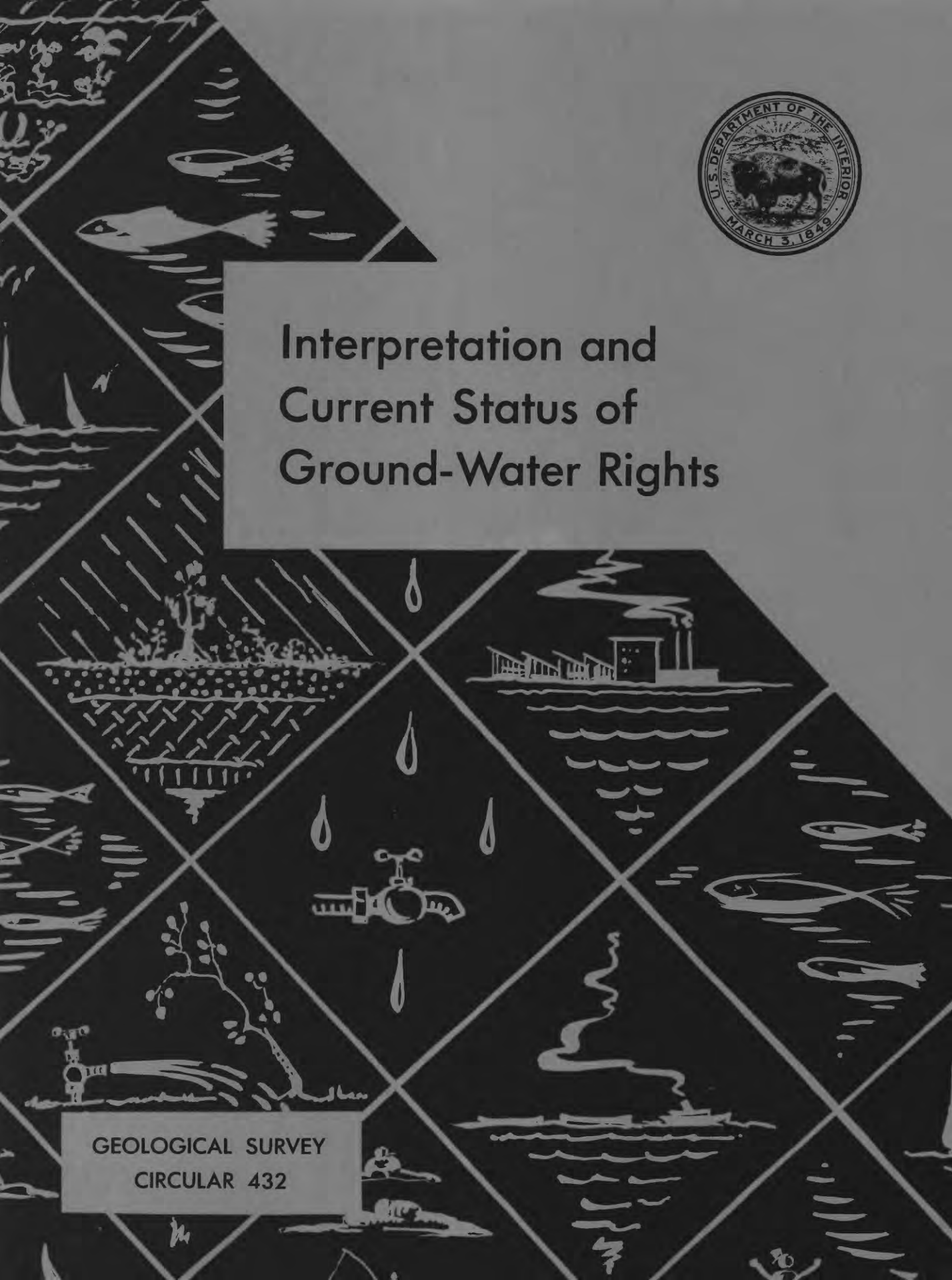
Interpretation and Current Status of Ground-Water Rights



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By Arthur M. Piper

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Interpretation and Current Status of Ground-Water Rights

By Arthur M. Piper

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This paper is concerned with the rights of individuals to withdraw water from permeable materials beneath the land surface, under the basic laws of the States in which they reside. It does not concern itself with limited-purpose statutes that seek only to prevent or abate pollution of naturally fresh waters, or to preclude waste of water; or that require well drillers to be licensed, or logs of wells to be filed with some administrative agency. Neither does it concern itself with certain municipal and local regulations that, to some extent, limit the freedom of action by individuals within those local jurisdictions.

DOCTRINES OF GROUND-WATER LAW IN RELATION TO HYDROLOGIC ENVIRONMENTS

Within the continental United States, the rights of individuals to use ground water derive from two contrasting doctrines of law: (1) the common-law or English doctrine, under the basic premise that the water (unless in "underground streams") is the absolute property of the owner of the overlying land, in perpetuity; and (2) the doctrine of prior appropriation, whose basic premises are that the water is the property of the State or of the "public"; that the individual appropriates a right to use a specified quantity of the water, provided the use is "beneficial"; and that "the first in time is the first in right," also in perpetuity.

These two general doctrines of ground-water law dominate, respectively, two unlike hydrologic environments—the common-law doctrine in the humid East, and the prior-appropriation doctrine in the semiarid or arid West [1]. There are, however, notable exceptions to this oversimplified generalization. The two hydrologic environments adjoin one another approximately along the 97th meridian —that is, roughly from 200 to 400 miles west of the Mississippi River.

The 31 States to the east of this hydrologic boundary are humid or subhumid. All of these States adhere to the common-law doctrine of ground-water rights, with variations.

In the humid region, as pointed out by Thornthwaite [2], precipitation as a rule is greater than the potential evapotranspiration —that is, greater than the potential rate at which the sun can pull water into the atmosphere from free water surfaces and through the leaves of vegetation. There, in general, precipitation is more than that necessary to sustain agriculture, and ordinarily the water surplus would more than suffice for the consumptive needs of man and animals in a simple agricultural economy. Also, ground-water supplies are recharged perennially and in relative abundance. In the era of colonization and so long as the economy was primarily agricultural, ground-water drafts in this region generally were small and scattered, and did not interfere seriously one with another. Thus, the common-law doctrine of ground-water rights presented few problems. Subsequently, however, in numerous areas of extensive urban and industrial growth many drafts on ground water interfered mutually and several variants of the common-law doctrine were evolved to cope with this. In the current urban and industrial "explosion," with its expected great increase in demand for water from all potential sources, the common-law doctrine may well become widely insufficient. The nature of this insufficiency will be discussed later.

The western of the two hydrologic environments comprises the 17 States of the arid or semiarid West. There, as a rule, average

precipitation is less than potential evapotranspiration. There, accordingly, the overall water supply is perennially insufficient for growing crops on all the land otherwise arable. Within the region, however, there are scattered areas of perennial water surplus—chiefly along the north Pacific coast and high in the mountain ranges. Principal ground-water supplies are scattered and some are recharged intermittently or in small volume.

In this region, much of the water is derived from areas that physically are not adapted to extensive agriculture or to urban and industrial development; conversely, many areas physically adapted to such development are poorly watered naturally. Accordingly, the common-law doctrine would have posed a drastic limit on orderly development and, in the pioneer era, the prior-appropriation doctrine evolved in respect to surface waters. Subsequently, by case law or by statute, the prior-appropriation doctrine has been extended widely to ground waters. California is a notable exception. There, most rights to ground water are under a variant of the common-law doctrine, although appropriative rights can be acquired to water that is surplus to needs of the owners of overlying land.

COMMON-LAW DOCTRINE

The basic doctrine.— Although its roots may be traced back many centuries into customs and legal principles of Europe, the specific basis for the common-law doctrine of ground-water rights in the United States usually is cited as the case of Acton v. Blundell in England in 1843 [3]. Its rigid concepts are expressed forcefully in a Connecticut decision of 1850, an Ohio decision of 1861, and an Illinois decision of 1899:

> The laws of its ["percolating" ground water] existence and progress * * * cannot be known or regulated. It rises to great heights, and moves collaterally, by influences beyond our apprehension. These influences are so secret, changeable and uncontrollable, we cannot subject them to the regulations of law, nor build upon them a system of rules, as has been done with streams upon the surface [4].

> The reasoning is briefly this: In the absence of express contract, and of poaitive authorized legislation, as between proprietors of adjoining land, the law recognizes no correlative rights in respect to underground waters percolating, oozing or filtrating through the earth; and this mainly from considerations of public policy. 1. Because the existence, origin, movement and course of such waters, and the causes which govern and direct their movements, are so secret, occult and concealed that an attempt to administer any set of legal rules in respect to them would be, therefore, practically impossible. 2. Because any such recognition of correlative rights would interfere to the material detriment of the common wealth, with drainage and agriculture, mining, the construction of highways and railroads, with sanitary regulations, building and the general progress of improvement in works of embellishment and utility [5].

> Water which is the result of natural and ordinary percolation through the soil is part of the land itself, and belongs absolutely to the owner of the land, and, in the absence of any grant, he may intercept or impede such underground percolations, though the result be to interfere with the source of supply of springs or wells on adjoining premises [6].

The strict common-law doctrine applies only to "percolating" ground water, not to water in a "defined underground stream." (The latter is governed by the companion riparian doctrine of surface watercourses.) In general, the common-law doctrine tends to foster, rather than restrain, excessive competition for a common ground-water source.

Even under strict application of these common-law concepts, the courts commonly have granted relief to a user of ground water who has been injured by wasteful use or malicious interference on the part of the owner of adjoining land. Ziegler [7] concludes that such precedent is perhaps no more than an expression of abhorrence to the idea of waste or malice, rather than an effort to soften the basic doctrine.

Principle of reasonable use.— An early variant of the common law of ground water softens the basic doctrine; this variant is the so-called American doctrine or principle of reasonable use. Its concept is expressed in an early decision by the Supreme Court of New Hampshire to the effect that, as between two neighbors, the right to withdraw "percolating" ground water "restricts each to a reasonable exercise of his own right, a reasonable use of his own property, in view of the similar rights of others." The same principle has been expressed in other decisions in terms such as "reasonable beneficial use," "reasonable economic use," or "best reasonable use." Interpreted strictly, the test of "reasonableness" applies primarily to the purpose for which ground water is withdrawn, not to the quantity of withdrawal. Thus, in early applications this variant of the common-law doctrine imposed only a transient restraint on those who might first withdraw ground water for a purpose other than natural—that is, for a use beyond sustaining life on the overlying lands. However, because "reasonable" becomes in time more or less synonomous with "ordinary," the mild restraint inherent in this principle fails as soon as a substantial number of land owners begin using

water for a common but previously unusual use. In the end, like the strict common-law doctrine, the principle of reasonable use may accelerate rather than prevent competitive withdrawal under which the total ground-water supply of a given area might in effect be confiscated by a few users.

Principle of correlative rights.—A further variant of the common-law doctrine evolved in California and Utah. (Subsequently, Utah has enacted a ground-water statute based on the doctrine of prior appropriation.) This further variant, the principle of correlative rights, holds that "the rights of all landowners over a common basin, saturated strata, or underground reservoir, are coequal or correlative, and that one landowner cannot extract more than his share even for use on his own lands where the rights of others are injured thereby; nor can he claim more than his share on the ground of peculiar benefit to him from its use."

This principle faces up to the reality that ground-water supplies are finite and variable in quantity. Under it, in a time of water shortage, all the landowners would share the shortage proportionately. Apportionment of a total supply is reasonably straightforward if all the landowners use water for the same purpose, as for irrigation. In that situation, apportionment by acreage of the several landownerships is feasible. Complexities arise if unlike uses of the water are involved.

Regulation of ground-water use under the common-law doctrine.—To cope with excessive competition for limited supplies of ground water or to resolve other troubles, several States adhering to the common-law doctrine have resorted to regulation of ground-water use. This is done under statutes that invoke the police power to assure the "public welfare, safety, and health."

New Jersey probably has gone farthest in an effort to limit ground-water withdrawals to perennial yield. The scope of its statute is indicated by the following quotation:

1. The Division of Water Policy and Supply of the State Department of Conservation shall delineate from time to time such areas of the State where diversion of subsurface and percolating waters exceeds, or threatens to exceed, or otherwise threatens or impairs, the natural replenishment of such waters.

2. In areas so delineated by the Division of Water Policy and Supply no person, corporation or agency of the public shall hereafter divert or obtain water from subsurface or percolating sources in excess of one hundred thousand (100,000) gallons per day for any purpose unless such person, corporation or agency of the public shall first obtain a permit for such withdrawal from the Division of Water Policy and Supply. Such permit may be refused, or if granted, may include such stipulations as may be necessary to conserve the subsurface and percolating waters of the State and prevent their exhaustion [8].

Under this statute, two "protected areas" had been designated as of 1950; one comprised parts of Middlesex and Monmouth Counties, the other, parts of Burlington, Camden, Gloucester, and Salem Counties. In such areas, control is exercised through a system of term licenses that are issued to users and that have many of the effects of the prior-appropriation doctrine. Licenses are renewable if the Division of Water Policy and Supply determines that the total water supply remains adequate. However, because the licenses do not run indefinitely, at least one manufacturer declined to locate a new plant in the State.

Local regulation of this sort by an executive agency is practiced also in Indiana ("restricted-use areas") and New York. The New York statute authorizes regulation only in four counties on Long Island (Kings, Queens, Nassau, and Suffolk Counties), with the objective of so managing the fresh ground-water body as to control the incursion of oceanic water. Uses of water for agriculture or for standby municipal fire protection, and all wells having a capacity not exceeding 45 gallons a minute, are exempted. Limited or revocable permits may be issued to applicants. The regulating agency, the Water Resources Commission, has general authority to conserve ground-water sources for public-supply purposes throughout the State and, as need may arise, could request the Legislature to extend specific regulation to areas other than Long Island [9].

Texas authorizes groups of water users to form conservancy districts "for the conservation, preservation, protection, and recharging and the prevention of waste of the underground water of an underground water reservoir or subdivision thereof" [10]. Such Districts are granted broad powers including the injunctive procedure "or other appropriate remedy in courts of competent jurisdiction" to enforce its rules and regulations. This procedure has the desirable feature that controls are exercised by the water users for their common benefit. Unfortunately, however, certain definitions and provisions of the

enabling legislation are hydrologically unsound.

Iowa in 1957 instituted State-wide regulation of all its waters, surface and ground. The basic philosophy appears to be police-power regulation under the common-law doctrine, although some aspects of the prior-appropriation doctrine are implied in the declaration of policy, which is cited in part below.

> It is hereby declared that the general welfare of the people of the state of Iowa 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 methods of use, of water be prevented * * *
>
> Water occurring in any basin or in any watercourse, or other natural body of water of the State, is hereby declared to be public waters and public wealth of the people of the state of Iowa and subject to use in accordance with the provisions of this chapter, and the control and development and use of water for all beneficial purposes shall be in the State, which, in the exercise of its police powers, shall take such measures as shall effectuate full utilization and protection of the water resources of the state of Iowa [11].

In the Iowa procedure, 10-year use permits are granted to applicants and these are extendable without public hearing if no objections are voiced. Rights acquired prior to enactment of the statute are recognized but permits are required for new uses, for increased uses by municipalities if they exceed 100,000 gallons a day or 3 percent of the previous daily maximum, and for increased uses by individuals if they exceed 5,000 gallons a day. So far as the writer is informed, the Iowa procedure is the first in the United States to impose a State-wide system of term permits. This is the distinctive feature of the procedure.

Maryland and Minnesota have enacted ground-water statutes and procedures similar to those of Iowa. However, these statutes exempt many uses of water and, in effect, are neither all-embracing nor limited to specific areas of known or incipient overdraft. All three of these statutes—those of Iowa, Maryland, and Minnesota—deviate from the prior-appropriation doctrine in that the "first in time" is not made the "first in right," unequivocally and in perpetuity.

Limitations of the common-law doctrine.— The writer, who is a ground-water hydrologist by profession, cannot accept the previously cited philosophy of the common-law doctrine of ground-water rights—that ground-water's behavior is incomprehensible, that it is not amenable to orderly management under an adequate system of laws, and that it is inessence inseparable from the earth materials which contain it.

There is an obvious fallacy in the common-law doctrine. Specifically, exclusive and unlimited right to use ground water underlying specific parcels of land can be real only if the water does not move laterally from the jurisdiction of one landowner to that of another. Actually, most ground water moves, although slowly, just as definitely as the water of a stream moves from the jurisdiction of one riparian owner to that of another. This fallacy was not of serious consequence in the environment from which the common-law doctrine sprang—a humid climate coupled with a simple agricultural economy and a dispersed population. Under those conditions the overall surplus in precipitation ordinarily assured that the rather small water-supply requirements of all landowners would be met in full.

The theoretical right of unlimited water use under the common-law doctrine may become imaginary in areas of intensive urban or industrial development, or of intensive agricultural development through irrigation (which is expanding steadily even in the humid East). Even in a humid environment, large demands for water at the places of concentrated use may become mutually exclusive or may drastically curtail the supply available to outlying areas. That such has occurred already is attested by the regulatory statutes in New Jersey and other States, as reviewed above. Considering the Nation's explosive growth in population and in industry, and the consequent expected great increase in the requirement for water, the common-law doctrine of ground-water rights may become widely untenable.

Police-power regulation of common-law rights might remain acceptable in the Nation's best watered areas. There, possibly, the available supply is ample for nearly all conceivable uses of water. An applicant would have reasonable assurance that a license or renewal would issue and that its restrictions, if any, would not be onerous. On the other hand, in many other areas no such assurance could exist. In such areas, uncertain tenure in a right to the limited ground-water supply might well preclude vigorous and stable economic development.

PRIOR-APPROPRIATION DOCTRINE

Basic concepts.— As has been stated, the essence of the prior-appropriation doctrine of ground-water rights is that the waters are "owned" by the public, that an individual appropriates a right to withdraw water for "beneficial" use, and that "the first in time is the first in right," in perpetuity. Such is the dominant law of the semiarid and arid West, in which the doctrine originated.

All ground-water statutes under the prior-appropriation doctrine recognize and validate "prior vested rights" that may have accrued to landowners under the common law. Some but not all specifically limit such prior rights to the quantity of water used beneficially. Nearly all the statutes exempt, from the traditional application-and-permit procedure, uses of water by individuals for domestic purposes or for watering livestock and small uses for any purpose. These exemptions are in large part for the convenience of the administering agency, to eliminate pointless "paper work"; they are in part a concession to the popular feeling that water, an essential of life itself, should be "free as air." Commonly they have fostered popular acceptance of a comprehensive ground-water statute.

Statutes invoking the doctrine of prior-appropriation have been applied to ground-waters in Colorado, Idaho, Kansas, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming. All 11 of these States are in the semiarid or arid West. Arizona applies the doctrine in declared "critical areas," for use of water on newly developed lands. In California, the doctrine applies to ground waters that may be surplus to the needs of owners of overlying lands and that are proposed to be exported beyond the basin of origin.

The statutes vary in their treatment of water "ownership." The Idaho statute makes the unequivocal statement that ground-waters are the "property of the State." Other jurisdictions declare the waters to be "public waters and public wealth of the people of the State," to "belong to the public," or to be "dedicated to the use of the people of the State." The essential common point is that the waters and the lands are declared to be separate entities, with no inherent attachment of one to the other.

At least in the public-land States, the legal basis for such legislative declarations usually has been cited as the Desert Land Act of March 1877, which reserved the waters of the concerned lands to be disposed of by the several States under their respective laws and court procedures. Thus, subsequent issue of a patent, whereby title to the land passed from the Federal government to an individual, did not of itself convey any title to water. The recent decision in the so-called Pelton case, in Oregon, rejected this basis for public ownership of waters; the situation is not yet clarified.

In other States, it is held widely that no reasonable basis exists for a legislative declaration separating land and ground water, under the principles that the water is the absolute property of the landowner and that the owner cannot be deprived of that property, even by legislation, without just compensation. These principles are invoked commonly, even though no use is made of the property—that is, of the water. In adopting its appropriation statute, Kansas sought to resolve this issue by providing that a landowner may seek redress in the courts for damage he may have suffered by limitation of his unused common-law right.

All ground-water statutes that invoke the prior-appropriation doctrine embody phraseology equivalent to the principle that "beneficial use shall be the basis, the measure and the limit of the right to the use of water." Essentially all the statutes provide for the right to be forfeited to the extent that it may not be exercised for some specified number of years, commonly from three to five years. However, under the principle that an appropriated right to use water is a property of the individual, the administering agencies commonly have been reluctant to invoke the procedures of forfeiture and the courts have avoided imposing forfeiture usless the appropriation was notoriously excessive.

The New Mexico statute.— As Hutchins has pointed out [12], the New Mexico appropriative ground-water statute was the first to be put into wide administrative operation, and it has established a general pattern for much of the subsequent legislation of that sort. That statute was enacted first in 1927, was ruled invalid owing to technical defects, and was replaced by the current statute enacted in

1931 and amended by additions in 1953 [13]. Basic provisions of the statute, as quoted below, are noteworthy.

75-11-1. The water of underground streams, channels, artesian basins, reservoirs, or lakes, having reasonably ascertainable boundaries, are hereby declared to be public waters and to belong to the public and to be subject to appropriation for beneficial use. [Modified by 75-11-9 and 75-11-21, below.]

75-11-2. Beneficial use is the basis, the measure, and the limit of the right to the use of the [ground] waters.

75-11-9. All underground waters of the State of New Mexico are hereby declared to be public waters and to belong to the public of the State of New Mexico and to be subject to appropriation for beneficial use within the State of New Mexico. All existing rights to the beneficial use of such waters are hereby recognized.

75-11-20. No person shall withdraw water from any underground source in the State of New Mexico for use in any other State by drilling a well in New Mexico and transporting the water outside the State or by drilling a well outside the boundaries of the State and pumping water from under lands lying within the territorial boundaries of the State of New Mexico.

75-11-21. No permit and license to appropriate underground waters shall be required except in basins declared by the state engineer to have reasonably ascertainable boundaries.

75-11-22. The state engineer and the attorney general or the various district attorneys are authorized and directed to use any and all legal means necessary to enforce the provisions of [the act].

An intending appropriator within a designated basin applies to the State Engineer for a permit. If no protests are filed, and if the State Engineer finds that unappropriated waters exist in the ground-water source designated in the application, or that the proposed appropriation would not impair prior rights to that source, the State Engineer issues a permit to appropriate all or part of the waters applied for, subject to the rights of prior appropriators. If protests are filed, the State Engineer holds a hearing before granting or denying the permit.

In 1950, the New Mexico statute was upheld in a concerted challenge of its constitutionality [14]. Two points made by the decision are of particular interest, as summarized in the next two paragraphs.

For the ground-water basin in litigation the east, south and west boundaries had been demonstrated. A definite north boundary could be inferred to exist from geologic and other evidence, but could be demonstrated precisely only by drilling numerous wells needed for no other current purpose. The lands of the challengers were within the alcove enclosed by the determined boundaries and, between them and the inferred north boundary, hundreds of operating wells demonstrated clearly that the basin was continuous. The court construed the statutory requirement of "reasonably ascertainable boundaries" in the sense of "sufficiently ascertainable" and held that boundaries were established sufficiently for the questions at issue.

The challengers contended that the waters at issue were their absolute property, they being the owners of the overlying land (invoking the principle of the common-law doctrine). The court held, however, that the Desert Land Act of 1877 had reserved those waters for disposition by the State. This is a specific example of a point made previously in general terms.

The Oregon statue.—In Oregon, an appropriative ground-water statute was enacted first in 1927, to cover only the semiarid and arid parts of the State. In 1955, that first statute was extensively amended to cope with prospective water-supply problems, and its coverage was extended over all the State. This amended code [15] is of special interest in a part of the legislative declaration of policy and in provisions for control of withdrawals in "critical" ground-water areas. These are cited below:

537.525 Legislative policy declaration. The Legislative Assembly recognizes, declares and finds that the right to reasonable control of all water within this state from all sources of water supply belongs to the public, and that in order to insure the preservation of the public welfare, safety, and health it is necessary that: ***

(9) Whenever wasteful use of ground water, impairment of or interference with existing rights to appropriate surface water, declining ground-water levels, interference among wells, overdrawing of ground-water supplies or pollution of ground water exists or impends, controlled use of the ground water concerned be authorized and imposed under voluntary joint action by the State Engineer and the ground-water users concerned whenever possible, but by the State Engineer under the police power of the State when such voluntary joint action is not taken or is ineffective.

The statute provides for the determination of a critical ground-water area by the State Engineer on his own motion or, in his discretion, on petition by any ground-water claimant or appropriator within the area in question. If this procedure is invoked, a public hearing is held, evidence is taken, and findings of fact are reached. If the facts are found to satisfy criteria specified in the statute, the State Engineer then "shall by order declare the area in question to be a critical ground-water area." Then:

537.735 (3) The order of the State Engineer may include any one or more of the following corrective control provisions:

(a) A provision closing the critical ground-water area to any further appropriation of ground water, in which event the State Engineer shall thereafter refuse to accept any application for a permit to appropriate ground water located within such critical area.

(b) A provision determining the permissible total withdrawal of ground water in the critical area each day, month or year, and, insofar as may be reasonably done, the State Engineer shall apportion such permissible total withdrawal among the appropriators holding valid rights to the ground water in the critical area in accordance with the relative dates of priority of such rights.

(c) A provision according preference, without reference to relative priorities, to withdrawals of ground water in the critical area for domestic and livestock purposes first, and thereafter other beneficial purposes, including agricultural, industrial, municipal other than domestic, and recreational purposes, in such order as the State Engineer deems advisable under the circumstances.

(d) A provision reducing the permissible withdrawal of ground water by any one or more appropriators or wells in the critical area.

(e) Where two or more wells in the critical area are used by the same appropriator, a provision adjusting the total permissible withdrawal of ground water by such appropriator, or a provision forbidding the use of one or more of such wells completely.

(f) A provision requiring the abatement, in whole or in part, or the sealing of any well in the critical area responsible for the admission of polluting materials into the ground-water supply or responsible for the progressive impairment of the quality of the ground-water supply by dispersing polluting materials that have entered the ground-water supply previously.

(g) A provision requiring and specifying a system of rotation of use of ground water in the critical area.

(h) Any one or more provisions making such additional requirements as are necessary to protect the public welfare, health and safety in accordance with the intent, purposes and requirements of ORS 537.505 to 537.795.

The administrative authority and discretion granted by the provisions just cited are without precedent under prior-appropriation statutes. They substantially restrict the philosophy of the prior-appropriation doctrine but face up to certain limitations of that doctrine, which will be reviewed.

The Oregon statute includes the further novel provision that the users of ground water from a particular basin or reservoir may agree voluntarily among themselves on procedures for managing that source consistently "with the intent, purposes, and requirements" of the code, and in particular for managing a potentially critical area. If the State Engineer finds that such an agreement is adequate and appropriate, he approves it and thereafter the provisions of the agreement control in lieu of formal orders, rules or regulations by the State Engineer. Such agreements may run for some pre-determined term, or may be disolved by consent of the parties participating. Also, they will be terminated by "order of the State Engineer when he finds, after investigation and a public hearing upon adequate notice, that the agreement is not being substantially complied with by the parties thereto or that changed conditions have made the continuance of the agreement a detriment to the public welfare, safety and health or contrary in any particular to the intent, purposes and requirements of [the code]." Under this provision, local water problems can be resolved by the persons immediately concerned. This is good government to the extent that it is "small" government. It may prove to be one of the most effective features of the code, as water users become widely informed as to the need for, and requirements of water-source management.

Limitations of the appropriation doctrine.—When it applies exclusively, the appropriation doctrine affords an obvious and practical mechanism for curtailing the use of water from streams or lakes whenever such use overtakes total supply. Adequate records of the valid appropriations and of streamflow are required, of course, but usually these records are available or can be developed. In respect to ground water, exclusive application of the appropriation doctrine would seem to offer the same mechanism for scaling use to supply; in actuality, however, the mechanism is far from effective. Reasons include the following:

1. When the natural regimen of a ground-water body is changed by withdrawal or other act of man, the affects commonly are obscure and develop very slowly.

2. Extensive hydrologic records and investigations are prerequisite to monitoring the behavior of a ground-water body under use. For few areas and for no State as a whole are such records and results of investigation available. Consequently, overdraft commonly escapes recognition while it is small.

3. Under most existing ground-water codes, incipient or actual overdraft would invoke the declaration of a "restricted-use" or "critical" area, and the prohibition or restriction of additional wells or increased

withdrawals. Such prohibition or restriction might be futile; development would be checked, but not necessarily its adverse effects.

4. The causes and effects of ground-water overdraft are not reversible immediately or fully. Consequently, cutting off withdrawals in the reverse order of their priorities of appropriation does not assure that the march of overdraft will be reversed. Under these circumstances, here stated all too briefly, responsible officials very commonly are reluctant to invoke statutory provisions for reducing use of ground water. They may have either of two reasonable doubts: that the available facts would suffice to sustain them against any appeal from an order for reduction, or that the statutory procedure would in fact recapture the status of the earlier appropriators.

5. Even in a ground-water basin in which perennial yield and appropriations for use are about equal in total, some further development may be feasible. Such is a common feature of irrigated areas, in which development tends to concentrate around the most productive wells and the most fertile lands, where as the less fertile lands or the areas of small yield from wells remain virtually untouched. For example, in the northern part of the Mimbres Valley, New Mexico, the ground-water supply has been fully appropriated (and possibly over-appropriated). In the southern part of that basin, however, considerable additional draft might be dispersed over an extensive area with little or no detriment to prior appropriators to the north. Strict application of the prior-appropriation doctrine would preclude the potential further development. Declaration of "critical" or "restricted" subareas does not offer a satisfactory solution because the boundaries of such subareas would be arbitrary, at least in part, and almost certainly would be indefensible in detail. The voluntary-agreement procedure of the Oregon code offers promise of resolving such dilemmas.

Effectiveness of the prior-appropriation doctrine is further and substantially limited when, as is generally the case, the ground-water code is administered under a register of priorities that is separate and distinct from the register of surface-water priorities. Combined registers would not be universally appropriate, for the reasons given above. Two instances from New Mexico experience are enlightening, as follows [16].

1. Under native conditions, certain large springs in the northern part of the Roswell basin acted as natural relief valves to a large body of artesian water. The flow from these springs was quickly appropriated by early settlers. Owing to subsequent intensive development of the ground-water supply by wells, the artesian head so decreased that the flow from individual spring orifices either ceased or diminished greatly. Thus, certain holders of the earliest surface-water rights in the basin abandoned their developments.

The artesian basin having been developed excessively, it was closed to further appropriation by the State Engineer. Under this action, however, holders of the depreciated surface-water rights were precluded from obtaining relief by tapping the ground-water body that had sustained those rights under natural conditions. In this instance, applicable law treats surface water and ground water as though they afforded distinct and separable sources of supply. Actually, the separation is not real in nature.

2. The Pecos River Compact, which governs the allocation of stream waters between New Mexico and Texas, provides that: "New Mexico shall not deplete by man's activities the flow of the Pecos River at the New Mexico-Texas state line below an amount which will give to Texas a quantity of water equivalent to that available to Texas under the 1947 condition... In maintaining the flows at the New Mexico-Texas state line required by this Compact, New Mexico shall in all instances apply the principle of prior appropriation within New Mexico." These two provisions might present a delemma like this:

A considerable part of the base flow in the Pecos River was derived, under native conditions, from the artesian and unconfined ground-water bodies of the Roswell basin. The ground-water withdrawals that have been cited, however, have greatly diminished this base flow, and their ultimate effect on the flow of the river will not be evident for many years to come. The ultimate effect may be so great that the flow at the State line is diminished "by man's activities" to less than that of 1947. Under these conditions, suspending the junior surface-water appropriations probably would be ineffective because

in large part they do not involve base flow. Suspending all ground-water rights that are junior to surface-water rights (many of them are) would in theory affect the river flow and ultimately might satisfy the terms of the compact. However, this remedy would take effect slowly, would not offer an immediate solution, and would be inequitable among the ground-water appropriators.

GROUND-WATER RIGHTS IN THE FUTURE

It is expected that the use of water in the United States will double within 20 to 25 years—primarily in industry, moderately in irrigated agriculture, and generally in urban, suburban, and rural areas. Owing to the distribution of industry, the prospective burden will fall most heavily on the East. Over all the Nation, however, the great majority of water sources, surface and ground, will of necessity be developed for the utmost "benefit" in use. Reuse of water will become commonplace.

Water-supply facilities will become progressively more costly and more complex; concomitantly, those who develop the facilities will want assurance that their investments can be recovered within the life of the developments. More and more, the rational solution for water-supply stringencies will require concerted action by fairly large groups of water users making mutual concessions to the common advantage. As the stringencies become more numerous and of greater geographic reach, the interests to be compromised will become more diverse, and the nature of the desirable compromise may change substantially from one time to another or from one place to another.

Strict adherence to current water-right doctrines would create many obstacles to adequate future management of water sources. Some sources would go unused or would be used at less than capacity, even while others were under needless and excessive competition. Slow and cautious as the process will be, and should be, the writer feels that substantial changes in water-right doctrine and law are inevitable. He believes that the following attitudes are emerging in the areas of greatest pressure on water supplies [1,17].

1. The basic premise of the common-law doctrine of water rights—that an individual can have exclusive jurisdition over any particular amount of water, to be used as he sees fit and then discarded—is unrealistic.

2. One principle of the prior-appropriation doctrine—that ownership of all water supplies rests in the "public" collectively—is a necessary basis for balancing supplies against prospective uses. However, other principles of the doctrine should be modified—appropriations of water should become contingent on a use which returns the optimum potential advantage to the "public" at that particular time and place; and the dogma of "the first in time is the first in right, in perpetuity," should be softened to something less than an absolute priority without regard to the manner of water use. In other words, the appropriation doctrine should be coupled to the police power of the State, to the end of optimum advantage to the general public welfare. The ground-water code adopted by Oregon in 1955, already cited, takes a first step in this direction.

3. Water sources and reservoir sites on the land surface and water sources and natural reservoirs beneath the land surface will come to be managed as a single supply for allocation among all needs. For such management, only an agency of the utility or improvement-district type, either an arm of government or functioning voluntarily under governmental license and regulation, seems to have the necessary broad competence.

If prospective water-supply needs are to be met, the laws of water rights in general and of ground-water rights in particular should: (1) afford flexibility whereunder the Nation as a whole may effectively manage its water destiny, under reasonable but adequate checks and balances; (2) in defining rights as between individuals, prescribe only essential and minimum restrictions; and (3) afford to groups of water users all reasonable freedom to act concertedly, mutually conceding some part of their individual "rights" to their common advantage.

In the writer's current opinion, these criteria can be satisfied most assuredly under selected aspects of the prior-appropriation doctrine, the police power, and the improvement-district philosophy. However, these must be coupled with wide education as to the facts about water.

The writer doubts that a single water-right statute would be equally and ideally advantageous in all the diverse water-supply environments of the United States—in other words, a "model" statute seems unattainable. More realistically, water-right statutes might adhere to a uniform basic theme, with details varied to suit particular environments. Progress to that end will come neither easily nor quickly.

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