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MANAGEMENT OF GROUNDWATER THROUGH MANDATORY CONSERVATION

MICHAEL J. KELLY*

INTRODUCTION

Groundwater,¹ which is located in rock and soil formations beneath the earth's surface, constitutes a substantial proportion of the water used in the United States.² In recent decades, national water use has increased dramatically,³ placing strains on these underground supplies. The western states⁴ are particularly reliant on groundwater sources,⁵ and many of them, as well as some eastern states, have sizeable areas that are withdrawing more groundwater from aquifers⁶ than is being replenished through such means as rainfall and stream inflow.⁷ This situation, known as groundwater over-

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1. Geologists usually limit the definition of "groundwater" to water beneath the "water table," the subsurface depth at which the rock or soil in a particular area is saturated with water. See C. FETTER, JR., *APPLIED HYDROGEOLOGY* 5 (1980); R. FREEZE & J. CHERRY, *GROUNDWATER* (1979). Legal rules for "groundwater" use do not distinguish between subsurface water below the water table and that which is above the water table, but they sometimes do distinguish between different types of subsurface water. In a number of states, subsurface water is classified as either percolating or part of an underground stream. See W. HUTCHINS, *WATER RIGHTS LAW IN THE NINETEEN WESTERN STATES* 631-34 (1974) (chapter on groundwater rights by W. Champion); Aiken, *Nebraska Groundwater Law and Administration*, 59 *NEB. L. REV.* 917, 937-38 (1980). Use of percolating subsurface water is governed by the state's rules for "groundwater" withdrawals, while use of water comprising an underground stream is governed by the state's rules for surface water exploitation. See W. HUTCHINS, *supra*, at 633.

In this article, "groundwater" refers to all subsurface water, and it is assumed that the legal rules for use of "groundwater" apply to the use of all subsurface water. Because only a small fraction of subsurface water exists as underground streams, this assumption is reasonable. W. HAMBLIN, *THE EARTH'S DYNAMIC SYSTEMS* 210 (1975).

2. See C. FETTER, *supra* note 1, at 3; R. FREEZE & J. CHERRY, *supra* note 1, at 6-7.

3. See C. FETTER, *supra* note 1, at 2-3 (from 1955 to 1970, total water usage in the U.S., excluding that for hydroelectric power generation, increased by 54 percent).

4. In this article, the seventeen western states are those continental states west of the ninety-eighth meridian: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming.

5. See R. FREEZE & J. CHERRY, *supra* note 1, at 6.

6. Rock and soil layers that can store and transmit groundwater fast enough to supply wells with reasonable amounts of water are known as groundwater basins or aquifers. C. FETTER, *supra* note 1, at 92. Geologists use a variety of terms to describe rock and soil layers that are too impermeable to support productive wells. See, e.g., *id.* at 93 (using the term "confining layer"); R. FREEZE & J. CHERRY, *supra* note 1, at 47 (using the term "aquitard").

7. See, e.g., U.S. WATER RESOURCES COUNCIL, *THE NATION'S WATER RESOURCES—1975-2000*, at 11-17 (1978) [hereinafter cited as *WATER RESOURCES COUNCIL*]; *id.* at 4 *SOUTH ATLANTIC-GULF REGION* 27; *id.* at 4 *MID-ATLANTIC REGION* 26-27; J.W. WRIGHT, *THE COM-*

draft,⁸ threatens both the quantity and quality of groundwater supplies.⁹

Unfortunately, the prevailing legal doctrines regulating groundwater rights are inadequate to control groundwater depletion. This article argues that effective control of groundwater overdraft can be achieved through adoption of a groundwater management plan that imposes mandatory, need-based quotas on all groundwater users. Because it authorizes the state to restrict the pumping rights of current groundwater users, however, such a plan is subject to the challenge that it is an unconstitutional taking of property without compensation. This article further asserts that, despite the uncompensated curtailing of current users' pumping rights, a mandatory conservation plan for controlling groundwater overdraft should be upheld as a constitutional exercise of the police power.

Part I of this article analyzes the prevailing common law and statutory groundwater property systems, and concludes that they do not provide a satisfactory means of controlling groundwater overdraft. It then discusses the advantages of combatting depletion through the use of mandatory, need-based quotas applied to all groundwater pumpers. Part II argues that, although there are precedents suggesting otherwise, applying such restrictions to existing groundwater users would not constitute an illegal, uncompensated taking of private property. Both the public rights theory and more traditional takings theories support this result.

ING WATER FAMINE 28 (1966); GOVERNOR'S COMMISSION TO REVIEW CALIFORNIA WATER RIGHTS LAW, FINAL REPORT 135-40 (Dec. 1978) [hereinafter cited as CAL. COMM'N REPORT]; NATIONAL WATER COMMISSION, WATER POLICIES FOR THE FUTURE 231, 238-39 (Final Report 1973) [hereinafter cited as NAT'L WATER COMM'N]; Comptroller General, Ground Water Overdrafting Must Be Controlled i-ii (General Accounting Office, Sept. 12, 1980); Lowe, Ruedisili, and Graham, *Beyond Section 858: A Proposed Ground-Water Liability and Management System for the Eastern United States*, 8 *ECOLOGY L.Q.* 132-33, 149 (1979). In some places, the amount of overdraft is extreme, making overdraft a particularly critical problem. WATER RESOURCES COUNCIL, *supra*, at 11. For example, in Pima County, Arizona, which includes the city of Tucson, 4.7 times more groundwater is being pumped than is being recharged. ARIZONA GROUND-WATER MANAGEMENT STUDY COMMISSION, FINAL REPORT 1-3 (June 1980) (citing 1975 ARIZONA WATER COMMISSION STUDY) [hereinafter cited as ARIZ. STUDY COMM'N] Tucson depends entirely on groundwater for its water supply. Higdon & Thompson, *The 1980 Arizona Groundwater Management Code*, 1980 *ARIZ. ST. L.J.* 621, 623 n.6 (citing Arizona Daily Star).

8. See, e.g., C. FETTER, *supra* note 1, at 389; E. JOHNSON, INC., GROUNDWATER AND WELLS 414 (1966). The term "mining" is also used. See, e.g., Aiken & Supalla, *Ground Water Mining and Western Water Rights Law: The Nebraska Experience*, 24 *S.D.L. REV.* 607, 608 (1979).

A related concept is "safe yield", which is defined as the rate at which water can be withdrawn from a groundwater basin without producing an undesired result. See C. FETTER, *supra* note 1, at 477; R. FREEZE & J. CHERRY, *supra* note 1, at 364. Safe yield used to be considered equivalent to the amount of water that could be withdrawn annually without creating overdraft. C. FETTER, *supra* note 1, at 385. But conceptions of "undesired result" have expanded, giving rise to uncertainty as to how to calculate safe yield. See *id.* at 385-86; R. FREEZE & J. CHERRY, *supra* note 1, at 364-65. A further complication in calculation of safe yield is that overdraft does not always decrease the net availability of groundwater. See *infra* note 10.

9. See *infra* notes 10-14 and accompanying text.

Although importation of surface water has been suggested as a solution to overdraft, it is largely infeasible because of its cost and legislation protecting water supplies in areas of origin. See *infra* note 41.

I. GROUNDWATER OVERDRAFT AND GROUNDWATER PROPERTY SYSTEMS

Groundwater overdraft is an increasingly widespread phenomenon that causes serious problems. As water is withdrawn from an aquifer, the water level drops, making pumping increasingly difficult and expensive. If overdraft is sustained, the groundwater source will eventually be exhausted or pumping may become so uneconomical as to be infeasible.¹⁰

Besides increased pumping expense and depletion of groundwater supplies, overdraft can create other problems. Groundwater and surface water are hydrologically connected;¹¹ therefore, overdraft can lead to sharp decreases in the availability of surface water.¹² Furthermore, sustained overdraft can cause the porous material surrounding an aquifer to compact, which can reduce the storage capability of the aquifer and cause overlying land to subside.¹³ Saltwater contamination of the groundwater supply can also result from overdraft.¹⁴

The prevailing legal doctrines regulating groundwater use were developed primarily to resolve conflicts among individual users, not to prevent depletion of groundwater supplies. Consequently, the doctrines have been ineffective in managing overdraft and in preventing the problems it creates. The following section of this article describes and evaluates these doctrines and then presents an alternative approach for managing groundwater.

A. *The Common Law Groundwater Doctrines*

Under the common law, an individual's right to use groundwater arises

10. An aquifer may actually become "economically depleted" before all water has been pumped from it. Aiken & Supalla, *supra* note 8, at 608. In Texas, for example, increased drilling costs associated with a declining water table have reduced the amount of drilling for groundwater from the Ogallala aquifer underlying the High Plains. Trelease, *Legal Solutions to Groundwater Problems—A General Overview* (address delivered at the Twelfth Biennial Conference on Groundwater, Sacramento, Cal.) (Sept. 20, 1979), *reprinted in* 11 PAC. L.J. 863, 864, 871 (1980). *See also* *The Wall Street Journal*, Oct. 12, 1982, at 33, col. 1 (citing Kansas City Federal Reserve Bank study predicting reduced feedlot business in Kansas, Oklahoma and Texas primarily because of unavailability of groundwater for producing feed). Under certain circumstances, temporary, limited overdraft can increase, rather than decrease, the net availability of groundwater by stimulating the outflow of water from surrounding, permeable material. *See* C. FETTER, *supra* note 1, at 379, 394-96.

11. Groundwater feeds streams and other surface water bodies, and surface water recharges aquifers. NAT'L WATER COMM'N, *supra* note 7, at 233.

12. C. FETTER, *supra* note 1, at 385 (groundwater withdrawals may reduce streamflow, which in turn would lower lake levels and dry wetlands); W. HAMBLIN, *supra* note 1, at 225; NAT'L WATER COMM'N, *supra* note 7, at 233-34. Conflicts between users of groundwater and users of surface water are well-documented. *See, e.g.,* *Fellhauer v. People*, 167 Colo. 320, 447 P.2d 986 (1968); NAT'L WATER COMM'N, *supra* note 7, at 233-34; Harrison & Sandstrom, *The Groundwater-Surface Water Conflict And Recent Colorado Legislation*, 43 U. COLO. L. REV. 1, 20-22 (1971).

13. R. FREEZE & J. CHERRY, *supra* note 1, at 370; W. HAMBLIN, *supra* note 1, at 228; Trelease, *supra* note 10, at 871-72. A groundwater aquifer is regarded by many as superior to an above-ground storage reservoir because water is not lost to evaporation and the stored water is not subjected to atmospheric pollutants, such as acid rain.

14. R. FREEZE & J. CHERRY, *supra* note 1, at 375; W. HAMBLIN, *supra* note 1, at 225; Trelease, *supra* note 10, at 872. Salt water can intrude into the aquifer either from the ocean or from saltwater brines trapped in sandstone surrounding the aquifer. *Id.*

from ownership of the overlying land. One of the three common law doctrines, absolute ownership, reasonable use, or correlative rights, is used in most of the eastern states and in the four western states that account for sixty one percent of the total groundwater overdraft in that region.¹⁵

The absolute ownership doctrine was first articulated in 1843 in the English case of *Acton v. Blundell*.¹⁶ Knowing little about groundwater,¹⁷ the Court of Exchequer Chamber applied the doctrine that he who owns the land also owns everything beneath the land,¹⁸ and held that the owner of a parcel of land has an unrestricted right to capture groundwater through pumping on the parcel.¹⁹

The right of absolute ownership was the first groundwater ownership rule to be used in the United States.²⁰ Contrary to the Court of Exchequer Chamber's characterization, subsequent decisions held that under the absolute ownership doctrine landowners do not actually own the water beneath their land. Rather, they have an unrestricted entitlement to pump on their land, even if the pumping dries up the wells of their neighbors.²¹ At first, the doctrine permitted even malicious pumping;²² but later most states modified the rule to prohibit such acts.²³ Aside from this minor restriction, the doctrine places no limits on groundwater withdrawals, and consequently can neither prevent nor correct an overdraft situation. Although Texas still follows the absolute ownership rule, most states have now rejected it.²⁴

New Hampshire was the first. In *Bassett v. Salisbury Manufacturing Co.*,²⁵

15. See Johnson, *The 1980 Arizona Groundwater Management Act and Trends in Western States Groundwater Administration and Management: A Minerals Industry Perspective*, 26 ROCKY MTN. MIN. L. INST. 1031, 1035-36 (1980). The four western states are: Arizona, California, Nebraska, and Texas. Arizona recently enacted a statute that regulates much of the groundwater pumping in the state. See *infra* note 66.

16. 12 M. & W. 324, 152 Eng. Rep. 1223 (Ex. Ch. 1843).

17. The court recognized its ignorance, referring to groundwater's mysterious source and movement. *Id.* at 350, 152 Eng. Rep. at 1233.

18. *Id.* at 353-54, 152 Eng. Rep. at 1235.

19. *Id.* at 354, 152 Eng. Rep. at 1235.

20. See Moses, *Basic Groundwater Problems*, 14 ROCKY MTN. MIN. L. INST. 501, 505-06, 522 (1968).

21. See, e.g., *Williams v. City of Wichita*, 190 Kan. 317, 329-30, 374 P.2d 578, 588 (1962). In *Acton*, for example, pumping by the defendant lowered the water level in the well of the plaintiff, an adjoining landowner. The plaintiff was denied relief because the defendant was said to have an unrestricted right to pump groundwater. 12 M. & W. at 354, 152 Eng. Rep. at 1235. Such a result is inconsistent with the idea that the plaintiff actually owned the water beneath his land.

22. See, e.g., *Huber v. Markel*, 117 Wis. 355, 363, 94 N.W. 354, 357 (1903) (defendant permitted to pump at full capacity, 24 hours a day, even though not using much of the water pumped), *overruled in State v. Michels Pipeline Construction, Inc.*, 63 Wis. 2d 278, 294-98, 217 N.W.2d 339, 346-48 (1974).

23. See, e.g., *Gagnon v. French Lick Springs Hotel Co.*, 163 Ind. 687, 696, 72 N.E. 849, 851 (1904) (appellate court upheld enjoining of pumping from wells whose owners were attempting to stop the flow from plaintiff's well); *City of Corpus Christi v. City of Pleasanton*, 154 Tex. 289, 293-94, 276 S.W.2d 798, 801 (1955) (dictum).

24. Texas's adherence to the absolute ownership rule was recently reaffirmed, with some legislative modification to protect neighboring landowners from land subsidence. See *Friendwood Dev. Co. v. Smith-Southwest Indus.*, 576 S.W.2d 21 (Tex. 1978). The rule apparently still prevails in the country of its origin. See *Langbrook Properties, Ltd. v. Surrey County Council*, [1969] 3 All E.R. 1424, 1439-40.

25. 43 N.H. 569 (1862).

the state supreme court, emphasizing the interdependence of groundwater users who pump from a common pool, adopted the rule of reasonable use.²⁶ That rule, which is still widely followed in the East,²⁷ allows overlying landowners to capture unlimited amounts of groundwater as long as they apply the water to reasonable uses of their property.²⁸ Like the absolute ownership rule, the reasonable use doctrine holds that the owner of a parcel of land has no ownership right in the corpus of water beneath the parcel. Only when water comes into the landowner's control does it become his personal property.²⁹

The reasonable use doctrine differs from the absolute ownership rule in two respects. First, it restricts transportation of groundwater, holding that groundwater can be used only on the parcel of land from which it was pumped, and provides injunctive relief and damages to a neighboring user injured as a result of an illegal transfer.³⁰ Second, the reasonable use rule bans flagrantly wasteful uses of groundwater,³¹ and provides injunctive relief to an injured neighboring pumper.³²

Neither of these restrictions, however, is equipped to solve a basin-wide groundwater overdraft problem. Courts have not always enforced the restriction on transportation of groundwater.³³ Although it is a pervasive rule in water law,³⁴ courts rarely interpret the doctrine against waste to declare a

26. *Id.* at 573-77.

27. *See, e.g.*, *Jones v. Oz-Arc-Val. Poultry*, 228 Ark. 76, 306 S.W.2d 111 (1957); *Higday v. Nickolaus*, 469 S.W.2d 859 (Mo. Ct. App. 1971); *Rothrauff v. Sinking Spring Water Co.*, 339 Pa. 129, 14 A.2d 87 (1940).

28. *Village of Tequesta v. Jupiter Inlet Corp.*, 371 So. 2d 663, 666 (Fla.), *cert. denied*, 444 U.S. 965 (1979); *Higday v. Nickolaus*, 469 S.W.2d 859, 866 (Mo. Ct. App. 1971); *Meeker v. City of East Orange*, 77 N.J.L. 623, 638, 74 A. 379, 385 (1909); *Drummond v. White Oak Fuel Co.*, 104 W. Va. 368, 375-76, 140 S.E. 57, 60 (1927).

29. *Town of Chino Valley v. City of Prescott*, 131 Ariz. 78, 82, 638 P.2d 1324, 1328 (1981); *Village of Tequesta v. Jupiter Inlet Corp.*, 371 So. 2d 663, 667 (Fla.), *cert. denied*, 444 U.S. 965 (1979).

30. *Farmers Investment Co. v. Bettwy*, 113 Ariz. 520, 558 P.2d 14 (1976) (en banc); *Bristor v. Cheatham*, 75 Ariz. 227, 255 P.2d 173 (1953); *Schenk v. City of Ann Arbor*, 196 Mich. 75, 163 N.W. 109 (1917); *Forbell v. City of New York*, 164 N.Y. 522, 58 N.E. 644 (1900); *Higday v. Nickolaus*, 469 S.W.2d 859 (Mo. Ct. App. 1971).

31. *Aiken & Supalla, supra* note 8, at 612; *Harnsberger, Oeltjen, & Fischer, Groundwater: From Windmills to Comprehensive Public Management*, 52 NEB. L. REV. 179, 205 (1973). The rule against waste, once solely a common law rule, *see* *Basinger v. Taylor*, 36 Idaho 591, 596-97, 211 P. 1085, 1086 (1922); *De Bok v. Doak*, 188 Iowa 597, 604-05, 176 N.W. 631, 633 (1920); *Barclay v. Abraham*, 121 Iowa 619, 624, 96 N.W. 1080, 1082 (1903); *Stillwater Water Co. v. Farmer*, 89 Minn. 58, 63, 93 N.W. 907, 909 (1903); *Doherty v. Pratt*, 34 Nev. 343, 348, 124 P. 574, 576 (1912), has since been codified in statutes regulating both groundwater and surface water. *See, e.g.*, COLO. REV. STAT. §§ 37-90-107(5), 37-92-103(4), 37-92-502 (1973); MONT. CODE ANN § 85-2-505 (1981); NEB. REV. STAT. 46-265 (1978); OKLA. STAT. ANN. tit. 82, § 1020.9 (West Supp. 1982).

32. *See, e.g.*, *De Bok v. Doak*, 188 Iowa 597, 176 N.W. 631 (1920) (use of groundwater for standing pond in which hogs wallowed enjoined); *Stillwater Water Co. v. Farmer*, 89 Minn. 58, 93 N.W. 907 (1903) (diverting groundwater into city sewer enjoined).

33. *See, e.g.*, *Jarvis v. State Land Dep't*, 106 Ariz. 506, 479 P.2d 169 (1970). In *Jarvis*, a municipality transported groundwater in violation of the reasonable use rule, but the Arizona Supreme Court allowed the transportation. The court invoked the state's preference statute, which gives preference to municipalities over irrigators in the processing of applications for surface water permits. *Id.* at 511, 479 P.2d at 174.

34. *See supra* note 31.

use unreasonable or to require restrictions on pumping.³⁵ Moreover, courts define waste according to local custom, allowing many inefficient uses simply because they are standard practice.³⁶ Thus, the reasonable use doctrine, as applied by the courts, does not significantly limit the quantity of groundwater landowners may use on their overlying land, and cannot prevent the development of an overdraft problem or correct an existing problem.

Only the third common law doctrine, the correlative rights rule, anticipates the possibility of a groundwater shortage. The rule was developed in California in recognition of the arid conditions existing in many areas of the state,³⁷ and today is followed most conspicuously in that state.³⁸ In addition to prohibiting wasteful uses of groundwater, the correlative rights rule requires that all users "share" groundwater shortages. When a water scarcity develops, the rule proportionately cuts back pumping and allows each user the right to draw a "reasonable share" of the available water.³⁹ California courts have determined share size on the basis of past use:⁴⁰ for example, if a

35. Clark, *Background And Trends In Water Salvage Law*, 15 ROCKY MTN. MIN. L. INST. 421, 461 (1969). Professor Sax reviewed the Utah Supreme Court's interpretations of the waste doctrine and concluded that, although the court often expounds the need to avoid waste, it rarely enjoins allegedly wasteful uses. J. SAX, *WATER LAW, PLANNING & POLICY* 273 (1968). In *City of Corpus Christi v. City of Pleasanton*, 154 Tex. 289, 276 S.W.2d 798 (1955), the Texas Supreme Court held that transporting groundwater in natural channels 118 miles from where it was pumped would not be enjoined, even though evidence showed that 63 to 74 percent of the water was lost to evaporation, transpiration, and seepage when it was being transported. *Id.* at 291, 276 S.W.2d at 800. Once the court determined that the end use of the water was lawful, it made no further inquiry into how the groundwater was being transported or used, and deferred to the legislature to decide that particular means of transporting water are wasteful.

36. A study of the waste doctrine as it has been applied in certain appropriation states, see *infra* text accompanying notes 47-54, concludes that "custom is unquestionably the most important factor bearing upon the waste standard." Note, *Water Waste—Ascertainment and Abatement*, 1973 UTAH L. REV. 449, 454. Community custom was used as a standard to judge the wastefulness of the use of groundwater and surface water in *Tulare Irrigation Dist. v. Lindsay-Strathmore Irrigation Dist.*, 3 Cal. 2d 489, 45 P.2d 972 (1935); acts resulting in the loss of 40 to 45 percent of water while it was being transported were not enjoined. Note, *supra*, at 455; *Tulare Irrigation Dist.*, 3 Cal. 2d at 572-73, 45 P.2d 1009-10. It seems that, because the costs of remedying a wasteful use are often significant, courts, out of a sense of equity, refuse to place the costs on an individual user. See Pring & Tomb, *License to Waste: Legal Barriers to Conservation and Efficient Use of Water in the West*, 25 ROCKY MTN. MIN. L. INST. 25-1, 25-19 (1979). The courts' reluctance to question wasteful local custom places the burden on legislatures to prevent wasteful uses.

37. *Katz v. Walkinshaw*, 70 P. 663 (Cal. 1902), *rev'd on rehearing*, 141 Cal. 116, 74 P. 766 (1903). Both Justice Temple, in the original decision, and Justice Show, in the rehearing, recognized that the common law of groundwater use and regulation must be adapted to the arid conditions in Southern California. See 70 P. at 665-66; 141 Cal. at 123-24, 74 P. at 767-69, 772-73. See also *Barton v. Riverside Water Co.*, 155 Cal. 509, 516, 101 P. 790, 793 (1909).

38. The correlative rights doctrine is also followed in Nebraska, see *Prather v. Eisenmann*, 200 Neb. 1, 6-7, 261 N.W.2d 766, 769-70 (1978); *Olson v. City of Wahoo*, 124 Neb. 802, 811, 248 N.W. 304, 308 (1933), and in New Jersey, see *Woodsum v. Township of Pemberton*, 172 N.J. Super. 489, 510, 412 A.2d 1064, 1075 (1980), *aff'd*, 177 N.J. Super. 639, 427 A.2d 615 (1981).

39. See, e.g., *City of Pasadena v. City of Alhambra*, 33 Cal. 2d 908, 926, 207 P.2d 17, 30 (1949), *cert. denied*, 339 U.S. 937 (1950); *Katz v. Walkinshaw*, 141 Cal. 116, 135-36, 74 P. 766, 772 (1903); *Prather v. Eisenmann*, 200 Neb. 1, 5, 261 N.W.2d 766, 771 (1978); *Woodsum v. Township of Pemberton*, 172 N.J. Super. 489, 501-02, 412 A.2d 1064, 1071 (1980), *aff'd*, 177 N.J. Super. 639, 427 A.2d 615 (1981).

40. California has a complicated system for determining who is entitled to share in the available water. Groundwater users include both overlying landowners and "appropriators" (non-overlying users). Overlying landowners have equal rights to the available water except as to share size. *Hudson v. Dailey*, 156 Cal. 617, 628, 105 P. 748, 753 (1909). Appropriators'

thirty percent reduction in withdrawals from a groundwater basin is necessary to eliminate overdraft, each groundwater user is required to pump thirty percent less water than in the past.⁴¹

California courts, however, have restricted rights to pump groundwater only where supplemental surface supplies were available to make up the shortage.⁴² Rather than using the correlative rights doctrine to force groundwater users to reduce water consumption, California courts have used

rights, however, are subordinate: their use can be completely cut off if necessary to protect overlying landowners. *City of Pasadena v. City of Alhambra*, 33 Cal. 2d 908, 926, 207 P.2d 17, 28-29 (1949). "As between appropriators . . . the one first in time is the first in right, and a prior appropriator is entitled to all the water he needs, up to the amount that he has taken in the past, before a subsequent appropriator may take any." *Id.* at 926, 207 P.2d at 29.

If, however, appropriators use groundwater for a certain period of time and under certain conditions, their appropriative rights are converted into "prescriptive" rights, which are equal in status to the rights of overlying landowners. *Id.* at 926-33, 207 P.2d at 28-29. An appropriative right "ripen[s] into a prescriptive right where the use is actual, open and notorious, hostile and adverse to the original owner, continuous and uninterrupted for the statutory period of five years, and under a claim of right." *Id.* at 926-27, 207 P.2d at 29.

Overdraft can qualify as an adverse use, *California Water Serv. Co. v. Edward Sidebotham & Son*, 224 Cal. App. 2d 715, 726, 37 Cal. Rptr. 1, 7 (1964), if the prescripted parties have notice that overdraft is occurring. *City of Los Angeles v. City of San Fernando*, 14 Cal. 3d 199, 282, 537 P.2d 1250, 1311, 123 Cal. Rptr. 1, 62. Such rights, however, cannot be acquired against public entities. *Id.* at 270-77, 537 P.2d at 1301-07, 123 Cal. Rptr. at 52-58. Because prescriptive rights are limited to acquisition only against private parties, their usefulness to control groundwater pumping is limited. Often the pumping of groundwater by municipalities accounts for the majority of a basin's overdraft, *see Gleason, Los Angeles v. San Fernando: Ground Water Management in the Grand Tradition*, 4 HASTINGS CONST. L.Q. 703, 704, 706 (1977), and enforcing prescriptive rights only against private users would be inequitable.

41. *See, e.g.*, *City of Pasadena v. City of Alhambra*, 33 Cal. 2d 908, 933, 207 P.2d 17, 32-33 (1949); *California Water Serv. Co. v. Edward Sidebotham & Son*, 224 Cal. App. 2d 715, 727, 37 Cal. Rptr. 1, 8 (1964). *But see* *Tehachapi-Cummings County Water Dist. v. Armstrong*, 49 Cal. App. 3d 992, 1000, 122 Cal. Rptr. 918, 924 (1975) (calculating share size not on past use, "but solely on . . . current reasonable and beneficial need for water"). Because the courts in these and other cases relied on the doctrine of mutual prescription as the basis for forcing reductions in pumping, *see, e.g.*, *City of Pasadena*, 33 Cal. 2d at 924-33, 207 P.2d at 28-33, and since that doctrine cannot be applied against municipalities, *see* note 40 *supra*, it is not clear how share size will be determined where a municipality is a party to an adjudication of a groundwater basin. It is not yet clear how Nebraska and New Jersey courts will assess share size. *See Prather v. Eisenmann*, 200 Neb. 1, 9, 261 N.W.2d 766, 771 (1978); *Woodsum v. Township of Pemberton*, 172 N.J. Super. 489, 510-12, 412 A.2d 1064, 1075-76 (1980), *aff'd*, 177 N.J. Super. 639, 427 A.2d 615 (1981).

42. J. BAIN, R. CAVES, & J. MARGOLIS, *NORTHERN CALIFORNIA'S WATER INDUSTRY* 454-55 (1966); CAL. COMM'N REPORT, *supra* note 7, at 146; Aiken & Supalla, *supra* note 8, at 616-17; Krieger & Banks, *Ground Water Basin Management*, 50 CALIF. L. REV. 56, 61, 69 (1962); Trelease, *supra* note 10, at 865-66. Because of the unavailability of alternative sources of water nearby, and the expense of and legal barriers to importing water from distant points, imported water may be difficult or impossible to obtain in the future. Trelease, *supra* note 10, at 866.

For the same reasons, prospects for importing water to solve overdraft problems occurring outside of California are also dim. *See, e.g.*, *Johnson, supra* note 15, at 1033; *Pring & Tomb, supra* note 36, at 25-2; *Schad, Western Water Resources: Means to Augment the Supply*, in *WESTERN WATER RESOURCES: COMING PROBLEMS AND THE POLICY ALTERNATIVES* 113, 120 (1980); *Henry, Commentary*, in *Id.* 134, 135-36; The University of California Agricultural Issues Task Force, *Agricultural Policy Challenges for California in the 1980's*, at 17, 18 (1978). *See generally* R.H. BOYLE, J. GRAVES, & T.H. WATKINS, *THE WATER HUSTLERS* (1971).

Although Orange County, California's use of water imported from the Colorado River to augment its supply of groundwater is often cited as an example of good conjunctive management of groundwater and surface water supplies, *see, e.g.*, *NAT'L WATER COMM'N, supra* note 7, at 235; K. Buckwalter, *Management of Groundwater in Southern California* 29-34 (spring 1970) (unpublished paper in Stanford Law School Library), it will be interesting to evaluate that management plan once Orange County's supply from the Colorado River is reduced in

the doctrine merely to allocate the cost of importing supplemental surface supplies to the overdrafted basin.⁴³

Even assuming that courts could implement the doctrine to curtail pumping when no alternative sources of water were available, the correlative rights rule is an inappropriate vehicle for resolving overdraft problems. Because share size is based on past use, users who anticipate court adjudication of rights to pump from their groundwater basin may increase their current withdrawals in hopes of maximizing their future shares.⁴⁴ This "race to the pumphouse" creates inequities⁴⁵ and accelerates depletion of groundwater supplies.⁴⁶

Thus, although the correlative rights doctrine is more sensitive to overdraft problems than are other common law doctrines, it nevertheless does not provide a satisfactory means of combatting groundwater depletion. Numerous commentators have criticized the common law doctrines for this failure.⁴⁷

B. *The Prior Appropriation Doctrine: A Statutory Approach to Regulating Groundwater Use*

Most of the western states have replaced the common law groundwater schemes with "prior appropriation" statutes.⁴⁸ Because these statutes pro-

order to supply the Central Arizona Project. Kovitz, *Water Experts See Mid-Decade Crisis in Southland*, Los Angeles Times, May 10, 1981, Part IX (Real Estate), at 1.

43. See, e.g., the description of the management plans developed pursuant to adjudications of the Central and West Basins, the Upper San Gabriel Valley, and the Chino Basin, in A. Schneider, *Groundwater Rights in California*, Staff Paper No. 2, Governor's Comm'n To Review California Water Rights Law 50-58 (1977).

44. *City of Los Angeles v. City of San Fernando*, 14 Cal. 3d 199, 267, 537 P.2d 1250, 1299, 123 Cal. Rptr. 1, 50 (1975); Gleason, *supra* note 40, at 709. Krieger & Banks, *supra* note 42, at 61-62.

45. Those who do not participate in the race will receive relatively small shares when the rights in the basin are adjudicated and will therefore have greater difficulty adjusting to the reduced supply than will their greedy fellow users.

46. Gleason, *supra* note 40, at 709.

47. See, e.g., Comptroller General, *supra* note 7, at iii; Trelease, *supra* note 10, at 865-68; Clark, *The Role of State Legislation in Ground Water Management*, 10 CREIGHTON L. REV. 469, 475 (1977).

48. See Radosevich, *Better Use of Water Management Tools*, in WESTERN WATER RESOURCES 253, 258-59 (1979). California, Nebraska and Texas, the three common law states in the West, plus Arizona, which was a common law state until 1980, see Johnson, *supra* note 15, at 1031, 1035 n.15, account for 61% of the total groundwater overdraft occurring in the West. *Id.* at 1035-36. In this article, Nebraska will be considered a common law state because of the limited application to date of its groundwater management statute. See *infra* note 82.

A few eastern states have enacted statutes that provide for comprehensive regulation of groundwater. See, e.g., FLA. STAT. ANN. §§ 373.013 to -617 (West 1974 & Supp. 1983); IOWA CODE ANN. §§ 455A.1-A.40 (West 1971 & Supp. 1983); KY. REV. STAT. ANN. §§ 151.010 to -990 (Bobbs-Merrill 1980 & Supp. 1982); MINN. STAT. ANN. §§ 105.37 to -81 (West 1977 & Supp. 1983).

The Kentucky statute has been criticized because it exempts a large number of uses from regulation. Ausness, *Water Use Permits in a Riparian State: Problems and Proposals*, 66 KY. L.J. 191, 229-32 (1977). A review of the first ten years of administration of the Iowa statute indicates that, although almost every request for a water use permit was granted, permits were not always granted for the amount of water requested. Hines, *A Decade of Experience Under The Iowa Water Permit System—Part One*, 7 NAT. RESOURCES J. 499, 532-35 (1967).

Georgia's Groundwater Use Act of 1972, GA. CODE ANN. §§ 17-1101 to -1115 (Supp. 1981) and South Carolina's Groundwater Use Act of 1969, S.C. CODE ANN. §§ 49-5-10 to 49-5-120

vide for quantification of existing rights to pump groundwater, they are superior to the common law which relies on expensive, time-consuming litigation to define pumping rights. Although many of the statutes preserve common law groundwater rights that existed on the effective date of the statute,⁴⁹ most declare that all unclaimed groundwater in the state belongs to the public,⁵⁰ and that any subsequent users must obtain a permit before pumping.⁵¹

Prior appropriation statutes do not base the right to pump groundwater on ownership of the overlying land. Rather, they establish a first-in-time, first-in-right priority system among users.⁵² In times of shortage, junior appropriators, the last to obtain permits, may have their rights to pump completely curtailed to protect the water supply of senior appropriators.⁵³ Frequently, the statutes also provide that water rights can be lost if not exercised.⁵⁴ Thus, prior appropriation statutes can be used to prevent serious overdraft problems from developing.⁵⁵

Nonetheless, they have critical drawbacks. Under prior appropriation

(Law. Co-op. 1977), both require users who pump more than 100,000 gallons per day to obtain a permit.

49. *See, e.g.*, ALASKA STAT. § 46.15.060 (1982); IDAHO CODE § 42-226 (Supp. 1983); KAN. STAT. ANN. §§ 82a-701(d) to -703 (1977 & Supp. 1982); OR. REV. STAT. § 537.585 (1981).

50. *See, e.g.*, IDAHO CODE § 42-226 (Supp. 1983); MONT. CODE ANN. § 85-2-101 (1981); WASH. REV. CODE ANN. § 90.44.040 (1962). *But see* COLO. REV. STAT. § 37-90-109 (1973 & Supp. 1982) (abolishing existing rights, but giving the holders of those rights priority under the prior appropriation statute).

51. *See, e.g.*, IDAHO CODE § 42-229 (1977); MONT. CODE ANN. § 85-2-302 (1981); WASH. REV. CODE § 90.44.050 (1962); WYO. STAT. ANN. § 41-3-905 (1977) (permit required before building well). Many statutes require *all* groundwater pumpers to obtain a permit, regardless of whether the pumper has a common law right that is preserved under the statute. *See, e.g.*, ALASKA STAT. §§ 46.15.040, 46.15.065 (1982); OR. REV. STAT. §§ 537.585-610 (1981).

52. *See, e.g.*, ALASKA STAT. § 46.15.050 (1982); IDAHO CODE § 42-226 (Supp. 1983); WASH. REV. CODE ANN. § 90.44.130 (1962).

53. *See, e.g.*, *Baker v. Ore-Ida Foods, Inc.*, 95 Idaho 575, 513 P.2d 627 (1973) (junior appropriator can be enjoined from further pumping where overdraft is occurring). *Cf. Mathers v. Texaco Inc.*, 77 N.M. 239, 421 P.2d 771 (1966) (senior appropriator's rights not impaired when junior appropriator permitted to pump, even though aquifer is being mined). These cases illustrate contrasting means of determining when groundwater is so scarce that junior appropriators can be enjoined from further pumping. While Idaho law restricts pumping by junior appropriators whenever overdraft is occurring, *see* IDAHO CODE § 42-237a(g) (Supp. 1983), New Mexico gives its State Engineer broad discretion to determine when there is sufficient water for later appropriators. For example, in *Mathers* he determined that water could be appropriated from an essentially nonrecharging aquifer at a rate that would leave one-third of the aquifer's current stock in storage after 40 years. 77 N.M. at 242, 421 P.2d at 774.

Commentators have criticized the prior appropriation doctrine as applied in some states because of its failure to clearly define when a junior appropriator is entitled to pump. *See, e.g.*, Corker, *Inadequacy of The Present Law to Protect, Conserve and Develop Groundwater Use*, 25 ROCKY MTN. MIN. L. INST. 23-1, 23-12, 23-13 (1979).

54. *See, e.g.*, IDAHO CODE § 42-237 (1977); NEV. REV. STAT. § 534.090 (1981); N.M. STAT. ANN. § 72-12-8 (Supp. 1982).

55. Johnson, *supra* note 15, at 1036. In 1927, New Mexico became one of the first states to enact a prior appropriation statute. *See* 1927 N.M. Laws 450 (amended 1931 N.M. Laws 229) (current version at N.M. STAT. ANN. §§ 72-12-1 to -28 (1978 & Supp. 1982)). Numerous commentators have cited New Mexico as an example of a state where groundwater resources are managed well. C. CORKER, *GROUNDWATER LAW, MANAGEMENT AND ADMINISTRATION*, 225-26, 340 n.17 (Nat'l Water Comm'n Legal Study No. 6, 1971); Clark, *supra* note 47, at 469-70; Note, *New Mexico's Mine Dewatering Act: The Search for Rehoboth*, 20 NAT. RESOURCES J. 653, 655-66 (1980).

statutes, the most senior appropriators have little incentive to use groundwater efficiently, because termination of their water supply is unlikely.⁵⁶ Indeed, statutes that call for forfeiture of unused groundwater rights actually discourage appropriators from undertaking conservation measures:⁵⁷ if appropriators conserve, they lose their rights to the amount of water conserved. Hence, such statutes do not ensure efficient use of groundwater.

Prior appropriation statutes that preserve existing groundwater rights raise an additional problem. They do not provide a means for alleviating pre-enactment overdraft conditions. Regulation of subsequent pumping only prevents the depletion rate from increasing. It does not eliminate depletion or even reduce the rate.⁵⁸ Thus, there are serious flaws in relying on prior appropriation statutes to control the use of groundwater.

C. *Imposing Quantitative, Need-Based Limits on All Pumpers of Groundwater*

None of the four prevailing groundwater property doctrines—absolute ownership, reasonable use, correlative rights, or prior appropriation—provides a fully satisfactory means of regulating groundwater use. The shortcomings, however, could be remedied by adopting an approach that imposes quantitative, need-based limits on all groundwater pumpers.⁵⁹

56. Although the doctrine against waste could be used to restrict a senior appropriator's use of groundwater, see *supra* note 31, that doctrine has not been applied to force conservation of groundwater use. See *supra* notes 34-36 and accompanying text.

57. See, e.g., Pring & Tomb, *supra* note 36, at 25-20 to -22; CAL. COMM'N REPORT, *supra* note 7, at 60.

58. Many of the states that have enacted prior appropriation statutes did not have serious overdraft conditions when their statutes were enacted and therefore did not need a mechanism for decreasing pre-enactment rates of water consumption. For example, New Mexico's groundwater statute was passed in 1927, see *supra* note 55; however, substantial groundwater pumping did not begin in most of that state's groundwater basins until after World War II. See, e.g., Harris, *Water Allocation Under The Appropriation Doctrine In The Lea County Underground Basin of New Mexico*, in *THE LAW OF WATER ALLOCATION IN THE EASTERN UNITED STATES* 155 (D. Haber and S.W. Bergen eds. 1958).

Oregon was another of the first states to pass a prior appropriation statute. 1927 Or. Laws 410 (current version at OR. REV. STAT. §§ 537.505 to .795 (1981)). Pumping of substantial amounts of water from Oregon's aquifers did not begin until after 1940. Note, *Rights to Under- ground Waters in Oregon: Past, Present and Future*, 3 WILLAMETTE L.J. 317, 318 (1965) (quoting Thirtieth Biennial Report of the State Engineer to the Governor of Oregon [1962-1964] at 20).

In Colorado, nontributary groundwater was essentially unregulated until 1957. 1957 Col. Sess. Laws 863 (repealed 1965). See Note, *A Survey of Colorado Water Law*, 47 DEN. L.J. 226, 312-13 (1970). Pumping of substantial quantities of groundwater, however, did not begin until the early 1960's. G. RADOSEVICH, K. NOBE, D. ALLARDICE, and C. KIRKWOOD, *EVOLUTION AND ADMINISTRATION OF COLORADO WATER LAW: 1876-1976*, at 114-15 (1976).

59. Another possible approach would be to use a price mechanism to encourage more efficient use of water. Numerous commentators have extolled the virtues of such an approach. See, e.g., NAT'L WATER COMM'N, *supra* note 7, at 247-59. But see Note, *Indian Claims to Groundwater: Reserved Rights or Beneficial Interest?*, 33 STAN. L. REV. 103, 106 n.12 (1980) (noting externalities that a market system would ignore). But it is doubtful that use of markets alone could return a seriously overdrafted aquifer to a safe condition. The price elasticity of demand for water, that is, the responsiveness of demand to changes in price, varies according to type of use. See, e.g., CORKER, *supra* note 55, at A1-83 n.23. For virtually all uses it is much lower than one: a one percent rise in price results in less than a one percent decline in the quantity of water used. See, e.g., *id.*; NAT'L WATER COMM'N, *supra* note 7, at 252-53, 256-57; Pope, Stepp, and Lytle, *Effects of Price Change Upon the Domestic Use of Water Over Time* (Water Resources Research Institute Report No. 56, March 1975).

Because demand for water is relatively inelastic, only a steep hike in prices could reduce

Such an approach would first call for determination of the rates at which groundwater is being withdrawn from and replenished to the aquifer. Next, the implementing authority would be required to decide what rate of overdraft, if any, should be permitted. Although the determination of rates of withdrawal and recharge will present a formidable challenge,⁶⁰ the more difficult question may be deciding the optimal rate of net withdrawal.⁶¹ Finally, the selected withdrawal rate must be divided among the groundwater users, by placing a quantitative limit on the amount of water that each user can pump.

Quotas should be set not according to past use, as under the correlative rights doctrine,⁶² nor according to time of initial pumping, as under the prior appropriation doctrine,⁶³ but simply according to need. Need would be determined by classifying all groundwater users according to type of use, such as irrigation or domestic. All persons using water for the same purpose would be given the same quota. Thus, for example, all irrigators growing similar crops under similar conditions would be allowed to pump the same amount of water per acre.⁶⁴ Existing users would be allowed to continue

pumping significantly; however, such an increase would be politically unacceptable. *See, e.g.*, Arizona Daily Star, Nov. 18, 1977, at 1 (raising water prices in Tucson resulted in three members of the city council being recalled). But a gradual price rise might not bring about enough conservation to save the aquifer. Furthermore, the uncertainty of the response to a price hike would make planning the depletion of the aquifer difficult.

Nonetheless, financial incentives could play an important part in any groundwater management scheme. For example, Arizona's groundwater statute provides for a pumping tax, the proceeds of which are to be used to defray administrative costs, purchase supplemental water supplies, and purchase and retire agricultural land. ARIZ. REV. STAT. ANN. § 45-611 (Supp. 1982-1983).

Recently, the U.S. Supreme Court made it clear that a state cannot attempt to solve its groundwater problems by preventing groundwater from being taken out of the state. *See Sporhase v. Nebraska ex rel. Douglas*, 102 S. Ct. 3456 (1982). Furthermore, as noted earlier, importation of surface water is not generally a feasible solution to overdraft. *See supra* note 42.

60. *See* CORKER, *supra* note 55, at 77, 80-81.

61. Not only is it difficult to calculate safe yield, *see supra* note 8, but safe yield may not be equivalent to the optimal withdrawal rate. Most notably, where an aquifer's rate of replenishment is zero or close to zero, *see* Meyers, *Federal Groundwater Rights: A Note on Cappaert v. United States*, 13 LAND & WATER L. REV. 377, 382 (1978), optimum benefits may be achieved by allowing a certain amount of overdraft, even though such use will eventually leave an area without a groundwater supply. The goal of Arizona's new statute is to return Arizona's major groundwater basins to safe yield by 2025, or 45 years after enactment of the statute. *See infra* notes 67-69 and accompanying text.

62. *See supra* notes 44-46 and accompanying text.

63. *See supra* text accompanying notes 52-53.

64. *See, e.g.*, ARIZ. REV. STAT. ANN. §§ 45-462 to -466 (Supp. 1982-1983) (providing for "irrigation grandfathered rights" and two types of "non-irrigation grandfathered rights"). *See also* Connall, *A History of the Arizona Groundwater Act*, 1982 ARIZ. ST. L.J. 313; Higdon & Thompson, *supra* note 7, at 650-51.

Under the Arizona statute, existing users who wish to change their type of use are often restricted from changing, by provisions designed to encourage conservation of groundwater generally and the retirement of land irrigated by groundwater. For example, owners of non-irrigation grandfathered rights may use their rights only for non-irrigation purposes, ARIZ. REV. STAT. ANN. §§ 45-470 to -471 (Supp. 1982-1983), and may convey them only for non-irrigation purposes. *Id.* at §§ 45-473 to -474. When an irrigation grandfathered right is changed to a non-irrigation use, the quantity of groundwater that may then be used is limited to the lesser of the amount of the irrigation grandfathered right or three acre-feet per acre per year. *Id.* at § 45-469 (average consumptive use of crops grown in central Arizona is approximately 3.6 acre-feet per acre per year, Johnson, *supra* note 15, at 1071 n.129).

their previous type of use,⁶⁵ pursuant to their pre-existing rights, but subsequent users would need a permit to engage in a particular use.⁶⁶

This proposed approach is similar to the groundwater management plan recently adopted in Arizona.⁶⁷ For groundwater basins in areas of the state initially covered by the statute,⁶⁸ the legislature has established the goal of safe yield⁶⁹ by January 1, 2025.⁷⁰ The goal of balancing groundwater withdrawals and recharge is to be achieved primarily by imposing increasingly stringent quotas on all groundwater users.⁷¹ Under the Arizona plan, the quotas will be established by type of use: agricultural users will be subject to an "irrigation water duty" based on "the quantity of water reasonably required to irrigate the crops historically grown," and presuming that

65. See, e.g., ARIZ. REV. STAT. ANN. § 45-512 (Supp. 1982-1983) (creating six classes of permits). See also Connall, *supra* note 64, at 337. Some types of uses are exempt from Arizona's permit requirement. ARIZ. REV. STAT. ANN. §§ 45-491 to -498 (Supp. 1982-1983) (cities, towns, and private water companies in service areas need not obtain permits), § 45-454 (Supp. 1982-1983) (permit exemption for small domestic wells).

66. See, e.g., ARIZ. REV. STAT. ANN. § 45-512 (Supp. 1982-1983).

67. See *id.* at §§ 45-401 to -637 (Supp. 1982-1983). For good summaries of the statute, see Connall, *supra* note 64, at 330-43; Higdon & Thompson, *supra* note 7, at 632-34; Johnson, *supra* note 15, at 1045-57, 1062-63 (1980); Pontius, *Groundwater Management in Arizona: A New Set of Rules*, 16 ARIZ. B.J. 28 (1980).

Before Arizona passed its new statute, groundwater use in the state was governed almost entirely by the reasonable use doctrine. See Connall, *supra* note 63, at 315. The only statutory control was a law that gave the State Land Department authority to delineate "critical groundwater areas." ARIZ. REV. STAT. ANN. §§ 45-301 to -324 (1956) (repealed 1980). Within these areas the law prohibited additional pumping for agricultural uses, § 45-314, but did not empower the state to restrict current pumping. The statute frequently was criticized for being inadequate to solve Arizona's groundwater mining problem. See, e.g., Trelease, *supra* note 10, at 867; Clark, *Arizona Ground Water Law: The Need for Legislation*, 16 ARIZ. L. REV. 799, 818 (1974).

68. These are called the "initial active management areas." See ARIZ. REV. STAT. ANN. §§ 45-411, 45-563 (Supp. 1982-1983). Together they include 80% of the state's population and 69% of the state's groundwater overdraft. Johnson, *supra* note 15, at 1046 (citing the Arizona Department of Water Resources). The statute also provides mechanisms for creation of "subsequent" active management areas. See ARIZ. REV. STAT. ANN. §§ 45-412, 45-415 (Supp. 1982-1983).

69. The statute defines safe yield strictly in terms of the quantity of groundwater withdrawn from and recharged to the aquifer: "'safe yield' means a groundwater management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial groundwater recharge. . . ." ARIZ. REV. STAT. ANN. § 45-561(6) (Supp. 1982-1983). This definition has been criticized as being too inflexible. Higdon & Thompson, *supra* note 7, at 638-39. See also *supra* note 8. Given that many of the undesirable results of persistent overdraft may be irreversible, see, e.g., Corker, *supra* note 53, at 23-20 to -21 (noting that once a groundwater basin is contaminated, it is likely to remain that way for decades or centuries), and given that some areas of the state rely exclusively on groundwater as their source of water, see Johnson, *supra* note 15, at 1043 (Tucson is one of the largest cities in the world relying on groundwater for all of its water supply), the statute's narrowly defined goal is perhaps the best way to manage the state's precious groundwater resources at this time.

70. ARIZ. REV. STAT. ANN. § 45-562(A) (Supp. 1982-1983). This is the goal for the Tucson, Phoenix, and Prescott active management areas. The management goal for the Pinal active management area is more flexible. *Id.* at § 45-562(B). The state water director will set the management goals for subsequent active management areas. *Id.* at § 45-569(A).

71. See *id.* at §§ 45-563 to -568. A groundwater user can obtain a variance from the conservation timetable by showing "compelling economic circumstances." *Id.* at § 45-574(C). Other means to achieve the management goal include a program for augmentation of the water supply and purchase and retirement of grandfathered rights. See *id.* at §§ 45-565(A)(4), 45-566(A)(4) and (A)(6), 45-567(A)(4) and (A)(6). The Central Arizona Project is expected to bring into the state an average of 1.2 million acre-feet per year from the Colorado River, Johnson, *supra* note 15, at 1044, not enough water to solve the state's overdraft problem. *Id.*

various conservation methods, such as lined ditches, are used.⁷² Municipal users will be subject to "reasonable reductions in per capita use,"⁷³ and, industrial users will be required to use the "latest commercially available conservation technology consistent with reasonable economic return."⁷⁴

The adoption of need-based quotas as exemplified in the Arizona plan would result in more effective management of groundwater than is provided by any of the current groundwater property doctrines. It would prevent the wasteful and inequitable "races to the pumphouse" encouraged by the correlative rights doctrine,⁷⁵ and unlike the prior appropriation doctrine,⁷⁶ would force all groundwater pumpers to achieve a certain degree of efficiency in their use of water. Because the proposed approach provides for quantitative adjustment of all pumping, including that by existing users, it could not only prevent overdraft from developing or worsening, but could also correct existing overdraft problems.⁷⁷

Efficient use of water could be further encouraged by providing that pumpers who use only part of their quotas do not forfeit their rights to use full quotas.⁷⁸ Without fear of losing legal rights, pumpers could then adopt conservation measures that reduce pumping below their legal quotas.⁷⁹

The proposed approach probably would be most effective if implemented at the state rather than the local level, because localities have shown great reluctance to impose significant restrictions on their groundwater use.⁸⁰ Furthermore, state control would facilitate conjunctive management of groundwater and surface water supplies.⁸¹ The Arizona statute described above provides for local participation in the management process, with final

72. ARIZ. REV. STAT. ANN. §§ 45-564(A)(1), 45-565(A)(1), 45-566(A)(1) (Supp. 1982-1983).

73. *Id.* at §§ 45-564(A)(2), 45-565(A)(2), 45-566(A)(2).

74. *Id.*

75. *See supra* text accompanying notes 44-46.

76. *See supra* text accompanying note 56.

77. *Cf. supra* text accompanying note 58 (prior appropriation statutes that preserve existing groundwater rights are inadequate to correct pre-enactment overdraft conditions).

The goal of the Arizona statute is to return major overdrafted groundwater basins initially covered by the act to a condition of safe yield 45 years after the statute was enacted. *See supra* notes 68-70 and accompanying text.

78. Pumpers who discontinue particular types of use, however, could be held to have forfeited their right to engage in the discontinued activity. *See supra* note 63.

79. *Cf. supra* text accompanying note 57 (forfeiture rule discourages adoption of conservation measures). The Arizona groundwater statute permits farmers to "bank" groundwater for future use if they use less than the amount permitted by their water duty. ARIZ. REV. STAT. ANN. § 45-467 (Supp. 1982-1983).

80. *See, e.g.*, Johnson, *supra* note 15, at 1047-49; Smith, *The Valley Water Suit and Its Impact on Texas Water Policy: Some Practical Advice for the Future*, 8 TEX. TECH. L. REV. 577, 634-35 (1977); Comment, *Ground Water Management: A Proposal for Texas*, 51 TEX. L. REV. 289, 297-98 (1973).

81. A state management body would have more incentive than a local authority to manage state groundwater and surface water with a goal of conservation, because it probably would not be dominated by local concerns of preserving the status quo. *See supra* note 79. Furthermore, because state control would mean that all state water supplies would be considered in making any management decision, a state body would be in a better position than a local authority to manage state groundwater and surface water supplies conjunctively. *See* Comment, *Texas Underground Water Law: The Need for Conservation and Protection of a Limited Resource*, 11 TEX. TECH. L. REV. 637, 652 (1980).

decisions being made by the State Water Director.⁸² Although Nebraska has also shown support for mandatory conservation of groundwater use, it has adopted a statute that gives localities authority to impose such controls.⁸³ These statutory restrictions raise the question of whether it is constitutional to require existing groundwater users to reduce their pumping.⁸⁴

II. THE CONSTITUTIONAL BARRIER TO A MANDATORY CONSERVATION PLAN—IMPAIRMENT OF "VESTED RIGHTS"

The constitutionality of quantitative, need-based limits is most likely to be challenged under the takings clause of the fifth amendment,⁸⁵ which provides that if the government takes private property for public use, it must

82. See Connall, *supra* note 64, at 333. See, e.g., ARIZ. REV. STAT. ANN. §§ 45-103(B) (Supp. 1982-83) (granting director broad authority), and §§ 45-418 to -421 (Supp. 1982-83) (establishing an area director and a groundwater users advisory council for each active management area).

83. In 1975, Nebraska, a common law state, enacted the Nebraska Ground Water Management Act, NEB. REV. STAT. §§ 46-656 to -674 (1978 & Supp. 1982). This statute provides that the State Director of Water Resources, upon local initiative, may designate control areas where there is "[a]n inadequate ground water supply to meet present or reasonably foreseeable needs for beneficial use of such water supply . . ." *Id.* at § 46-658(1)(a)(i) (Supp. 1982). Once this designation has been made, the local district "shall" adopt one or more of the following controls: mandatory conservation for all current users, rotation of wells, well-spacing, installation of meters, and "such other reasonable regulations as are necessary to carry out the intent of this act." *Id.* at § 46-666(1)(a) to (e) (emphasis added). As of July 1, 1979, five control hearings had been held, three areas had been designated control areas, two of these had established controls, and only one had firmly decided to impose quantitative limits on groundwater withdrawal. Aiken & Supalla, *supra* note 8, at 628-29, 640-41.

84. The issue could also arise under several other statutes, depending on how those statutes were applied and interpreted. See COLO. REV. STAT. § 37-90-109 (1973 & Supp. 1982) (imposing prior appropriation system on existing, as well as subsequent users); *id.* at § 37-90-137(4) ("We believe that the Colorado legislature in enacting the 1965 Act and adding section 37-90-137(4) exercised the power—long recognized but previously virtually dormant—to legislate concerning nontributary waters. . . . We recognize, however, that many landowners may have come to rely on wells tapping non-tributary sources based on local custom, well permits, and judicial decrees. We express no opinion on the scope of those rights or the extent to which the 1965 Act, including section 37-90-137(4), can be applied to limit them." State of Colo. v. Southwestern Colo. Water Conservation Dist., Civ. Action No. 79SA38 (Colo. 1983)); MONT. CODE ANN. § 85-2-507(4)(d) (1981) (in "controlled groundwater areas," board of natural resources can "reduc[e] the permissible withdrawal of groundwater by any appropriator"); OR. REV. STAT. § 537.735(4)(d) (1981) (in "critical groundwater areas," Water Resources Director can "reduc[e] the permissible withdrawal of groundwater by any one or more appropriators"); S.D. COMP. LAWS ANN. § 46-6-6.2 (Supp. 1982) (where groundwater shortage exists, water management board shall reduce equally the permissible output of all large capacity wells).

85. Other questions that a court might face are whether the conservation criteria are reasonably related to the goal of preserving the water supply, and whether they are being applied fairly to all groundwater users.

The conservation criteria must be reasonably related to the goal of the management plan, whether it be planned depletion or safe yield. See, e.g., *Nectow v. City of Cambridge*, 277 U.S. 183, 188 (1928); *Village of Euclid v. Ambler Realty Co.*, 272 U.S. 365, 395 (1926); *Bushnell v. Sapp*, 194 Colo. 273, 279-80, 571 P.2d 1100, 1104 (1977); *Turnpike Realty Co. v. Town of Dedham*, 362 Mass. 221, 228, 284 N.E.2d 891, 896 (1972). This prevents the government from using the criteria arbitrarily.

Furthermore, no group of groundwater users should be required to make a disproportionate sacrifice nor should the conservation criteria be used to redistribute groundwater from one group of users to another. Although the courts give the legislature great deference to classify in the exercise of the police power, see, e.g., *Continental Baking Co. v. Woodring*, 286 U.S. 352, 370-71 (1932); *In re Spring Valley Dev.*, 300 A.2d 736, 752-54 (Me. 1973), that power may not be used to favor one group of citizens over another. See, e.g., *Hale v. City and County of Denver*,

justly compensate the owner.⁸⁶ Existing users would contend that a forced reduction in pumping without compensation constitutes an illegal taking of their private property right to pump groundwater, a right that has been vested in them by the common law or by statute. They would focus on the lack of compensation rather than challenge the authority of the state, because there is little question that, if compensation were afforded, need-based quotas would qualify as a public use restriction and thus would be upheld as a constitutional exercise of state police power.⁸⁷

Precedential support for such a challenge appears in cases that have tested the constitutionality of other statutory restrictions on groundwater use, particularly laws replacing common law systems with prior appropriation systems. These decisions have upheld restrictions on common law rights to pump groundwater,⁸⁸ but have stressed that the restrictions applied only

159 Colo. 341, 346, 411 P.2d 332, 335 (1966); *State v. Lee*, 356 So. 2d 276, 279-82 (Fla. 1978); *Liquor Store v. Continental Distilling Corp.*, 40 So. 2d 371, 388 (Fla. 1949).

86. U.S. CONST. amend. V, § 1. The takings clause of the fifth amendment applies to the states through the fourteenth amendment. See *Chicago, Burlington & Quincy R.R. v. Chicago*, 166 U.S. 326 (1897). Numerous state constitutions provide that compensation must be paid when property is either taken or damaged. See, e.g., CAL. CONST. art. 1, § 19. For a list of these state constitutional provisions, see Note, *Inverse Condemnation: Its Availability in Challenging the Validity of a Zoning Ordinance*, 26 STAN. L. REV. 1439, 1439 n.3 (1974). The California Supreme Court has suggested that these provisions expand the range of governmental action requiring compensation. See *Bacich v. Board of Control*, 23 Cal. 2d 343, 350, 144 P.2d 818, 823 (1943). This article will analyze only the interpretation given to the Just Compensation Clause of the U.S. Constitution.

Rights to pump oil and gas have, however, been more extensively regulated than rights to pump groundwater. See H. WILLIAMS, R. MAXWELL & C. MEYERS, *CASES AND MATERIALS ON THE LAW OF OIL AND GAS* 13-19 (1964). Extensive regulation of oil and gas pumping has been upheld as a valid exercise of the police power. See, e.g., *Champlain Ref. Co. v. Corporation Comm'n*, 286 U.S. 210 (1932); *Woody v. State Corp. Comm'n*, 265 P.2d 1102 (Okla. 1954). Given the absence of such an activist history in the regulation of rights to pump groundwater, it would be incorrect to argue that, simply based on precedent from the regulation of oil and gas pumping, greater restrictions on groundwater pumping should be upheld as a constitutional exercise of the police power. In the latter case, property owners' expectations would be significantly altered, suggesting that compensation would be required. See *infra* note 115.

87. "The role of the judiciary in determining whether [the power of eminent domain] is being exercised for a public purpose is an extremely narrow one." *Berman v. Parker*, 348 U.S. 26, 32 (1954). Courts uphold, as valid exercises of the police power, many laws that restrict private property to protect the environment. See, e.g., *Miller v. Schoene*, 276 U.S. 272, 279-80 (1928); *Callopy v. Wildlife Comm'n*, 625 P.2d 994 (Colo. 1981); *Morshead v. California Regional Water Quality Control Bd.*, 45 Cal. App. 3d 442, 119 Cal. Rptr. 586 (1975); *State v. Dexter*, 32 Wash. 2d 551, 202 P.2d 906, *aff'd per curiam*, 338 U.S. 863 (1949); *Just v. Marinette County*, 56 Wis. 2d 7, 201 N.W.2d 761 (1922). Moreover, in upholding a state law restricting use of river water, the Supreme Court stated that "[f]ew public interests are more obvious, indisputable and independent of particular theory" than the public interest in preserving the water supply in its rivers. *Hudson County Water Co. v. McCarter*, 209 U.S. 349, 356 (1908). That statement carries strong implications for laws designed to preserve groundwater supplies. Most importantly, courts have explicitly recognized the power of states to impose restrictions for purposes of protecting groundwater supplies. See, e.g., *Town of Chino Valley v. City of Prescott*, 131 Ariz. 78, 83, 638 P.2d 1324, 1329 (1981), *appeal dismissed*, 457 U.S. 1101 (1982); *Southwest Eng'g Co. v. Ernst*, 79 Ariz. 403, 409, 291 P.2d 764, 768 (1955). Thus, courts are unlikely to hold that a law imposing need-based quotas fails to meet the public use requirement for state restrictions on private property. Nevertheless, a groundwater regulation statute enacted for a legitimate public purpose may not unduly burden interstate commerce. See *Sporhase v. Nebraska ex rel. Douglas*, 102 S. Ct. 3456, 3463-67 (1982).

88. See, e.g., *F. Arthur Stone & Sons v. Gibson*, 230 Kan. 224, 630 P.2d 1164 (1981); *Williams v. City of Wichita*, 190 Kan. 317, 374 P.2d 578 (1962), *appeal dismissed*, 375 U.S. 7 (1963);

to unexercised rights to pump.⁸⁹ Several cases clearly indicate that impairment of exercised pumping rights would require compensation.⁹⁰

For example, in *Baeth v. Hoisveen*,⁹¹ plaintiffs were granted a permit by the State Water Commission to pump 200 gallons per minute. Plaintiffs had applied for a right to pump 900 gallons per minute, and challenged the constitutionality of the statute which gave the state the power to limit their pumping. In deciding that the statute was constitutional, the court reasoned that, had the plaintiffs been pumping groundwater at the time the statute was enacted, they would have acquired a "vested right" to the amount they were then applying to a beneficial use, and the state could not have retroactively limited their pumping without providing compensation.⁹² This article argues, however, that requiring existing users to conform to quantitative,

Baumann v. Smrha, 145 F. Supp. 617 (D. Kan.), *aff'd per curiam*, 352 U.S. 863 (1956); *Baeth v. Hoisveen*, 157 N.W.2d 728 (N.D. 1968).

89. See, e.g., *F. Arthur Stone & Sons v. Gibson*, 230 Kan. 224, 229, 232, 630 P.2d 1164, 1169, 1171 (1981); *Williams v. City of Wichita*, 190 Kan. 317, 334-35, 374 P.2d 578, 591 (1962), *appeal dismissed*, 375 U.S. 7 (1963); *Baeth v. Hoisveen*, 157 N.W.2d 728, 733 (N.D. 1968).

90. See, e.g., *Baumann v. Smrha*, 145 F. Supp. at 624-25 (in enacting statutes regulating groundwater use, state must recognize and afford protection to exercised pumping rights), *aff'd per curiam*, 352 U.S. 863 (1956); *Undlin v. City of Surrey*, 262 N.W.2d 742, 746 (N.D. 1978) (holding that if city had interfered with plaintiff's exercised pumping right, city must compensate plaintiff). Commentators have also recognized the possibility of drawing a distinction between impairment of exercised water rights and impairment of unexercised water rights. See *Beck & Hart, The Nature And Extent Of Rights In Water In North Dakota*, 51 N.D.L. REV. 249, 260-64 (1974); *Larson, The Development of Water Rights and Suggested Improvements in the Water Law of North Dakota*, 38 N.D.L. REV. 243, 254-56, 269-70 (1962); *O'Connell, Iowa's New Water Statute—The Constitutionality of Regulating Existing Uses of Water*, 47 IOWA L. REV. 549, 606-09 (1962).

Although some decisions suggest that the state has broad police power to regulate groundwater, see, e.g., *Southwest Eng'g Co. v. Ernst*, 79 Ariz. 403, 409, 291 P.2d 764, 768 (1955); *Town of Chino Valley v. Prescott*, 131 Ariz. 78, 83, 638 P.2d 1324, 1329 (1981), none of these decisions endorsed state action depriving a groundwater user of the quantity of water that he was pumping at the time that the state imposed additional restrictions. In *Southwest Eng'g Co.*, the Arizona Supreme Court considered the constitutionality of Arizona's 1948 "critical groundwater area" legislation, which altered the reasonable use rule by prohibiting any additional pumping in designated areas. Although the court endorsed a broad use of the police power, it emphasized the importance of protecting the rights of existing users.

In *Friendswood Dev. v. Smith-Southwest Indus.*, 576 S.W.2d 21 (Tex. 1978), the issue was whether land subsidence caused by groundwater pumping was actionable in tort. The court held that groundwater users pumping under the absolute ownership rule would not be liable for subsidence of their neighbors' land since the users' rights to take groundwater were an established rule of property. The court, however, pursuant to legislative act or policy, could limit future groundwater withdrawals if the pumping was performed so negligently that it caused land subsidence.

In *Chino Valley*, the Arizona Supreme Court was called upon to rule on the constitutionality of Arizona's 1980 groundwater legislation insofar as it limited a user's right, under the reasonable use rule, to enjoin a neighbor from using groundwater away from the overlying land. The court held that the Act did not unconstitutionally infringe upon the plaintiff's right to protect its groundwater by preventing non-overlying uses, because the plaintiff possessed only a usufructuary right and did not own the groundwater. Although the court declared that the state's power to regulate groundwater is broad, it was careful to limit its decision to the facts. The decision did not restrict the quantity of groundwater that the plaintiff was pumping. Rather, the court based its decision on two previously recognized principles. First, the court emphasized that, under the reasonable use rule, the plaintiff did not own the groundwater beneath his land. Second, the court held that the state could change one of the plaintiff's rights under the reasonable use rule, the right to prevent non-overlying uses, a right which had not been of much value in the past. See *supra* note 33.

91. 157 N.W.2d 728 (N.D. 1968).

92. *Id.* at 733.

need-based pumping limits does not constitute a taking of property and thus does not require compensation. Both a theory of public rights and a more traditional takings approach support this conclusion.

A. *Public Rights Theory*

It has proved difficult to develop coherent guidelines for determining when government restrictions on private property constitute a compensable taking.⁹³ Professor Sax has suggested that the problem is best conceptualized by recognizing that one individual's property use often affects other individuals' property uses.⁹⁴ The "public rights" of owners holding diffuse interests should be accorded the same protection as the property right of an individual.⁹⁵

For example, a factory owner who uses his property for activities that release pollutants into the air affects the availability of clean air to other parcels of property. Conversely, an individual who insists on being able to breathe unpolluted air affects the factory owner's ability to use his property for activities that release pollutants into the air.⁹⁶ Each activity has a spill-over effect. Whereas releasing pollutants imposes a burden on a wide segment of the population, insisting on being able to breathe unpolluted air imposes a burden on a single property owner.

When the government permits the factory owner to release pollutants, the government is not required to compensate the public for the resulting decline in air quality. Similarly, under public rights theory, as propounded by Professor Sax, the government should not be required to compensate the factory owner when the government restricts the release of pollutants to safeguard the public interest in breathing clean air.⁹⁷ The theory thus permits the government to vindicate either of the two conflicting rights—the factory

93. *Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 123 (1978); Sax, *Takings, Private Property and Public Rights*, 81 *YALE L.J.* 149, 149 (1971). See also Dunham, *Griggs v. Allegheny County in Perspective: Thirty Years of Supreme Court Expropriation Law*, 1962 *SUP. CT. REV.* 63, 105-06 (1962).

94. Sax, *supra* note 93, at 152.

95. See *infra* note 97. Professor Sax explains that neither nuisance law nor the public trust doctrine is capable of protecting "public rights" as he defines them. See Sax, *supra* note 93, at 155 n.16. Private nuisance law is inadequate because it is available only when the individual claimant suffers substantial, particularized harm, not shared by the public. W. PROSSER, *TORTS* § 88, 585-87 (4th ed. 1971). Although nuisance law protects some public rights, public nuisance law is inadequate because it depends on community representatives deciding that a particular case offends the public, *id.*, and, in Sax's view, this decision is often weighed heavily in favor of private property rights. Sax, *supra* note 93, at 155 n.16. The public trust doctrine is incapable of protecting public rights because its protection is limited to property owned by a public body. See *id.*

96. See Sax, *supra* note 93, at 162.

97. See *id.* at 162. Thus, central to the theory is the belief that courts should accord diffusely held interests the same level of protection as they accord interests that are not diffusely held. See *id.* at 159-60. Sax illustrates this point with a wetlands example. Because marine life that breeds along the wetlands shorelines requires maintenance of the shoreline to survive, the wetlands owner who wants to develop his tract demands that ocean users tolerate a change in their use of the ocean. Ocean users, on the other hand, demand that the wetlands owner restrict the use of his land. Traditional takings law may hold that a restriction on the wetlands owner's ability to develop his land is a taking of property for which the public must compensate the landowner. The public rights critique, however, questions why, if the wetlands owner's activi-

owner's right to use his property for polluting activities and the public's right to breathe clean air—without affording compensation.⁹⁸

The theory does not, however, hold that whenever the government regulates or infringes a private interest in the name of public welfare, the government need not compensate the owner of the infringed right.⁹⁹ When the government restricts an activity to alleviate spillover effects, it is not required to compensate, because it is merely vindicating a pre-existing public right.¹⁰⁰ But when the government restricts an activity that has no such spillover effects, it is acquiring something to which it was not previously entitled, and it must therefore pay for what it has obtained.¹⁰¹

Groundwater pumping is an activity that can have significant spillover effects.¹⁰² Just as the public has a right to clean air, it has a right to protect groundwater supplies. In the past, the public did not overtly assert its right because water appeared to be plentiful and overdraft problems were either unknown, not significant enough to cause alarm, or ignored. Consequently, landowners freely pumped groundwater within the confines of rules designed to mediate disputes among individual users rather than disputes between individual users and the public as a whole.¹⁰³ Now that overdraft is widespread and poses a significant threat to the adequacy of water supplies,¹⁰⁴ the public must assert its dormant right to protect groundwater supplies.

In some regions, the problem of overdraft has become such a serious

ties impose restrictions on the use of the ocean, "the wetlands owner ought not be compelled to buy that right." *Id.* at 160 (emphasis in original).

By ignoring the cumulative right, each person having an interest in the use of the ocean is treated not as a legitimate interest holder but as an interloper, and is forced to pay for the protection of his interest. This result is the consequence of our traditional inability to recognize public rights; i.e., our inability to see that claims of rights to use resources ought not to be discriminated against simply because they are held in one, rather than another, conventional form of ownership. *Id.*

98. *See id.* at 163.

99. *Id.* at 161.

100. *See id.* at 155-61.

101. *See id.* at 164-66. Using an airport and a neighboring farmer as an example, if the airport wants to construct a tall building, it will obstruct the farmer's sunlight. If the farmer asserts a right to quiet, it will interfere with the airport's ability to operate. No matter how these conflicts are resolved, the government should not be required to compensate, because the rights asserted by each party have spillover effects. If, however, the airport wants to take part of the farmer's land to build another runway, thus infringing the farmer's right to his land, the situation is different. Compensation is due, because the right asserted by the farmer affects the airport's ability to undertake a use beyond its domain. *Id.*

102. *See supra* text accompanying notes 10-14.

103. *See, e.g., State ex rel. Emery v. Knapp*, 167 Kan. 546, 555, 207 P.2d 440, 447 (1949). Speaking of the recently enacted statute regulating surface water and groundwater, the court said: "Heretofore we have approached the questions [of water rights] largely on the basis of individual interest alone. Under this declaration and other provisions of the act we now approach them upon the basis of the interest of the people of the state . . ." *See also* the descriptions of the reasonable use, correlative rights, and appropriation doctrines at text accompanying notes 25-57. The right to pump groundwater is defined primarily according to what other groundwater users are doing and not according to an overall management scheme.

Under the appropriation doctrine, the standard usually employed to determine whether a permit to pump should be granted is whether existing groundwater uses will be impaired. *See, e.g., COLO. REV. STAT. §§ 37-90-107(3) to -107(4)* (1973 & Supp. 1982) (regulating groundwater pumped from "designated" groundwater basins).

104. *See supra* text accompanying notes 6-9.

threat that the state must require landowners to pump less water than they are presently taking.¹⁰⁵ Under public rights theory, the introduction of such limits should not require compensation, because the government is simply regulating the spillover effects of groundwater pumping.¹⁰⁶

To hold otherwise would be to assume that currently exercised private interests enjoy a special status *vis-a-vis* a previously existing but unasserted public interest.¹⁰⁷ Such a position defines rights according to what the status quo presently recognizes, rather than according to some other notion that may be more just. Recognizing rights and defining fairness solely according to expectations developed from previously acceptable practices is dangerous because it shelters the status quo from the normal process of legislative change without questioning whether existing expectations make some larger normative sense.¹⁰⁸ When individual and public interests collide, an individual claiming a private right should not necessarily be preferred simply because he has been exercising his right while the public has not been asserting its right.¹⁰⁹

Although courts have never formally adopted a public rights takings

105. This is what has happened in Arizona. See *supra* notes 67-74 and accompanying text.

106. Even if the government regulates water from an overdrafted basin in an area where the general public has an adequate alternative source of water, the state's conservation requirements should not constitute a taking. In such a case, the government is not regulating private property for the purpose of directly enhancing the public resource base; rather, the government is essentially arbitrating private property owners' competing claims to a common pool. When the government acts to resolve conflict among private property owners, the regulation should not constitute a taking, because the government is not expropriating private property for its own benefits. See Sax, *Takings and the Police Power*, 74 YALE L.J. 36, 61-64 (1964). Although Professor Sax later disowned the view expressed in 1964, see Sax, *supra* note 93, at 150 n.5, under his later view no compensation would be required in the above situation because the government would be regulating spillover effects. See *supra* notes 99-101 and accompanying text.

107. Assuming the continued vitality of the cases allowing uncompensated restrictions on unexercised pumping rights, see *supra* notes 88-92 and accompanying text, to require compensation would be to hold that currently exercised water rights enjoy special status compared to currently unexercised water rights. Legal commentary has explicitly questioned the wisdom of attaching constitutional significance to whether a water right is presently being invoked. See O'Connell, *supra* note 90, at 608-09.

108. B. ACKERMAN, PRIVATE PROPERTY AND THE CONSTITUTION 105 (1977). See also Graetz, *Legal Transitions: The Case of Retroactivity in Income Tax Revision*, 126 U. PA. L. REV. 47, 74-75 (1977). The Supreme Court has recognized that the scope of the police power (and hence the scope of individuals' private property rights) may expand or contract as living conditions change. *Euclid v. Ambler Realty Co.*, 272 U.S. 365, 386-87 (1926). Indeed, the Supreme Court has recognized that a state's interest in and power to protect the water in its rivers may increase as its population and the demand for water increase. *Hudson County Water Co. v. McCarter*, 209 U.S. 349, 356 (1908).

To question the degree of protection that should be given to expectations developed from previously acceptable practices does not mean that such expectations should not be given great weight when attempting to determine the permissible extent of the government's power to regulate the interests of individual property owners. See, e.g., discussion of Michelman's utilitarian takings theory, at note 115 *infra*.

109. See Sax, *supra* note 93, at 157-58. Professor Sax illustrates with the following example:

If two property owners have adjoining tracts, one of which has traditionally absorbed drainage water, the upper owner is not necessarily entitled to drain that water to the lower land. Analogously, one should be prepared to recognize a public interest in flood control *equal in stature* to the private property owner's interests. In this way, the conflict can be resolved so as to maximize net benefits from the resource network in question, and either claimant might constitutionally be required to yield without receiving compensation.

Id. (emphasis added).

theory as described above, they have held in specific cases that the public interest may be weighed against a landowner's currently exercised interest, and that the public interest may demand that the landowner's interest be restricted without compensation. An example is *State v. Dexter*,¹¹⁰ where a state statute restricted logging activity by requiring owners of forested land to leave a certain number of trees standing for reseeded and restocking purposes. In *Dexter*, the Washington Supreme Court held, and the United States Supreme Court affirmed, that the statute did not constitute a taking requiring compensation.¹¹¹ The court explained that if the landowners were allowed to continue their unrestricted logging efforts, it would create a danger of floods and soil erosion, as well as eventually lead to destruction of the forested lands in the state, thereby destroying a permanent source of employment for the state's citizens and endangering the state's economic standing.¹¹² The court based its holding on the premise that private enterprise must use its property in ways that are consistent with the public welfare.¹¹³

By the same reasoning, when a state attempts to save its water supply from the consequences of overdraft by enacting a statute that requires groundwater users to reduce their current pumping, the statute should not constitute a taking requiring compensation. Like owners of forested land, owners of land overlying an aquifer must use their land in ways consistent with the public welfare. The government should therefore be allowed to restrict pumping that contributes to groundwater overdraft, which endangers a permanent source of the region's water supply.

While a theory of public rights may be appealing, particularly to conservationists, because it accords equal treatment to privately and diffusely held interests, it arguably underemphasizes a central premise of the just compensation requirement, that the government's ability to single out particular citizens' rights for sacrifice to the general welfare should be limited.¹¹⁴ This "flaw" in a pure theory of public rights is not fatal to the conclusion that restrictions on groundwater pumping do not constitute a taking requiring compensation. Even if one rejects the public rights theory, and asserts that whenever state regulation severely burdens a few the public must compensate them for their losses, the imposition of mandatory conservation requirements survives takings analysis.

110. 32 Wash. 2d 551, 202 P.2d 906, *aff'd per curiam*, 338 U.S. 863 (1949).

111. *Id.* at 559-60, 202 P.2d at 910.

112. *Id.* at 553-55, 202 P.2d at 908.

113. *Id.* at 555, 202 P.2d at 908. In *Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104 (1978), the Supreme Court also appeared, at least implicitly, to recognize the potential importance that "public rights" may have in a takings analysis. Emphasizing the social value of historic preservation, *id.* at 107-09, the Court held that no compensable taking occurred when enforcement of the New York City Landmarks Preservation Law prevented the owners of Grand Central Station from constructing an office building in the air space above the station, even though the proposed building met all zoning requirements.

114. For cases stating this premise, see *Agins v. City of Tiburon*, 447 U.S. 255, 260-61 (1980); *Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 123 (1978). See also L. TRIBE, *AMERICAN CONSTITUTIONAL LAW* § 9-4 at 463 (1978).

B. *Traditional Takings Analysis*

There are a number of different taking theories, and it can be argued that noncompensatory conservation requirements are constitutional under any of the prominent ones.¹¹⁵ This discussion, however, is limited to the diminution in value theory, which is the model most predominantly in use

115. Prominent takings theories not discussed in the text include the physical invasion theory, the noxious use theory, the social balancing theory, and Professor Michelman's utilitarian theory. The physical invasion theory states that the government may not physically invade private property without compensating the property owner. *See, e.g.*, *United States v. Causby*, 328 U.S. 256 (1946); *Mugler v. Kansas*, 123 U.S. 623 (1887); *Pumpelly v. Green Bay Co.*, 80 U.S. 166 (1871). Some commentators have criticized the theory as being underinclusive and overinclusive, *see, e.g.*, Michelman, *Property, Utility and Fairness: Comments On The Ethical Foundations Of "Just Compensation" Law*, 80 HARV. L. REV. 1165, 1226-28 (1967), but others have praised it as being fair, efficient, supported by history, and predictable. Note, *Reexamining the Supreme Court's View of the Taking Clause*, 58 TEX. L. REV. 1447, 1464-67 (1980). Under this theory, noncompensatory conservation requirements do not constitute a taking because limitations on the usufructuary right to pump groundwater, a right that is of uncertain duration and value in an overdrafted aquifer, are not as offensive as an actual invasion of one's territory, Michelman, *supra*, at 1228, such as, the purposeful flooding of property. *See Pumpelly v. Green Bay Co.*, 80 U.S. 166 (1871); *but cf.* Note, *Water Use Regulation in Colorado: The Constitutional Limitations*, 49 U. COLO. L. REV. 493, 502-03 (1978).

The noxious use theory focuses on the degree to which regulated uses of property are compatible with community welfare. *See Berger, A Policy Analysis Of The Taking Problem*, 49 N.Y.U. L. REV. 165, 172-75 (1974); Sax, *Takings and The Police Power*, 74 YALE L.J. 36, 48-50 (1964). If a use is deemed noxious, wrongful, or harmful to the public, the government may validly regulate it without compensating for any resultant decrease in value. *See, e.g.*, *Hadacheck v. Sebastian*, 239 U.S. 394 (1915). The theory differs from public rights theory in that when uses conflict, as when one property owner wants to pollute and another wants clean air, it identifies one of the two parties as the harm-causer and the other as the innocent victim, and it subjects only the harm-causer to noncompensatory regulation. *See, e.g.*, Sax, *Takings and the Police Power*, 74 YALE L.J. 36, 48-50 (1964). Commentators have criticized the theory because the concept of harm creation is manipulable. *See, e.g., id.*; Michelman, *supra*, at 1196-1200. Just as the brickyard owner in *Hadacheck* was identified as the harm-causer because his activities impaired air quality, so too can groundwater users be identified as harm-causers because their activities threaten water supplies.

The social balancing theory weighs society's gains from a regulation against the private losses it causes. If the gains exceed the losses, no taking has occurred and no compensation need be paid. *See Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 414 (1922) (dictum). *See also* Michelman, *supra*, at 1193-94. Although the right to pump groundwater in an overdrafted basin would suffer little or no decline in value when it was subjected to a management plan requiring conservation, *see infra* text accompanying notes 119-130, the gains to society from preventing impairment of the water supply would be enormous, especially where most of the water supply is obtained from beneath the surface.

The utilitarian theory proposed by Michelman performs the social balancing analysis more systematically. Michelman, *supra*, at 1208-18. Professor Michelman's theory weighs the gains to society from regulation, efficiency gains, against productivity losses due to regulated parties' upset expectations, demoralization costs, and states that regulation should not be undertaken unless the efficiency gains exceed the demoralization costs. *Id.* at 1215. The theory also considers the costs of locating and compensating those persons burdened by regulation, settlement costs, and argues that compensation should be paid only when the settlement costs are lower than the demoralization costs. *Id.*

Although difficult to measure, the efficiency gains from enacting a management plan quantifying rights in an overdrafted basin would be significant. The transaction costs associated with obtaining or disposing of water rights would be lower than under many current systems because each right would represent a specific quantity of water available over a certain time span. In such circumstances, an efficient market for water rights could evolve, making it easier to buy and sell water rights. With a more predictable supply, investment would increase. The investment would be an indicator of the future value of water, a value that would be so speculative as to discourage further investment until rights were adequately quantified through mandatory conservation limits. Pumping costs would stabilize once overdraft was reduced or

today,¹¹⁶ and which best illuminates the purpose of the just compensation clause of protecting against unfairly burdening those being regulated.

Under the diminution in value theory, determining whether the government has taken a property right requires assessment of the extent to which the government's action has diminished the property's market value.¹¹⁷ Courts generally require a total or near total economic loss.¹¹⁸ Where an aquifer is seriously overdrafted, enactment of a management plan that restricts pumping will not cause such economic loss.

Groundwater overdraft can impose costly burdens on those who pump groundwater. In addition to higher costs of pumping from a lower water table,¹¹⁹ contamination and limited storage capacity pose serious problems.¹²⁰ Overdraft can lead to subsidence of land, which may result in the cracking of buildings, collapse of well casings, increased flood hazards, damage to roads and underground pipelines, and other expensive destruction.¹²¹ Where groundwater overdraft is causing or is about to cause these

eliminated. Finally, the social resource base would be enhanced by obtaining an aquifer with a stable supply of clean water.

The short-term demoralization costs from upsetting the existing groundwater property scheme probably would vary inversely with the severity of the overdraft problem. Where a serious overdraft problem existed, user expectations might not be seriously upset by imposition of quotas. Given the severe consequences of allowing uncontrolled depletion to continue, groundwater users may be expecting some government intervention. ("Water users have long been on notice that the [s]tate would at some point have to intervene to regulate prospective uses of a dwindling resource in face of increased use." *Cherry v. Steiner*, 543 F. Supp. 1270, 1280 (D. Ariz. 1982).) Furthermore, any demoralization costs would be exceeded by the "moralization gains" accruing over the long run. Existing users forced to curtail their pumping would use their water more productively in the future because they would have a dependable supply. Thus, the net demoralization costs of enacting a groundwater management plan requiring conservation would be low, while the efficiency gains would be high, suggesting that such a plan should be implemented.

Settlement costs would vary directly with the alleged demoralization costs. Where the overdraft problem was serious and there was no history or expectation of government intervention, conservation requirements would have to be especially intrusive on existing rights, resulting in high demoralization costs and high settlement costs. If the groundwater supply were saved, however, the long-term moralization gains would be significant. Given the low net demoralization costs, compensation would not be required.

116. *Sax, supra* note 93, at 152 n.8. The diminution in value theory made its debut in *Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 413 (1922). For more recent examples of its use, see *Hodel v. Virginia Surface Mining & Reclamation Assoc.*, 452 U.S. 264, 294-97 (1981); *Pruneyard Shopping Center v. Robins*, 447 U.S. 74, 83-85 (1980); *Kaiser Aetna v. United States*, 444 U.S. 164, 178-79 (1979).

117. *See, e.g.*, *Penn Cent. Transp. Co. v. New York*, 438 U.S. 104, 124 (1978); *Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 413 (1922). Many commentators have urged that this factor alone should not determine whether a taking has occurred. *See, e.g.*, *Michelman, supra* note 115, at 1191-93; Note, *Water Use Regulation in Colorado: The Constitutional Limitations, supra* note 115, at 493-94. They agree, however, that the diminution in value of private property caused by regulation is an important factor to consider when attempting to resolve the takings issue. *See, e.g.*, *Michelman, supra* note 115, at 1191.

118. *See, e.g. Hadacheck v. Sebastian*, 239 U.S. 394 (1915); *L. TRIBE, supra* note 113, § 9-3 at 460 n.3; *Sax, supra* note 92, at 151 n.7, and 152 n.8.

119. *See supra* note 13 and accompanying text.

120. *See supra* notes 13-14 and accompanying text.

121. *See, e.g.*, *Bouwer, Land Subsidence and Cracking Due to Groundwater Depletion*, 15 *GROUND WATER* 358, 358 (1977); *R. FREEZE & J. CHERRY, supra* note 1, at 370; *W. HAMBLIN, supra* note 1, at 228. Furthermore, the decrease in availability of groundwater and surface water caused by sustained overdraft, *see supra* notes 10-12 and accompanying text, means that water may be unavailable to protect life or property in an emergency. *See HAMBLIN, supra* note 1, at 225.

problems, control of overdraft through pumping restrictions may yield a net economic benefit to those who are forced to reduce their pumping.

Even where overdraft is not creating such hazards, the introduction of need-based quotas may result in economic gains for groundwater pumpers in overdrafted aquifers. While common law groundwater systems entitle users to pump large amounts of water, they do not provide users with much certainty that water supplies will remain available at nonnegligible levels. Under the absolute ownership and reasonable use doctrines, groundwater users have an essentially unrestricted right to pump, but they have little control over the quantity of water other users will pump.¹²² Thus, their water supply is indefinite: they face the prospect of overdraft leading to steadily increasing pumping costs and depletion of their aquifer at an uncertain time in the future.¹²³ Under the correlative rights doctrine, groundwater users in unadjudicated basins also have undependable water supplies. They bear the risk that litigation costs or delays¹²⁴ may prevent final adjudication of their groundwater rights. If their basin is adjudicated, they bear the risk that their share size will be miniscule.¹²⁵ Prior appropriation statutes that preserve common law groundwater rights at overdraft levels¹²⁶ incorporate the indefinite nature of the common law rights.¹²⁷

Under any of these groundwater doctrines, property values in overdrafted basins will be negatively affected both by the serious threat that groundwater will become unavailable, and by the uncertainty of when groundwater will be available.¹²⁸ For many groundwater users, a right to an annual quantity of water that is certain to be available both now and for many years in the future may be preferable to, and more valuable than, a right to a larger but less secure annual quantity of water.¹²⁹ Thus, control of overdraft through the use of need-based quotas, which gives groundwater users secure water supplies,¹³⁰ may yield economic benefits to existing groundwater users even when overdraft is not causing harmful side effects such as land subsidence.

Not all groundwater users, however, will regard pumping restrictions as

122. See *supra* text accompanying notes 16-36.

123. See *supra* note 10 and accompanying text.

124. Krieger & Banks, *supra* note 42, at 66; Trelease, *supra* note 10, at 867-68.

125. See *supra* notes 44-46 and accompanying text.

126. See *supra* text accompanying notes 49, 58.

127. Prior appropriation statutes that do not preserve such common law pumping rights result in less uncertainty, particularly for the most senior appropriators. See *supra* text accompanying notes 52-53.

128. The assertion that most investors are risk-averse, and therefore demand a higher return before they will invest in riskier projects, is generally accepted in the financial community. See, e.g., R. BREARLY & S. MEYERS, PRINCIPLES OF CORPORATE FINANCE 141 (1981).

129. Economic analyses of groundwater pumping in the high plains of Texas and Oklahoma have shown that restrictions on groundwater withdrawals would result in higher farm income than if groundwater pumping continued unrestricted. Aiken, *The National Water Policy Review and Western Water Rights Law Reform: An Overview*, 59 NEB. L. REV. 327, 334 (1980) (citing H. Mapp & V. Eidman, An Economic Analysis of Regulating Water Use in the Central Ogallala Formation 58-63 (Okla. Stat. Univ. Tech. Bull. No. T-141, 1976)).

130. Users know what quantity of water they can pump and how long their supply will last. See *supra* text accompanying notes 59-83. Of course, control of overdraft does not eliminate the uncertainty of the availability of water caused by weather conditions.

economically beneficial. For some, the decrease in property value attributable to a reduction in the permissible pumping level may not be outweighed by the increase attributable to the enhanced certainty of future groundwater supplies. In such cases, the reduction in value will not be extreme enough to constitute a taking under the diminution in value theory, because the groundwater user will retain a right to a dependable supply of a specific quantity of water. So long as that quantity of water is nonnegligible, which it would be when the state imposes quotas that are designed to allow existing uses to continue under conservation conditions, the right will not be valueless and the groundwater user will not suffer the total or near total economic loss that is required by the diminution in value theory.¹³¹

CONCLUSION

Groundwater overdraft is a serious problem in many parts of the United States. Prevailing groundwater property systems do not deal with the problem satisfactorily: the absolute ownership and reasonable use doctrines provide no means of controlling overdraft; the correlative rights doctrine may lead to wasteful and inequitable "races to the pumphouse"; the prior appropriation doctrine provides inadequate incentives for efficient water use, and, if common law pumping rights are preserved, provides no means of correcting preexisting overdraft problems. The drawbacks in these systems can be overcome by determining the rate at which water can be safely withdrawn from an overdrafted aquifer, and then using need-based quotas to achieve that depletion rate.

Although the introduction of such an approach would force existing groundwater users to reduce their pumping, it would not constitute a taking requiring compensation. All prominent takings theories support this conclusion, but two are of particular note: the public rights theory, which is attractive from a policy perspective, and the diminution in value theory, which is the approach most widely used today. The public rights theory holds that when uses of property have mutually incompatible spillover effects, the government can restrict either use without affording compensation. Because groundwater pumping is an activity with serious spillover effects, mandatory limits on pumping would be constitutional under this theory.

Under the diminution in value theory, the government is not required to compensate unless its restrictions on property cause such a large decrease in property value that the owner suffers total or near total economic loss. Groundwater users forced to reduce their pumping to comply with need-based quotas would not suffer such loss. Not only would the use of need-based quotas prevent the costly side effects that overdraft sometimes causes, it would also ensure the availability of future water supplies, thus leaving groundwater users with a property right that can hardly be considered valueless. States should not hesitate to restrict groundwater pumping to combat groundwater overdraft.

131. See *supra* notes 117-18 and accompanying text.