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Storing Water Underground: What's the Aqui-Fer?

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ARTICLE OUTLINE

I. INTRODUCTION

Supplies of usable water are often geographically isolated from demands for usable water;[1] especially in the semi-arid Western half of the United States.[2] In geographically confined

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1. *See generally* U.S. WATER RESOURCES COUNCIL, THE NATION'S WATER RESOURCES (1968).
2. *See* NATIONAL WATER COMMISSION, WATER POLICIES FOR THE FUTURE 8-9 (1973).

areas of the West, surface flows may be inadequate to meet local needs, even when such flows are augmented by naturally occurring supplies of groundwater.[3] Furthermore, in the long run, the amount of groundwater annually available to supplement surface flows is necessarily limited by the safe yield[4] of the underlying aquifer or groundwater basin. When the safe yield of a basin is exceeded by withdrawals, an annual overdraft in the form of groundwater mining occurs. Since continual groundwater mining will eventually exhaust the aquifer, overdrafts cannot be used to support long-term development of a region unless there are concurrent plans to supplement local, naturally occurring water with imported water.[5] This need for additional water has periodically been the source of many wildly imaginative and often exceedingly expensive proposals for transporting water from areas of relative abundance to areas of relative scarcity.[6]

Not only is the most abundant supply of water often located in areas far removed from the areas of greatest need, but the supply of water naturally available within an area is not constant through time since precipitation varies greatly within and between years. Annual variation in precipitation has a particularly significant impact on groundwater recharge. With an average precipitation cycle encompassing many years,[7] the safe yield of an aquifer or basin must be calculated relative to a multiyear cycle. While annual variation in precipitation also affects the amount of surface water available, the most im-

3. Southern California, for instance, is relatively isolated hydrologically and consequently must import water from the Colorado River and the Sierra Nevada Mountains, each source well over 200 miles from the place of use. *See* J. HIRSHLEIFER, J. DEHAVEN & J. MILLIMAN, WATER SUPPLY 293-94 (1969).

4. The definition of the term *safe yield* varies with the context in which it is used, but it generally refers to the maximum average annual withdrawal that can be made without depleting the long-term stored supply of water in an aquifer.

5. Repeated annual overdrafts, withdrawals in excess of safe yield, reduce the amount of water in storage. Once this water supply is exhausted, either a new supply must be found or consumption of water must be reduced. To predicate economic development on exhaustion of a scarce resource invites serious long-term economic consequences.

6. *See* NATIONAL WATER COMMISSION, *supra* note 2, at 317. The most grandiose of all schemes is the well-publicized North American Water and Power Alliance (NAWAPA) plan sketched by an engineering consulting firm in 1964 that would divert waters from Alaskan and Canadian rivers for use as far south as Mexico. At the time the plan was developed, the project cost was estimated at $100 billion. RALPH M. PARSONS CO., WATER: OUR NUMBER ONE PROBLEM (undated pamphlet).

7. *See generally* Tannehill, *Is Weather Subject to Cycles?*, in U.S. DEP'T OF AGRICULTURE, WATER: THE YEARBOOK OF AGRICULTURE 1955 84 (1955).

portant component of surface flow variability is probably seasonal variation in precipitation.[8] Supplies of surface water in the Western states are usually heaviest in the spring when snow melt in the mountains occurs;[9] demand for water is also seasonal, peaking during the irrigation season.[10] The result may be serious temporal imbalances in natural water supplies because water, even if generally abundant, is unavailable at the time it is most needed.

Temporal imbalances in water supplies have traditionally been alleviated by damming rivers and constructing reservoirs to store excess flow available during periods when supply exceeds demand. The stored water is then used during peak demand periods when naturally occurring supplies are insufficient to service demands. Such water-storage projects, often federally financed, gained widespread public acceptance largely because of side benefits[11] in the form of recreation[12] and flood control.[13] Furthermore, large users of water from water-storage projects typically did not have to pay the entire cost of such water because of direct federal subsidies[14] and/or a potential for shifting a nonproportional share of costs onto the public through hydroelectric revenues.[15] To the extent that costs were borne ratably by consumers of electricity rather than by users

8. *See generally* W. VIESSMAN, J. KNAPP, G. LEWIS & T. HARBAUGH, INTRODUCTION TO HYDROLOGY 26-30, 103-08 (2d ed. 1977). Variation in stream flows is, of course, a very complex topic. Stream flows vary with snow melt, soil characteristics, groundwater levels, topography, and a host of other factors in addition to precipitation.
9. *See generally* Work, *Measuring Snow to Forecast Water Supplies*, in U.S. DEP'T OF AGRICULTURE, WATER: THE YEARBOOK OF AGRICULTURE 1955 95 (1955).
10. Since irrigation currently is, and is expected to remain, by far the largest consumptive use of water in the United States, the fact that demand for irrigation water is highly seasonal is of extreme importance. *See* U.S. WATER RESOURCES COUNCIL, *supra* note 1, at 1-12 to 1-13.
11. Subsequent studies have shown that benefits actually achieved were often less than those originally prophesied. *See* R. HAVEMAN, THE ECONOMIC PERFORMANCE OF PUBLIC INVESTMENTS: AN EX POST EVALUATION OF WATER RESOURCE INVESTMENTS (1972).
12. *See* NATIONAL WATER COMMISSION, *supra* note 2, at 187-99.
13. *See generally id.* at 149-61.
14. Many large federal projects were constructed as public works projects during the 1930's. Flood control and navigation projects have traditionally been heavily subsidized. *See generally, e.g.*, STAFF OF HOUSE COMM. ON AGRICULTURE, GOVERNMENT SUBSIDY HISTORICAL REVIEW, 91st Cong., 2d Sess. 104-07 (G.P.O. 1970). Reclamation project costs, while in theory reimbursable from the sale of irrigation water, are also heavily subsidized by virtue of 40-year, no-interest repayment schedules and the fact that power revenues are used to return part of the irrigation costs. Reclamation Project Act of 1939, 43 U.S.C. § 485 (1970).
15. *See* NATIONAL WATER COMMISSION, *supra* note 2, at 488.

of water, an artificially high demand for an augmented water supply was created.

The existence of relatively inexpensive water, of course, tends to encourage overdevelopment of industry and population in areas in which naturally occurring water supplies are relatively scarce.[16] Thus, southern California and central Arizona experienced rapid growth in population and industry despite serious water shortages.[17] As demand for water continually increases in response to the growth of population and water intensive industries,[18] water shortages may develop which cannot be alleviated by correcting temporal imbalances alone. Such shortages can only be alleviated by suppressing demand or by transferring water from a geographic area of relative abundance.

Increasingly, then, serious water imbalances become spatial rather than temporal.[19] Correcting spatial imbalances requires capturing water many miles from the point of eventual use and transporting it by canals, aqueducts, or some other medium to the area of use.[20] Furthermore, even where the imbalance is strictly temporal, potential for a physical solution based on local surface impoundments may not be good. Most potential surface reservoir sites have already been used and certainly the best sites are no longer available.[21] In addition, remaining reservoir sites are not likely to have great hydroelectric generating potential,[22] thereby eliminating a potential source of internal subsidi-

16. Historically, water has been viewed as a free good. To the extent that a cost was associated with water, the cost was to defray delivery expenses. Since the marginal costs of delivering additional increments of water typically were low, decreasing block-rate pricing systems were developed to encourage high volume water use. Thus, pricing systems encouraged water consumption, and hence growth, in areas lacking abundant long-term natural supplies. *See generally* J. HIRSHLEIFER, J. DEHAVEN & J. MILLIMAN, *supra* note 3, at 87-113.
17. The California experience is chronicled in some detail in *id.* at 302-10. Southern California rates were traditionally lower than those found in many parts of the United States containing significantly more abundant long-term natural supplies. Arizona's water problems are analyzed in great detail in M. KELSO, W. MARTIN & L. MACK, WATER SUPPLIES AND ECONOMIC GROWTH IN AN ARID ENVIRONMENT (1973).
18. Agriculture is probably the most significant water intensive industry. *See generally* M. KELSO, W. MARTIN & L. MACK, *supra* note 17.
19. A spatial imbalance occurs when water hydrologically available in a geographic area is insufficient to meet local water demands even when the water supply is managed in a way that minimizes temporal imbalances.
20. *See* note 3 *supra*.
21. Reservoir sites themselves are a finite resource. As is the case for other resources, the best supplies tend to be used first with marginal units available only at increasing costs.
22. T. PRICE, HYDROELECTRIC POWER POLICY 10-11 (Nat'l Water Comm'n 1971).

zation.[23] Equally important, however, is that many of the side benefits that accompanied early surface projects are no longer thought to be of significant importance. Most rivers posing serious flood threats have been "tamed"[24] and flood plain zoning and other land use planning techniques[25] are seen as increasingly attractive alternatives for solving the remaining problems. In addition, because of remoteness of location or duplication of existing facilities, marginal recreational benefits of new projects may be minimal or, where a project destroys the natural recreational potential of an area,[26] negative. Furthermore, increased public awareness of environmental issues has increased resistance to surface storage projects because of perceived negative environmental impacts[27] and possible safety hazards[28] associated with surface impoundment of large quantities of water. Finally, increased concern about energy utilization has focused attention on the need to use natural resources and public facilities more efficiently.[29] As a consequence, alternatives to surface impoundment and transmission of water are receiving great attention. A logical hydrologic alternative may often be underground storage and transmission. In addition to potential cost savings,[30] use of underground water storage capacity avoids many of the environmental objections to surface storage and yields an important side benefit in the form of

23. Under section 9 of the Reclamation Project Act of 1939, 43 U.S.C. § 485h (1970), irrigation project costs beyond the ability of irrigators to repay are assigned to power accounts. The potential for internal subsidization exists, of course, in any multi-purpose project. Such subsidies, while not without some justification, raise significant issues of equity and allocative efficiency. *See generally* Posner, *Taxation by Regulation*, 2 BELL J. ECON. & MANAGEMENT SCI. 22 (1971).
24. "Tamed" may not be the appropriate word since massive destruction has occurred in areas "protected" by federal flood control programs. *See generally* NATIONAL WATER COMMISSION, *supra* note 2, at 149-61.
25. *Id.* at 154-56.
26. *Id.* at 199, recommendation 5-39 (free stream fishing, white water boating, and other benefits are foregone when a reservoir is constructed).
27. T. PRICE, *supra* note 22, at 36-37.
28. The widely publicized failure of the Teton Dam in the summer of 1976 spurred renewed emphasis on the safety component of dam construction and reservoir location. *Teton Dam Disaster: Hearings Before the Subcomm. on Conservation, Energy, and Natural Resources of the House Comm. on Gov't Operations*, 94th Cong., 2d Sess. (1976).
29. Water conservation was one of the major issues addressed in President Carter's comprehensive review of federal water resources policy. *See* Water Resources Council, *Water Resource Policy Study*, 42 Fed. Reg. 36,788, 36,794-95 (1977).
30. The attractiveness of underground storage from a cost standpoint may vary with the type of injection system used. Use of injection wells, for instance, may prove prohibitorily expensive in nearly all cases. On the other hand, given the escalating costs of surface projects, the potential for

water conservation as water losses through evaporation are decreased.[31]

Hydrologically, of course, surface and groundwaters are inextricably related.[32] At some point it becomes necessary to manage such resources conjunctively if public benefit is to be maximized. While potential benefits from conjunctive use and management of surface and groundwaters are arguably great,[33] use of underground water storage capacity is a necessary prerequisite to their attainment. Unfortunately, however, the law of private and public underground water storage rights is largely a matter of conjecture,[34] although a large body of law exists concerning other subsurface property rights. While there are well-established property rights in groundwater, minerals, oil and gas, and oil and gas storage space, there is great variation in the nature of the rights among jurisdictions.[35] Clearly, underground water storage rights cannot be defined without considering the implications of other vested subsurface property rights. The difficulty is in articulating underground water storage rights which are consistent with existing vested property rights and which permit exploitation of the water storage capacity for public benefit.

It is the purpose of this article to explore the necessary ele-

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directly reducing costs through groundwater storage is great.

Potential cost savings may be realized in another manner. Seepage from unlined delivery canals and deep percolation of applied irrigation water from surface projects may significantly augment naturally occurring groundwater supplies. To the extent that surface water irrigation districts retain some proprietary interest in this stored groundwater, their incentive to undertake costly canal lining improvement projects may be diminished, resulting in considerable savings to society.

31. It should be noted, however, that some efforts to conserve water may increase consumption of energy. For an analysis of the relationship between water management and energy use, see Hazen & Roberts, *Energy Requirements in Surface and Ground Water Management*, in WATER RESOURCES CENTER, UNIVERSITY OF CALIFORNIA, DAVIS, PROCEEDINGS—TENTH BIENNIAL CONFERENCE ON GROUND WATER 146 (December 1975).
32. *See generally* W. WALTON, THE WORLD OF WATER 133-74 (1970).
33. *See generally* Robie, *Ground Water Resources of California: Opportunities and Obstacles to Optimum Use*, in WATER RESOURCES CENTER, UNIVERSITY OF CALIFORNIA, DAVIS, PROCEEDINGS—TENTH BIENNIAL CONFERENCE ON GROUND WATER 4-6 (December 1975).
34. Apparently the issue has been extensively litigated only in California. *See* § II-C-1 of text *infra*.
35. The lack of uniformity among jurisdictions regarding existing subsurface property right systems makes it virtually impossible to develop a universally applicable system of underground water storage rights. This article, therefore, concentrates on the question of how meaningful underground water storage rights might be articulated under widely varying systems of existing subsurface property rights.

ments of a meaningful system of underground water storage rights and to suggest ways in which apparent conflicts between the requirements of an underground water storage rights system and presently vested subsurface property rights might be resolved. First, after determining the necessary elements of a meaningful system of groundwater storage rights, the various theories of existing subsurface property rights must be examined. Next, potential conflicts between such existing rights and the necessary elements of a meaningful system of underground water storage rights must be identified. Finally, potential conflicts must be resolved or avoided, a task that can be aided by analogizing to the law of surface waters and the law of wild animals.

There are at least three necessary elements of a meaningful system of property rights for underground water storage: (1) a right to store; (2) a right to protect; and (3) a right to recapture.[36] A right to store is a right to artificially introduce water into the storage space, a right that raises the collateral issue of who "owns" the underground storage strata. A right to protect is a right to prevent others from capturing the water once it is introduced into storage. Finally, a right to recapture is a right in a storing party to extract the water stored at a later date, a right which raises the problem of how artificially stored water can be identified once it commingles with naturally occurring groundwater. Taken together, a right to protect and a right to recapture give the storing party an *exclusive* right to capture the water stored, an absolutely essential feature of a meaningful system of underground property rights for water storage.

The foregoing elements of a groundwater storage rights system must be established in a manner not inconsistent with a particular state's presently vested subsurface property rights. Once such a system of consistent groundwater storage rights is identified at least two issues remain: (1) how can groundwater storage rights be transferred or otherwise efficiently allocated when storage space is scarce relative to demand, and (2) how are conflicts between groundwater storage rights and other property rights to be resolved? The first issue is important only when storage space is inadequate to supply the needs of all potential storers. The second issue requires consideration of to whom and in what circumstances a user of underground water storage space is liable for damage caused to an overlying owner or to other potential users of the storage space.

36. For a lengthy discussion of these three elements with reference to California cases, see Gleason, *Water Projects Go Underground*, 5 ECOLOGY L.Q. 625 (1976).

II. THE RIGHT TO STORE

In the past, a surface owner's title to land was considered unlimited in vertical extent upward or downward. *Cujus est solum, ejus est usque ad coelum et ad inferos*[37] was an accepted maxim of the common law.[38] While the common law doctrine retains some validity, it no longer has the sanctity of a mathematical axiom, having been expressly rejected by the United States Supreme Court with respect to navigable airspace.[39] Although most discussion and criticism of the rule has involved rights above the land surface,[40] the rule has also been questioned where subsurface rights were at issue, notably as to the extent of a conveyance by deed.[41] While the vertical extent of title is no longer without limit,[42] the common law rule retains some vitality as witnessed by the fact that, absent severance, minerals in place beneath the surface of the land normally belong to the owner of the surface.[43] Nevertheless, the doctrine by itself is not very useful in identifying and defining the parameters of underground storage rights, particularly the right to artifically store water underground. In fact, the commentators who have addressed the question have assumed that property rights in the surface do not imply property rights in the water storage capacity beneath the surface, at least not a sufficient property interest to support an action for trespass absent actual use of the subsurface area by the overlying owner.[44] Underground storage

37. "To whomsoever the soil belongs, he owns also to the sky and to the depths." BLACK'S LAW DICTIONARY 453 (rev. 4th ed. 1968).

38. The doctrine is generally attributed to Sir Edward Coke. *See* 1 E. COKE, INSTITUTES OF THE LAWS OF ENGLAND 4 a. (19th ed. London 1832) (1st ed. n.p. 1628) Blackstone expanded on the doctrine:

> Land hath also, in its legal signification, an indefinite extent, upwards as well as downwards. *Cujus est solum, ejus est usque ad coelum*, is the maxim of the law; upwards, . . . and, downwards, whatever is in a direct line, between the surface of any land and the centre of the earth, belongs to the owner of the surface . . . . So that the word "land" includes not only the face of the earth, but everything under it, or over it.

2 W. BLACKSTONE, COMMENTARIES *18 (footnotes omitted). The rule was further acknowledged by Chancellor Kent, 3 J. KENT, COMMENTARIES ON AMERICAN LAW *401, and has been repeatedly cited by American courts. *See, e.g.*, Toth v. Bigelow, 1 N.J. 399, 64 A.2d 62 (1949).

39. United States v. Causby, 328 U.S. 256 (1946).

40. *See* notes 260-62 and accompanying text *infra*.

41. *See, e.g.*, Shell Oil Co. v. Manley Oil Corp., 37 F. Supp. 289 (E.D. Ill. 1941), *rev'd on other grounds*, 124 F.2d 714 (7th Cir. 1941).

42. *See* § V-A of text *infra*.

43. 3 ROCKY MOUNTAIN MINERAL LAW FOUNDATION, AMERICAN LAW OF MINING § 15.13 (1976).

44. C. CORKER, GROUNDWATER LAW, MANAGEMENT AND ADMINSTRATION 183-86 (Nat'l Water Comm'n 1971).

rights do, of course, exist and have been extensively developed in oil and gas law. Before attempting to define groundwater storage rights, it will, therefore, be useful to examine the nature of underground storage rights in oil and gas law.

A. Underground Storage Rights in Oil and Gas Law

Rights to water or to oil and natural gas are almost always considered separately from rights to other minerals because of an inherent tendency in the former to move from place to place, unconfined by property boundaries.[45] The transient nature of these minerals has often been analogized to the movements of wild animals.[46] The wild animal analogy will prove particularly appropriate when the right to recapture is considered[47] but it also sheds light on the issue of who has the right to use underground storage space. While many commentators have criticized the wild animal analogy in the field of oil and gas,[48] a close examination of the analogy will help illuminate the similarities and differences between underground storage of oil and gas on the one hand and underground storage of water on the other.

Rights to underground storage cannot always be conveniently separated from rights in the corpus of the mineral. Williams and Meyers[49] have identified four separate theories of the nature of a landowner's interest in oil and gas corpus: (1) a nonownership theory; (2) a qualified ownership theory; (3) an ownership in place theory; and (4) an ownership of strata theory.[50]

The first two theories are a consequence of the migratory or fugitive nature of oil and gas. By analogy to the law of wild animals, it is assumed that oil and gas are incapable of ownership until reduced to possession. Thus, the nonownership theory supposes that no person owns oil and gas until it is produced and, furthermore, that any person may attempt to capture free oil and gas provided he does not go onto the land of another to effect the capture.[51] The qualified ownership theory[52]

45. 1 H. WILLIAMS & C. MEYERS, OIL AND GAS LAW § 203 (1977).
46. *Id.*
47. *See* § III-A-1-b of text *infra*.
48. *See, e.g.*, 2 AMERICAN LAW OF PROPERTY § 10.8 (A. Casner ed. 1952); Colby, *The Law of Oil and Gas*, 31 CALIF. L. REV. 357 (1943); Stamm, *Legal Problems in the Underground Storage of Natural Gas*, 36 TEX. L. REV. 161 (1957).
49. 1 H. WILLIAMS & C. MEYERS, *supra* note 45.
50. *Id.* § 203, at 31.
51. *Id.* § 203.1.
52. *Id.* § 203.2.

differs from the nonownership theory only with respect to the existence of certain correlative rights in landowners overlying a common reservoir. Specifically, the qualified ownership theory imposes a duty on overlying landowners not to waste[53] the oil and gas and not to produce it in such a manner as to damage the formation and thereby reduce the ultimate recovery. In all other respects the qualified ownership theory is indistinguishable from the nonownership theory, with each overlying owner allowed to pump as much as he wants, ownership being determined by possession.[54]

Under the nonownership theory, it was held in *Hammonds v. Central Kentucky Natural Gas Co.*[55] that a landowner could not recover in trespass for the occupation and use of strata underlying the surface of her land when a natural gas company introduced gas into the strata for storage purposes. Consistently applying the wild animal analogy, the court reasoned that the natural gas company would lose ownership when it lost possession, specifically when the gas escaped and wandered onto the plaintiff's land. Since the gas company was no longer responsible for the location of the gas, the gas being free, it could not be liable for trespass.[56] The gas company, however, won only a Pyrrhic victory since the plaintiff landowner could capture the free gas beneath her land and sell it. As the foregoing example illustrates, it is futile to have one element of a meaningful storage right, a right to store, without the other two elements, a right to protect and a right to recapture.

The ownership in place theory,[57] in effect, rejects the migratory theory of oil and gas and holds that the interest of a landowner in oil and gas positioned beneath his land is the same as his interest in solid minerals. Apparently, under such a theory, ownership of the mineral interest does not include ownership of the storage space once the storage stratum is depleted. Ownership of the storage capacity remains in the person who has title to the surface.[58] Thus, a party seeking to store gas underground must secure storage rights from the owner of the overly-

53. *See, e.g.*, Ohio Oil Co. v. Indiana, 177 U.S. 190 (1900). In *Ohio Oil* the Court upheld the constitutionality of legislation prohibiting the waste of gas by allowing it to escape into the air against an assertion that the statute divested private property without due process of law. The Court viewed the statute as one protecting private property from being taken by one of the common owners without regard to the interests of the others.
54. 1 H. WILLIAMS & C. MEYERS, *supra* note 45, § 203.2, at 43-44.
55. 255 Ky. 685, 75 S.W.2d 204 (1934).
56. *Id.* at 687-91, 75 S.W.2d at 205-06.
57. 1 H. WILLIAMS & C. MEYERS, *supra* note 45, § 203.3.
58. *See* Tate v. United Fuel Gas Co., 137 W. Va. 272, 71 S.E.2d 65 (1952).

ing land. The consequence of failing to secure such rights prior to storage would presumably be liability for trespass. Since the migratory theory of oil and gas is rejected under this theory, however, the injector of gas should retain title to it even when stored under another's property without permission.[59] A company which stores gas thus would have an exclusive right to capture but no right to store.

The ownership of strata theory[60] explicitly recognizes private ownership of underground storage capacity. Under this theory, oil and gas interests are conveyed by conveying the strata that contain the minerals. Since the strata themselves are conveyed, it follows that the mineral owners are also the owners of the storage capacity created when the gas is exhausted from the various strata.[61] Consequently, a third party wanting to store gas underground would secure his right to do so from the mineral stratum owner, not the surface owner. Presumably, failure to secure such right before injecting gas into storage would result in loss of title to the introduced gas since "geological formations or strata common to this class of minerals may be exhausted a thousand times and the mineral owner still retains the exclusive right to take all the minerals which find their way into the formation, whether through injection or in any other way."[62]

Significantly, none of the oil and gas cases seems to question the existence of private storage rights.[63] Rather, the major concern is who must be compensated and how storage rights can be acquired.[64] It has, however, been suggested that the owner of an exhausted gas stratum has no more use for it than he does for the airspace miles above his home and that, consequently, no one should be required to pay for using the space, at least until it is proved at some future date that the owner of the overlying fee or mineral stratum, as the case may be, could make effective use of the storage space.[65] While this argument has much appeal,[66] many states have rejected it by implication

59. In general, a possessor of personal property retains no interest against the true owner. Thus, assuming that the injector manifests no intent to abandon the gas injected, his title should be good against the overlying owner.
60. 1 H. WILLIAMS & C. MEYERS, *supra* note 45, § 203.4.
61. *See* Central Ky. Natural Gas Co. v. Smallwood, 252 S.W.2d 866 (Ky. 1952).
62. *Id.* at 868.
63. *See generally* 2 AMERICAN LAW OF PROPERTY, *supra* note 48, § 10.8.
64. *See generally* Stamm, *supra* note 48.
65. Note, 36 VA. L. REV. 947, 954-55 (1950).
66. *Cf.* Edwards v. Sims, 232 Ky. 791, 797, 24 S.W.2d 619, 622 (1929) (Logan, J., dissenting) (majority opinion held it trespass for the sole possessor of the entrance of a cave to enter under the surface of another while exploring or developing the cave).

in conferring on natural gas companies the power to condemn needed storage space.[67]

Interestingly, to the extent that the wild animal analogy was rigidly followed in oil and gas law, the state could regulate or allocate underground storage space without compensating an overlying owner. Wild animals are public goods subject to the absolute control of the state.[68] The state may, at its discretion, allow them to be reduced to possession or may prohibit them from being taken at all. If oil and gas were also public goods subject to the same degree of state control, it would seem that underground storage space could be used by the state without compensation since if the state has the power to totally forbid private capture of oil and gas it would seemingly also have the power to use space formerly occupied by oil and gas for storage without payment of compensation.

In any event, a significant difference between wild animals and oil and gas[69] is that while the general public is endowed with a right to attempt to reduce wild animals to possession, *only owners* of surface rights within an oil or gas field are endowed with a right to attempt to reduce those minerals to possession. The right to capture oil and gas is thus a private right linked to surface property rights while the right to capture wild animals is a public right totally disassociated from surface rights. The distinction is a subtle one. While a surface owner may permit another to enter his property for the purpose of hunting wild animals, only the public can confer a right to capture such animals.[70] In contrast, a landowner's power is not limited to permitting entry to hunt for oil and gas, but encompasses the power to confer on that party the right to capture any oil or gas subsequently found.

The distinction between the right to capture oil and gas and the right to capture wild animals suggests a rationale for the common practice of compensating someone for the use of oil and gas storage space. If nothing else, the owner of the surface

67. *See, e.g.*, ARK. STAT. ANN. §§ 53-901 to 907 (1971) (natural gas public utilities); COLO. REV. STAT. §§ 34-64-101 to 107 (1973) (natural gas public utilities); NEB. REV. STAT. §§ 57-601 to 609 (Reissue 1974); OKLA. STAT. ANN. tit. 52, §§ 36.1-.7 (West 1951) (natural gas public utilities).

68. *See* notes 211-17 and accompanying text *infra*.

69. *See* Ohio Oil Co. v. Indiana, 177 U.S. 190 (1900).

70. The public can restrict hunting to certain periods of the year, or limit the number of animals that can be taken, or prohibit all hunting. Similarly, the public can encourage the hunting of certain animals through reward or bounty programs. In any event, when a hunter enters the land of another to hunt for wild animals, his right to capture them is ultimately regulated by the public.

fee loses his private right to explore for oil and gas once foreign gas is injected into the storage stratum. Since changing technologies periodically increase the amount of gas that can be extracted from a previously "exhausted" stratum, the right given up is not without value.[71]

Most legal experience in underground storage to date has been with oil and gas. Interest in underground storage of water is a fairly recent phenomenon that has been little developed in the courts. An analysis of oil and gas law suggests several conclusions. While a surface owner no longer has unqualified rights from the depths to the sky, the existence of private subsurface property rights for storage of oil and gas is not seriously questioned. As a consequence, failure to acquire a valid storage right before commencing storage has serious implications that vary from liability for trespass to loss of the exclusive right to recapture the stored minerals depending on which theory of oil and gas ownership is adopted. Unless underground storage of water can be differentiated from underground storage of oil and gas, it is unlikely that water can be effectively stored underground.[72] Existence of a private natural gas storage right, however, may be a necessary consequence of the universally accepted private right of capture for oil and gas. To the extent that the right to capture water is more like the right to capture wild animals than the right to capture oil and gas, a state's experience with underground storage of oil and gas, while relevant, need not be controlling.

B. Underground Storage Rights in Water Law

With the exception of California,[73] the states have developed little case law concerning rights in underground water storage space. Just as property rights in the corpus of oil and gas form the basis of underground oil and gas storage rights, rights to the corpus of groundwater should form the basis of underground water storage rights. Rights to the corpus of groundwater are

71. In addition to changing technologies, changing prices affect the amount of gas that can be extracted from a given stratum. At low gas prices a stratum may be economically exhausted. At higher prices it might become feasible to extract more gas without a change in technology.

72. Recognition of private storage rights for oil and gas is not a serious economic problem since oil and gas are relatively high value products and the usable storage space is relatively confined. Water, in contrast, is a relatively low value product and the storage space may underlie a vast area. Transaction costs of dealing with overlying owners would, therefore, probably act as an economic barrier to exploiting the underground water storage space even ignoring the fair rental value or fair market value of the storage space.

73. For a discussion of California cases, see § II-C-1 of text *infra*.

generally of four types:[74] (1) appropriative, (2) overlying, (3) prescriptive, and (4) pueblo. Of these, the latter two are of limited importance. Prescriptive rights are merely vested rights to use water created by adverse use of a limited supply for a statutory period.[75] Pueblo rights, on the other hand, are historical rights of American cities in the Southwestern states, as successors to Spanish or Mexican pueblos, to use waters naturally present within the old pueblo limits for the use of the city and its inhabitants.[76]

Appropriative rights to groundwater exist, at least to some extent, in the majority of the Western states.[77] While the precise nature of the rights and the manner in which they are established vary from jurisdiction to jurisdiction,[78] prior appropriation rights are premised on the proposition that "first in time is first in right." While prior appropriation has long been the law in the Western states with respect to surface waters,[79] its application to percolating groundwaters is of fairly recent origin.[80] Consequently, in many instances, most groundwater rights in an existing appropriation system are, in fact, rights which vested as overlying-landowner rights prior to adoption of the groundwater appropriation system.[81] An essential feature of all appropriation systems, however, is a requirement that a permit be secured if a new groundwater right is acquired.[82] The permit requirement and pervasive involvement of the state in allocating groundwater rights are important factors to consider when attempting to define the nature of property rights in underground storage space.

Overlying rights, in contrast to appropriation rights, have their origin in the common law.[83] Such rights are established in accordance with three rules: (1) the English rule of absolute

74. *See generally* 2 W. HUTCHINS, WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES 145-71, 631-53, 665-96 (completed by H. Ellis & J. DeBraal, U.S. Dep't Agric., Misc. Pub. No. 1206, 1974); Clark, *Western Ground Water Law*, in 5 WATERS AND WATER RIGHTS §§ 440-445 (R. Clark ed. 1972).
75. *See* City of Pasadena v. City of Alhambra, 33 Cal. 2d 908, 207 P.2d 17 (1949), *cert. denied*, 339 U.S. 937 (1950).
76. *See generally* 2 W. HUTCHINS, *supra* note 74, at 145-71.
77. Clark, *supra* note 74, § 441, at 414 n.27.
78. *Id.* §§ 442.1-.3.
79. Hutchins, *Background and Modern Developments in State Water-Rights Law*, in 1 WATERS AND WATER RIGHTS §§ 18.1-.2 (R. Clark ed. 1972).
80. Clark, *Classes of Water and Character of Water Rights and Uses*, in 1 WATERS AND WATER RIGHTS § 52.2(B)(1) (R. Clark ed. 1972).
81. *See id.* § 52.2(B).
82. *See* Clark, *supra* note 74, § 442.2.
83. *Id.* § 441.

ownership;[84] (2) the American rule of reasonable use;[85] and (3) the California rule of correlative rights.[86] The English rule is analogous to the nonownership theory of oil and gas rights;[87] it is a pure right of capture. Under this rule, an overlying landowner has a right of access to all of the water beneath the surface of his land and he may capture it and put it to any use whatsoever.[88] Few American states accept this rule.[89] The American rule is similar to the English rule in that it is also a right of capture but the American rule contains the added provision that water captured must be reasonably used on the land of the overlying owner.[90] In this manner it is similar to the qualified ownership theory of oil and gas rights.[91] Finally, the California rule of correlative rights adopts the American rule as long as supplies are adequate to meet all reasonable needs of overlying owners,[92] but when supplies are insufficient to meet such needs, the existing supply is shared ratably among overlying owners.[93] The California rule thus recognizes some ownership of water in place, at least in times of shortage. As such, it is analogous to the ownership in place or ownership of strata theories of oil and gas rights.[94]

The theory of groundwater rights that a state has adopted has important and obvious implications for the right to protect and the right to recapture artificially stored water. In addition, as in oil and gas law, the theory of rights to the corpus of groundwater prevailing in a given jurisdiction should be a useful factor to be weighed in determining the parameters of a right to introduce water into storage. More specifically, whether a landowner can prevent a party from storing water under his

84. *See* Acton v. Blundell, 152 Eng. Rep. 1223 (Ex. 1843).
85. *See* Forbell v. City of New York, 164 N.Y. 522, 58 N.E. 644 (1900).
86. *See* Katz v. Walkinshaw, 141 Cal. 116, 74 P. 766 (1903).
87. *See* note 58 and accompanying text *supra*.
88. It has been argued that the English rule rests on the maxim "to whomsoever the soil belongs, he owns also to the sky and to the depths." Meeker v. City of East Orange, 77 N.J.L. 623, 74 A. 379 (1909). *See also* notes 37-44 and accompanying text *supra*.
89. A SUMMARY—DIGEST OF STATE WATER LAWS 52-53 (R. Dewsnup & D. Jensen eds., Nat'l Water Comm'n 1973).
90. *See* 2 C. KINNEY, IRRIGATION AND WATER RIGHTS § 1191 (2d ed. 1912).
91. *See* notes 52-54 and accompanying text *supra*.
92. To the extent that more water is available than is necessary to meet the needs of overlying owners, it is available for appropriation by others. *See, e.g.*, Katz v. Walkinshaw, 141 Cal. 116, 134-36, 74 P. 766, 771-72 (1903); City of Pasadena v. City of Alhambra, 33 Cal. 2d 908, 925-26, 207 P. 2d 17, 28 (1949), *cert. denied*, 339 U.S. 937 (1950).
93. *See* City of Pasadena v. City of Alhambra, 33 Cal. 2d 908, 926, 207 P.2d 17, 28-29 (1949), *cert. denied*, 339 U.S. 937 (1950).
94. *See* notes 57-62 and accompanying text *supra*.

land and whether a landowner is entitled to compensation for use of the storage space beneath his land will likely depend upon the nature of his rights to the corpus of groundwater. In contrast to oil and gas, however, where the right to store is private and the question is one of whom should be compensated,[95] there is the possibility that water storage rights are public and no one need be compensated.

Where groundwater rights are based on prior appropriation, there may be an especially strong argument that the right to store is public. Most Western states as part of their general appropriation scheme declare that groundwater is dedicated to the public.[96] Where the public is deemed to own the water, a valid appropriation requires a permit. The landowner's property right in groundwater is thus limited to the size and priority of the appropriation that his permit grants. Consequently, an appropriator has no inherent right to capture artificially stored groundwater present under his land, or at least no right to capture stored water in excess of the amount granted by his appropriation.[97]

The key to finding public storage rights in appropriation states, however, is not that rights are appropriative but that ownership of the water and ownership of the right to capture are both likely to be in the general public. If the public owns the water and the right of access to the water, the public should logically be considered the owner of the storage space in which the water is found, to which it alone has the right of access. Furthermore, even absent explicit recognition of public ownership of the underground storage capacity, there are strong arguments that the overlying landowner in appropriation states should not be entitled to compensation for water stored beneath his land. Even if the possibility of governmental tort immunity is ignored, a landowner is not entitled to damages for trespass or to compensation for a taking merely because naturally occurring water in storage beneath his land is not available for withdrawal under the terms of his appropriation permit. Yet the situation is no different where a groundwater aquifer is recharged artificially, unless, of course, the higher water table interferes with a present use of land by the overlying owner.[98]

95. *See* notes 63-64 and accompanying text *supra*.
96. Clark, *supra* note 74, § 440, at 409 n.8.
97. The fact that an appropriation right is of indefinite duration despite depletion might, however, create serious problems. As the natural source diminishes, a valid appropriation would arguably allow the appropriator to continue withdrawing water to the extent of his appropriation even if it results in his withdrawal of artificially stored waters. *See generally id.* § 442.2, at 425.
98. For a discussion of when liability is appropriate, see § V of text *infra*.

It has previously been shown that oil and gas are not perfectly analogous to wild animals because of the existence of private rights of capture in the former and public rights of capture in the latter. The analogy of groundwater to wild animals may, however, be particularly appropriate in an appropriation jurisdiction in which the right to capture is likely a public one. If so, private storage rights for water need not be recognized in an appropriation jurisdiction despite their recognition in oil and gas law. Of course, to the extent that an appropriation right is a vested right to pump to the limits of the appropriation, a storing party's right to protect stored water might be seriously threatened,[99] particularly if naturally occurring groundwater is insufficient to satisfy all appropriations, a condition which is not infrequent in the Western states.[100]

In contrast, where overlying rights to groundwater are recognized, it may be more difficult to find a public right to store. The existence of overlying rights seems to imply that the right to capture is a private right appurtenant to the land and not a public right.[101] This would apparently establish private ownership of the underground storage capacity. In terms of delineating possible public rights to store, however, not all overlying rights theories present difficulties of equal magnitude.

At first glance the English rule of absolute ownership presents a strong case for private storage rights in that the right to capture is clearly private and without limit. Upon closer analysis, however, it becomes apparent that the right to store may, in fact, be a public one,[102] albeit not a meaningful one since there is no corresponding public right to protect. Presumably, water

99. *See* § III-A-2 of text *infra*.

100. *See* Bagley, *Water Rights Law and Public Policies Relating to Ground Water "Mining" in the Southwestern States*, 4 J. L. & ECON. 144 (1961).

101. All overlying rights are variations on the English or common law rule of absolute ownership. Common law groundwater rights were clearly appurtenant to the land. *See* J. LONG, IRRIGATION § 45 (2d ed. 1916).

102. One could, of course, hypothesize a situation in which a state adopted an absolute ownership rule based on ownership in place or ownership of strata theories. *See* notes 57-62 and accompanying text *supra*. In either event the storage space would be clearly private and any use of it by other than the owner would be compensable. If the ownership of the water differed from ownership of the surface, the owner of the water would own the storage capacity under the ownership of strata theory. The converse would be true under an ownership in place theory. No jurisdiction has, however, adopted either theory of groundwater ownership and it would appear that such a system would be unworkable other than in the exceptional circumstance in which a confined aquifer is located wholly beneath the lands of a single overlying owner. In the latter situation, there would be no issue of storage rights since water could not be introduced into storage without the consent of the surface owner.

present under the land of an overlying owner would be available for him to capture whether it was naturally occurring or artificially induced, and hence there would be no right to protect. On the other hand, it could be argued that as long as groundwater enters the land of an overlying owner by percolation, the intrusion is attributable to the migratory nature of groundwater and not the volitional act of a potential defendant in a trespass action.[103] If so, the overlying owner would not likely be able to recover for trespass nor successfully argue a public taking,[104] and the right to store could thus be a public right. As a practical matter, however, one could not store water under another's land without first securing from him a covenant not to pump. The effect is thus the same as if the right to store were a private right itself.

In states which have adopted the American rule there is at least a marginally better argument that meaningful public storage rights exist. The American rule recognizes some limitation on the right of capture. The precise nature of the limitation may vary from state to state.[105] Where groundwater is dedicated to or presumed to be owned by the public, the "reasonable use" limitation might be viewed as a qualification on a landowner's usufructory right to the water and hence, an incident of public ownership. In contrast, if water is presumed to be privately owned, the "reasonable use" limitation is merely a form of police power regulation, not an incident of public ownership. The former situation is analogous to an appropriation state that publicly owns the water, with the major difference being that "reasonable use" imposes a less definite limitation on the right of access than does a fixed appropriation. To the extent that the right of access to underground storage space is publicly owned, an overlying landowner should have no right to complain of the presence of stored waters absent some actual interference with the enjoyment of his property. Where groundwater or the right to access is viewed as private property, however, the situation is more analogous to the English rule. It is very difficult to argue that meaningful public storage rights exist when the water is privately owned property and only its use is regulated. Absent public ownership of the storage space, there is always a poten-

103. *Cf.* Hammonds v. Central Ky. Natural Gas Co., 255 Ky. 685, 75 S.W.2d 204 (1934) (gas company using exhausted field for underground storage of gas held not liable to owner of part of field for use of her land since the company relinquished absolute title to the gas by storing it underground). *See* note 55 and accompanying text *supra*.

104. A landowner could, however, recover in nuisance if there was actual interference with the use and enjoyment of his property. *See* § V-D of text *infra*.

105. *See generally* Hanks & Hanks, *The Law of Water in New Jersey: Groundwater* 24 RUTGERS L. REV. 621. 630-48 (1970).

tial for trespass liability if the storage rights are not purchased. More importantly, however, private ownership of the water and a private right of capture makes it very difficult to articulate a right to protect stored water.

Of the overlying-rights theories, the California rule of correlative rights affords the greatest potential for asserting meaningful public rights to use the underground water storage strata. The cornerstone of the correlative rights doctrine is the concept of sharing in time of shortage while allocating excess water by appropriation in times of plenty.[106] The doctrine is designed to maximize the beneficial use of scarce water resources, while at the same time giving preference in the use of groundwater to overlying landowners. Overlying landowners may have their share fixed by a court order when there is insufficient water to meet all needs. Traditionally, an insufficient supply exists when all appropriators have either been prohibited from pumping or have acquired prescriptive rights[107] and an overdraft of the basin still occurs.[108]

The California rule clearly contemplates private property rights of overlying owners in naturally occurring waters beneath their lands.[109] The fact that excess water is available for appropriation, however, suggests that public rights exist in a portion of naturally occurring groundwater. The coexistence of public rights with private rights in naturally occurring groundwaters supports a contention that overlying landowners would have no private correlative rights in artificially stored groundwaters.[110] Given a dual system of public and private rights in the corpus of groundwater, does it necessarily follow that there must be a dual system of storage rights as well? To the extent that overlying owners have property rights in the groundwater in place beneath their land,[111] they might logically have a prop-

106. *See* Katz v. Walkinshaw, 141 Cal. 116, 74 P. 766 (1903).

107. The fact that prescriptive rights can accrue against an overlying owner would seem to imply a degree of "ownership in place" of groundwater in correlative rights states.

108. *See* City of Pasadena v. City of Alhambra, 33 Cal. 2d 908, 207 P.2d 17 (1949), *cert. denied*, 339 U.S. 937 (1950).

109. *See* 2 W. HUTCHINS, *supra* note 74, at 668-83.

110. The correlative rights doctrine is designed to maximize the use of scarce, naturally occuring water resources while giving priority in the use of groundwater to overlying owners, thus preserving the natural locational advantage of landowners situated above a productive aquifer. *See generally* Katz v. Walkinshaw, 141 Cal. 116, 74 P. 766 (1903). The purpose of the doctrine is in no way furthered by applying it blindly to imported, artificially stored groundwaters.

111. The fact that in California prescriptive rights to groundwater can vest once there is an overdraft, City of Pasadena v. City of Alhambra, 33 Cal. 2d

erty right in the storage space as well.[112] On the other hand, storage space occupied by excess waters available for appropriation would arguably be public.[113] Furthermore, if overlying landowners have no property interest in artificially stored waters beneath their land, they seemingly have little basis for claiming a property interest in the storage space occupied by the artificially stored water.[114] Of course it is not difficult to imagine hypothetical situations in which artificially induced waters occupy storage space formerly occupied by naturally occurring groundwaters in which an overlying owner had a correlative rights interest. Recognition of a dual system of underground storage rights would be cumbersome to say the least[115] and particularly anomalous if an overlying owner has no rights to the water artificially stored and no alternative use for the storage space. California, in fact, has solved the problem by finding a public storage right in the form of an implied easement to use underground storage capacity to store or transmit artificially recharged groundwater.[116]

As a practical matter, however, it is easier to find public storage rights in correlative rights states than in American rule states, not because of basic differences in the underlying-rights concepts, but because correlative rights are so pervasively regulated by the state. Where police power regulation is extensive, the line between public and private rights becomes more difficult to discern. Furthermore, correlative rights were developed in response to a general policy directed toward maximizing the productive use of water resources.[117] If rights are unclear, it should be presumed that they do not exist in a form that would thwart the basic policy direction.

Finally, some useful analogies can be made to surface water rights. While a stream bed may be private property, it is general-

908, 926, 207 P.2d 17, 28-29 (1950), would seem to support the existence of property rights in the water in place as opposed to rights arising only upon capture.

112. For the oil and gas storage analogy, see notes 56-58 and accompanying text *supra*.

113. If private storage rights are dependent on ownership of the water in place, the existence of water in place which is publicly owned would arguably support a contention that the storage space occupied by such public water is also public. *But see* note 58 and accompanying text *supra*.

114. The oil and gas analogy is again useful. *See* notes 68-71 and accompanying text *supra*.

115. For instance, in the hypothetical above, temporal changes in the public and private waters occupying the subsurface strata would result in comparable shifts in public and private storage rights, a result inconsistent with most notions of property.

116. *See* notes 288-90 and accompanying text *infra*.

117. *See* § II-C-1 of text *infra*.

ly recognized that an individual who artificially augments streamflow may recapture the additional water at some downstream point after due allowance for losses from seepage and evaporation.[118] At least where surface water is dedicated to the public and the right to capture surface water is a publicly granted right, limited use apparently can be made of private property (the stream bed) by public or private parties without constituting a public taking or a private trespass.[119] If a similar approach were taken to underground storage rights, the question of whether the storage space was private or public would be largely academic.

In conclusion, the right of public or private parties to make use of underground storage capacity for storage or transmission of water without compensation of the overlying landowners is not clearly established at the present time. Neither is it established, however, that there is no such right. Delineating the right in any state requires careful analysis of that state's system of groundwater rights. States with appropriative groundwater rights will likely find it easier to discover public rights to use the underground water storage space without liability than will those states with overlying rights. With the overlying-rights theories, a state applying the English rule of absolute ownership would find it most difficult to establish public rights of storage without compensating the overlying owners.[120] Correlative-rights states should find it easier than other overlying-rights states to establish public storage rights largely as a consequence of the pervasiveness of regulation under the California rule. American rule states would occupy a middle point on the scale. Finally, it may not be necessary to reach the question of whether or not underground storage space is "owned" by the overlying landowners if it is established that such owners have no cause of action for trespass against a storing party and have no rights to capture water stored there by others.[121]

C. Statutory Authority for the Right to Store

State courts have rarely discussed the issue of property rights in underground storage space for water. An exception,

118. *See, e.g.*, United States v. Haga, 276 F. 41 (S.D. Idaho 1921); Miller v. Wheeler, 54 Wash. 429, 103 P. 641 (1909).

119. The extent to which the statement must be modified when a property owner is actually damaged is explored in § V of text *infra*.

120. "Compensation," under such circumstances, is best viewed as a bribe to prevent the overlying landowner from exercising legal rights rather than the *quid pro quo* of a storing party's conduct.

121. *See* § V-A of text *infra* (trespass liability); § III-A of text *infra* (right to prevent others from recapturing stored water).

however, is California which has addressed the problem in a series of cases beginning with *City of Los Angeles v. City of Glendale*.[122] The California decisions place heavy reliance on existing state statutes in reaching their results.[123] In addition, the groundwater code of the state of Washington explicitly recognizes the ownership of artificially stored groundwater resulting from the operation of surface water systems and distinguishes it from naturally occurring groundwater.[124]

1. *California*[125]

The constitution of the State of California confers broad powers on the state to safeguard its water supply and to apply it to maximum beneficial use. Article X, section 2 provides in part:

> because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.[126]

Although this constitutional provision continues by explicitly referring to surface waters, it has been judicially interpreted as applying to all natural waters in the state[127] including waters artificially stored underground.[128] With such a broad constitutional sanction allowing police power regulation of California's water resources, it is not surprising that California courts early established a public right to use groundwater basins for storage.[129] The leading case is *City of Los Angeles v. City of Glendale*.[130] In *Glendale*, Los Angeles sought to establish that its pueblo right to waters of the Los Angeles River[131] included a

122. 23 Cal. 2d 68, 142 P.2d 289 (1943).
123. Comprehensive statutes provide extensive regulation of all waters in California. The general state policy, to regulate all waters in a manner that will maximize their beneficial use, is found in CAL. WATER CODE §§ 100-108 (West 1971).
124. WASH. REV. CODE ANN. § 90.44.130 (1961).
125. For two extensive analyses of California groundwater and underground storage rights, see Krieger & Banks, *Ground Water Basin Management*, 50 CALIF. L. REV. 56 (1962) and Gleason, *supra* note 35.
126. CAL. CONST. art. X, § 2 (West Supp. 1977) (formerly art. XIV, § 3).
127. Joslin v. Marin Mun. Water Dist., 67 Cal. 2d 132, 429 P.2d 889, 60 Cal. Rptr. 377 (1967).
128. *See* Niles Sand & Gravel Co. v. Alameda County Water Dist., 37 Cal. App. 3d 924, 112 Cal. Rptr. 846 (1974), *hearing denied* (Cal. Sup. Ct., May 8, 1974), *cert. denied*, 419 U.S. 869 (1975).
129. *See generally* Krieger & Banks, *supra* note 125.
130. 23 Cal. 2d 68, 142 P.2d 289 (1943).
131. For good discussions of pueblo rights in California, see W. HUTCHINS, THE

right to waters imported and either spread[132] or sold to farmers in the San Fernando Valley. Most of the waters in the Los Angeles River were traceable to water-bearing strata in the San Fernando Basin.[133] Los Angeles imported substantial amounts of water from the Owens River Valley and either spread this water or sold it to farmers. While a portion of the water sold to farmers was consumed in crop production, substantial quantities seeped through the root zone and into the water-bearing strata of the basin where it would eventually find its way into the Los Angeles River. Los Angeles argued that it sold and spread such water with the avowed intention of recapturing the seepage when it reached the river. The Supreme Court of California upheld the claim of Los Angeles to the imported water:

> [Los Angeles] had a prior right to use the water brought into the San Fernando Valley. It did not abandon that right when it spread the water for the purpose of economical transportation and storage. . . . It would be as harsh to compel plaintiff to build reservoirs when natural ones were available as to compel the construction of an artificial ditch beside a stream bed. . . . [I]n selling water to the farmers, as in spreading water, plaintiff was interested in its economical transportation and storage.
>
> . . . Once within the basin . . . it was in effect within plaintiff's reservoir.[134]

In analogizing use of underground storage space to use of a stream bed, the court relied on a California statute that codified a rule of law which had developed during mining days.[135] The statute[136] provides that any person may transport imported water in a natural stream bed and later reclaim it as long as his reclamation does not thereby diminish the water already lawfully appropriated by another. These holdings of the California Supreme Court were reaffirmed by that court's landmark decision in *City of Los Angeles v. City of San Fernando*.[137] There, the court extended *Glendale* by holding, in effect, that under another section of the California Water Code,[138] mutual pre-

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CALIFORNIA LAW OF WATER RIGHTS 256-62 (1956) and 2 W. HUTCHINS, *supra* note 74, at 145-71.

132. "Spreading" refers to the process of recharging groundwater aquifers by depositing water over a large surface area and letting it enter the aquifer by natural percolation.

133. The San Fernando Basin is the drainage basin for the area immediately surrounding and including the cities of Los Angeles and Glendale.

134. 23 Cal. 2d at 76-78, 142 P.2d at 294-95.

135. Gleason, *supra* note 35, at 640.

136. CAL. WATER CODE § 7075 (West 1971).

137. 14 Cal. 3d 199, 537 P.2d 1250, 123 Cal. Rptr. 1 (1975).

138. CAL. CIV. CODE § 1007 (West Supp. 1977).

scription[139] of public water rights was barred.[140] The effect of *San Fernando* was to prevent any private rights from attaching to public waters by prescription.[141] As a consequence of *San Fernando*, a public body in California can import waters and use such waters to recharge groundwater basins without concern that third parties might, by capturing and using some of the artificially stored waters, establish prescriptive rights to the continued use of a portion of those waters. This judicial protection of a public entity's investment in underground storage and transmission is a significant factor in reducing the real cost of such projects.[142]

Perhaps an even more significant California decision for underground storage of water was *Niles Sand and Gravel Co. v. Alameda County Water District*.[143] While *San Fernando* established a *public* right to transport and store imported waters underground, *Niles* extended underground public storage rights to limit overlying *private* property rights.[144] *Niles* explicitly recognized that protection of underground storage capacity and a basin's water supply may require that otherwise legitimate activities of overlying landowners be regulated.[145]

Niles involved the activity of a private company engaged in sand and gravel mining. As part of its operation, it pumped large quantities of groundwater out of its pits and into a flood

139. The doctrine of mutual prescription of groundwater rights was first proclaimed in City of Pasadena v. City of Alhambra, 33 Cal. 2d 908, 207 P.2d 17 (1949), *cert. denied*, 339 U.S. 937 (1950). Although some commentators question whether mutual prescription is the proper way to characterize the situation, *see* 2 W. HUTCHINS, *supra* note 74, at 676-79, the *Pasadena* court held that the commencement of an overdraft created a situation of adverse use against existing pumpers sufficient to establish rights in all users after the statutory period had run, necessitating pro rata reductions in the amounts which all pumpers were permitted to extract.

140. 14 Cal. 3d at 264-86, 537 P.2d at 1297-1313, 123 Cal. Rptr. at 48-64.

141. Actually, the effect of *San Fernando* was even broader in that it also prohibited public rights from attaching to public waters by prescription. CAL. CIV. CODE § 1007 (West Supp. 1977) provides that "no possession by any person, firm or corporation no matter how long continued" shall result in a prescriptive title against the state. The *San Fernando* court construed the word "person" to include governmental agencies. 14 Cal. 3d at 277, 537 P.2d at 1307, 123 Cal. Rptr. at 58.

142. Without this protection a public entity could, of course, protect its investment by appropriate legal action before the running of the statutory period in the event of adverse use. With the protection, legal action to prevent loss of its rights should be unnecessary as would extreme vigilance to detect adverse use. The result is significantly lower real costs.

143. 37 Cal. App. 3d 924, 112 Cal. Rptr. 846 (1974), *hearing denied* (Cal. Sup. Ct., May 8, 1974), *cert. denied*, 419 U.S. 869 (1975).

144. *See* Gleason, *supra* note 35, at 649-64.

145. 37 Cal. App. 3d at 937, 112 Cal. Rptr. at 855.

control channel that flowed into San Francisco Bay. After Niles had engaged in its mining activity for ten years, the Alameda County Water District began recharging the groundwater basin with imported water. In seven years, the recharge had raised the water table in the basin to the point at which the flow of groundwater into the pit seriously threatened the quarry operation. Eventually, Niles instituted an inverse condemnation suit against the Water District claiming damages to his quarry allegedly caused by the seepage of recharged groundwater into this pit. The District countered by asking the court to enjoin Niles from pumping the groundwater out of its pit and to award damages for groundwater previously pumped from the pit.[146] The trial court held for the District[147] and the court of appeals affirmed.[148] Both the California and United States Supreme Courts declined to review the case.[149]

Interestingly, California has codified the common law rule that surface owners have rights in anything permanently situated beneath the surface.[150] In developing the doctrine of correlative rights, however, California courts have refused to apply the doctrine of absolute ownership to groundwater[151] since groundwater is not *permanently* situated beneath the surface. This enabled the court in *Niles* to find a servitude in the form of an underground storage right predicated on the correlative rights exception carved out of the common law rules.[152] This public servitude was held to restrain overlying landowners from discharging more than their reasonable share of groundwater found in the basin.[153] A public flooding and water flow servitude are, however, expressly recognized by California statutes.[154] *Niles* can, therefore, be read as merely applying these servitudes to underground as well as surface flooding and water flow. Significantly, however, the court in *Niles* declared that the servitude had its birth in the 1903 decision of *Katz v. Walkin-*

146. *Id.* at 926, 112 Cal. Rptr. at 847-48.
147. *Id.* at 927, 112 Cal. Rptr. at 848.
148. 37 Cal. App. 3d 924, 112 Cal. Rptr. 846 (1974).
149. *Id., hearing denied* (Cal. Sup. Ct., May 8, 1974), *cert. denied*, 419 U.S. 869 (1975).
150. The statute provides: "RIGHTS OF OWNER. The owner of land in fee has the right to the surface and to everything permanently situated beneath or above it." CAL. CIV. CODE § 829 (West 1954).
151. Katz v. Walkinshaw, 141 Cal. 116, 74 P. 766 (1903).
152. 37 Cal. App. 3d at 934-35, 112 Cal. Rptr. at 853.
153. *Id.* at 934, 112 Cal. Rptr. at 853.
154. SERVITUDES ATTACHED TO LAND. The following land burdens, or servitudes upon land, may be attached to other land as incidents or appurtenances, and are then called easements.

. . . .

10. The right of flooding land;

shaw.[155] Thus, rather than announcing a change in property rights, the court merely declared what the rights had always been, at least since 1903. Furthermore, and most significantly, the *Niles* court denied damages to the quarry for inverse condemnation and held instead that Niles was making an unreasonable use of underground storage space.[156] By linking property rights in underground storage space to groundwater rights, the *Niles* court relied on the broad police powers to protect water resources given to the state by the California constitution.[157] California, by relying on the fact that water has been generally singled out for special treatment,[158] has been able to treat underground water storage rights in a significantly different manner than it might have if it had been faced with the question of underground storage rights for other minerals.

2. *Washington*

The State of Washington has a comprehensive groundwater code which specifically articulates rights in water artificially stored as a result of the operation of surface water systems.[159] Under the code, the Department of Ecology is granted full authority to manage and regulate all groundwaters within the state, including commingled naturally occurring and artificially stored groundwaters. In addition, a section of the code[160] authorizes the Department of Ecology to establish groundwater management areas and subareas for specific surface areas within the state as well as depth zones within such areas and subareas. After establishment of such areas, any person claiming to have an interest in artificially stored groundwaters within an area or zone must file a declaration with the Department of Ecology. In addition, anyone who is withdrawing or has withdrawn artificially stored groundwater must file a statement. The Department of Ecology, in return, must accept or reject any declarations filed. Thus, the Department of Ecology has the

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11. The right of having water flow without diminution or disturbance of any kind;

CAL. CIV. CODE § 801 (West 1954).

155. 37 Cal. App. 3d at 935, 112 Cal. Rptr. at 853. The argument is that *Katz* imposed an obligation on overlying owners to refrain from discharging more than a "reasonable" share of water into the basin. This obligation can be thought of as a public servitude. According to the *Niles* court, pumping and discharge by an overlying owner is "unreasonable" if it redounds to the general detriment of the district's restorative programs.

156. *Id.*

157. *See* note 77 and accompanying text *supra*.

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

159. WASH. REV. CODE ANN. § 90.44 (1961).

160. *Id.* § 90.44.130.

authority to regulate the withdrawal and use of all groundwaters within a specific geographic portion of the state, including public waters of the state, artificially stored groundwaters, or commingled public and artificially induced waters.[161]

Regulations promulgated under Washington's groundwater code establish a permit system for the withdrawal of artificially stored waters that are commingled with public groundwaters.[162] The applications for permits are to be approved if

> (a) [a]rtificially stored waters are available for withdrawal; and
> (b) [t]he public interest will not be detrimentally affected; and
> (c) [r]ights to withdraw public water will not be impaired; and
> (d) [t]he interests of the holder [of an interest in artificially stored water] will not be impaired; and
> (e) [t]he withdrawal and use [conforms to special regulations established] for the specific groundwater area, subarea, or zone. . . .[163]

The regulations further provide that permits so issued shall not be considered water rights within other provisions of the code.[164] Thus, the Washington system recognizes and protects the interests of someone artificially recharging a basin while, at the same time, it permits regulated withdrawals of commingled public waters.

An example of the operation of the Washington statutory scheme can be observed in connection with the Columbia Basin Project.[165] Vast quantities of water were withdrawn from the Columbia River and used for irrigation on more than one million acres of arid lands in east-central Washington. As a result of seepage through the root zone, groundwater tables began to rise.[166] The Bureau of Reclamation contended that waters applied to the northern and northwestern portion of the project would be recaptured by project facilities further south, mainly Potholes Reservoir.[167] As the water tables rose, groundwater

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161. The state of Washington allocates rights to groundwater under a prior appropriation statute.

> This chapter regulating and controlling ground waters of the state of Washington shall be supplemental to chapter 90.03, which regulates the surface waters of the state, and is enacted for the purpose of extending the application of such surface water statutes to the appropriation and beneficial use of ground waters within the state.

Id. § 90.44.020.

162. WASH. AD. CODE ch. 173-136 (undated looseleaf compilation of agency regulations).

163. *Id.* § 173-136-040.

164. *Id.* § 173-136-070.

165. *See In re* Ruling Upon Declaration of Claim of Artificially Stored Groundwaters in the Quincy Ground Water Subarea, No. 74-772 (Wash. Dep't of Ecology 1975) [*hereinafter* cited as Dep't of Ecology Ruling].

166. *Id.* at 4.

167. *Id.* at 7.

pumping from the basin increased.[168] In 1967, the Bureau entered into a temporary agreement with the Department of Water Resources (forerunner to the Department of Ecology) allowing the Bureau to issue temporary licenses for withdrawal of artificially recharged groundwater and assess a charge of three dollars per acre each year.[169] Eventually, the Department of Ecology established groundwater subareas[170] and the Bureau promptly proceeded to file the appropriate declarations of claims to the artificially stored water[171] as required under the adopted regulations.[172] The Department of Ecology eventually ruled favorably on the Bureau's declarations both as to its claims to artificially stored groundwaters and the number of acre feet of water annually withdrawn for use.[173] In accepting nearly all of the Bureau's declarations, the Department of Ecology also issued a complex set of management regulations to implement the acceptance order.[174] The intent of the regulations is to allow the Department of Ecology to issue the maximum number of ten-year groundwater permits consistent with an overriding policy of not depleting the groundwater supply or the quantity required for percolation into Potholes Reservoir for project reuse.[175] In addition, the Department of Ecology retains the right to reduce withdrawals, apparently by giving consideration to the order of appropriation.[176] To complete the management scheme, the Bureau of Reclamation is authorized to issue licenses to permit holders for an annual allotment of 3.5 acre feet per acre at a cost which is variable and calculated to help defray the project's operation and maintenance expenses.[177]

The Washington scheme is an example of the type of regulation possible in a state in which groundwaters are subject to appropriation by permit. The naturally occurring groundwater is public property and the right to capture it is also a public right

168. *Id.* at 4.
169. Memorandum, *Management of Artificially Stored Groundwater—Columbia Basin Project, Washington* (March 11, 1975) (from Comm'r, Bureau of Reclamation, to Ass't Reg. Dir., Boise, Idaho) [hereinafter cited as *Bureau Memo*].
170. Dep't of Ecology Ruling, *supra* note 165, at 5.
171. *Bureau Memo, supra* note 169, at 2.
172. WASH. AD. CODE ch. 173-176 (undated looseleaf compilation of agency regulations).
173. Dep't of Ecology Ruling, *supra* note 165, at 10.
174. WASH. AD. CODE ch. 173-134 (undated looseleaf compilation of agency regulations).
175. *Bureau Memo, supra* note 169, at 3.
176. WASH. AD. CODE § 173-134-070(2) (undated looseleaf compilation of agency regulations).
177. *Bureau Memo, supra* note 169, at 3.

that is allocated to private parties by granting appropriation permits. Consequently, the question of private ownership of the underground storage space is never reached. Furthermore, the statutes in Washington specifically authorize the creation of vertical management zones for groundwater where more than one distinct geologic layer is involved.[178]

III. THE EXCLUSIVE RIGHT TO CAPTURE STORED GROUNDWATER

The right to store artificially introduced water underground is of little importance if overlying owners have a right to capture water solely by virtue of its presence under the surface of their lands. Consequently, in order for investment in artificial recharge of groundwater basins to take place, the parties inducing the recharge must be assured that they will have the exclusive right to capture artificially induced waters. An exclusive right to capture necessarily implies that (1) other parties can be prohibited from capturing the water and (2) the party inducing the recharge shall have a right to recapture the stored water. The precise nature of recapture rights must be determined in light of the differences in particular states' systems of groundwater use.[179] Washington statutes, for example, explicitly recognize an exclusive right to recapture artificially stored groundwater[180] while Arizona case law, in contrast, historically recognized an absolute right in the overlying landowner to capture water located beneath the surface of his land as long as the water was put to beneficial use.[181] In most states, however, the issue is unclear. Furthermore, where prior decisions would indicate a particular result, courts faced with a recharge case might well be able to distinguish prior cases in order to reach a more socially desirable result. The following sections explore the means by which states facing a variety of groundwater laws might find exclusive rights to capture artificially stored waters in the storing party.

A. The Right to Protect

1. The Question of Intent

One might well argue that the question of whether or not others can be prevented from capturing artificially stored

178. WASH. REV. CODE ANN. § 90.44.130 (1961).
179. *See* § II-B of text *supra*.
180. WASH. REV. CODE ANN. ch. 90.44 (1961).
181. *See* Jarvis v. State Land Dep't, 104 Ariz. 527, 456 P.2d 385 (1969), *modified*, 106 Ariz. 506, 479 P.2d 169 (1970) (including a discussion of how Arizona statutes modify the absolute ownership rule).

groundwaters ought to be, at least in part, a question of the intent of the recharging party.[182] Often, however, determining intent will not be difficult. Where water is imported and injected into a groundwater aquifer either by an injection well, spreading operations, or some other means whose sole purpose is to place the imported water in storage, it is obviously the intent of the recharging party that the water is to be recaptured at some later date. The intent, however, is not nearly so clear if, for instance, imported water is sold to farmers for irrigation and one portion is returned to the hydrologic cycle through evaporation or transpiration and another portion seeps through the root zone and enters the underlying water-bearing strata.[183] Finding an intent to recapture is even more difficult where the recharge occurs despite efforts to minimize it by, for example, lining distribution canals.[184] The threshold question of whether the right to prevent others from capturing water in any way depends on the intent of the storing party to recapture it himself[185] is undoubtedly one of first impression in most states,[186] but useful analogies can be found, particularly in the law of surface waters and the law of wild animals.

a. The Law of Surface Waters

In many states it is well settled that an appropriator of surface waters can recapture waste and seepage water *before it leaves his land* and apply it to additional land notwithstanding the fact that junior appropriators have previously relied on such waste waters.[187] Other states that allow recapture limit reuse to the same lands.[188] Once the waters have been aban-

182. *See, e.g.*, City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199, 257-58, 537 P.2d 1250, 1294, 123 Cal. Rptr. 1, 44 (1975).

183. This was, in part, the situation in City of Los Angeles v. City of Glendale, 23 Cal. 2d 68, 142 P.2d 289 (1943), and City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199, 537 P.2d 1250, 123 Cal. Rptr. 1 (1975). *See* notes 130-37 and accompanying text *supra*.

184. Irrigation districts, as an alternative to conjunctive use and management of ground and surface water, may try to minimize the amount of water that seeps into underground storage by lining canals. For a description of such activity by the Central Nebraska Public Power and Irrigation District, see Harnsberger, Oeltjen & Fischer, *Groundwater: From Windmills to Comprehensive Public Management*, 52 NEB. L. REV. 179, 284-92 (1973).

185. A recharging party not intending to recapture recharged groundwater directly might still want exclusive control over the recharged water so that it might license its use by private parties, thereby defraying part of the costs of surface delivery.

186. For two exceptions, see § II-C of text *supra* (California and Washington examples).

187. *See, e.g.*, Cleaver v. Judd, 238 Or. 266, 393 P.2d 193 (1964).

188. *See, e.g.*, Comstock v. Ramsey, 55 Colo. 244, 133 P. 1107 (1913).

doned or lost from the control of the original user, it is likely that they cannot be reclaimed.[189] Once they return to their source, however, they can be used in accordance with the system which allocates rights to the source, usually an appropriation system for streams in the Western states.[190] The situation is somewhat more complex where a user, such as an irrigator or an irrigation project, attempts to recapture return flows after they have entered a watercourse but before they are beyond control of the user. Here, the issue of abandonment,[191] a question of intent, is often controlling.[192] Finally, the return flow from foreign or developed waters[193] is often treated somewhat differently in recognition of the expense incurred in developing or importing the foreign waters. It has been held, for instance, that a city that develops a source of water may (a) reuse, (b) make successive use of, or (c) dispose of imported water after use.[194] After abandonment, the waters are subject to appropriation[195] but they are not subject to rights of owners of riparian lands because such waters do not become a part of the natural waters of the stream.[196]

Although the rules governing use of seepage or return flows are by no means uniform, there does seem to be a definite pattern to the decisions that bears on the right to prevent other parties from capturing stored groundwater. There is a generally recognized right to recapture waste waters or return flows before they are physically beyond the control of the appropriative landholder.[197] Although released waters are generally subject to use by someone, one cannot acquire permanent rights in the released waters since the original user is always free to "use" a

189. *See, e.g.*, Stevens v. Oakdale Irr. Dist., 13 Cal. 2d 343, 90 P.2d 58 (1939); Eddy v. Simpson, 3 Cal. 249 (1853).

190. *See, e.g.*, Las Animas Consol. Canal Co. v. Hinderlider, 100 Colo. 508, 68 P.2d 564 (1937); Jones v. Warmsprings Irr. Dist., 162 Or. 186, 91 P.2d 542 (1939).

191. " 'Abandoned property' . . . is that to which [an] owner has relinquished all right, title, claim, and possession with the intention of not reclaiming it or resuming its ownership, possession, or enjoyment." BLACK'S LAW DICTIONARY 13 (4th ed. rev. 1968).

192. *See* Jones v. Warmsprings Irr. Dist., 162 Or. 186, 91 P.2d 542 (1939).

193. Developed waters are subterranean or underground waters that are "discovered and brought to the surface by the exploitation of man, and which otherwise would run to waste." BLACK'S LAW DICTIONARY 538 (4th ed. rev. 1968). Foreign water is water brought by artificial means into an area from a different watershed. 2 W. HUTCHINS, *supra* note 74, at 585.

194. Denver v. Fulton Irr. Ditch Co., 179 Colo. 47, 506 P.2d 58 (1972).

195. *See* Stevens v. Oakdale Irr. Dist., 13 Cal. 2d 343, 90 P.2d 58 (1939).

196. *See, e.g.*, Crane v. Stevenson, 5 Cal. 2d 387, 54 P.2d 1100 (1936); Elgin v. Weatherstone, 123 Wash. 429, 212 P. 562 (1923).

197. *See, e.g.*, Smithfield West Bench Irr. Co. v. Union Cent. Life Ins. Co., 113 Utah 356, 195 P.2d 249 (1948).

higher proportion of the water he is entitled to. By analogy, then, it would appear that even if there were no way to prevent third parties from pumping stored waters, the third party pumpers would acquire no right to continually receive the groundwater flows. This is of significance mainly where the recharge of an aquifer is inadvertent as where seepage from irrigation canals and subsurface irrigation drainage waters[198] raise the water table, thereby increasing the attractiveness of pump irrigation.[199] Under such circumstances, an irrigation district should be free to reduce seepage by lining canals, reduce subsurface drainage by supporting and sponsoring more efficient application systems, or recapture escaping waters for sale and distribution by installing high capacity wells on district property. While not an ideal solution, the power to institute such actions might prove a powerful inducement to encourage pump irrigators to purchase licenses from the district that would assure them a continuing supply of imported groundwater.[200]

In addition, it is generally recognized that seepage or return flows, even if abandoned by the original user, may not be captured by anyone else until they have returned to their original source. Furthermore, streams may be used to transfer water from one point to another point once the original right to the water is established. Taken together, these two concepts would seem to support a rule that water owned by a particular party could be injected into a groundwater basin either directly[201] or indirectly[202] and that overlying landowners could be prohibited from intercepting such waters provided that the original user had the right and the intent to recapture the injected water at some point to which the waters would flow. Conceptually, it would seem to make little difference whether the flow from point *A* to *B* occurred in the form of underground percola-

198. Subsurface irrigation drainage waters are waters that seep beneath the root zone and into the underlying aquifer during application.

199. Several factors combine to increase the attractiveness of pump irrigation. As the water table rises, concern over the eventual exhaustion of a groundwater aquifer lessens. In addition, rising water tables decrease the amount of "lift" required to get groundwater to the surface, thereby decreasing the cost of pump irrigation.

200. The difficulty, of course, is that groundwater in this situation is a common good. Without additional rights to the stored water, a district could not exclude a single landowner from access to the water. Consequently, it is to the advantage of an individual landowner to "hold out," hoping that enough of his neighbors will purchase licenses from the district to insure a continuing supply of groundwater without his having to purchase a license. *See generally* Hardin, *The Tragedy of the Commons*, 162 SCI. 1243 (1968).

201. Injection wells and spreading operations are examples of direct recharge.

202. Seepage and subsurface irrigation drainage are examples of indirect recharge.

tion,[203] underground stream flow,[204] surface watercourse, or some combination thereof. The latter was the situation in *City of Los Angeles v. City of Glendale*.[205] In *Glendale*, the court upheld the right of the City of Los Angeles to use a groundwater basin to transport imported water into the Los Angeles River from which it recaptured and distributed the water to Los Angeles customers. It would appear, however, that an intent to recapture and reuse the water must exist at the time of the original distribution.[206]

Finally, where the waters involved are developed or imported at great expense, there is a greater tendency to allow the developer to recapture and reuse water by virtue of the general equity principle that one who invests time and effort in a project is entitled to receive the fruits of his labor.[207] Furthermore, those whose rights depend upon the natural water available in a stream, that is, riparians, have no right to the return flow of imported waters even if abandoned unless they can show that the imported waters would have been naturally occurring waters absent the diversion. While abandoned imported waters are available to surface appropriators, they are available only to the extent they have been abandoned. By analogy, to the extent rights to groundwater can be characterized as rights to capture naturally occurring groundwater, pumpers can be restricted from free access to stored *imported* groundwater. In the event that excess water becomes available for use, it can be allocated by permit or license.[208] To the extent that an overlying landowner's rights under state law are usufructuary[209] and thereby analogous to those of a surface riparian, overlying landowners would have no right to imported groundwater, even if it were deemed abandoned by the importer. Thus, an intent by the importer to recapture the water or to reuse it would be immaterial.

203. Percolating waters are "[t]hose which pass through the ground beneath the surface of the earth without any definite channel, and do not form a part of the body or flow, surface or subterranean, of any watercourse." BLACK'S LAW DICTIONARY 1761 (4th ed. rev. 1968).

204. Underground streams are those which flow in known and defined or ascertainable channels. *See* A SUMMARY—DIGEST OF STATE WATER LAWS, *supra* note 87, § 4.2, at 50-52.

205. 23 Cal. 2d 68, 142 P.2d 289 (1943).

206. *But see* City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199, 257-60, 537 P.2d 1250, 1292-94, 123 Cal. Rptr. 1, 43-45 (1975).

207. *See* Santa Cruz Reservoir Co. v. Rameriz, 16 Ariz. 64, 141 P. 120 (1914).

208. *See* notes 174-77 and accompanying text *supra*.

209. This implies that an overlying landowner has no property right in the water *per se*, merely a right to capture and use it. All overlying rights are variations on a right of capture and hence, to a degree, usufructuary. *See generally* § II-B of text *supra*.

Certainly the state has an interest in insuring that groundwater, even if imported, is not wasted by non-use if a demand for it exists, but the surface water analogy is justification for treating the allocation of imported groundwater differently than the allocation of naturally occurring groundwater. To the extent an importer expresses an intent to store water underground, it has not abandoned the water even though it does not intend to immediately recapture it. As long as the storage is a reasonable use of water as, for instance, storage to moderate variability in the hydrologic cycle, it should be permitted. Furthermore, one who imports water and stores it intending to sell it to overlying landowners has not abandoned it and should be permitted to effectuate the sale, perhaps with appropriate safeguards to insure the reasonableness of the price.[210] Only if the importer truly gives up all claim to the imported water should it be deemed abandoned, in which case it would be available for allocation by the state under any scheme it might choose to adopt. Until abandonment, withdrawals could be limited to the state or to someone with a license from the state. Of course, the above analogies may not be appropriate for all states because of widely varying systems of surface and groundwater allocation schemes in existence. Nevertheless, it need not be a foregone conclusion that imported groundwater need necessarily be subject to the same rules of property that govern naturally occurring groundwater.

b. The Law of Wild Animals

In establishing a right to exclude others from capturing imported surface water, a useful analogy can also be drawn to the law of wild animals. In general, wild animals are subject to private ownership only to the extent the state chooses to make them so.[211] Insofar as the state makes them subject to private ownership, they become private property only after they are deprived of their natural liberty and come under the possession, custody, or control of man.[212] Possession of wild animals, however, is not enough to confer private ownership; to divest the

210. Price regulation might be required because of the potential for one importer to monopolize the supply of imported water. An effective storage monopoly requires that the monopolist have priority in the use of a finite storage space. Since storage rights arguably belong to overlying owners it would be particularly unjust to permit a storage monopoly to develop without providing safeguards against exploitation.

211. *See, e.g.*, Commonwealth v. Worth, 304 Mass. 313, 23 N.E.2d 891 (1939); People v. Zimberg, 321 Mich. 655, 33 N.W.2d 104 (1948).

212. *See, e.g.*, Barrow v. Holland, 125 So. 2d 749 (Fla. 1960); Graves v. Dunlap, 87 Wash. 648, 152 P. 532 (1915).

state of title the act of possession must be in compliance with state law. While the owner of land is not the owner of wild animals found thereon, he generally has the exclusive right to capture them and reduce them to possession subject to the regulatory authority of the state.[213] Thus, a landowner generally has a qualified interest in animals found on his land. Absent a license, however, there is no right to search for or claim wild animals on the land of another.[214] A landowner with a qualified interest in animals found on his own land may, of course, grant another his right to search for wild animals.

Any property right acquired in wild animals can be lost if the animal escapes and returns to its natural state.[215] In such circumstances, the animal is free to be captured by someone else who would then acquire defeasible title to it. If, however, the animal can be identified and is pursued by the original owner or if the animal does not return to its natural state, the original possessor retains his property rights in the animal,[216] even if the animal escapes to another's property where the original owner cannot pursue it without being a trespasser.[217]

The parallels between the law of wild animals and the law of groundwater are indeed striking, especially where groundwater law is based on one of the overlying rights theories. In such instances, property rights to groundwater are of a qualified nature and are vested in the overlying landowner. Ownership of water, to the extent it is recognized at all, is not recognized until the water is reduced to possession. In addition, a landowner has no right to pursue water found on the land of another. Furthermore, once water reverts to its natural state and is removed from the property of the overlying owner, it generally cannot be recaptured.[218]

Imported groundwater, however, has two critical attributes that distinguish it from naturally occurring groundwater. First, the right to ownership of imported groundwater is likely more absolute than usufructuary and, second, the natural state for imported water is in the basin of its origin and not in the basin where it may be artificially stored. Thus, by analogy to the law of wild animals, property rights in artificially stored water need not be lost solely because it escapes from under the land of the storer to the land of others.[219] Perhaps more importantly, if the

213. *See* Seaboard Air Line R.R. v. Richmond-Petersburg Turnpike Auth., 202 Va. 1029, 121 S.E.2d 499 (1961).
214. *See, e.g.*, State v. Repp, 104 Ia. 305, 73 N.W. 829 (1898).
215. *See, e.g.*, Graves v. Dunlap, 87 Wash. 648, 152 P. 532 (1915).
216. *See, e.g.*, Kesler v. Jones, 50 Idaho 405, 296 P. 773 (1931).
217. *See* Goff v. Kilts, 15 Wend. 550 (N.Y. 1836).
218. *But see* notes 133-35 and accompanying text *supra*.
219. Since the imported water has not returned to its natural state, the importer

analogy were consistently followed, other landowners would have no right to capture the stored water since it never reverted to its free and natural state. It is possible to identify the imported water by the amount which natural recharge is augmented.[220] Thus, the escape is temporary and the escaped substance can be identified as the property of the importer because of its location in other than its natural state or location.[221]

Finally, again by analogy, the right to exclude other landowners from possession of the importer's stored water should not be defeated by the fact that the importer would have no right to pursue the water onto the property of other landowners without committing a trespass.[222] Intent is important only in the negative sense of whether there was an intent to abandon all interests in the water when it was introduced into the storage basin. Absent such an intent, property rights in the stored water should remain in the storing party. If the water is abandoned, the state should retain the right to reallocate the abandoned property which it could exercise by a special allocation or by allowing the abandoned property to be captured in the same manner as naturally occurring groundwater.

In any event, the wild animal analogy provides another justification for treating imported water differently from naturally occurring water. Of course, as with surface water analogies, the appropriateness of the wild animal analogy depends in large measure on the precise system of groundwater rights recognized in a particular state, but it seems especially appropriate where ownership of the groundwater in place is recognized as public with a qualified private right of capture.

2. The Question of Vested Property Rights

A significant obstacle to preventing others from capturing water artificially stored under their land might exist in the form of vested property rights in withdrawing a certain quantity of water per year. This can be a particularly imposing problem in

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retains a property interest in it. The problem is really one of identification. To the extent that escaped wild animals have not returned to their natural state, *e.g.*, an elephant escaping from the circus, identifying them as personal property is not difficult. Similarly, imported water which escapes can be identified by the augmentation of natural supplies of water.

220. *See* City of Los Angeles v. City of San Fernando, 14 Cal. 3d 262, 537 P.2d 1250, 123 Cal. Rptr. 1, 47 (1975).

221. For a similar argument analogizing oil and gas to wild animals, see White v. New York State Gas Corp., 190 F. Supp. 342, 348 (W.D. Pa. 1960).

222. A landowner, for instance, would have no right to locate a well on his neighbor's land to recapture water that escaped from his own land in the form of subsurface irrigation drainage.

an appropriation jurisdiction in which there is usually no provision for ratably restricting all appropriators. As long as there is enough natural recharge to satisfy all existing appropriations there would presumably be no problem, since the appropriations could be satisfied without depleting the stock of artificially stored waters. However, to the extent that prior appropriations exceed natural supply, some of the artificially stored water would arguably be available for capture by appropriators under the terms of their grant. Whether the appropriation right can be limited to specific naturally occurring waters or whether it is an absolute right to pump up to the amount of the appropriation irrespective of the source of the groundwater depends on the precise nature of the state right.

A similar problem would be presented in the American rule states[223] whenever there was insufficient natural recharge to satisfy all of the reasonable needs of overlying landowners. Again, the seriousness of the problem depends upon the precise nature of the right of capture. If it is a public right, it need not be expanded to include a right to capture artificially stored waters.[224] If it is a private right, however, restricting the right to capture naturally occurring waters might arguably constitute a partial taking of the right. On the other hand, restricting the right of capture to naturally occurring waters would appear to be permissible police power regulation. It is, of course, possible to argue that the use of artificially stored waters is not a reasonable use of water as required by the doctrine. Historically, however, reasonableness goes not to the source of the water but to the use of water after it is captured.[225]

The English rule states would have the most difficulty in restricting third parties from pumping artificially stored water. Presumably, overlying landowners in such states would acquire a qualified property right in all water stored beneath their land subject only to its capture. In contrast, the problem is least severe in correlative rights states in which there is no vested right of capture independent of the rights of others, at least once it is established that the supply of naturally occurring water is insufficient for the reasonable needs of overlying owners.[226] In

223. *See* note 85 and accompanying text *supra*.
224. *Cf.* notes 69-71 and accompanying text *supra* (general public has right to capture wild animals; only surface owners have right to oil and gas).
225. *See generally* Hanks & Hanks, *supra* note 105, at 633-37, 639-48.
226. On the other hand, to the extent that supplies of groundwater are sufficient to meet the reasonable needs of all overlying owners, rights to groundwater under a correlative rights theory are nearly indistinguishable from rights to groundwater under an American rule theory, at least from the vantage point of the overlying owners.

any event, irrespective of the water rights theory adopted by a particular state, absent settled law to the effect that an overlying landowner has the right to capture all waters found beneath his land, *including those introduced by others*, it should not be assumed that rights to artificially induced groundwater cannot be vested differently from rights to naturally occurring groundwater. Furthermore, the fact that an overlying landowner may have a limited right to capture and assert ownership over a portion of the artificially stored water may not be a serious problem if recharge is adequate to meet all needs and costs of recharge are in part assessed to overlying landowners, or more appropriately, to the users.[227]

B. The Right to Recapture

The second element of an *exclusive* right to capture groundwater artificially introduced into a basin is a right to recapture. If there exists a right to store water underground, and a right to protect the water in storage from capture by others, by implication there must exist a right to recapture the water stored if it can be reasonably identified; otherwise stored water could not be used by anyone. Identifying the water stored is the major difficulty in effectuating a right to recapture. When imported water is used to recharge a groundwater basin the water so introduced becomes commingled with water already in storage and with naturally occurring recharge. As a practical matter, it is impossible to physically trace the corpus of the recaptured water to the stored water. Consequently, a tracing requirement would effectively prevent utilization of a state's underground storage capacity. If, however, the water imported is of the same average quality or better quality than the water in storage, it is reasonable to treat all sources of groundwater as fungible. Any augmentation of existing supplies should then be attributed to stored waters and, therefore, be available for recapture. This, of course, requires a fairly sophisticated system of hydrologic monitoring. Such monitoring, however, is within the reach of current technology and was, in fact, contemplated by the California Supreme Court in *Los Angeles v. San Fernando*[228] and by the groundwater code of the State of Washington.[229]

It has long been recognized in some states that "proprietary"

227. Ignoring second best problems, resources are allocated optimally only when the beneficiaries of a particular activity pay all of the costs of that activity.

228. 14 Cal. 3d 199, 260, 537 P.2d 1250, 1295, 123 Cal. Rptr. 1, 46 (1975).

229. WASH. AD. CODE ch. 173-136 (undated looseleaf compilation of agency regulations).

waters can be commingled with stream waters in order to move the proprietary waters from point *A* to point *B*.[230] At point *B* the proprietary waters can be recaptured from the stream after due allowance for losses due to evaporation and seepage. The point of measurement is important. The water recapturable when a stream bed is used for conveyance is not the amount initially added to the stream, but rather the amount of the additional water that is still present in the stream when it gets to point *B*. The risk of water loss during conveyance is properly borne by the party transporting the water. Similarly, the risk of artificially storing water underground should be borne by the party storing the water. This is accomplished by limiting the right to recapture to a quantity of water equal to the net addition to the groundwater supply rather than the amount actually injected underground.[231] Such an accounting procedure also allows credit for indirect recharge such as return flows from subsurface drainage which occur when imported water is used for irrigation.[232]

A second requirement of a right to recapture stored groundwater is access to the groundwater basin at the point of recapture. Access can be in the form of access to stream waters fed by the recharged groundwater aquifer,[233] access to reservoir waters fed by artificially introduced water,[234] or access to overlying land on which pumps can be installed.[235] When a public agency stores water underground, access is probably no problem since the power of eminent domain will undoubtedly be available to secure the needed access. If access is not available and cannot be acquired by purchase or through eminent domain proceedings, one might well argue that the stored water had been abandoned or lost through non-use[236] since in terms of direct recapture potential it would be completely beyond the

230. *See* notes 134-36 and accompanying text *supra*.
231. *See* City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199, 262, 537 P.2d 1250, 1296, 123 Cal. Rptr. 1, 47 (1975).
232. *See* Gleason, *supra* note 35, at 645.
233. *See* City of Los Angeles v. City of Glendale, 23 Cal. 2d 68, 71-72, 142 P.2d 289, 292 (1943).
234. *See* notes 165-77 and accompanying text *supra* (Potholes Reservoir in Washington entitled to seepage flows of imported waters).
235. Access in the form of overlying land may, however, be limited by the extent to which stored water can be pumped without interfering with the pumping operations of other overlying owners. Well interference might thus place a practical limit on the amount of stored water that can be recaptured by pumping from any given location.
236. Groundwater rights are generally acquired through use and hence can be lost through non-use. *See generally* Clark, *Loss of Ground-Water Rights*, in 5 WATERS AND WATER RIGHTS § 444 (R. Clark ed. 1967). To the extent that stored water is treated similarly, rights to it could also be lost by nonuse.

control of the storing party. Insofar as the importer manifests an intent to sell the water to overlying landowners by way of some licensing mechanism, and assuming that the potential to sell the water legally exists,[237] the water should not be deemed abandoned merely because there is no right to access and no intention of recapturing the stored water directly. Licensing arrangements, however, raise complex questions as to the proportion of water pumped that should be attributable to stored water versus the proportion attributable to naturally occurring water.

San Fernando indicates that the right to recapture may be partially conditioned on status as a public agency, particularly where priority of recapture is in issue.[238] Actually, priority as to right of recapture should rarely be an issue.[239] The real issue is allocating the recapture right among importers in proportion to the amount of water they add to storage. If substantially all of the safe yield of a basin is attributable to stored imported water then obviously the importers would have priority of capture over landholders with overlying rights. But there seems to be no reason for treating private importers less favorably than public importers. Each importer should have the right to proportionally recapture the water that it places in storage.

Priority as to the right of recapture, however, should be distinguished from priority among potential purchasers of the imported water. Although the market system is probably the most efficient method of allocating artificially stored groundwaters among potential purchasers, the state may have some interest in fostering a non-market allocation of imported water.[240] To the extent that it wishes to do so, it can follow the example of Washington and require a state permit to sink a well, and a license from the importer to commence pumping.[241] This permits a state to exercise final control over the distribution of

237. Given the fact that artificially stored groundwater would be commingled with naturally occurring groundwater and that existing groundwater rights generally do not contemplate artificial storage, it is likely that an importer would need statutory authority to sell imported water to which he does not have direct access.

238. 14 Cal. 3d 199, 286-87, 537 P.2d 1250, 1313-14, 123 Cal. Rptr. 1, 64-65 (1975).

239. Priority of recapture would likely be an issue only during excessively dry periods when short run serious declines in the amount of water naturally available in the aquifer might limit the withdrawal of artificially stored waters to less than the amount stored.

240. The state may, for instance, want to provide a minimum amount of water for every domestic user at a low price.

241. *See* notes 174-77 and accompanying text *supra*.

all waters in a state, including imported stored water not recaptured by the importers.[242] Although the details of a right to recapture can be tailored to fit the needs of a particular state, the basic right itself seems to follow naturally once a right to store water underground and a right to protect the stored waters from recapture by others is established. The critical factor enabling the system to work is the availability of hydrologic data that is sufficiently sophisticated to permit accurate estimation of the increment in groundwater supply that is attributable to artificial storage at any particular point of extraction.

IV. PRIORITY IN STORAGE RIGHTS

Closely related to the right to store water underground and the exclusive right to recapture it is the question of who is to be given priority in storage rights where storage space limitations preclude accommodating all potential storers to the extent they desire. Although multiple parties stored water in *San Fernando*, the court did not reach the question of priority of storage rights because there was no shortage of underground storage space at that time.[243] However, several alternative ways of coping with potential conflicts can be envisioned.

One alternative would be that storage rights could be allocated on the basis of prior appropriation with the first in time being first in right. Of course, to the extent that demand for storage space exceeds supply, a valuable property right is created in the early appropriators. If that right is transferable, prior appropriators would be the beneficiaries of windfall gains.[244] If the rights were non-transferable there would likely be a misallocation of storage space since there would be no guarantee that the holder of an early storage right would necessarily make the most efficient economic use of such a right.[245] Furthermore, to the extent that the storage space becomes a valuable commodity because of shortages, many of the arguments against recognition of private underground storage rights vested in overlying landowners are no longer valid. If allocation of rights to underground storage will result in wind-

242. This raises the possibility of significant state-federal conflicts where, as in the Potholes Reservoir in Washington, the federal government is the importer.

243. 14 Cal. 3d 199, 264, 537 P.2d 1250, 1297, 123 Cal. Rptr. 1, 48 (1975).

244. The appropriators would benefit from windfall gains only to the extent that they could sell their storage right for more than they had invested in it.

245. If a market system is working efficiently resources are automatically transferred to their most economic use since the higher value user can always bid the resources away from a lower value user.

fall gains there seems little reason to favor importers of foreign water over overlying landowners, or early importers over late importers.[246]

A second possibility in allocating storage rights would be to freely permit anyone to store water in a basin, but when the aggregate of water to be stored exceeds the amount of storage space, the rights of the storers would be correlated with each storer's proportion of the total space based on historical use.[247] To the extent that no legal action to protect storage rights was taken by existing holders of the storage rights, the statute of limitations would begin to run so that eventually rights would vest by mutual prescription.[248] There is, however, no reason to suspect that forced proportional reductions in storage by all users would in any manner approach an optimal distribution of the storage space among competing users. In fact, quite the opposite is likely to be the case if the rights acquired are non-transferable.[249] Finally, to the extent that rights are established by mutual prescription, a priority for public storage projects might be inadvertently created where state statutes provide that adverse rights can never mature against the public.[250]

A third possibility, where rights to storage space are public, is that the state could, by permit, allocate rights to use storage space for varying durations depending on the nature of the use and the necessity of a long-term investment commitment. Such permits need not be renewable as a matter of right, and storers, therefore, could be granted a license to store water only for a particular purpose and for a fixed period of time; they would

246. Windfall gains result in a redistribution of wealth. Although there may be important reasons for undertaking such a redistribution between appropriately defined classes, the classes indicated above are not likely to be the appropriate ones. There is no apparent reason for redistributing wealth from late importers to early importers or from overlying land owners to importers.

247. *Cf.* note 139 and accompanying text *supra* (discussion of mutual prescription in the *Pasadena* case).

248. In contrast to *Pasadena*, here the overdraft is in storage space as opposed to water stored. In either case the overdraft triggers the statute of limitations for prescriptive rights.

249. As long as one potential storer gains more benefit from a marginal unit of storage space than another potential storer, the first party should be able to purchase the storage right from the second party if the goal is to maximize beneficial use of underground storage space.

250. Such would apparently be the result in California following the *San Fernando* decision which held that mutual prescription of public water rights was barred by CAL. CIV. CODE § 1007 (West Supp. 1977) (quoted in note 141 *supra*). City of Los Angeles v. City of San Fernando, 14 Cal. 3d 199, 264-86, 537 P.2d 1250, 1297-1313, 123 Cal. Rptr. 1, 48-64 (1975).

not gain permanent property rights to the storage capacity of a basin. The cost of a permit would likely increase over time as storage space became more scarce. At renewal time, the storage right could be shifted to a higher value use if one existed. Allocating scarce storage space by willingness to pay would likely foster an economically optimum allocation of storage resources. The use of a permit system would, however, allow the state to depart from the ability to pay criterion if it appeared in the best interests of the state to do so.[251] Windfall gains incident to the plan would inure to the benefit of the public rather than to the benefit of private parties. And, finally, no valuable use of storage space would ever be precluded solely because it did not become a profitable use of storage until after storage space was fully allocated.[252]

Aside from administrative difficulties, several difficult questions face a state involved in allocating scarce groundwater storage resources. For example, should any priority be given to public as opposed to private replenishment projects? Economic theory would suggest not, assuming that rights to the storage space were freely transferable.[253] Nevertheless, to the extent that the public needed storage and could afford to pay a fair price for it, it would undoubtedly have the ability to condemn the needed space if it were held by a private party.[254] The ability to condemn is singularly valuable since it keeps isolated holdouts from extracting exorbitant prices and thereby realizing huge windfall gains. If the public could dominate the use of storage, however, it seems equally likely that it could force private parties to pay exorbitant sums for storage rights. Private parties, of course, would have no recourse to condemnation powers[255] to secure a fair price. Thus, the third system described

251. Municipalities, for instance, could be given priority for underground storage of water to meet the domestic needs of their inhabitants, or some minimal level of such needs.

252. Such would be the case if storage rights were allocated by prior appropriation and the rights were not freely transferable.

253. As long as storage space is freely transferable and suitable protections against holdouts exist, storage space will be optimally allocated by the market between public and private users.

254. For an exhaustive discussion of the power of eminent domain in water law, see Harnsberger, *Eminent Domain and Water Law*, 48 NEB. L. REV. 325 (1969).

255. If overlying property owners have private rights in underground water storage space as they do in oil and gas law for gas storage space, the power to condemn would undoubtedly be essential to secure such storage rights for potential importers of water. Conceivably, private parties could be given condemnation powers as is common for oil and gas storage. *See* note 66 and accompanying text *supra*.

above is also valuable because it prevents any party, public or private, from securing long-term property rights in storage space and thereby obtaining a monopoly which would permit exploitation of potential private purchasers.

Finally, a major question in the allocation of storage space is how storage space can be claimed for future needs. The problem has at least two aspects. First, it is difficult to determine precisely how much space will be available in a future period or conversely, how much artificial recharge can be permitted while maintaining a certain amount of space for future use. Underground storage capacity is not instantly used up. The physical process of recharging an aquifer or reaching capacity may take many years.[256] Accurate hydrologic models are a necessity if the long-run effects of projected storage plans are to be accurately predicted. The second aspect of the problem is the determination of whether rights to store water underground depend on use or whether they are rights defined in terms of a specific section of the storage space. The problem is most serious where the rights allocated are permanent property rights rather than short-term licenses. If the rights are defined by priority of use, a race to occupy the storage space may be instituted with the aquifer recharged at a faster than optimal rate. If the rights are to space, then desired space may remain unused until some future date when the holder of the right finally needs all of his allocated space. Of course, a variety of schemes could be hypothesized which would help alleviate the problem, including a right given the holder of the storage right to temporarily sublet unneeded space. Again, however, the optimum solution seems to be suggested by the third method of allocating storage rights because of its potential to maximize present and future use without creating private holdout problems or private windfall gains. In any event, the problem of allocating scarce storage space among competing users will probably not be faced in most jurisdictions for many years.[257]

256. The factors which affect the rate at which an aquifer can be recharged are many and complex but include the method of recharge, fluid properties such as velocity, pressure, temperature, density, and viscosity which may vary with time and space, and geologic considerations. *See generally* J. GILLESPIE, G. HARGADINE & M. STOUGH, ARTIFICIAL RECHARGE EXPERIMENTS (Bull. No. 20, Kan. Water Resources Bd. 1977). Just as it generally takes many years to exhaust an aquifer, however, it will likely take a considerable amount of time to recharge one.

257. While the supply of storage space will probably exceed the demand in most areas for the reasonably foreseeable future, questions concerning the allocation of storage rights are not wholly academic. To the extent storage rights vest during periods of abundant storage space they may prevent efficient allocation during periods of relative scarcity if the rights structure is not initially designed to handle problems of scarcity.

V. LIABILITY FOR DAMAGE CAUSED BY STORAGE

Anyone storing water underground is potentially liable for any damage that might be caused by the stored water. Although potential injury could take many forms, such as deteriorated water quality or reduced drainage capacity, it will most likely be in the form of water ponding or marshing at the surface or seeping into and interfering with mining operations. Although not strictly analogous since water placed underground is not escaping, liability for storage injuries is very similar to liability for escaping waters. Such liability can rest on trespass, negligence, strict liability, or nuisance.[258]

A. Liability Based on Trespass

At common law a surface owner's rights extended to the depths and to the heavens and any intrusion onto, under, or over the surface of his property was deemed a trespass.[259] The common law rule, however, was forced to give way to the realities of modern life following the invention of the airplane. While the airspace directly above the surface remains nearly as inviolable as the surface itself,[260] it is clear that there is no general liability for overflight absent unreasonable interference with the surface,[261] although a number of theories have been promulgated to reach this result.[262] The flight cases, it would seem, are persuasive analogies for abandoning the "to the depths" portion of the common law maxim as well.[263]

In fact, some erosion of the "to the depths" portion of the maxim has already taken place. While it is clear that a trespass can occur when an underground intrusion takes place,[264] liability for trespass has, at times, been limited to intrusions within a space in which the overlying owner can make reasonable use of the subsurface on the theory that a landowner's title does not extend beyond a depth which the owner can reasonably use.[265] There is, however, considerable conceptual difficulty in limiting the vertical extent of title to land to a depth which the owner can

258. *See* C. CLARK, SURVEY OF OREGON'S WATER LAWS 66-92 (Oregon State U. Water Resources Res. Inst. 18, March, 1974).
259. *See* W. PROSSER, LAW OF TORTS 69-73 (4th ed. 1971).
260. *See, e.g.*, Hall v. Browning, 195 Ga. 423, 24 S.E.2d 392 (1943).
261. *See, e.g.*, Atkinson v. Bernard, Inc., 223 Or. 624, 355 P.2d 229 (1960).
262. *See, e.g.*, Harvey, *Landowners' Rights in the Air Age: The Airport Dilemma*, 56 MICH. L. REV. 1313 (1958).
263. C. CORKER, *supra* note 44, at 183-85.
264. *See, e.g.*, North Jellico Coal Co. v. Helton, 187 Ky. 394, 219 S.W. 185 (1920).
265. *See* Boehringer v. Montalto, 142 Misc. 560, 254 N.Y.S. 276 (1931). *But see* Edwards v. Lee, 230 Ky. 375, 19 S.W.2d 992 (1929).

reasonably use. Since the depth that an owner could reasonably use might change over time in response to new technologies or newly discovered mineral deposits, the extent of title would be an ever changing variable. While there should arguably be no more liability in trespass for an intrusion below the zone of actual or potential use than for an overflight at 40,000 feet, the best solution is not to limit the vertical extent of title but rather to limit the applicability of trespass to surface invasions. While there may be some justification for protecting the surface or near surface by common law trespass to land, there seems to be no justification for penalizing technical intrusions that do not constitute an unreasonable interference with an owner's use of his property.[266] Except in the case of surface outcroppings of water or other actual damage to the surface or near surface,[267] trespass should not be available for imposing liability on one artificially increasing groundwater supplies. Such a limitation on trespass actions would, of course, mean that even actual interference with the subsurface[268] would not support an action in trespass. Nuisance principles, however, would protect an overlying landowner whenever an actual interference constituted an unreasonable interference with the overlying owner's use and enjoyment of his property. Such a rule, while admittedly a departure from historical treatment of subsurface invasions,[269] would, nevertheless, comport with recent treatments of above surface invasions in the flight cases[270] while confining trespass to the physical areas most deserving of absolute protection.

B. Liability Based on Negligence

It is quite clear that to the extent an importer of water is

266. In fact, it seems useful to view trespass as an historical anomaly. In a modern society in which it is necessary to accomodate a variety of potentially conflicting uses of property, the nuisance standard of predicating liability on an unreasonable interference with another's use and enjoyment of his property seems preferable to the more absolute trespass standard of liability predicated upon any physical intrusion. While perhaps any intrusion at the surface or near surface would constitute an unreasonable interference and thereby justify imposing liability on trespass principles, such is not obviously the case for above surface or below surface invasions.

267. Near surface would include protection of areas necessary for lateral or subjacent support.

268. Actual interference would include such things as loss of oil and gas storage potential, interference with existing or potential mining operations, etc.

269. *See, e.g.*, Alphonzo E. Bell Corp. v. Bell View Oil Syn., 24 Cal. App. 2d 587, 76 P.2d 167 (1938) (slant-drilling of an oil well constituted a trespass).

270. Atkinson v. Bernard, Inc., 223 Or. 624, 355 P.2d 229 (1960). For a collection of flight cases in a taking context, see Annot., 77 A.L.R.2d 1355 (1961).

negligent in recharging an aquifer, he will be liable for damage that occurs as the proximate result of his negligence. Recovery for negligence has been allowed in a variety of analogous situations. Liability has been imposed where leakage from reservoirs has injured the property of others[271] and where groundwater has been unlawfully diverted.[272] Similarly, irrigation districts have been held liable for damage to lands caused by seepage from irrigation canals,[273] and for failure to line canals where the soil was naturally incapable of retaining water.[274] Furthermore, the fact that a canal is present pursuant to a right of way has been held not to bar recovery by a landowner injured by seepage.[275] Thus, it would seem clear that an importer of water should be liable in negligence if he negligently introduces water into storage and thereby injures the property of an overlying landowner.[276]

C. Liability Based on Strict Liability

The doctrine of strict liability for damage caused by abnormally dangerous activities was developed in *Rylands v. Fletcher*.[277] In *Rylands*, water seeped from a reservoir into a mine, seriously impairing its operation. The court in *Rylands* announced a rule that when one contains something unnaturally upon his property, he is strictly liable for any subsequent injury that occurs if that object or substance escapes.[278] Aside from the fact that *Rylands* has not been uniformly accepted in American jurisdictions,[279] the doctrine there announced would seem to have little application to the artificial storage of water underground except, perhaps, during the actual injection process. First, parties storing water underground make no attempt to

271. Kelly v. Town of Winthrop, 219 Mass. 471, 107 N.E. 414 (1914).
272. Stone v. Providence Gas & Water Co., 13 Pa. D. & C. 557 (1904).
273. *See, e.g.*, Salt River Valley Water User's Ass'n v. Stewart, 44 Ariz. 119, 34 P.2d 400 (1934); McKain v. Platte Valley Pub. Power & Irr. Dist., 151 Neb. 497, 37 N.W.2d 923 (1949).
274. Kaylor v. Recla, 160 Or. 254, 84 P.2d 495 (1938).
275. *See, e.g.*, Smith v. Rock Creek Water Corp., 93 Cal. App. 2d 49, 208 P.2d 705 (1949). *But see* Sutro Heights Land Co. v. Merced Irr. Dist., 211 Cal. 670, 296 P. 1088 (1931).
276. It would, for instance, appear to be actionable negligence for an importer to fail to consider the effect of aquifer recharge on lands of overlying owners if the effect of the recharge was to raise the water table to a level that caused flooding of lowlands on the property of overlying owners. Of course, to the extent recovery was permitted in trespass for the intentional invasion of stored waters, negligence theories of liability would be unnecessary.
277. L.R. 3 E. & I. App. 330 (1868).
278. *Id.* at 339-40.
279. *See, e.g.*, Turner v. Big Lake Oil Co., 128 Tex. 155, 96 S.W.2d 221 (1936).

confine it to the vertical boundaries of their property and, consequently, there is no "escape." Second, even if intentional seepage were deemed an escape, underground storage, in contrast to surface storage, does not seem to be an abnormally dangerous or unnatural activity.[280] Consequently, strict liability should rarely be available to impose liability on importers of groundwater.

D. Liability Based on Nuisance

Assuming that any remedy is limited to damages, nuisance appears to be the best theory for imposing liability on importers of groundwater for injury to the property interests of overlying landowners. Nuisance has the attractiveness of not depending on the sanctity of title and possession nearly as much as on the existence of actual conflicts in the use and enjoyment of property. Furthermore, nuisance can be grounded in intent, negligence, or strict liability.[281] Nuisance recognizes that property rights are not absolute but that reasonable and conflicting uses of land must be accommodated as much as possible.[282] The requirement of actual conflict and the emphasis on accommodation of conflicting rights in accordance with a reasonable use standard should help promote economically optimal use of underground storage space.[283]

Nuisance principles have been applied to conventional water conflicts in the past[284] and it seems likely that they could profitably be applied to groundwater storage conflicts in the future. The major difficulty with nuisance is its unpredictability.[285]

280. Strict liability is generally reserved for situations in which an activity, irrespective of its inherent danger, is abnormally dangerous in relation to its surroundings. *See* RESTATEMENT (SECOND) OF TORTS § 520, n.3, at 57-58 (Tent. Draft No. 10, 1964).

281. RESTATEMENT (SECOND) TORTS § 822, Comment a, at 23 (Tent. Draft No. 17, 1971).

282. Thus it is only unreasonable interference that is the subject of nuisance with unreasonableness generally determined by balancing the utility of an actor's conduct against the gravity of its harm. *See generally* RESTATEMENT OF TORTS § 822, Comment j (1939).

283. There is a remarkable similarity between the nuisance test of unreasonableness, *see* RESTATEMENT (SECOND) TORTS, *supra* note 281, § 822, Comment a, at 23; and the general economic efficiency criterion which posits that the beneficiaries of an activity should bear its costs. Where rights are in irreconcilable conflict, nuisance favors those whose social utility is greatest.

284. *See, e.g.*, Barstow Town Co. v. Carr, 234 S.W. 555 (Tex. Civ. App. 1921).

285. Because of the balancing process, it is difficult to determine in advance whether a particular activity will constitute a nuisance. In contrast, it is generally quite easy to determine whether a particular activity constitutes an intentional invasion, the test if liability is based on trespass.

This lack of predictability is offset, however, by the great potential that nuisance has for balancing competing property interests. Probably the major advantage of relying on nuisance principles for resolving conflicts involving underground water storage rights is that in the vast majority of instances there would be no recognized conflict, and imported water could be confidently stored under the land of overlying owners without excessive risk of civil liability or loss of an importer's property interest in the stored water.[286]

E. The State of Nature Concept

In *Niles Sand & Gravel v. Alameda County Water District*,[287] the court found a public servitude for groundwater and groundwater conservation purposes inherent in California's correlative rights doctrine.[288] The public servitude included a public right to store water underground.[289] *Niles* held that enforcement of the servitude under the police power could severely limit private property rights, specifically the right to mine for sand and gravel, without constituting a taking. The court, however, limited its holding to a public right to store water at a level no higher than that existing in a state of nature, with state of nature defined as "that condition which would have existed without diversion from the watershed and/or extractions from the basin."[290] Apparently, under *Niles*, overlying owners have compensable property rights in the subsurface area located above the natural water table which can be protected by nuisance, or possibly trespass, actions.

The California courts apparently will not protect reliance on an existing state of nature if the existing state is not also the natural state.[291] Why the state of nature should serve as the cut-

286. Generally, where a landowner was not making actual use of the subsurface and assuming that groundwater recharge did not cause surface ponding, flooding, or other drainage problems, it seems clear that any invasion by a storing party would be prima facie reasonable and hence, not a nuisance.

287. 37 Cal. App. 3d 924, 112 Cal. Rptr. 846 (1974), *hearing denied* (Cal. Sup. Ct., May 8, 1974), *cert. denied*, 419 U.S. 869 (1975).

288. *Id.* at 934-35, 112 Cal. Rptr. at 852.

289. Gleason, *supra* note 35, at 655.

290. 37 Cal. App. 3d at 929, 112 Cal. Rptr. at 849.

291. The *Niles* court approved the trial court's conclusion of law, *id.* at 931, 112 Cal. Rptr. at 851 (quoting in part trial court's conclusions of law), that property overlying the Niles Basin was subject to a public servitude for water and water conservation purposes to a groundwater elevation of 20 feet above sea level. *Id.* at 933, 112 Cal. Rptr. at 852. The 20-foot elevation was established by the trial court as the state-of-nature water table with state of nature defined as "that condition which would have existed without diversion from the watershed and/or extractions from the basin." *Id.* at 929, 112 Cal. Rptr. at 849.

off point for private compensable rights is somewhat puzzling. Apparently, as a matter of California public policy, public water rights are superior to nearly all other forms of property rights,[292] at least arguably justifying the state of nature distinction. It would seem, however, that simple reliance on nuisance theory to resolve actual conflicts would yield a more just result. First, as in *Niles*, a substantial investment may have been made in reliance on a depleted water table. While the public could undoubtedly assert a right to store water underground notwithstanding this investment, it would seem that a compensable taking has occurred.[293] Second, the natural water table may be higher than or lower than an optimal level set to accommodate storage rights with other property rights.[294]

Expanding on the latter point, a serious problem with the California approach occurs where swamp lands and sloughs have been drained and developed.[295] A state of nature servitude would imply that those lands could be flooded without compensating overlying owners. It is hard to imagine that public policy would dictate such a result. To the extent that a state of nature distinction has any merit at all it would seem to be as a delimiter of the outer bounds of permissable trespass actions. At a depth below the natural water table, an overlying landowner should not be able to prevent "groundwater trespasses,"[296] irrespective of his interest in preventing other types of subterranean trespass.[297] It does not, of course, follow that any intrusion into subterranean space above the state of nature water table should

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292. The *Niles* facts seem to present the extreme situation. Since overlying owners were denied compensation in *Niles*, it is hard to conceive of a factual situation in which private property rights would ever be superior to public water rights when the two were in conflict.

293. For an excellent analysis of the various established theories of "taking" and a proposed theory based on reasonable expectations, see Berger, *A Policy Analysis of the Taking Problem*, 49 N.Y.U. L. REV. 165 (1974).

294. The effect of the *Niles* decision would be to freeze public water storage rights at a state-of-nature level. Ironically, water tables are likely to be lowest in areas most in need of supplemental water sources. With a low natural water table, public storage rights would be most restricted in areas in which they are most needed.

295. *See* Gleason, *supra* note 35, at 660.

296. Given the author's belief that trespass is generally an inappropriate device for protecting subsurface rights, it seems particularly unreasonable to hold that water percolating through the soil at no greater elevation than it would occupy absent human action becomes a trespass merely because it is replenished to that level by a human act.

297. One could agree, for instance, that certain kinds of direct subsurface invasions, *e.g.*, slant drilling, should properly be the subjects of trespass actions even if the state of nature level limited trespass actions involving stored water.

be actionable as a trespass. Nuisance principles should provide more equitable protection. To the extent that trespass is available to overlying landowners for use against importers of groundwater, however, it should be limited to the area above the natural groundwater level or, in the case of extremely high natural water tables, to the surface and near surface.

F. Vertical Zoning

A possible aid in solving groundwater storage conflicts is to vertically zone land for water storage much as land has traditionally been zoned horizontally. Vertical zoning is not an untested concept, though apparently its use has heretofore been confined to above surface zoning.[298] There seems to be no conceptual reason why vertical zones could not be used underground. If desired, the zone dedicated to underground water storage could be set at a state of nature level. Nonconforming uses at the commencement of the plan would, however, be protected at least until their investment could be recovered. Given the lengthy period of time that it takes to significantly augment storage in an aquifer, the notice given by the adoption of the zone might prevent any real and substantial conflicts later. Furthermore, to the extent that temporarily protecting a nonconforming use would jeopardize a storage plan, the state could exercise its power of eminent domain to purchase and eliminate the nonconforming use. Thus, the original investment of the landowner would be protected, the public would pay the full costs of storing water underground, and an efficient allocation of storage resources would result. In addition, the state would retain the power to permit other reasonable uses of land in the zone dedicated to storage through the use of nonexclusive zones, variances, or special use permits. To the extent that requests for use were wholly incompatible with underground storage of water they could be denied. Under a zoning scheme importers of groundwater would continue to be liable for interference with the rights of overlying landowners, but by regulating subsurface property rights the incidence of actual interference should be minimized.[299]

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298. *See generally*, Committee on Public Regulation of Land Use, *Zoning: Air Lot Regulation/Title Insurance*, 5 REAL PROPERTY, PROB. & TR. J. 260 (1970).

299. Zoning, of course, would in no way affect the issue of who owns the water storage space or even who has a right to use it. By providing notice to overlying landowners, however, it might prevent some of the more serious conflicts in use of storage space from arising.

VI. CONCLUSION

In most jurisdictions, the law of underground storage rights for water is unclear. Ascertaining the law with some precision is, however, a necessary prerequisite for effective conjunctive management and use of scarce water resources. Most conjunctive management schemes, to be economically feasible, require that underground storage rights be public property or, at the very least, if private property, that private parties are not automatically entitled to compensation for water artificially stored underground. Whether or not such rights *will* be recognized in states eventually asked to consider the question is largely unanswerable. Whether or not such results *could* be reached in a manner consistent with underlying pre-existing property rights is a very complex question.

To find a public or a semi-public property right in the underground water storage capacity of overlying lands will, at the minimum, require that states distinguish existing law with respect to underground storage of oil and gas. Since water is often lumped with oil and gas in dicta, this may prove a formidable task. On the other hand, the law of wild animals offers a particularly useful analogy on which a valid distinction might rest. Additionally, however, ultimate resolution of the question requires an analysis of property rights in the water itself and the extent to which those rights are presently vested. Furthermore, the manner in which disputes over subsurface property rights are judicially resolved is an important factor in determining the practical extent of existing private rights. Finally, it must be recognized that it is highly unlikely that existing law will clearly "dictate" a particular conclusion.

In resolving questions involving underground water storage rights, courts and legislatures should be ever cognizant of the public value which inheres in managing a state's surface and groundwater resources conjunctively, and they should recognize that a necessary condition for such management is a legally and economically acceptable way of using underground water storage capacity. Finally, they should recognize that an effective underground storage right must include a right to store, a right to protect, and a right to recapture, and that the value of the storage right depends on how it is allocated among competing users as well as the extent to which exercise of the storage right may result in liability for interference with existing property rights.