilities to areas overlying groundwater basins with accessible

20. *See* Thompson, *supra* note 5, at 685 n.36.

21. Most of these arrangements have been limited to the storage of water in basins for the use of overlying landowners. *See* CALIFORNIA WATER PLAN UPDATE VOL. 1, *supra* note 2, at 3-51 to 3-53 (discussing examples of conjunctive use activity in California). For a review of the legal authority for public agencies in California to store imported water in groundwater basins and later extract the water so stored, see City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199 (1975) (public agencies have the right to the return flow from water imported into a groundwater basin); City of Los Angeles v. City of Glendale, 23 Cal. 2d 68 (1943) (upholding the right of Los Angeles to use the San Fernando Valley for imported groundwater banking); Niles Sand & Gravel, Co. v. Alameda County Water Dist., 37 Cal. App. 3d 924 (1974) *cert. denied*, 419 U.S. 869 (1975) (Alameda County Water District has authority to store water in a groundwater basin pursuant to its police powers, and prevention of salt water intrusion is a beneficial use).

22. DWR classified all of the groundwater that was pumped as a substitute for the transferred surface water as "new" water. This classification was based on a finding that groundwater was not taken from a hydrologically connected surface water system and was, therefore, new water in the sense that the water would not have been available for appropriation as part of the surface water system. *See* Gray, *supra* note 6, at 22.

23. *See* LITTLEWORTH & GARNER, *supra* note 16, at 2.

24. *See* CALIFORNIA WATER PLAN UPDATE VOL. 1, *supra* note 2, at 3-48.

25. *See* Ronald B. Robie & Patricia R. Donovan, *Water Management of the Future: A Groundwater Storage Program for the California State Water Project*, 11 PAC. L. J. 41, 43 (1979). An aquifer has vacant space if there are openings between soil particles or soil strata which could hold additional water. *See* Gregory, *supra* note 13, at 258 n.116.

26. *See* CALIFORNIA WATER PLAN UPDATE VOL. 1, *supra* note 2, at 3-23 to 3-45; *see also* Russell Kletzing, *Imported Groundwater Banking: The Kern Water Bank: A Case Study*, 19 PAC. L. J. 1225 (1988).

available storage. The water then is placed in the basin by one of two methods; direct recharge or "in lieu" storage. With direct recharge, water is directly recharged into a basin through the use of either spreading fields[27] or injection wells.[28] The "in lieu" method is accomplished by delivering surface water to groundwater users who agree to forgo pumping during the delivery period.[29] Through either method, the importer of the water retains title to the water it places (or allows to remain) in the groundwater basin and has the right to extract the water when surface supplies are scarce.

Under such programs, the state's groundwater basins serve the same function as surface reservoirs. The vacant storage capacities of groundwater basins allow for the capture and exploitation of water that is not currently applied to beneficial use. Conjunctive use programs, therefore, result in a net gain to California's water supply without the development of additional surface water storage facilities. This new water may be used to satisfy currently unmet needs wherever they occur throughout the state, and helps to ensure a stable water supply for the future. Additionally, such programs increase the flood control capacity of the state's reservoirs. By placing water that is currently stored in surface reservoirs in groundwater basins, space may be left in surface reservoirs to absorb a sudden influx of water without the need to release water from dams.

There are a variety of other advantages to storing water in groundwater basins rather than in surface reservoirs. First, underground storage decreases the demand for construction of expensive surface storage facilities.[30] Second, groundwater basins serve as natural distribution systems and thereby obviate some of the need to construct additional conveyance facilities.[31] Third, water stored underground is not lost to evaporation.[32] Fourth, "groundwater basins provide natural treatment and purification"[33] and, therefore, can both improve water quality and reduce the costs of treatment. Fifth, groundwater serves as an emergency supply in the event of disruptions to surface water systems.[34] Sixth, while water is stored within the basin, the groundwater level within the basin will be raised and the energy cost of extracting water from the basin will be reduced. Finally, "storage of surface water in natural underground basins avoids nearly all the surface land use dislocations and stream effects that would otherwise result, since the building of surface reservoirs often requires extensive land excavation as well as the rerouting of local streams."[35]

B. Prerequisites for the Creation of Conjunctive Use Programs

For groundwater basins to be employed as subterranean reservoirs, there must be an established method for regulating activities that affect the basin to ensure that the water stored in the aquifer will be protected from

27. When a groundwater basin is recharged by the maintenance of a spreading field, water is spread over porous surface areas. "The water's weight and density force it to percolate through the underlying soil and into the underground basin." Victor E. Gleason, *Water Projects Go Underground*, 5 ECOLOGY L.Q. 625, 627 (1976). The use of spreading fields is generally the preferred means for directly recharging water into an aquifer because it is the least costly method.

28. Under this method, water is injected into the ground by the use of force other than gravity. *See id.*

29. *See* Robie & Donovan, *supra* note 25, at 45.

30. For a comparison of the water development costs of surface water and groundwater facilities, see CAL. DEP'T OF WATER RESOURCES, BULL. 76, DELTA WATER FACILITIES (1998).

31. Because water moves freely throughout a groundwater basin, a user can withdraw water from any point overlying the basin. As is discussed below, groundwater basins can consist of hundreds of miles of hydrologically connected aquifers. Thus, water can be extracted from a location that is geographically distant from, but hydrologically connected to, the place of active recharge. *See* Gleason, *supra* note 27, at 626-27; Peterson, *supra* note 11, at 1396-97; Christopher B. Amandes, *Controlling Land Surface Subsidence: A Proposal for a Market Based Regulatory Scheme*, 31 UCLA L. REV. 1208, 1246 (1984). The cost of transporting water between hydrologically separate waterways can be quite significant. For example, it is estimated that it will cost $50 million to move water eighty to ninety miles from the Colorado River to the Central Arizona Project. *See* Thompson, *supra* note 5, at 709 n.143.

32. *See* Robie & Donovan, *supra* note 25, at 45.

33. D. JAQUETT & N. MOORE, EFFICIENT WATER USE IN CALIFORNIA: GROUNDWATER USE AND MANAGEMENT 3-4 (1978).

34. "Where imported water has been brought in by aqueduct, the stored water in the underground reservoir provides a reserve against failure of the aqueduct." Kletzing, *supra* note 26, at 1245.

35. Robie & Donovan, *supra* note 25, at 44-45.

degradation or loss so it later can be extracted for beneficial uses. A vital first step in the development of an effective groundwater management strategy is a thorough understanding of the hydrological and geologic conditions of the basin. Because a conjunctive use program involves the commingling of native groundwater and imported water, there also must be a system for establishing and protecting the rights of those who depend on both types of sources. In addition, conjunctive management usually involves the recharge and discharge of large quantities of water within a basin, which may result in dramatic changes in the water table over relatively short periods of time. Fluctuations of water levels in a groundwater basin can affect the land overlying the basin, the purity of the water contained within the basin, the ability of users to withdraw water from established wells and the structure of the basin itself. These potentially deleterious third-party effects must be identified and assessed before the benefits of such a program can be evaluated. Finally, conjunctive management requires water users to enter into voluntary agreements to establish the methods, procedures and responsibilities for the delivery, storage and recapture of water within a particular basin. Conjunctive use programs will only come to fruition if the parties with rights to surface water and those who control the management of groundwater basins and conveyance facilities view participation in such programs as mutually advantageous. Thus, there must exist incentives for parties to broker such agreements before a conjunctive use program can become operational.

1. *Groundwater* Hydrology

In theory, a groundwater basin can serve the same function as a surface reservoir: it can act as a natural receptacle for storing water for subsequent extraction and application to beneficial use. The physical realities of a groundwater basin differ, however, from a surface reservoir, and these differences render many of the management techniques developed for the control of surface reservoirs inapplicable to groundwater basins.[36] "In many ways, groundwater is more difficult to manage than air or surface water because it is not directly accessible and exists under a wide variety of hydrological conditions."[37] Because the physical characteristics of groundwater basins vary greatly, the suitability of a particular basin to serve as an area for immediate storage and later extraction depends on its hydrological and geological features, as well as on the quality of the water stored within the basin.

The California Water Code defines groundwater as "all water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water which flows in known and definite channels."[38] Water within the zone of saturation accumulates in the interstices of underground rocks and sediments and moves with relative ease through the permeable strata in which it is contained to supply wells and springs.[39] The subsurface geological formations in which the water occurs are called aquifers.[40] As one author stated "[a] typical aquifer . . . in some ways is similar to a bucket of sand half-filled with water. Drilling a well is like digging a hole in this sand and allowing it to fill with water which can then be removed."[41] A groundwater basin consists of "a geologically and hydrologically defined area which contains one or more aquifers which store and transmit water and will yield significant quantities of water to wells."[42]

36. For example, it is often difficult to determine the precise boundaries of a groundwater basin. The identity of parties whose activities can affect the quantity and quality of water within a basin can only be determined when the physical limits of a basin have been defined.

37. Michele Engel, *Comment, Water Quality Control: The Reality of Priority in Utah Groundwater Management*, 1992 UTAH L. REV. 491, 496 (1992).

38. CAL. WATER CODE § 10752(a) (West 1992 & Supp. 1993).

39. *See* Peterson, *supra* note 11, at 1394.

40. *See* Weber, *supra* note 9, at 669-72 (1994) ("hydrologists uniformly define an aquifer simply as a rock unit that will yield water in usable quantity to a well or spring") (citing R. HEATH, BASIC GROUNDWATER HYDROLOGY 4 (1982)).

41. Gary Widman, *Groundwater-Hydrology and the Problem of Competing Well Owners*, 14 ROCKY MTN. MIN. L. INST. 523, 525 (1968).

a. *Geological Features that Influence Recharge*

The manner in which water reaches the subterranean permeable strata depends on the geological characteristics of the aquifer into which it flows. An aquifer is classified as either confined or unconfined. In a confined aquifer, a permeable strata of rock, sand or gravel is surrounded by a layer of relatively impermeable rock or clay, which acts as a barrier to the transmission of water from outside the aquifer.[43] Confined aquifers can only be recharged at points where the permeable strata comes into contact with the surface or porous soil[44] or by penetrating the impermeable layer and forcing water into the basin. By contrast, an unconfined aquifer has no such barrier and water can flow across most of its surface area.[45] Thus, an aquifer can be recharged through the use of spreading fields or natural percolation only if it has a sufficiently permeable layer through which the water can percolate.

b. *Determining a Groundwater Basin's Capacity to Retain Water*

The storage capacity of a groundwater basin is a function of the geological material of which it is comprised. An aquifer has vacant space when the openings between the soil particles, or soil strata, can hold more water.[46] The amount of water contained within a basin is dependent on the historic amounts of precipitation, recharge and total outflows. For a groundwater basin to be an appropriate site for a conjunctive use project, it must have the capacity to accept and retain a minimum amount of imported surface water. Thus, one prerequisite to designation of a basin for conjunctive use is the determination that there is sufficient unused storage space to render the administration of the project economical.

Many aquifers are hydrologically connected to surface water systems and to other aquifers; that is, they share a permeable layer through which water can flow. The movement of water between hydrologically connected systems will depend on the relative water levels in each system. For example, when the water table of a groundwater basin intersects with a stream bed, the groundwater will provide a base flow for the stream.[47] In this circumstance, water added to the basin will not increase the amount of water contained within the basin, but will increase the flow of the connected stream. Similarly, extractions from a groundwater basin can result in the lowering of the water table and cause water from a connected surface water system to percolate into the basin. To ensure that water intentionally placed within an aquifer is retained, and that the operation of a conjunctive use project will not interfere with the flow of surface water systems, the project basin should be sufficiently isolated from adjacent surface and groundwater systems.

c. *Geological Features that Affect the Extraction of Water*

As previously noted, water within a groundwater basin will flow with relative ease throughout the permeable layer in which it is contained. The mobility of water within the aquifer will depend on the hydraulic conductivity of the basin material.[48] Where a basin is comprised of porous granular deposits such as sand and gravel, water will travel throughout the basin at a greater rate than if the basin is comprised of fine grained material of low permeability such as silts, clays and tills which

42. GOVERNOR'S COMM. TO REVIEW CAL. WATER RIGHTS LAW, FINAL REPORT 174 (1978). Unlike the term "aquifer," however, the definition of "groundwater basin" lacks precision and many hydrologists speak only in terms of aquifers. *See* Weber, *supra* note 9, at 670. While there is considerable overlap between the two terms, a basin is the preferred water management term because it focuses on the area of land overlying the subterranean structure and it recognizes that multiple layers of hydrologically connected aquifers may underlie a single area. *See id.* at 670-71.

43. *See* Debbie Sivas, *Groundwater Pollution from Agricultural Activities: Policies for Protection*, 7 STAN. ENVTL. L. J. 117, 118-19 (1987/1988).

44. *See* V. PYE ET AL., GROUNDWATER CONTAMINATION IN THE UNITED STATES 2 (1983). Some aquifers are completely surrounded by an impenetrable layer and, therefore, are not capable of receiving natural or intentional recharge. *See id.*

45. *See id.* Some aquifers are surrounded by aquitards which are confining beds that retard but do not prevent the flow of water into and out of the aquifer.

46. *See* Gregory, *supra* note 13, at 258, n.116.

47. Peterson, *supra* note 11, at 1397-98.

48. *See* Kevin L. Patrick & Kelly E. Archer, *A Comparison of State Groundwater Laws*, 30 TULSA L.J. 123, 126 (1994).

restrict the movement of groundwater.[49] The amount of energy that is required to extract water from a well will depend upon the porosity of the material in the basin as well as the depth of the basin. Thus, a basin that is located close to the surface and comprised of porous material would be the most economical site for a conjunctive use project.[50]

d. *Groundwater Quality Considerations*

Under a conjunctive use management scheme, native groundwater will commingle with imported surface water. The quality of the water that is later extracted, as well as the water that is contained within the basin, will be affected by both sources. To ensure that neither source of water is unacceptably degraded, the relative quality of both must be assessed prior to instituting the conjunctive use program.

The quality of the native groundwater will be affected by the permeability of the surface land overlying the aquifer. For example, if an unconfined aquifer lies under an area of agricultural development, the return flow from irrigation may carry with it various salts, pesticides and other pollutants it picks up when it leaches through the surface soil. This percolating return flow can increase the level of contaminants in the aquifer and render the water stored within the basin unfit for some uses. Thus, a conjunctive use program may need to include control over the type of uses to which the land overlying the basin can be dedicated.

As noted above, the operation of a conjunctive use project frequently involves the recharge and discharge of large amounts of water from a basin. The fluctuation in water levels can result in the change of gradient within the basin and thereby alter the rate or direction of groundwater flow. This change in groundwater flow can have several negative effects on the quality of water stored within the basin. For example, "groundwater replenishment can result in accelerated groundwater degradation by forcing contaminated water in the basin to flow towards wells."[51] The withdrawal of project water also can exacerbate pollution problems within a basin by hastening the rate at which pollutants are dispersed throughout the aquifer.[52] The level and location of contaminants within a basin should, therefore, be assessed before project water is recharged into it.

Moreover, the sudden draw down of water during times of extraction can cause water of lesser quality to migrate into the basin from a hydrologically connected aquifer or body of surface water. When a basin is adjacent to an ocean or a saline aquifer, for example, the withdrawal of water can allow for intrusion of saltwater into the freshwater aquifer and, if the intrusion occurs in large quantities, render the water stored within the basin unusable without treatment.[53] The fact that a basin is adjacent to a saltwater body or a contaminated basin, however, does not necessarily render it unsuitable for a groundwater storage project. The operation of a conjunctive use project is likely to result in higher groundwater levels than would occur without the project, even during times when project water is extracted. If the groundwater levels are maintained at a sufficiently high level, the contaminated water will not migrate into the basin. Moreover, even if the water table is significantly lowered during extraction, the flow of water from an adjacent system can be prevented by the use of injection wells to create a hydraulic barrier and block the movement of

49. *See* CALIFORNIA WATER PLAN UPDATE VOL. 1, *supra* note 2, at 3-48 to 3-49.

50. There may be risk associated with storing water within such a basin, however. First, a basin that is close to the surface is more susceptible to contamination from activities occurring on land overlying the basin. Second, the hydraulic conductivity of a basin controls the mobility of contaminants within a basin. When contaminants reach a basin which is comprised of highly porous material, the contaminants will migrate through the basin at a fast rate and thereby impact the quality of all the water stored within the basin.

51. Susan M. Trager, *Emerging Forums for Groundwater Dispute Resolution in California: A Glimpse at the Second Generation of Groundwater Issues and How Agencies Work Towards Problem Resolution*, 20 PAC. L. J. 31, 41 (1988).

52. *See* Gregory, *supra* note 13, at 229.

53. *See* Kenneth A. Hodson, *The Dormant Commerce Clause and the Constitutionality of Intrastate Groundwater Management Programs*, 62 TEX. L. REV. 537, 541 (1983). The presence of saline in water significantly limits the uses to which water can be applied. "If as little as two percent of the water in affected portion of the aquifer is saline, water from the aquifer is unfit for human consumption." *Id.*

water into the basin.[54] It is important that the proximity of a contaminated water source be assessed, however, before a conjunctive use project is implemented so that the potential risk of contamination and the cost of prevention can be evaluated.

2. *Definition and Priority of* Water Rights

California has separate legal regimes for allocating and managing surface water and groundwater. When the two systems intersect, as happens under a conjunctive use program, the complexity of the disparate legal regimes creates uncertainty as to how conflicts between different water users will be resolved. This uncertainty may discourage participation in conjunctive use programs. For a conjunctive use program to function, parties who depend on each source of water must have assurances that their rights will not be impaired.

a. *Surface* Water Rights

Under a conjunctive use program, parties with rights to surface water voluntarily place a portion of their supply in a groundwater basin. "There are three rights that are necessary for an imported groundwater banking project: the right to place water in storage, the right to protect water while it is being stored, and the right to withdraw the water for use."[55] A surface water user can place water in a basin either by contracting with overlying landowners or by purchasing land overlying a basin and maintaining replenishment facilities. Before transporting water to the basin, the party holding surface water rights will need assurances that the basin has sufficient available storage space to accept the project water. To protect the water while it is in storage, the owner of surface water rights must have legal assurance that she will retain title to the water and can, therefore, prevent others from interfering with her right. The surface water user also must have some authority to prevent others from taking actions which would result in the degradation of the quality of the water so stored. Finally, the surface water user must have the ability to extract the water from the basin in times of shortage and to transport the water to places of use wherever the need occurs.

b. *Groundwater* Rights

A conjunctive use project also may affect the rights of parties who depend on groundwater. To encourage parties who control the management of groundwater basins to participate in such projects, as well as to ensure that the operation of such a program does not result in the unacceptable impairment of vested rights, groundwater users must have assurances that native groundwater supplies will not be diminished and that the quality of water will not be degraded due to the operation of the project. Groundwater users currently have the right to utilize the safe yield of a groundwater basin.[56] If imported water fills all the useable storage in a groundwater basin and prevents natural recharge from reaching the basin, the operation of a conjunctive use project could result in the diminution of available water. Groundwater users with rights to the native supplies must be assured that this will not occur or that they will be compensated for the displacement of native recharge.[57] In addition, to protect the quality of the native supplies, groundwater users also must have the legal authority to prevent both the introduction of poor quality water into the basin and the recharge or extraction practices that could degrade the water quality. Finally, groundwater users will need assurances that the extraction of imported water will not interfere with their existing wells.

54. Several water agencies have used injection wells to prevent the influx of seawater into overdrafted groundwater basins. *See, e.g.*, Trager, *supra* note 51, at 40 (discussing a program implemented by the Los Angeles County Flood Control District and the Orange County Water District).

55. Kletzing, *supra* note 26, at 1246.

56. *See, e.g.*, Alpaugh Irrigation Dist. v. City of Riverside, 113 Cal. App. 2d 286, 292 (1950). DWR defines "safe yield" as "the maximum quantity of water that can be continuously withdrawn from a groundwater basin without adverse effect." CAL. DEP'T OF WATER RESOURCES, BULL. 118, CALIFORNIA'S GROUNDWATER 4 (1975). A number of water managers and commentators have criticized the concept of safe yield as being inherently subjective and hydrologically unsound. *See* Weber, *supra* note 9, at 673-77; Kletzing, *supra* note 26, at 1242-44.

57. *See* Robie & Donovan, *supra* note 25, at 55.

3. Other Externalities

The operation of a conjunctive use program has the potential to infringe on the property rights of nonparticipants and to cause environmental damage, including subsidence of surface land, permanent loss of groundwater storage capacity through compaction, flooding of overlying lands, degradation of the quality of water stored in the basin, interference with the water rights of non-participants in the program, impairment of overlying wells, reduction in native groundwater supply and damage to surface vegetation. Before the benefits of a conjunctive use project can be accurately evaluated, these risks must be assessed.

a. Land Subsidence

Aquifers are composed of compressible material. When water is withdrawn from an aquifer, the pressure within it may be reduced and may result in the compaction of the water bearing strata.[58] When the materials within an aquifer compress, the overlying surface may subside. Subsidence can adversely affect the physical integrity of surface structures such as roads, buildings and water distribution systems; alter the gradients and drainage patterns of canals and irrigated land; and cause low lying areas to become submerged.[59] Depletion of groundwater supplies has caused land subsidence in California in the past. For example, parts of the Santa Clara Valley subsided by more than thirteen feet between 1933 and 1967 as a result of overdraft of the underlying basin.[60]

Indeed, the very existence of conjunctive management may increase the risk of subsidence. Under a typical conjunctive use scheme, water is withdrawn from an aquifer when surface water supplies are scarce. During these times, the natural recharge of the basin also is reduced. Therefore, the sudden withdrawal of large quantities of water stored within the basin can result in a significant reduction of the pressure within an aquifer and cause it to collapse. If a groundwater basin historically has experienced large fluctuations in water levels without experiencing subsistence, however, the risk of subsidence from conjunctive use may be minimal.

b. Loss of Basin Storage Capacity

When a groundwater basin compacts, the finer sediments within the water bearing strata lose porosity.[61] The pore space reduction caused by the compaction reduces the amount of water that the aquifer can store. This deformation of an aquifer's sediments is irreversible, and the basin's lost storage capacity can never be recovered.[62] The loss of storage space, thus, diminishes the ability of the water managers to use groundwater basins to their fullest potential.

c. Flooding

During years of high precipitation, the natural recharge of water into a groundwater basin can cause it to fill to overflowing.[63] During such periods, water tables may rise to the surface and cause flooding of overlying land.[64] If a groundwater basin does not have adequate storage space available, the operation of a conjunctive use program may exacerbate the risk of overfill and flooding.

d. Degradation of Water Quality

The operation of a conjunctive use project also can result in the degradation of the quality of water stored within a basin. The effects of such degradation are not limited to those who use the groundwater. If the aquifer is hydrologically connected to a surface water system, the contamination of groundwater resources can impair the ecosystem that depends on the connected water system.[65]

58. *See* Peterson, *supra* note 11, at 1395.

59. *See* Amandes, *supra* note 31.

60. *See id.* at 1213.

61. *See* Peterson, *supra* note 11, at 1396.

62. *See* Amandes, *supra* note 31, at 1210.

63. *See* Anderson, *supra* note 17, at 570.

64. *See id.* (describing the damage that the City of San Bernardino suffered when, as a result of natural recharge and a groundwater recharge program, the Bunker Hill basin flooded low lying land in the city).

65. *See* Gregory, *supra* note 13, at 238.

e. *Impairment of* Wells

Finally, when water is pumped from an aquifer, a cone of depression in the water table is created around the point of extraction. If a large quantity of water is withdrawn over a short period of time, the cone of depression created by the pumping may significantly lower the water levels in the area surrounding the extraction facility. This draw-down can temporarily impair the flow of water to neighboring wells. Further, if the extraction of the project water substantially lowers the water table, existing wells may have to be deepened and more energy will have to be expended to pump water from greater depths.[66]

4. *Incentives for Participation*

As the foregoing indicates, there are significant costs and risks associated with participation in conjunctive use programs. In most cases, the parties involved in the program will have to install pumps, monitoring wells and recharge facilities. In some cases, they may have to construct a water transportation system or secure the right to use existing conveyance facilities. The transaction costs of conjunctive management also may be significant because the parties will need to broker agreements to establish methods for obtaining surface water for import and recharge, schedules for recharging into and extracting water from the basin, and a means of supervising compliance with the agreements.

In addition, the operation of a conjunctive use program has the potential to impair the water rights of third parties. Disputes over groundwater rights usually are both protracted and costly.[67] If the third party's challenge is successful, the participants in the conjunctive use program may lose the benefits of their invested capital. Even if the legal challenge is ultimately unsuccessful, the project may be delayed if a court issues a preliminary injunction and such delay could be lengthy and costly.[68] Additionally, the participants in the program run the risk of incurring liabilities for third party damages that result from operation of the program. Therefore, to encourage parties to voluntarily participate in conjunctive use programs, it is essential that these types of risks be minimized and that liability to third parties be clearly assigned.

III. Legal and Institutional Regimes for Regulation of Groundwater

The California Water Code does not comprehensively regulate the use of groundwater. Consequently, groundwater management has evolved through a combination of appellate court decisions and local agency rulemaking.[69] Overlying these rules are myriad state and federal statutes,[70] Article X, Section 2 of the California Constitution, and a variety of contracts that interact to direct how particular groundwater resources are allocated and used. The story of California groundwater rights, thus, is the story of the development of these decentralized rules and the tensions among them.

Article X, Section 2 of the California Constitution is the cornerstone of California's water law and policy.[71] It requires that all uses of water

66. *See* Hodson, *supra* note 53, at 541.

67. *See* Kletzing, *supra* note 26, at 1227; Frank J. Trelease, *Legal Solutions to Groundwater Problems: A General Overview*, 11 PAC. L. J. 863, 867-68 (1980).

68. *See* Kletzing, *supra* note 26, at 1229 (estimating that the granting of a preliminary injunction to a party challenging the legality of the Kern County Water Bank could cost the DWR six to eight million dollars in interest expenses alone).

69. *See* Kevin Neese, *Tehama County Groundwater Management Ordinance*, *in* MAKING THE CONNECTIONS, PROCEEDINGS OF THE TWENTIETH BIENNIAL CONFERENCE ON GROUNDWATER 47, 48 (J.J. DeVeries & J. Woled eds. 1996) [hereinafter MAKING THE CONNECTIONS].

70. *See, e.g.*, Federal Endangered Species Act, 16 U.S.C. §§ 1531-1543 (1988); Central Valley Project Improvement Act, Pub. L. No. 102-575, §§ 3401-3412, 106 Stat. 4706 (1992); Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387; Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-666; California Environmental Quality Act, CAL. PUB. RES. CODE § 21000 (West 1992 & Supp. 1993); California Endangered Species Act, CAL. FISH & GAME CODE § 2050 (West 1992 & Supp. 1993).

71. Article X, Section 2 declares, *inter alia*, "that because of conditions prevailing in this state the general welfare requires that the water resources of the state be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water is prevented, and that the conservation of such water is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare. The right to water or to the use or flow of water in or from any natural stream or water course in this state is and shall be limited to such water as shall be reasonably required for the beneficial use to be served, and such right does and shall not extend to the waste or unreasonable method of diversion." Cal. Const. art. X, § 2.

be both reasonable and beneficial. No one can obtain or hold a water right unless the water is used in a reasonable manner, for a beneficial purpose and through a reasonable method of diversion. The California Water Code authorizes the State Water Resources Control Board ("SWRCB" or "Board") to take all appropriate measures to prevent the waste or misuse of any water in the state.[72] Thus, all water users are subject to the reasonable use requirement.

California recognizes several categories of water rights, each based on hydrological characteristics. Rights in surface water are governed by the doctrines of riparianism and prior appropriation.[73] Rights to subterranean waters are based on ownership of overlying land and appropriation.[74] According to the California Supreme Court, "[c]onceptually, what is meant by a water right is the right to use the water—to divert it from its natural course."[75] This right to use water is a real property right,[76] and real property remedies, therefore, are available for invasions of water rights.[77]

The right to use groundwater depends on the geological formation in which the water is found. "For legal purposes, underground waters are divided into three categories: (1) the underflow of surface stream; (2) a definite underground stream; and (3) percolating waters."[78] Underflow and water in underground streams are subject to the rules governing rights in surface water.[79] To acquire a right in underflow or water in underground streams, one must either own land contiguous to the watercourse of which the underflow or underground stream is a part or obtain a permit or license from the SWRCB to use such water.[80]

California law presumes that all subterranean water is percolating.[81] A claimant who wants to appropriate groundwater through the statutory procedure has the burden of proving that the water is part of an underground stream system.[82] Percolating waters include water in underground basins and groundwater that has escaped from streams.[83] As discussed below, common law principles govern the allocation of percolating groundwater. The California legislature consistently has followed a hands-off policy with regard to the regulation of groundwater rights.[84] These rights are generally not defined or quantified.

A. Acquisition of Groundwater Rights

"Water begins its juridical life as the quintessential public resource: owned by no one individual but held in common by all."[85] One can convert the publicly-owned water into private property "by appropriation in the manner

72. CAL. WATER CODE § 275 (West 1992 & Supp. 1993).

73. *See* United States v. State Water Resources Control Board, 182 Cal. App. 3d 82, 101 (1986).

74. *See* LITTLEWORTH & GARNER, *supra* note 16, at 47-53.

75. *State Water Resources Control Board*, 182 Cal. App. 3d at 100. Before 1903, the right to percolating waters was controlled by the same common law principles that governed rights over rocks and minerals contained in land. The owner of land overlying percolating waters had absolute ownership in and control of the use of the percolating waters and adjacent landowners could not prevent an overlying owner from diverting all groundwater found under his land even where such diversion injured the adjacent owner's groundwater rights. *See* 62 CAL. JUR. 3d § 394 (1981). In *Katz v. Walkinshaw*, the California Supreme Court rejected the common law rule of absolute ownership of percolating waters and adopted the doctrine of correlative rights under which all proprietors of land overlying a groundwater basin share in common the right to use the groundwater. 141 Cal. 138 (1903).

76. *See* Title Ins. & Trust Co. v. Miller & Lux, 183 Cal. 71, 81 (1920).

77. *See* Miller & Lux v. Enterprise Canal & Land Co., 169 Cal. 71, 81 (1915).

78. LITTLEWORTH & GARNER, *supra* note 16, at 48.

79. *See* Rancho Santa Margarita v. Vail, 11 Cal. 2d 501, 536 (1938); City of Los Angeles v. Pomeroy, 124 Cal. 597, 623-35 (1890); Prather v. Hoberg, 24 Cal. 2d 549, 557-62 (1944); CAL. WATER CODE § 1200 (West 1992 & Supp. 1993).

80. CAL. WATER CODE § 1200 (West 1992 & Supp. 1993).

81. *See Pomeroy*, 124 Cal. at 628, 633-34.

82. In determining whether groundwater is percolating or part of a stream system, a court considers the following factors: whether the water flows through a defined channel, the direction and rate of the subsurface flow, and the relationship between the surface and subsurface hydrographs. *See* Cave v. Tyler, 147 Cal. 454, 456 (1905); Larsen v. Appollonio, 5 Cal. 2d 440, 444 (1936); Barton H. Thompson, Jr., *Legal Disconnections Between Surface Water and Ground Water*, *in* MAKING THE CONNECTIONS, *supra* note 69, at 21. *See also* Arroyo Ditch & Water Co. v. Baldwin, 155 Cal. 280, 284 (1909) (one claiming a right in groundwater has the burden of proving that the water is part of a flowing stream); Russell Kletzing, *supra* note 26, at 1232-33. *See generally* Wells A. Hutchins, *California Ground Water: Legal Problems*, 45 CAL. L. REV. 688 (1957).

83. *See* Montecito Valley Water Co. v. City of Santa Barbara, 144 Cal. 578, 584 (1904).

84. *See* Thompson, *supra* note 5, at 722.

85. Gregory A. Thomas, *Conserving Aquatic Biodiversity: A Critical Comparison of Legal Tools for Augmenting Streamflows in California*, 15 STAN. ENVTL. L. J. 3, 12 (1996).

provided by law."[86] Because the state legislature has generally not regulated groundwater, "the manner provided by law" has been judicially defined. Over the last 100 years, the courts have developed the majority of rules relating to the character and scope of groundwater rights in California.

The California Supreme Court established the basic rule governing groundwater rights in *Katz v. Walkinshaw*.[87] In *Katz*, the plaintiffs were overlying landowners who had used groundwater obtained from artesian wells to irrigate their land for twenty years.[88] The defendant, an owner of land overlying the same aquifer as the plaintiffs' land, extracted groundwater and sold it for use on non-overlying land.[89] The plaintiffs alleged that continuation of the defendant's water exportation had destroyed the artesian head of their wells, effectively prohibiting the continued use of their property.[90]

The court in *Katz* concluded that, due to California's arid climate, the ends of justice would not be served by adopting the English common law rule of absolute ownership of percolating groundwater.[91] It recognized that, because water is a scarce resource in California, the rule of absolute ownership would result in unacceptable uncertainty in titles to water rights.[92] Instead, the court adopted the rule of reasonable use of percolating waters and the doctrine of correlative rights.[93] Under this doctrine, all overlying landowners have an equal right to the beneficial use of water. Where there is insufficient supply to meet the overlying owners' demands, all must equally share in the shortage.[94]

Groundwater that is surplus to the reasonable and beneficial needs of the overlying owners is available for appropriation for use outside the basin.[95] Unlike surface water, underflow or underground stream water, there is no statutory procedure for perfecting an appropriative right to groundwater.[96] Moreover, no centralized agency makes the determination of whether a basin contains water that is available for appropriation.[97] One gains an appropriative right to groundwater simply by taking it and applying it to a beneficial use.[98] Appropriative rights are governed by the "first in time, first in right" doctrine. If overlying owners require the full safe yield of a basin to satisfy their reasonable, beneficial uses, however, no surplus exists and no water is available for appropriation.[99] The correlative rights of overlying landowners, like riparian rights, do not depend upon use and are not lost by nonuse.[100]

Public purveyors of groundwater may not assert the overlying rights of their customers; rather, they must exercise appropriative rights.[101] Thus, the rights of private overlying users are technically paramount to the needs

86. CAL. WATER CODE § 102 (West 1992 & Supp. 1993).

87. 141 Cal. 116 (1903).

88. *Id*. at 138.

89. *See id*.

90. *See id*.

91. *Id*. at 123-38.

92. *See id*. at 128.

93. *See id*. at 134-36.

94. *See id*.

95. *See Id*. at 135-36; *see also* Tehachapi-Cummings County Water Dist. v. Armstrong, 49 Cal. App. 3d 992, 1001 (1975). "A groundwater basin is in a state of surplus when the amount of water being extracted is less than the maximum that could be withdrawn without adverse effects on the basin's long term supply. Overdraft commences whenever extractions increase, or the withdrawable maximum decreases, or both, to the point where the surplus ends." Wright v. Goleta Water Dist., 174 Cal. App. 3d 368, 371 n.2 (1985).

96. CAL. WATER CODE § 1200 (West 1992 & Supp. 1993); *see also Katz*, 141 Cal. at 134-35.

97. By contrast, section 1375 of the Water Code provides that the SWRCB must make a determination that unappropriated water is available before it can grant a permit. The Water Code further provides that A[i]n determining the amount of water available for appropriation, the board shall take into account, whenever it is in the public interest, the amounts of water needed to remain in the source for protecting beneficial uses, including any uses specified to be protected in any relevant water quality control plan established pursuant to Division 7 (commencing with Section 13000) of this code." CAL. WATER CODE § 1243.5 (West 1992 & Supp. 1993).

98. *See* Hutchins, *supra* note 82, at 688.

99. *See* Corona Foothill Lemon Co. v. Lillibridge, 8 Cal. 2d 522, 531 (1937); *see also* Monolith Portland Cement Co. v. Mojave Pub. Util. Dist., 154 Cal. App. 2d 487, 494 (1957).

100. *See, e.g.*, Hudson v. Dailey, 156 Cal. 617, 627-28 (1909); Burr v. Maclay Rancho Water Co., 160 Cal. 268, 280; City of San Bernardino v. City of Riverside, 186 Cal. 7, 25 (1921); Orange County Water Dist. v. City of Riverside, 173 Cal.App.2d 137, 165 (1959).

101. *See* City of San Bernardino v. City of Riverside, 186 Cal. 7, 25 (1921); *see also* Orange County Water Dist. v. City of Riverside, 173 Cal. App. 2d 137, 165 (1959).

of public agencies that depend on groundwater.[102] In overdrafted basins, however, public agencies may establish prescriptive rights against private groundwater users. Such prescriptive rights may become superior to the overlying landowners' rights. Additionally, intervening public use may limit a private owner's water rights remedy to damages, in place of an injunction, where public policy considerations require a reallocation of water rights.[103]

An importer of water has an exclusive right to recapture the return flow[104] attributed to its deliveries of imported water[105] to users in a basin.[106] Additionally, public agencies are entitled to use underground basins for temporary storage of imported water by means of artificial recharge and subsequent recapture and to protect the water so stored from expropriation by others.[107] The owner of stored water has a right to extract an equivalent amount, less losses.[108] "No statewide permit system exists for the allocation of underground storage capacity, nor is the permission of landowners overlying the storage area required in order to store imported water underground."[109] The importer of stored water may be liable, however, for third-party damages that result from the storage project.[110]

B. Limitations on Groundwater Rights

Although some observers contend that there is no groundwater management program in California,[111] there are a variety of methods by which groundwater basins are managed, and a number of important basins are tightly regulated. While no agency has comprehensive authority to define the character or extent of groundwater rights, the courts have jurisdiction to determine some groundwater rights and to limit pumping through adjudication. The role of the courts in determining groundwater rights has evolved over the last hundred years from a narrow one of resolving discrete conflicts between groundwater users to a broad one of developing comprehensive plans for allocation of groundwater in particular basins. In addition, the California Water Code grants the SWRCB and various local agencies some groundwater management authority. By virtue of their police power, cities and counties also can regulate some aspects of groundwater use. Finally, various federal and state statutes may affect a water user's exercise of its groundwater rights.

1. *Adjudication*

Adjudication is a method of regulating groundwater use in basins that are in a state of overdraft.[112] When a basin is in overdraft there is no surplus water available for the acquisition or enlargement of appropriative rights. Appropriations in excess of the surplus invade senior appropriators' and overlying owners' water rights, which usually entitle them to an injunction.[113] One product of the adjudication is judicial determination of the nature and quantity of each groundwater user's share of the basin's safe yield.[114]

In defining a groundwater user's water rights, the court must consider the reasonableness of each use. The determination of what is a reasonable use of water will vary with

102. *See* LITTLEWORTH & GARNER, *supra* note 16, at 51.

103. *See id.* at 51.

104. Where diverted surface water or pumped groundwater is applied to surface use, a certain amount of water is not consumed but rather percolated back into the ground. This water is called "return flow."

105. "Imported water" is "foreign water imported from a different watershed." City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199, 261 n.51 (1975).

106. *See id.* at 262.

107. *See id.* at 263-64.

108. *See id.*

109. LITTLEWORTH & GARNER, *supra* note 16, at 51.

110. *See* Anderson, *supra* note 17, at 570 (discussing damage that resulted to streets, building and pipelines in San Bernardino when natural and intentional recharge combined to cause the Bunker Hill Basin to overflow).

111. *See, e.g.*, Eric L. Garner et al., *Institutional Reforms in California Groundwater Law*, 25 PAC. L.J. 1021, 1022 (1994) (describing California groundwater law as "the right to pump as much water as possible until one is sued").

112. *See* Neese, *supra* note 69, at 48.

113. *See* People v. City of Los Angeles, 34 Cal. 2d 695 (1950).

114. *See* Neese, *supra* note 69, at 49.

115. Tulare Irrigation Dist. v. Lindsay-Strathmore Irrigation Dist., 3 Cal. 2d 489, 567 (1935).

the facts and circumstances of each particular case.[115] A court adjudicating a groundwater basin must consider the needs of all other users of the groundwater. As the California Supreme Court held:

> What may be a reasonable beneficial use, where water is present in excess of all needs, would not be a reasonable beneficial use in an area of great scarcity and great need. What is a beneficial use at one time, may because of changed conditions, become a waste of water at a later time.[116]

The inquiry into the reasonableness of a particular use also must include what the Supreme Court has called "state-wide considerations of transcendent importance."[117] The Court has stated that a paramount consideration in making this determination is "the ever increasing need for the conservation of water in this state, an inescapable reality of life quite apart from its express recognition in [Article X, Section 2]."[118] Thus, a court adjudicating the rights of producers in a particular basin has the duty to consider the reasonableness of a particular use in the broader context of current water needs of all of California. If a producer's use is found to be unreasonable given competing demands, either basin-wide or state-wide, the court can find that the producer has no right to use such water.[119] The California Supreme Court has not yet decided whether Article X, Section 2 requires the optimal use of water, or if it simply prohibits the wasteful use of water.[120]

While a court has the authority to determine the existence, extent and character of a groundwater user's exercised rights, a court cannot determine the prospective rights of overlying landowners. In *Wright v. Goleta Water District*,[121] the court of appeal held that a judicial determination of basin rights is only binding on parties to the litigation because an adjudication of groundwater rights is essentially a private lawsuit.[122] In *Wright*, the court rejected the trial judge's decision to subordinate an unexercised overlying right to an exercised appropriative right.[123] The trial court had based its holding upon the California Supreme Court's reasoning in *In re Waters of Long Valley Creek Stream System*.[124] *Long Valley* held that the SWRCB could relegate unexercised riparian rights to the lowest priority in a basin-wide statutory adjudication of *surface* water rights.[125] The *Long Valley* court recognized that, in this context, uncertainty concerning water rights could inhibit long-range planning and foster litigation.[126]

In *Wright*, the court of appeal observed that such concerns should apply with "equal vigor" to groundwater since the legislature had failed to enact a groundwater regulatory scheme to carry out the state's constitutional water policies.[127] The court concluded, however, that the doctrine of *stare decisis*, as well as due process concerns, prevented it from redefining a non-party's groundwater rights.[128] The court stressed the fundamental difference between judicial determination of groundwater rights and the SWRCB's adjudication procedures at issue in *Long Valley*.[129] In a statutory adjudication, the SWRCB engages in a comprehensive and final

116. *Id.*

117. Joslin v. Marin Mun. Water Dist., 67 Cal. 2d 132, 140 (1967)

118. *Id.*

119. *See id.*

120. *See* LITTLEWORTH & GARNER, *supra* note 16, at 69; *see also* Nat'l Audubon Soc'y v. Superior Court, 33 Cal. 3d 419, 447 n.28 (1983).

121. 174 Cal. App. 3d 74 (1985).

122. *Id.* at 87-89.

123. *Id.*

124. 25 Cal. 3d 339 (1979); *see also* 174 Cal. App. 3d at 86.

125. 25 Cal. 3d at 359.

126. *Id.* at 355.

127. 174 Cal. App. 3d at 86.

128. *See id.* at 87.

129. *See id.* at 86-90. The California Water Code expressly authorizes the SWRCB "to determine [in a stream system adjudication proceeding] all rights to water of a stream system whether based upon appropriation, riparian right, or other basis of right." CAL. WATER CODE § 2501 (West 1992 & Supp. 1993).

130. The California Water Code provides that it is the duty of all claimants to appear and submit proof of their claims in a statutory adjudication proceeding. A claimant who fails to appear "shall be barred and estopped from subsequently asserting any rights theretofore acquired and shall be held to have forfeited all rights to water theretofore claimed by him on the stream system, other than as provided in the decree, unless entitled to relief under the laws of this state." *Id.* § 2774.

determination of *all* water rights in the system.[130] The court reasoned that this consideration "transcend[s] those at stake in a private dispute between a limited number of parties."[131]

While an overlying owner cannot lose her rights to use water in an underground basin by nonuse,[132] she may lose them through prescription.[133] When an appropriator takes water from a basin that is not surplus, she invades overlying owners' and senior appropriators' right to use the groundwater.[134] An appropriator's extraction and export of non-surplus water may ripen into a prescriptive right when the essential elements of adverse possession are met.[135] In particular, the overlying owner must have notice of the adverse use.[136] Moreover, the basin must be in a continuous state of overdraft for the prescriptive period.[137] A prescriptive right entitles the adverse user to use the water for the specific purpose for which the water has historically been used and in a specific quantity.[138]

The doctrine of mutual prescription adopted by the Supreme Court in P*asadena v. Alhambra*[139] fundamentally shaped groundwater adjudications. Under this law, when a basin does not contain sufficient water to satisfy the needs of the overlying producers over a protracted period, all appropriators and overlying owners invade each other's water rights. Therefore, each user can gain prescriptive rights vis-a-vis all other users.[140] The court can limit pumping to the basin's safe yield[141] and require all users proportionately to reduce their extractions.[142] Groundwater rights are allocated on the basis of historic pumping rates, as represented by the five prior years of record for each extractor.[143]

The California Supreme Court modified the doctrine of mutual prescription in L*os Angeles v. San Fernando*.[144] The court held that section 1007 of the Civil Code prohibits prescriptive rights from accruing against public agencies and public utilities.[145] This limitation is particularly significant because there are "not many groundwater basins that do not have some public users."[146] Thus, individuals are prohibited from gaining mutual prescriptive rights to much of the groundwater in California and run the risk of losing their water

131. L*ong Valley*, 25 Cal. 3d at 360.

132. S*ee* Hudson v. Dailey, 156 Cal. 617, 627-28 (1909).

133. It is not clear, however, whether overlying rights that have not yet been exercised can be lost by prescription. In a cryptic footnote, the California Supreme Court has stated that the prescriptive rights of appropriators "would not necessarily impair the private defendants' right to ground water for *new* overlying uses for which the need had not yet come into existence during the prescriptive period." City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199, 293 n.100 (1975).

134. S*ee* City of Pasadena v. City of Alhambra, 33 Cal. 2d 908, 929 (1949).

135. To obtain a prescriptive water right, the use must be reasonable and beneficial, open and notorious, adverse and hostile, continuous and uninterrupted for a period of five years, exclusive and under claim of right. S*ee* Saxon v. DuBois, 209 Cal. App. 2d 713, 719 (1962).

136. S*ee* Los Angeles v. San Fernando, 14 Cal. 3d 199, 282 (1975) (stating that a prescriptive period does not commence until water users with paramount rights have notice that an overdraft exists); S*ee also* P*asadena*, 33 Cal. 2d at 930 (holding that the long-term lowering of water levels is sufficient to charge owners with notice of deficiency).

137. S*ee* City of Los Angeles v. City of San Fernando, 14 Cal. 3d at 284.

138. S*ee* City of San Bernardino v. City of Riverside, 186 Cal. 7, 25, 31 (1921).

139. 33 Cal. 2d 908 (1949).

140. S*ee id*. at 933.

141. S*ee id*. at 924.

142. S*ee id*. at 936.

143. S*ee id*.

144. 14 Cal. 3d 199 (1975).

145. The court stated that "occupancy for the period prescribed by the Code of Civil Procedure as sufficient to bar any action for the recovery of the property confers a title thereto, denominated by a title by prescription, which is sufficient against all, but no possession by any person, firm or corporation no matter how long continued of any land, water, water right, easement, or other property whatsoever dedicated to a public use by a public utility, or dedicated to or owned by the state or any public entity, shall ever ripen into any title, interest or right against the owner thereof." I*d*. at 270 n.66.

146. Kletzing, *supra* note 26, at 1238.

147. S*ee id*. at 1227 (noting that the S*an Fernando* decision reduced the incentive for private users to instigate basin adjudication proceeding because public agencies whose withdrawal of water from the basin would be protected from loss of rights by prescription); *see also* Thompson, *supra* note 5, at 686-700 (discussing the dominant role that local water institutions play in allocating and managing water resources in the western United States).

rights to public agencies.[147] The court further limited the potential impact of prescriptive rights by holding that users of the native supply in the basin cannot gain prescriptive rights to imported water stored in a basin.[148]

Once a court has determined the relative rights of water users in a basin, it usually will appoint a watermaster to manage the basin.[149] The court order often grants the watermaster authority to charge groundwater producers special assessments to cover the cost of administering the judgment.[150] In many adjudicated basins, the watermaster also is empowered to operate replenishment programs to prevent future overdrafts.[151] Once a groundwater basin is adjudicated, the trial court usually retains jurisdiction to modify its orders as conditions may change.[152] Generally, a watermaster does not have the power to regulate the extractions of groundwater to control the movement of contamination in a basin or the land use practices of overlying land owners to prevent contamination in a recharge area.[153] The watermaster may petition the court, however, to modify the order to allow the watermaster to regulate some additional aspects of groundwater extraction and management.[154]

Basin-wide adjudication can increase the certainty of water rights because the outcome includes defined and quantified pumping rights. "Definition of water rights allows for prioritization in the event of shortage and quantification accommodates internal water transfers."[155] Courts also have the flexibility individually to address problems that are specific to the basin and to craft equitable remedies tailored to address the unique conditions of the basin.

There are several concomitant drawbacks to the adjudication process, however. Groundwater adjudication is generally a time-consuming and costly process.[156] The participants are required to forfeit their rights independently to devise solutions to future problems and to abdicate control over their water use practices to the court and watermaster. Moreover, water users only have an incentive to utilize the adjudicative process to define water rights when a basin has suffered a protracted period of overdraft. Because a basin and the water contained within it can be severely damaged by long periods of overdraft, water users are unlikely to use the adjudicative process to ensure that the basin is maintained in its most productive state. Finally, the very nature of the adjudicative process requires judges to make important policy decisions without legislative guidance.[157]

2. *State Water Resources Control Board*

While the California Water Code assigns the primary duty of regulating water resources to the State Water Resources Control Board,[158] it does not grant the Board direct regulatory

148. *See San Fernando*, 14 Cal. 3d at 270-77, 286-87. Because *San Fernando* involved public importers of water, it is not entirely clear whether a party could gain prescriptive rights against a private importer of water. It seems likely, however, that the policy reasons for exempting public importers from the doctrine of prescriptive rights would apply with equal vigor to private importers and a court would find that prescriptive rights do not attach to imported water. *See id.* at 261 (noting that the reason for giving priority to users who import water is "to credit the importer with the fruits of his expenditures and endeavors in bringing into the basin water that would not otherwise be there").

149. *See* ANNE J. SCHNEIDER, GROUNDWATER RIGHTS IN CALIFORNIA, GOVERNOR'S COMMISSION TO REVIEW CALIFORNIA WATER RIGHTS 53-58 (1977) (describing watermaster management).

150. *See id.* at 22-25.

151. *See id.*

152. *See, e.g.*, Tulare Irrigation Dist. v. Lindsay-Strathmore Irrigation Dist., 3 Cal. 2d 489, 524-25 (1935).

153. *See* BLOMQUIST, *supra* note 19, at 175-76 (discussing how the San Gabriel Basin watermaster had to petition the court to limit pumping for quality reasons).

154. *See id.* For example, the court granted the watermaster for the San Gabriel Basin the authority to limit extracts to help prevent the spread of contaminants within the basin and to facilitate remediation in 1990. In 1991, the court approved the watermaster's plan for implementing this authority. Similar water quality authority was granted to the Upper Los Angeles River Area watermaster in 1993. *See* CALIFORNIA DEP'T OF WATER RESOURCES, WATER FACTS NO. 3: ADJUDICATED GROUNDWATER BASINS IN CALIFORNIA (1996).

155. Neese, *supra* note 69, at 49.

156. For example, it took twenty years to adjudicate the San Fernando Basin and the adjudication of the Raymond Basin took twelve years to complete. *See* Garner et al., *supra* note 111, at 1023; *see also* BLOMQUIST, *supra* note 19, at 73-95 (describing the adjudication proceedings in the Raymond Basin); 97-126 (analyzing the problems and solutions developed in the West Basin proceedings); 127-58 (discussing the Central Basin).

157. *See* Wright v. Goleta Water Dist., 174 Cal. App. 3d 368 (1985).

158. *See, e.g.*, CAL. WATER CODE §§ 1200-1851 (West 1992 & Supp. 1993).

jurisdiction over groundwater.[159] The SWRCB does have some authority, however, to regulate groundwater rights. The SWRCB has concurrent jurisdiction with the courts to enforce the reasonable and beneficial use requirement of Article X, Section 2 on all water uses.[160] Section 275 of the Water Code further provides that DWR and the Board "shall take all appropriate proceedings or actions before executive, legislative, or judicial agencies to prevent waste, unreasonable use, unreasonable method of use or unreasonable method of diversion of water in this state."[161] The SWRCB also "has broad authority to define reasonable water use, to investigate alleged misuses, and to order the violating party to correct the misuse through various means, including implementation of water conservation measures"[162] and it is "the primary state agency with jurisdiction over the implementation and enforcement of federal and state water quality law."[163]

Although the California Water Code does not authorize the SWRCB to determine groundwater rights in a statutory adjudication of a stream system,[164] it can act as a referee to court adjudications of groundwater basins.[165] A court can refer matters to the SWRCB to investigate and report on any issue involved in a lawsuit for the determination of rights to water.[166] Any party may take an exception to the Board's findings, however, and thereby require a trial court to conduct a *de novo* review.[167] The SWRCB can also initiate an adjudicative proceeding in courts to protect groundwater quality.

3. *Local Management of Groundwater Basins*

While the California Water Code does not authorize the Board, or any other state agency, to comprehensively regulate groundwater rights, the legislature has granted various local entities some authority to manage groundwater basins.[168] Local water agencies play a vital role in the allocation of the state's water resources, because they often hold legal title to water rights for the benefit of their users, control extraction and conveyance facilities, and are responsible for delivering water to consumers.[169] The use of institutions to supply water is not surprising because the economies

159. *See id.* at § 1202.

160. *See* Imperial Irrigation Dist. v. State Water Resources Control Bd. [hereinafter IID I], 186 Cal. App. 3d 1160, 1162-63, 1171 (1986) (finding that the SWRCB has the authority to adjudicate the constitutional issue of the unreasonable use of water); Imperial Irrigation Dist. v. State Water Resources Control Bd. [hereinafter IID II], 225 Cal. App. 3d 548, 561 (1990) (concluding that the SWRCB had the power to establish standards of reasonableness and to determine whether the irrigation practices of the district were reasonable or wasteful). The Board has been reluctant to exercise its authority under the reasonable use doctrine to reduce a user's water rights, or to require users to implement conservation methods, because of the expense involved in investigating waste and improving water efficiency. *See, e.g.*, George W. Pring & Karen A. Tomb, *License to Waste: Legal Barriers to Conservation and Efficient Use of Water in the West*, 25 ROCKY MTN. MIN. L. INST. 25-1, 25-8 to 25-32 (1972); Steven J. Shupe, *Waste in Western Water Law: A Blueprint for Change*, 61 OR. L. REV. 483, 485-91 (1982); *but see* Thompson, *supra* note 5, at 729-30 (discussing SWRCB's order finding that the Imperial Irrigation District's water use practices were unreasonable and wasteful in violation of constitutional mandate).

161. CAL. WATER CODE § 275 (West 1992 & Supp.).

162. Thomas, *supra* note 85, at 26.

163. Gray, *supra* note 15, at 249 n.1 (referencing CAL. WATER CODE §§ 13000-14920 (West 1992 & Supp. 1993)).

164. CAL. WATER CODE § 2500 (West 1992 & Supp. 1993).

165. *See id.* § 2000.

166. *See id.*

167. *See* CAL. WATER CODE § 2017; *see also* LITTLEWORTH & GARNER, *supra* note 16, at 106-07 (describing how the court in *Environmental Defense Fund v. East Bay Municipal Utility District*, 26 Cal. 3d 327 (1980), had to conduct a lengthy trial after the parties took exceptions to the SWRCB's resolutions of issues).

168. California has a long history of using local districts to fulfill a variety of public purposes. In 1887, the legislature enacted the Wright Act, which authorized the formation of irrigation districts with the power to issue bonds and charge assessments against all property within the district for the purpose of developing or acquiring water for irrigation uses. *See* DONALD WORSTER, RIVERS OF EMPIRE: WATER, ARIDITY, AND THE GROWTH OF THE AMERICAN WEST 108-09 (1985).

The Supreme Court upheld the constitutionality of the Act in *Fallbrook Dist. v. Bradley*,164 U.S. 122 (1896). The Court deferred to the California legislature's determination that the public generally, and not just those who received water deliveries from the district, benefited from the district's services. The Court stated:

> To irrigate and thus bring into possible cultivation these large masses of otherwise worthless lands would seem to be a public purpose and a matter of public interest, not confined to the landowners, or even to any one section of the state. The fact that the use of water is limited to the landowner is not therefore a fatal objection to this legislation. It is not essential that the entire community or even any considerable portion thereof should directly enjoy or participate in an improvement in order to constitute a public use.

Id. at 161.

169. *See, e.g.*, Thompson, *supra* note 5, at 686-701 (describing the role that water institutions play in the allocation of water resources in the western United States).

of scale involved in the development and distribution of water resources make it far less expensive for an institution to maintain large extraction or diversion facilities and "to transport water to a number of consumers in the same region than for each consumer to collect and bring in her own water."[170] The establishment of local agencies endowed with some governmental powers also allows local water users, who control water agencies through voting rights, to overcome some of the uncertainties engendered by California's complex and multi-layered system for regulating water uses and to manage water rights equitably and efficiently. California has several different types of local agencies with the authority to manage and regulate the state's groundwater re-sources.

a. *Special* Act Districts

Through the enactment of special district acts, the legislature has created (or authorized the creation of) public agencies to regulate groundwater use in specific basins.[171] Special water districts are designed to preserve "the groundwater resources within the territory of the agency for agricultural and municipal and industrial uses."[172] The legislature has declared that the creation of special groundwater districts "is in the public interest and that the creation of the [groundwater management agencies] . . . is for the common benefit of water users."[173]

Special groundwater management districts possess a wide array of tools to carry out their mandate of protecting the groundwater basins over which they lie and the groundwater resources within their territory. The agencies generally are empowered to adopt groundwater management plans when they determine that "groundwater management activities are necessary in order to improve or protect the quantity or quality of groundwater supplies within a groundwater basin or aquifer."[174] As part of a groundwater management plan, agencies can exercise some or all of the following powers: (1) store and recapture water in groundwater basins

170. *Id*. at 689; *see also* Robert A. Young, *Why Are There So Few Transactions Among Water Users*, AM. J. AGRIC. ECON. 1143, 1144 (1986); John M. McDowell & Keith R. Ugone, *The Effect of Institutional Setting on Behavior in Public Enterprises: Irrigation Districts in the Western States*, 1982 ARIZ. ST. L.J. 453, 480-82 (discussing the economies of scale involved in storing, transporting and distributing water).

171. There are ten special Groundwater Management Districts established under California law. *See* CAL. WATER CODE APP. §§ 118-1 to 118-801 (West 1992 & Supp. 1993) (Monterey Peninsula Water Management District), *id*. §§119-101 to 119-1201 (Sierra Valley Groundwater Management District), *id*. §§119-1301 (Long Valley Groundwater Management District), *id*. §§121-102 to 121-1101 (Fox Cannon Groundwater Management Agency), *id*. §§ 124-101 to 124-1101 (Pajaro Valley Water Management Agency), *id*. §§ 128-1 to 128-901 (Mono County Tri-Valley Groundwater Management District), *id*. §§ 129-101 to 129-1201 (Honey Lake Valley Groundwater District), *id*. §§ 131-101 to 131-1201 (Ojain Groundwater Management Agency), *id*. §§ 10700. (Mendocino Community Service District). In 1995, the legislature also authorized the formation of the Surprise Valley Groundwater Management District. *See id*. §§ 137-101 to 137-1301. The voters of the district, however, have not yet approved the formation of such a district.

Two special act water districts, the Orange County Water District, *see id*. §§ 40-1 to 40-78, and the Santa Clara Valley Water District, *id*. §§ 60-1 to 69-35, have been granted groundwater management powers. These districts can levy a "basin equity assessment" or pump taxes to regulate groundwater extractions, but they do not possess the authority to regulate groundwater extractions by ordinance. *See, e.g.*, CAL. WATER CODE APP. § 40-31.5; Weber, *supra* note 9, at 735.

172. CAL. WATER CODE APP. § 121-102 (West 1992 & Supp. 1993).

173. *Id*.

174. *See, e.g., id*. § 119-501 (authorizing Sierra Valley Groundwater Management District to conduct hydrological investigation and study of the basin over which the district lies), *id*. § 121-501 (Fox Canyon Water District), *id*. §124-701 (Pajaro Valley Water Management Agency). The legislature has specifically instructed certain groundwater management agencies to conduct comprehensive studies of the hydrologic conditions of the basin over which they lie. Section 131-603 of the California Water Code provides, for example, that:

> the [Ojai Groundwater Management] Agency shall undertake a groundwater management study for future extractions from the basin. As a part of this study, the agency shall determine the hydrologic characteristics of the basin, which shall include all of the following information:
>
> (1) Existing groundwater storage capacity;
>
> (2) Existing groundwater storage;
>
> (3) Existing and projected groundwater use;
>
> (4) A review of the boundaries of the basin;
>
> (5) The average annual variation in storage in existing groundwater storage;
>
> (6) Projected annual rainfall, runoff, and recharge rates;
>
> (7) Long-term recoverable storage, including an estimate of nonrecoverable storage; and
>
> (8) Potential extractions and storage programs.

Id. § 131-603.

and surface reservoirs within their district; (2) require users within their jurisdiction to utilize conservation measures and practices;[175] (3) "control groundwater extractions by regulating, limiting or suspending extractions from extraction facilities, the construction of new extraction facilities, the enlarging of existing facilities and the reactivation of abandoned extraction facilities;"[176] (4) regulate replenishment programs;[177] (5) determine the amount of groundwater space available within the groundwater basin and allocate the available storage space;[178] and (6) "commence and prosecute actions to enjoin unreasonable uses or methods of use of groundwater within the district or outside of the district to the extent those uses or methods of use affect the groundwater supply within the district."[179]

The enabling legislation for some of the groundwater management districts grants the agency the power to control the places where the water can be dedicated to use and provide a legislative prioritization of appropriative groundwater rights. Five groundwater management agencies have been granted authority to restrict the exportation of their groundwater supplies.[180] The enabling acts for these districts prohibit the exportation[181] of water from the district without a permit from the controlling agency. The statutes then provide that a permit may be issued only if the applicant demonstrates that there is surplus water available, and the district determines that the exportation of district water will not adversely affect the rights of groundwater users within the district.[182] The district is instructed to limit or to suspend exports whenever it determines that such limitation is needed to protect the groundwater basin.[183]

The legislation that created the Sierra Valley Groundwater Management District and the Mono County Tri-Valley Groundwater Management District also sets forth priorities of rights to the district's groundwater. Both overlying users and appropriators who use water within the boundaries of the district, but not on land overlying the basin,[184] are given priority over appropriators who use the water outside the district. Because the priority is granted "irrespective of the time the export uses are commended,"[185] this provision can result in the reordering of existing uses.[186] Parties who use water on land overlying the basin have superior rights under state groundwater law, but the acts authorize the districts to assign equal priority to some district off-basin users, if the district finds that the off-basin use "is necessary for the equitable distribution of the groundwater resource."[187]

Most groundwater management districts

175. S*ee id*. § 119-702(d) (Sierra Valley Groundwater Management District and Long Valley Groundwater Management District), *id*. § 121-701(a) (Fox Canyon Groundwater Management Agency), *id*. § 131-702(a) (Ojai Groundwater Management Agency), *id*. §129-702(b) (Honey Lake Valley Groundwater Management District).

176. I*d*. § 121-701(b) (Fox Canyon); *id*. §119-702(g) (Sierra Valley and Long Valley Groundwater Management Agencies), *id*. § 129-702(c) (authorizing the Honey Lake Groundwater Management District to limit extractions "in order to improve and protect the quality of groundwater supplies or to respond to, and rectify, conditions of subsidence"), *id*. § 137-702(g) (Surprise Valley Groundwater Basin Act).

177. S*ee, e.g., id*. §§ 129-702(d), 119-702(h), 124-703, 131-703.

178. S*ee, e.g., id*. §§ 124-703, 119-702(h), 137-702(h). Two groundwater management acts, the Sierra Valley Groundwater Basin Act and the Pajaro Valley Water Management Agency Act, provide that "[t]he district, or other persons pursuant to an agreement with the district, shall have the sole right to store and recapture water in the groundwater basin." I*d*. § 119-702(i); *see also id*. 124-704.

179. I*d*. § 129-702(e); *see also id*. §§ 118-328(e), 121-701(c), 124-705, 131-702(b).

180. The districts that possess export authority include: the Sierra Valley Groundwater Management District, the Long Valley Groundwater Management District, the Mono County Tri-Valley Groundwater Management District, the Honey Lake Valley Groundwater Management District and the Ojai Basin Groundwater Management District.

181. The statutes generally define export to mean "groundwater extracted for use outside the boundaries of the district." I*d*. §§ 119-307, 128-307, 129-307, 131-309.

182. S*ee id*.

183. S*ee id*. §§ 119-706, 119-707, 128-706(b), 128-707.

184. The statutes call these users "district off-basin users." I*d*. §§ 119-306, 128-306 ("District off-basin user" means a person extracting groundwater for use on land within the district that does not overlie the groundwater basin).

185. I*d*. §§119-709.7, 128-710.

186. Because both exporters and district off-basin users are exercising appropriative rights, under the common law system, the use which was commenced first would have absolute priority over the later. Weber, *supra* note 9, at 738.

187. CAL. WATER CODE APP. §§ 119-709.7, 128-710 (West 1992 & Supp. 1993).

also have the power to define and quantify rights to groundwater within their district in times of shortage. When a district determines that it is necessary to limit or suspend extraction to prevent overdraft, it has the authority to quantify each user's right and to apportion the available supply. Generally, the available water supply is divided among district users based on either the historic amount of water used[188] for the percentage of overlying land each groundwater producer owns or leases.[189] The agency may adjust the figure, however, if it determines that such a division will not result in the equitable distribution of water throughout the entire district.[190]

Groundwater management districts also may regulate groundwater use by requiring well registration and extraction statements, by determining well spacing, and by prohibiting well interference.[191] Groundwater management districts can fund their management activities through groundwater extraction and management charges.[192]

b. *General Act Districts*

The legislature has authorized the formation of various water districts of limited statutory powers to conduct certain groundwater management activities.[193] None of the general act districts have the authority to directly regulate or to limit groundwater extractions or to define groundwater rights. Many of these water districts can indirectly manage groundwater use, however, through their authority to levy assessment fees on the production of groundwater ("pump taxes") and to manage replenishment programs.[194] General act districts also have the authority to initiate or participate in litigation that affects the common supply of users within the districts and to take other actions to protect the quality of groundwater.[195]

c. *Area of Origin Statute Limitations: Water Code Section 1220*

"In 1984, the Legislature enacted sweeping 'area of origin' protection for over a dozen identified Northern California stream systems."[196] This legislation included section 1220 of the Water Code. Section 1220 prohibits the pumping of groundwater "for export within the combined Sacramento and Delta-Central Sierra Basins . . . unless the pumping is in compliance with a groundwater management plan that is adopted by [county] ordinance . . . ."[197] Pursuant to this section, the board of supervisors of a county that includes any part of the combined Sacramento and Delta-Central Sierra Basin is authorized to adopt groundwater management plans "to implement the purposes of this section."[198] The legislation does not require the county board of supervisors to enact such management plans, however, nor does it specify the components that such a

188. *See, e.g.*, CAL. WATER CODE APP. § 124-712 (West 1992 & Supp. 1993) ("available supply of groundwater shall be allocated primarily on the basis of the amount of water used by the operator as a percentage of the total amount of the water being used within the agency").

189. *See, e.g., id.* § 128-709 ("rights to the use of the available supply of groundwater shall be allocated primarily on the basis of the number of acres overlying the basin or subbasin that a user owns or leases in proportion to the total number of acres overlying the basin or subbasin").

190. In making this determination, the agencies must consider the following factors: "(a) The number of acres actually irrigated compared to the number of acres owned or leased. (b) Crop type. (c) Wasteful or inefficient use. (d) Reasonable need. (e) Water conservation activities. (f) Any other factors that the board reasonably determines it should consider in order to reach an equitable distribution within the entire district." *Id.* § 128-709; *see also id.* § 119-709.5.

191. *See, e.g., id.* §§ 119-601 to 119-605, 119-703, and 119-704.

192. *See, e.g., id.* §§ 129-801 to 129-807, and 129-901 to 129-905.

193. *See* CAL. WATER CODE § 20500 (Irrigation Districts), *id.* § 3000 (County Water Districts), *id.* § 34000 (Water Districts), *id.* § 39000 (Water Storage Districts), *id.* § 50000 (Reclamation Districts), *id.* § 55000 (County Waterworks Districts), *id.* § 56000 (Drainage Districts), *id.* § 60000 (Water Replenishment Districts), *id.* § 70000 (Levee Districts) *id.* § 71000 (Municipal Water Districts), *id.* § 74000 (Water Conservation Districts).

194. *See* Neese, *supra* note 69, at 50.

195. *See, e.g.*, CAL. WATER CODE § 60222 (authorizing a water replenishment district to take any action necessary to prevent "interference with water, the quality thereof, or water rights of persons or property within the district"), *id.* §§ 74641-74643 (enabling Water Conservation Districts to bring or to participate in litigation involving the use or ownership of water rights within the district and in actions to prevent interference with water within the district).

196. Weber, *supra* note 9, at 689 (citing CAL. WATER CODE §§ 1215-1220).

197. CAL. WATER CODE § 1220 (a) (West 1992 & Supp. 1993).

198. *Id.* § 1220(b).

199. *See* Weber, *supra* note 9, at 688.

plan should include.[199]

d. AB 3030 *Groundwater Management* Plans

In 1992, the legislature passed the Groundwater Management Act, commonly referred to as AB 3030, which added sections 10750 through 10755.4 to the Water Code.[200] The purpose of the legislation was to clarify the authority of local water agencies (including cities and counties) to manage and regulate the use of groundwater. The law applies to all groundwater basins in the state, except for those that have been adjudicated.[201] Adoption of a local groundwater management plan pursuant to AB 3030 is optional. Local water agencies may not regulate groundwater under AB 3030, however, within the service area of another local agency without the agreement of the other agency.[202]

The formulation and adoption of local groundwater plans must be conducted in accordance with the notice, comment and public hearing requirements of section 6066 of the Government Code.[203] Landowners within the jurisdiction of the agency may file written protests to the plan.[204] If a majority of the landowners objects to the plan, the agency must withdraw it and may not consider the adoption of a new or revised plan for a period of one year.[205]

According to the legislature, a local groundwater management plan may include the following components:

(a) The control of saline water intrusion;

(b) Identification and management of wellhead protection areas and recharge areas;

(c) Regulation of the migration of contaminated groundwater;

(d) The administration of a well abandonment and well destruction program;

(e) Mitigation of conditions of overdraft;

(f) Replenishment of groundwater extracted by water producers;

(g) Monitoring of groundwater levels and storage;

(h) Facilitating conjunctive use operations;

(i) Identification of well construction policies;

(j) The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects;

(k) The development of relationships with state and federal regulatory agencies; and

(l) The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.[206]

AB 3030 authorizes the local agency to adopt rules and regulations to implement the plan.[207] These rules and regulations do not constitute, however, a "binding determination of the water rights of any person or entity."[208] The Act also stipulates that the local agency may not limit or suspend groundwater pumping unless it has determined "through study and investigation that groundwater replenishment programs or other alternative sources of water

200. CAL. WATER CODE §§ 10750-10755.4 (West 1992 & Supp. 1993).

201. *See id.* § 10750.2. The local agency or watermaster with jurisdiction over an adjudicated basin may consent, however, to regulation under AB 3030. *See id.*

202. *See id.* § 10750.7. There is a slightly different rule with respect to groundwater basins that are critically overdrafted as defined by DWR. *See id.* § 10750.8.

203. *See id.* §§ 10753.2-10753.6.

204. *See id.* §§ 10753.5, 10753.6.

205. *See id.* § 10753.6(c). The Act defines "majority" as protesting landowners who represent more than fifty percent of the assessed value of the land within the agency that is subject to the proposed groundwater management plan.

206. CAL. WATER CODE § 10753.7.

207. *See id.* § 10753.8(a).

208. *Id.* § 10753.8(b).

supply have proved insufficient or infeasible to lessen the demand for groundwater."[209] Finally, in adopting rules and regulations to implement the plan, the local agency must consider the potential impact of its actions on business and agriculture and, "to the extent practicable and consistent with the protection of the groundwater resources, minimize any adverse impacts on those business activities."[210]

The Act grants local agencies the power to take all actions necessary to replenish groundwater and to manage the aquifer to achieve sustainable yield.[211] This authority includes the establishment and collection of fees and assessments to pay for these programs and to regulate the extraction and use of groundwater.[212] Before it may adopt a fee or assessment program, however, the agency must conduct an election. A majority vote of the "votes cast" is required for approval of fees or assessments.[213]

Finally, the legislature stated its intent "to encourage local agencies, within the same groundwater basin, . . . to adopt and implement a coordinated groundwater management plan."[214] To accomplish this, the Act authorizes local agencies to enter into joint powers agreements or other agreements with public entities and private parties.[215]

One of the difficulties in implementing AB 3030, of course, is coordination among local water agencies, private property owners, businesses, cities, counties and other public agencies (such as sewage treatment plant operators) that overlie, or whose actions affect, the groundwater basin. There is little information available on this subject.

e. *City and County Groundwater Management* Powers

The California Supreme Court has held that regulation of groundwater is within municipal police power.[216] Thus, a city or county may enact laws to manage groundwater in an effort to promote the health, safety and welfare of its citizens.[217] Local governments may not pass laws, however, that duplicate, contradict or enter into an area of law occupied by general state law.[218] State law occupies a field when its coverage of a subject matter clearly indicates that the matter is exclusively within the state's jurisdiction.[219]

Over the past few decades, several counties have exercised their police power to regulate the extraction and use of groundwater.[220] These ordinances prohibit the export of groundwater without a permit. In general, the county will only issue a permit if the applicant demonstrates that the exportation of the water will not injure county water users or damage the groundwater basin.[221]

Recently, the Third District court of appeal, in the case of B*aldwin v. Tehama*, held that state law, while regulating aspects of groundwater, does not preempt county regulation.[222] In *Tehama*, local landowners brought a facial challenge to a county ordinance claiming that state law preempted the county's authority to enact

209. I*d*. § 10753.8(c).

210. I*d*. § 10753.9.

211. S*ee id*. § 10754.

212. S*ee id*. §§ 10754, 10754.2.

213. S*ee id*. § 10754.3. The wording of this section suggests that the majority of "votes cast" to approve the adoption of a fee or assessment program is a majority of the voters, not a majority of the landowners representing more than fifty percent of the assessed value of the land within the agency. Thus, the voting requirement for approval of fees and assessments is different from the majority vote required to veto the agency's adoption of the local groundwater management plan.

214. I*d*. § 10755.2(a).

215. S*ee id*. § 10755.2(b), (c).

216. S*ee* I*n re* Mass, 219 Cal. 422, 424-25 (1933).

217. S*ee id*.; E*x P*a*rte* Elam, 6 Cal. App. 233 (1907).

218. S*ee id*.

219. S*ee* Fisher v. Berkeley, 37 Cal. 3d 644, 708 (1984).

220. S*ee* Imperial County, Cal., Ordinance 420 (July 18, 1972), 432 (Nov. 21, 1972); Butte County, Cal., Ordinance 1859 (Aug. 23, 1977); Glenn County, Cal., Ordinance 672 (Sept. 6, 1977); Modoc County, Cal., Ordinance 255 (Mar. 6, 1978); Sacramento County, Cal., Ordinance 410, § 2 (1980); Inyo County, Cal., Referendum Measure A (passed Nov. 4, 1980); Nevada County, Cal., Ordinance 1365 (Jan. 27, 1986); 1370 (Mar. 24, 1986); Tehama County, Cal., Ordinance 1552 (Feb. 4, 1992), 1553 (Feb. 18, 1992).

221. For a survey of the county ordinances, see Weber, *supra* note 9; *see also* Gregory S. Weber, F*orging a* M*ore* C*oherent* G*roundwater* P*olicy in* C*alifornia*: S*tate and* F*ederal* C*onstitutional* L*aw* C*hallenges to* L*ocal* G*roundwater* E*xport* R*estrictions*, 34 SANTA CLARA L. REV. 273 (1994) (discussing local government's constitutional authority to restrict groundwater exports).

222. 31 Cal. App. 4th 166, 171 (1994).

223. S*ee id*. at 172.

groundwater regulation.[223] The Tehama county ordinance prohibited the "mining" of groundwater within the county and the extraction of groundwater for export without a permit granted by the board of supervisors. A permit would be issued only if the board found that the proposed use of groundwater would not result in overdraft, saltwater intrusion, adverse effects on stream flows, lowering of the water table or mining of the groundwater basin. The ordinance further prohibited the operation of a well in a manner that would result in the radiance of influence of the well transgressing the property lines of the parcel on which the well was located.[224]

The court of appeal reversed the trial court's decision that the county ordinance was preempted by state law.[225] The court concluded that, because there was no comprehensive state-wide regulatory scheme for managing groundwater rights, the county could regulate groundwater uses. Although the Court did not rule on the constitutionality of the various prohibitions of the ordinance, it did indicate that an ordinance that barred present use of water simply to protect a future use within the area of origin might conflict with the dictates of Article X, Section 2.[226]

The *Tehama* decision allows cities and counties more aggressively to manage their groundwater resources. Direct regulation of groundwater can avoid the need for lengthy and costly adjudications. Moreover, direct regulation requires no special election, but simply the passage of an ordinance. These types of ordinances are not generally subject to the veto provisions that limit AB 3030 water plans.

224. *See id.* at 171-72.

225. *See id.* at 182.

226. *See id.*

IV. Legal Uncertainties Inherent in the Current Regime for Regulating Groundwater

Conjunctive use of surface and groundwater, as well as the concomitant movement of water between in-basin and off-basin sites, inevitably gives rise to a number of complex legal questions. Prominent legal issues include: the rights of users to interconnected surface and groundwater; the priority of rights to storage space within an aquifer; agency authority to manage water imported and stored in a groundwater basin; protection of water quality; and regulation of exported water.

A. Uncertainties Regarding Rights to Interconnected Surface and Groundwater

As previously noted, many groundwater basins are hydrologically connected to surface water systems. If such a basin is used as a storage site for a conjunctive use project, conflicts may develop between parties who hold rights to the surface water and those who hold rights either to the native groundwater or the imported "project" water. For example, if the extraction of project water during times of scarcity causes the groundwater table to drop to the extent that surface water percolates into the basin, parties with rights to the surface water may claim a right to prohibit the agency administering the conjunctive use program from exporting project water from the basin. The resolution of such a conflict would be highly fact specific, and the outcome is uncertain.

B. Lack of Priorities to Storage Space

Public agencies have a right to place water in natural groundwater basins as part of a conjunctive use project.[227] There exists no statewide system, however, for allocating storage space within basins or for prioritizing the rights of the various entities who participate in, or who may be affected by, such projects. For example, it is

227. *See generally* City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199 (1975); Niles Sand & Gravel Co. v. Alameda County Water Dist., 37 Cal. App. 3d 924 (1974), *cert. denied*, 419 U.S. 869 (1974).

an open question whether an overlying landowner or agency that wishes to use all of the available storage space in an aquifer has the right to enjoin an off-basin entity from storing water in the basin.[228] Similarly, it is unclear whether an agency with an established conjunctive use program could prevent another entity from storing water in the same basin when the former intends eventually to use all of the available storage space as part of its program.

If more than one water agency uses a particular basin to store water, conflicts over the right to extract the water stored in the basin also may develop. For example, groundwater recharge can cause a basin to fill and thereby prevent natural recharge from percolating into the basin. In such a situation, the amount of native groundwater stored within the basin will be diminished and the loss of that natural recharge must be allocated. If only one agency has water stored in the basin, and is therefore responsible for the artificial filling of the basin, that agency should be liable for the loss of native groundwater supply.[229] If more than one entity stores imported water in a basin, however, the law does not adequately define how liability for the loss of natural recharge would be allocated.[230]

C. Protection of the Quantity of Project Water Stored in a Groundwater Basin

For a conjunctive use project to function, the supplier of the imported project water must have legal assurances that it will have a superior right to the water it stores in the basin. Although the courts have held that an importer of water has an exclusive right to recapture water attributable to its deliveries,[231] the enforcement of such a right is complicated by the fact that groundwater rights are generally not quantified under California law.

Because groundwater is a common resource, the extraction of water from any point overlying the basin may affect the amount of water within the entire basin. Thus, an importing agency must have the ability to monitor the water levels within a basin to ensure that no one is wrongfully taking project water from the basin. If the imported water is being extracted unlawfully, the drop in groundwater levels would notify the supplier that its rights were being invaded.[232] A declining groundwater table would not inform the agency, however, of the identity of the parties who were invading its water rights. To identify the party or parties, the agency would need to monitor the amount of water that each extraction facility overlying the basin was producing.

To accomplish this, the agency would have to have access to the pumping records for each well that produces water from the basin.[233] Currently, there is no statewide requirement that groundwater users maintain a record of their extractions; nor does any state agency collect and maintain such data. Moreover, agencies only have the authority to require groundwater producers to maintain extraction records if their enabling legislation specifically provides such power.[234] Therefore, the agency would need to work with either a local agency that had the authority to require recordkeeping (if one existed for the basin), or the agency would have to enter into contracts with the overlying landowners under which the overly-

228. In *Los Angeles v. San Fernando*, the California Supreme Court did not address the issue of prioritization of groundwater basin storage space, because it found that there was not "any shortage of underground storage space in relation to the demand therefor." 14 Cal. 3d at 264. The legislature has provided, however, that the Sierra Valley Groundwater Management District and the Pajaro Valley Water Agency shall have exclusive authority to store water in the underlying groundwater. Moreover, other special acts districts are authorized to allocate the available storage space within their groundwater basin. These agencies, therefore, could enjoin others from storing water within their districts.

229. *See* Victor E. Gleason, *The Legalization of Ground Water Storage*, 14 AM. WATER RESOURCES ASS'N, WATER RESOURCES BULL. 532 (June 1978).

230. *See* Robie & Donovan, *supra* note 25, at 55.

231. *See* City of Los Angeles v. City of San Fernando, 14 Cal. 3d at 264; City of Los Angeles v. City of Glendale, 23 Cal. 2d at 76-77.

232. To ascertain whether the drop in the water table was attributable to an extraction of the natural groundwater to which the supplier has no rights or to the extraction of imported water to which the importer has an exclusive right, the supplier also would need to monitor the amount of natural recharge that was reaching the basin.

233. The most accurate way to measure the amount of water that is being pumped from a groundwater basin is to monitor individual pumping, which requires the licensing of wells and the installation of meters. *See* Thompson, *supra* note 5, at 698 n.84.

234. *See supra* note 174 and accompanying text.

ing owners would agree to compile the relevant information. Only with such information could the water importing agency adequately supervise the amount of water taken from the basin.

D. Protection of Water Quality

The quality of water stored within a groundwater basin will depend on the level of contaminants present in the basin, as well as on the quality of water that recharges the basin. If the quality of the water imported into the basin is of significantly lesser quality than the native groundwater, a court would have the authority to enjoin the importation and artificial recharge.[235] Conversely, the quality of the imported water can be diminished by its placement in an aquifer. Surface activities may threaten water quality in the aquifer generally, and it is uncertain whether the importing agency would have the legal authority to control land uses that may be polluting the aquifer.[236]

E. Exportation of Project Water

In *Los Angeles v. Glendale* and *Los Angeles v. San Fernando*, the California Supreme Court upheld Los Angeles' rights to recapture imported water that is stored in a groundwater basin, or which is used on overlying land and which subsequently percolates into the aquifer. Since that time, however, the legislature has enacted, or authorized the enactment of, restrictions on the exportation of groundwater from specified basins.[237] The effect of these export limits on the operation of conjunctive use programs is unclear. For example, no court has yet determined the effect of section 1220 of the Water Code on an agency's ability to pump foreign water that it imports into a basin for subsequent use outside the basin. Section 1220 expressly prohibits the pumping of groundwater for export from within the identified basins "unless the pumping is in compliance with a groundwater management plan" adopted by the county board of supervisors.[238] If an agency stores water within one of the identified basins, this section may preclude the agency from transporting the stored water for use outside the basin unless the export of the stored water is in compliance with the designated groundwater management plan. The legislature may not have intended this limitation to apply to the export of stored foreign water, because the water did not originate within the protected watersheds.[239] It did not expressly exempt imported water from the coverage of section 1220, however.[240]

If section 1220 does apply to the export of stored water, it is difficult to assess its effects on the operation of conjunctive use projects. The statute requires groundwater exports to be "in compliance with" an adopted groundwater

235. Article X, Section 2 of the California Constitution would prohibit the placement of highly contaminated water within a basin. It is uncertain, however, what level of disparity in water quality must be present before a groundwater user could prevent an agency from discharging poorer quality water into the basin. Taking into consideration the statewide need to maximize developed water supplies, a court would be likely to find that some degradation of water quality is acceptable given the benefits obtained through the conjunctive use program. *See, e.g.*, Anderson, *supra* note 17, at 574 (describing the SWRCB's decision to authorize the discharge of water of poorer quality than the native supply in the Chino Basin based on its determination that the value of the conjunctive use program outweighed the risk to water quality).

236. *See* Linda A. Malone, *The Necessary Interrelationship Between Land Use and Preservation of Groundwater Resources*, 9 UCLA J. ENVTL. L & POL'Y 1 (1990).

237. The legislature also may have authorized local agencies to limit the export of groundwater as part of a local groundwater management plan enacted pursuant to AB 3030. *See* Weber, *supra* note 9, at 696. Several cities and counties have also enacted export regulations pursuant to their police power.

238. It is noteworthy that the basins which are protected by section 1220 may be particularly well-suited to serve as conjunctive use project sites because there already exists in these areas a vast network of conveyance facilities and, thus, a conjunctive use program would not require the large expenditures to construct adequate conveyance facilities. Moreover, these basins have suffered extended periods of overdraft, and the storage of project water within the basin could help to mitigate the adverse effects of such overdraft.

239. Section 1220 is part of a larger area-of-origin statute that the legislature enacted to ensure that the appropriation of water from the designated area to meet the supply needs of other regions does not deprive users within the designated areas of water from meeting their needs. *See* 1984 Cal. Stat. § 1.

240. The legislature did create two exceptions to section 1220. First, the statute does not apply to exports by either the United States Bureau of Reclamation or the California Department of Water Resources. CAL. WATER CODE § 1215 (West 1992 & Supp. 1993). Second, "water that has seeped into the underground from any reservoir, afterbay, or other facility of an export project may be returned to the water supply of the export project." *Id.* § 1220. Whether the latter exemption could be construed to exempt project water that is directly discharged into a groundwater basin governed by section 1220 for subsequent export is an open question.

241. *Id.* § 1220(a).

management plan.[241] This could be interpreted as prohibiting all pumping for export until a county enacts a groundwater management plan with which the export pumping would need to comply. Alternatively, the section can be read as only prohibiting exports that contravene an enacted groundwater management plan; and, if no such plan exists, there are no restrictions on groundwater exports.[242] Under the former interpretation, a county could prevent its groundwater basins from being used as part of a conjunctive use project simply by not acting. Under the latter construction, a county would have to enact a groundwater management plan to prevent an agency from utilizing available storage space in its basin.[243]

Similar questions arise in those basins that are governed by local groundwater management plans adopted under AB 3030, or pursuant to city or county ordinance. Generally, these plans prohibit the export of groundwater without a permit and provide that a permit will only be granted if the governing agency determines that the exports will not adversely affect in-basin users.[244] It is unclear whether local governments have the authority under AB 3030, or pursuant to their police powers, to limit an importing agency's property rights to water stored within a basin .

V. The Feasibility of Establishing Conjunctive Use Programs Under the Current Law

"Legal uncertainties regarding groundwater storage rights have been raised continually as a serious obstacle to developing a comprehensive program of groundwater storage and management."[245] These obstacles can be overcome, however, by the creation of institutional arrangements that address the problems analyzed above. The specific design of these arrangements will depend on the types of water rights, laws and water management issues that are present in the basin chosen for the conjunctive use project.

A. Adjudicated Basins

Creation of a conjunctive use program is easiest in an adjudicated groundwater basin.[246] In an adjudicated basin, the rights to the native water supply are defined by a court order. The pumping rights are quantified and a court-appointed watermaster, who manages the basin, usually maintains complete extraction records for each well that produces water from the basin. The importing agency, therefore, would not be required to monitor extractions to ensure that its stored supply is protected.[247] Moreover, as part of the adjudication itself, the hydrological and geological characteristics of the basin are studied and factual disputes are resolved. Based on these data, the importing agency could determine, to a large degree of certainty, the basin's physical capacity to receive and retain project water without having to invest in extensive scientific studies. The data also would help to avoid factual disputes if conflicts over the basin's water supply develop at a later date. In such a basin, the outcomes of future disputes would be most predictable, and the importing agency would have relative certainty in its continued right to the use of the stored water supply.

In addition, the legislature has prohibited local agencies from adopting AB 3030 ground-

242. *See* Weber, *supra* note 9, at 696.

243. Determination of the potential effect of section 1220 groundwater management plans on the ability of agencies to engage in conjunctive management programs within the "protected area" is further complicated by the fact that the county board of supervisors is not permitted to "exercise the powers authorized by this section within the boundaries of another local agency supplying water to that area without the prior agreement of the governing body of that other local agency." CAL. WATER CODE § 1220(c) (West 1992 & Supp. 1993). Thus, if section 1220 is read to require a county board of supervisors to enact a groundwater management plan before a conjunctive use project could legally be operable, any local water supply agency that delivered water within the county would have the power to veto the creation of the project.

244. For a survey of the substantive provisions of various county export ordinances, see Weber, *supra* note 9, at 698-735.

245. Robie & Donovan, *supra* note 25, at 51.

246. Indeed, some observers have considered adjudication to be an essential prerequisite to groundwater banking. *See, e.g.*, James H. Krieger & Harvey O. Banks, *Ground Water Basin Management*, 50 CAL. L. REV. 56, 61 (1962).

247. The importing agency's assurance that individual overlying landowners will not invade its rights to stored water is somewhat diminished by the fact that the court does not have authority to determine such users' unexercised rights. *See* Wright v. Goleta Water Dist., 174 Cal. App. 3d 74 (1985).

water management plans for basins that are subject to court orders, judgments or decrees.[248] Therefore, a conjunctive use program maintained in an adjudicated basin would not run the risk of being subjected to multiple, potentially conflicting groundwater management plans.

B. Special Act Districts

Special groundwater management districts possess a variety of management powers that would assist the creation of conjunctive use projects. First, special districts are authorized to store and recapture water within the basins under their jurisdiction. Second, the legislature has endowed several special districts with the power to allocate available storage space within their basins. Thus, an importing agency could enter into a contract with the special district to guarantee the right to use a specified amount of storage within the aquifer and to operate a conjunctive use project for a specific amount of time. Third, the special district's power to require groundwater producers to maintain extraction records could provide the importing agency with assurances that no one would interfere with its right to the stored water. Finally, special districts are authorized to limit extractions if they determine that such action is necessary to protect a groundwater basin. If the district exercises this authority, it can quantify groundwater users' rights and thereby define rights to the native supply.

C. General Act Districts

Although general act districts do not possess the power to directly manage groundwater extraction, they nonetheless can exert considerable management authority over underlying groundwater basins. For example, districts that supply water to their members often hold title to the water rights or water contract rights of their members. An importing agency could minimize the risks inherent in implementing a conjunctive use program by contracting with the district to establish methods for determining the amount of water that the district's members may extract from the basin. If the district violated the agreement, the importing agency could sue to enforce the contract without the need to bring all groundwater users into the litigation. Because many general districts also have the authority to maintain groundwater replenishment programs, the district and the importing agency allocate between themselves the available storage within the basin.

D. Basins Subject to AB 3030 Management Plans

AB 3030 expressly authorizes local agencies to include in their groundwater management plans procedures for facilitating conjunctive use operations.[249] The plan also can provide for the monitoring of groundwater levels and storage,[250] management of recharge areas[251] and procedures for reviewing land use activities that "create a reasonable risk of groundwater contamination."[252] Thus, local agencies that desire to participate in conjunctive use programs could use the authority granted in AB 3030 to clarify the rules applicable to such programs.

E. Basins Subject to Multiple Agency Control

Because the physical boundaries of California's groundwater basins often do not align with the political boundaries of local water agencies and municipalities, there may be a multitude of public entities that possess some management authority over a single groundwater basin. The interplay of the various entities' management plans and authorities can greatly complicate the process of establishing a conjunctive use program, as well as increase the transaction costs of implementing such a program.

F. Basins with Export Restrictions

As discussed previously, an importing agency that wants to store water in a basin that

248. *See* CAL. WATER CODE § 10753 (West 1992 & Supp. 1993).

249. *See id.* §10753.7(i).

250. *See id.* § 10753.7(g).

251. *See id.* § 10753.7(b).

252. *Id.* § 10753.5(l).

is subject to export restrictions risks losing the right to extract water for use outside the basin. Because the law does not clearly address the rights of importing agencies subsequent to exporting project water, this risk may prevent the implementation of a conjunctive use program in any basin subject to export restrictions.

VI. Suggestions for Legal Reform

As the legislature has recognized, the design, implementation and maintenance of conjunctive use projects will require substantial investments. Water agencies and water users will participate in such programs only if there exist adequate legal assurances that they will benefit from participation and that their property rights will not be impaired.[253] Under the current legal regime for regulating California's water resources, however, there are significant impediments to the creation of conjunctive use projects. While parties can overcome many of these impediments by contracting with agencies endowed with some groundwater management authority, the legal uncertainties unnecessarily increase the cost of implementing such programs and may discourage the creation of innovative techniques for managing water resources.[254]

To address these problems, the legislature should amend the Water Code to eliminate the unnecessary risks associated with participation in conjunctive use programs and assign the risks that cannot be eliminated. This new legislation should include express authorization for local entities with groundwater management authority to engage in conjunctive use programs, and clarification of the ambit of the various agencies' control over the water stored and used in such programs. Rights to water stored in a groundwater basin pursuant to a conjunctive use project are most secure where a local water management agency has the authority to define rights to the native supply, define and prioritize rights to available storage space, protect recharge areas and monitor extractions.

Delegation of this authority to local agencies is preferable to creation of a state groundwater management law or agency. Because California encompasses a large and hydrologically diverse area, the distinct problems of the different areas require specialized attention. Moreover, it is unlikely that the legislature would enact broad-scale legislation that alters the way in which the state's groundwater resources are managed.[255]

A. Amend AB 3030

AB 3030 has provided local water agencies with many of the tools needed to create and to administer conjunctive use programs. The legislature could encourage the development of conjunctive use projects by strengthening this law in three ways. First, it should amend Water Code section 107540.4 to require local agencies with regulatory control over groundwater basins to adopt groundwater management plans.[256] By directing local agencies to develop groundwater management plans, the legislature would encourage the agencies to develop a better understanding of the hydrology of the basin, water rights, water quality, supply and demand, and other information that is essential to conjunctive water management.

Second, AB 3030 should also be amended to clarify the extent of local agencies' legal authority to enter into conjunctive management agreements. Section 10753.7 of the Water Code provides that an agency may include in its groundwater management plan compo-

253. *See, e.g., id.* § 1011.5.

254. *See, e.g.*, Zachary Smith, *Rewriting California Groundwater Law: Past Attempts and Prerequisites to Reform*, 20 CAL. W. L. REV. 223 (1984).

255. There have been many calls for the creation of a centralized state agency to manage California's groundwater resources. These proposals have been met with strong opposition. For a discussion of the various legislative attempts to increase state control over groundwater, see Kletzing, *supra* note 26, at 1254-57; Robie & Donovan, *supra* note 25, at 51; and Krieger & Banks, *supra* note 246, at 67-68. *See also* CAL. ASSEMBLY INTERIM COMM. ON WATER, GROUNDWATER PROBLEMS IN CALIFORNIA 47-48 (Assembly Comm. Reps., Vol 26, No. 4, 1962); GOVERNOR'S COMM. TO REVIEW CAL. WATER RIGHTS LAW, FINAL REPORT 168 (1978).

256. Section 10750.4 currently provides: "Nothing in this part requires a local agency overlying a groundwater basin to adopt or implement a groundwater management plan or groundwater management program pursuant to this part." CAL. WATER CODE § 10750.4 (West 1992 & Supp. 1993).

nents designed to facilitate "conjunctive use operations."[257] This section does not define the type of actions an agency may take to carry out such a program, however. For example, it is unclear whether a local agency may establish priorities to the use of available storage space in the basin.[258] It is also unclear whether local agencies may compel their members to participate in a conjunctive use program. The legislature should amend AB 3030 expressly to provide for this authority.

Third, to ensure that local agencies consider and evaluate competing views and needs when designing their management plans, the legislature should provide specific criteria that an agency must consider when establishing rules and regulations to carry out the local groundwater management plans and conjunctive use programs. These criteria should require the local agency to consider not simply the needs of its users and region, but also the demand for water in other parts of the state that might benefit from conjunctive management of the groundwater basin over which the agency has jurisdiction. The Water Code currently requires the agency only to consider the effects of its AB 3030 plan "on business activities, including agricultural operations, and to the extent practicable and consistent with the protection of the groundwater resources, minimize adverse impacts on those business activities."[259] By directing local agencies to take into account broader state interests when designing and implementing groundwater management plans, the legislature could help prevent the "Balkanization" of California's water resources policy.

B. Enact Water Export Legislation

The existence of local groundwater plans or ordinances that prevent, or severely limit, the export of groundwater from specified basins may cripple efforts to create conjunctive use programs. The legislature should clarify the authority of local agencies to enact and enforce anti-export ordinances. These ordinances should not necessarily be prohibited. Although anti-export laws may frustrate the development of conjunctive use projects, they also provide certainty to the supplier of imported water. Where an anti-export ordinance is in place, an agency that imports and stores water in the basin will have assurances that no third parties will extract the stored water for export outside the basin. The legislature should declare that local groundwater laws which prohibit or restrict the export of native groundwater may not be applied to imported water stored in the basin for subsequent use or export. The legislation also should provide that the importing agency and other parties to the conjunctive use agreement shall retain the rights to use or to export the project water. Finally, the legislature should provide that local agencies may not prevent the implementation of a conjunctive use program simply by failing to enact a local groundwater plan or other groundwater management ordinance.

VII. Conclusion

To ensure that California is able to meet its water needs in the twenty-first century, new ways of managing available resources must be created. One of the most promising techniques for stretching developed water resources is the establishment of conjunctive use programs. Although there remain a variety of institutional constraints imposed by California's multi-layered and complex system of allocating its water resources that make it difficult to establish such programs, it is possible under current law for water agencies to design and to implement broad-scale conjunctive use programs by clarifying the participants' rights and liabilities in contractual agreements.

257. *Id.* § 10753.7.

258. Section 10753.8 does state that "[n]othing in this part shall be construed as authorizing the local agency to make a binding determination of the water rights of any person or entity." *Id.* § 10753.8(b). This does not preclude the agency from establishing priorities to the use of storage space, however.

259. *Id.* § 10753.9.

To facilitate these arrangements, the California legislature should modify the statutes that govern groundwater and local water agencies to help accomplish more efficient conjunctive management of the state's water resources. By clarifying the authority of local agencies to design, maintain and enforce conjunctive use agreements, the legislature should remove barriers that presently create disincentives for participation in such programs.