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### Well Interference and Ground Water Mining: The Legal Framework

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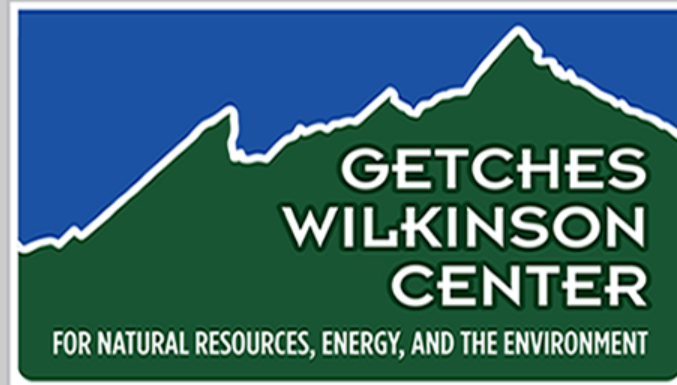
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**WELL INTERFERENCE AND GROUND WATER MINING:  
THE LEGAL FRAMEWORK**

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**Uncovering the Hidden Resource:  
Groundwater Law, Hydrology and Policy in the 1990s**

**University of Colorado at Boulder  
Natural Resources Law Center  
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## I. GROUND WATER ALLOCATION DOCTRINES

Common law doctrines include the overlying rights doctrines of absolute ownership, reasonable use, correlative rights and "eastern correlative rights," based on the Restatement of Torts (2d). Many eastern states still adhere to common law ground water allocation doctrines. California, Arizona, Nebraska and Texas are the only western states following common law allocation principles in varying degrees. Oklahoma, originally a reasonable use jurisdiction, follows a statutory adoption of the correlative rights doctrine. Several eastern states have adopted water permit statutes, although disputes may still be judicially resolved under common law rules. Western ground water statutes are appropriate, although the doctrine is applied somewhat differently to ground water than it is to surface water.

### A. Common Law Overlying Rights Theories.

In an overlying rights jurisdiction a landowner can install a well without a license by virtue of owning "overlying land," i.e. land overlying the ground water supply. Tarlock, Law of Water Rights & Resources §4.01 et seq (Clark Boardman 1991).

1. Absolute Ownership. The English rule of absolute ownership is the first and most primitive ground water allocation doctrine. Under the absolute ownership doctrine the landowner is considered to "own" the ground water underlying his land. This means a landowner can withdraw ground water without legal liability to neighboring overlying owners. The absolute ownership doctrine is based on the 1843 English decision of *Acton v. Blundell*, 152 Eng.Rep. 1223. In that case the court considered ground water occurrence and usage effects a mystery, which justified a no liability rule because the effects of one person's ground water use on another's property was unknowable. The first American case adopting the English rule was *Wheatley v. Baugh*, 25 Pa.St.Rep. 528 (1855). See generally Tarlock §4.04; Beck (ed.), Waters & Water Rights §21 (Mitchie 1991).

While the absolute ownership doctrine originally was followed in most western states, today Texas is the only western state adhering to the English rule. *Houston & Tex. Cent. R.R. v. East*, 98 Tex. 146, 81 S.W. 279 (1904); *Friendswood Dev. Co. v. Smith-Southwest Industries*, 576 S.W.2d 21 (Tex. 1978). Connecticut, Georgia, Louisiana, Maine, Massachusetts, Mississippi, Rhode Island and Indiana may to some extent still follow the absolute ownership rule. Tarlock §4.04; cf. Waters & Water Rights §21.07.

Rights of Use. Ground water can be used on non-overlying

land and can be sold for non-overlying use, regardless of the consequences on other overlying users. Fire Dist. No. 1 v. Graniteville Spring Water Co., 103 Vt. 89, 152 A. 42 (1930); Texas Co. v. Burkett, 117 Tex. 16, 296 S.W. 273 (1927). Historically under the absolute ownership doctrine landowners have been immune from liability for even malicious ground water withdrawal for the purpose of injuring a neighbor. Huber v. Merkel, 117 Wis. 355, 94 N.W. 354 (1903); overruled, State v. Michels Pipeline Const. Co., 63 Wis.2d 278, 217 N.W.2d 339 (1974). In 1978 the Texas Supreme Court ruled that landowners would be liable for subsidence resulting from "negligent" ground water withdrawals. Friendswood Dev. Co. v. Smith-Southwest Industries, 576 S.W.2d 21 (Tex. 1978).

2. Reasonable Use. Under the reasonable use doctrine ground water may be used without waste on overlying land. The reasonable use doctrine is also referred to as the American rule, as it was established in Bassett v. Salisbury Mfg. Co., 43 N.H. 569 (1862), and subsequently was followed by many states. While the American rule was adopted at one time in several western states, only Arizona and Nebraska now use the American rule as a partial basis for ground water allocation. Alabama, Florida, Kentucky, Maryland, New York, North Carolina, Tennessee and perhaps Illinois follow the reasonable use doctrine. Tarlock §4.05[1]. Cf. Water & Water Rights §23.02.

Rights of Use. The reasonable use doctrine is only a modest modification of the absolute ownership doctrine. Under the reasonable use doctrine landowners may be liable for injuries arising from their ground water withdrawals if their use is unreasonable. In this unreasonable does not involve a comparative analysis of the competing uses, as do the Restatement of Torts (2d) and eastern correlative rights doctrines. Instead, an interfering use is unreasonable only if it is wasteful or if it occurs on non-overlying lands. Forbell v. City of New York, 164 N.Y. 522, 58 N.E. 644 (1900); Jarvis v. State Land Dep't, 106 Ariz. 506, 479 P.2d 169 (1970).

While superficially the reasonable use doctrine appears more progressive than the English rule, there is little functional difference between the two. Under the reasonable use doctrine a landowner may withdraw as much water as he wishes without waste for us on overlying land. In addition, wasteful or non-overlying uses may not be actionable in reasonable use jurisdictions as plaintiffs must show actual injury to have standing. Canada v. City of Shawnee, 179 Okla. 53, 64 P.2d 694 (1937). (Cf. the common law riparian rights doctrine in which riparians can enjoin nonriparian uses even in the absence of actual harm.) Thus, as a

practical matter the reasonable use doctrine allows ground water to be sold or used on non-overlying land, unless the use or transfer interferes with the use of other overlying owners.

Non-Overlying Uses. The concept of what constitutes overlying land has not been well defined. The issue is whether it includes simply the tract of land on which the well is located, or whether it includes all land overlying a common ground water supply. In Arizona, the Supreme Court has interpreted "overlying land" as the tract of land from which the water was pumped. *Farmers Investment Co. v. Bettwy*, 113 Ariz. 520, 558 P.2d 14 (1976); Tarlock §4.05[2]. Now Arizona statutes authorize municipalities to purchase and physically transfer ground water irrigation rights for municipal use. Nebraska (the other western reasonable use state) statutes authorize both industrial and municipal non-overlying ground water uses if a state permit has been obtained. Neb.Rev.Stat. §46-638 et seq.; §46-675 et seq.

3. Correlative Rights. The California rule of correlative rights is an extension of the reasonable use doctrine to allow non-overlying ground water use by non-overlying users (referred to as "appropriators"). See generally Tarlock §4.06; *Waters & Water Rights* §22. The correlative rights theory includes prorata sharing during shortages and allows rights to be established for water stored underground (i.e. recharged ground water). The correlative rights doctrine is followed in its entirety only in California. However, its aspect of prorata sharing during shortages has been incorporated into western critical area statutes and the Restatement of Torts (2d) §858(1)(b). Correlative rights has been adopted to some extent by courts in Arkansas, Delaware, Minnesota, Missouri, Nebraska and New Jersey. Tarlock §4.06[2].

Rights of Use. Overlying landowners can make a reasonable use of ground water. *Katz v. Walkinshaw*, 141 Cal. 116, 70 P. 663 (1902), 74 P. 766 (1903). However, non-overlying landowners can "appropriate" "surplus" ground water not needed by overlying owners. Tarlock §4.06[1].

Well Interference Conflicts. Overlying owners theoretically will proportionally share the safe yield. Appropriative (i.e. nonoverlying) withdrawals will be stopped if they interfere with overlying uses. If appropriators may have obtained prescriptive rights against private overlying users, appropriators are treated as overlying owners.

Ground Water Depletion. During shortages, all withdrawals (including prescriptive appropriative withdrawals) are subject to proportional sharing. See Tarlock §4.06[3][4]. Shortages occur

when withdrawals are greater than net recharge. However, this has been applied only to quantify rights in water stored underground, and not to restrict withdrawals during water shortages. Aiken, Nebraska Ground Water Law and Administration, 59 Neb.L.Rev. 917, 934-35 (1980).

For many years Oklahoma was a reasonable use jurisdiction. Now ground water rights are allocated by statute. Allocations are given by state to each overlying owner of his proportionate share of the supply based on a minimum aquifer life of 20 years, a statutory adaptation of the sharing principle of the correlative rights doctrine. Jensen, Allocation of Percolating Water Under the Oklahoma Ground Water Law of 1972, 14 Tulsa L.Rev. 437 (1979).

4. Restatement of Torts (2d)/Eastern Correlative Rights. Section 858 of the Restatement of Torts (2d) provides that an overlying owner who withdraws ground water for a beneficial purpose is not liable for interfering with another's water use unless:

(a) the withdrawal of groundwater unreasonably causes harm to a proprietor of neighboring land through lowering the water table or reducing artesian pressure,

(b) the withdrawal of groundwater exceeds the proprietor's reasonable share of the annual supply or total store of groundwater, or

(c) the withdrawal of ground water has a direct and substantial effect upon a watercourse or lake and unreasonably causes harm to a person entitled to the use of its water.

Section 850A enumerates the factors to be considered in a judicial determination of whether the complained overlying use is unreasonable:

- (a) the purpose of the use,
- (b) the suitability of the use to the watercourse,
- (c) the economic value of the use,
- (d) the social value of the use,
- (e) the extent and amount of harm it causes,
- (f) the practicality of avoiding the harm by adjusting the use or method of use of one proprietor or the other,
- (g) the practicality of adjusting the quantity of water used by each proprietor,
- (h) the protection of existing values of water uses,



land, investments, and enterprises, and

(i) the justice of requiring the user causing the harm to bear the loss.

The Restatement was followed in *Maerz v. U.S. Steel Corp.*, 323 N.W.2d 524 (Mich. 1982); *Cline v. American Aggregates Corp.*, 474 N.E.2d 324 (Ohio 1984); and *State v. Michels Pipeline Const. Co.*, 217 N.W.2d 339 (Wisc. 1974); and rejected in *Wiggins v. Brazil Coal & Clay Corp.*, 452 N.E.2d 958 (Ind. 1983). See Tarlock §4.06[5]. Wisconsin, Florida, Tennessee, Alabama and North Carolina have to some extent implemented the "eastern correlative rights" doctrine, which is based upon Restatement principles. *Waters & Water Rights* §22.06.

## B. Statutory Allocation.

1. Prior Appropriation. The common law doctrines of absolute ownership and reasonable use have been replaced by prior appropriation statutes in most western states. States which have adopted prior appropriation statutes include California (regarding non-overlying uses only); Colorado (regarding tributary and designated ground water); Idaho; Kansas; Montana; Nevada; New Mexico; North Dakota; Oregon; South Dakota; Utah; Washington and Wyoming. Only Texas, Arizona and Nebraska do not allocate ground water by prior appropriation. 59 Neb.L.Rev. 927n33; Tarlock §6.03[1]. Ground water appropriation statutes have withheld takings challenges. Tarlock §6.03[2].

Appropriation Procedures. An state appropriation permit is required before a well can be installed or used. A ground water appropriator must meet the same requirements as for a surface water appropriation: due diligence, perfection, actual use, beneficial use, etc. Applicants may be required to perform pumping tests so that the state water administrator can determine whether the applicant's pumping will harm existing appropriators. Junior ground water appropriations may be subject to a variety of conditions protecting the rights of senior ground (and surface) water appropriators, such as restricted withdrawal rates, maintenance of reasonable pumping depths, etc. Applications for junior ground water appropriations may be denied where they would interfere with senior appropriations or exceed applicable ground water depletion rates.

Ground water appropriations are subject to the same restrictions and enjoy the same privileges as surface water appropriations. However, as discussed at II(C) below, some of these principles are applied differently to ground water circumstances than they would be to surface water circumstances. For example, sen-

ior appropriators cannot automatically expect that the state engineer will shut down the fending junior appropriator whenever the senior appropriator makes a priority call. Similarly, in most states senior ground water appropriators are not entitled to maintenance of original ground water levels.

2. Eastern Permit Statutes. Several eastern states have adopted statutes requiring permit for large water uses. States with integrated surface and ground water permit requirements include Connecticut, Iowa, Kentucky, and Maryland. Tarlock §4.09[2]. States with separate ground water permit statutes include Florida, Minnesota, Wisconsin and New York. Tarlock §4.09[3]. In some of these permit states, ground water disputes may still be judicially resolved under common law rules. States that may establish "critical area" restrictions include Georgia, Indiana, Mississippi, New Jersey, North Carolina, South Carolina and Virginia. Tarlock §4.09[4]. Ground water permit statutes have withstood takings challenges. Tarlock §4.09[1].

## II. WELL INTERFERENCE CONFLICTS

A. Background. See generally Hutchins, Protection in the Means of Diversion of Ground-Water Supplies, 29 Cal.L.Rev. 1 (1940); Widman, Groundwater-Hydrology and the Problem of Competing Well Owners, 14 Rocky Mtn.Min.L.Inst. 523 (1968); Tarlock §6.04.

1. Water Table Aquifers. When a well is drilled into a water table aquifer, the pump is set below the top of the saturated zone or aquifer. When the well is pumped, the portion of the aquifer at the pump is physically dewatered; i.e. drained into the well. It is as if a ground water vacuum is created by the pump. As ground water flows towards the pump, an inverted "cone of depression" is created with the point at the pump and the large part of the cone at the top of the aquifer. As pumping continues, the size of the cone enlarges. When pumping stops, the cone will gradually contract. If there is sufficient recovery time, the cone will completely disappear. When the cones of depression of two or more wells intersect, the wells are interfering with each other. Typically the yield of both wells will be reduced, although this depends on the depth of the wells, the depth and transmissivity of the aquifer, etc.

2. Artesian Aquifers. When a well is drilled into an artesian aquifer, pressure will force the water level in the well above the water level in the aquifer. (In a water table aquifer, the water level will be the same inside and outside the well before the well is pumped.) When a high capacity well is pumped, it will eventually reduce artesian pressure in the well and the

aquifer as a whole. Thus the water levels in all the wells will fall. Ultimately enough water will be withdrawn from the aquifer that all the artesian pressure is lost. At this point the aquifer will behave as a water table aquifer.

A typical problem with artesian aquifers is that domestic and livestock wells will be installed with no pumps or with pumps set at relatively shallow depths because the artesian pressure either yields flowing wells or brings water close enough to the surface for a short pumping lift. If a high capacity well is drilled into the same aquifer, the ground water level may fall below the level of the shallow pumps in the small wells, such that the pumps burn up and must be replaced.

3. Policy Implications. There are many circumstances in which well interference conflicts occur. The typical situation is where a new well allegedly interferes with existing wells. If there is enough water for all if existing wells and pumps are deepened, the issue is economic: who pays for the new wells, junior user or the senior user? When there is not enough water for all even if well capacities are increased, the issue becomes who is entitled to water and whose use will be curtailed.

## B. Common Law.

1. Absolute Ownership. Under the absolute ownership doctrine there is no legal liability for interfering with the production of another's well. Thus, if a senior user's well must be replaced, the senior user bears the cost, even if the well would have been adequate if the junior use had not been initiated. When supplies are inadequate for all, the user with the deepest well and most powerful pump will get the water. This is referred to as the law of capture.

2. Reasonable Use. Generally an overlying owner can pump as much ground water as he wishes without legal liability. If a junior user's withdrawals reduces a senior user's ground water production, the junior will not be liable if the junior use is overlying and not wasteful. If the junior use reduces a senior user's production and the junior use is unreasonable, i.e. wasteful or non-overlying, the junior user (1) may be liable for damages [e.g. if a well must be replaced] or (2) the unreasonable use may be enjoined [e.g. if insufficient ground water is available].

In Nebraska, the reasonable use doctrine has been modified by statutory ground water preferences. In *Prather v. Eisenmann*, 200 Neb. 1, 261 N.W.2d 766 (1978) the Nebraska Supreme Court

ruled that an irrigator was liable for interfering with private domestic wells after the domestic well owners proved interference. In Nebraska domestic use is preferred over all other ground water uses, and agricultural uses are preferred over manufacturing and industrial uses. Neb.Rev.Stat. §46-613.

3. Correlative Rights. When conflicts among overlying users occur, each is entitled to his proportionate share of the available supplies. *Katz v. Walkinshaw*, 141 Cal. 116, 70 P. 663 (1902), 74 P. 766 (1903). When conflicts between overlying and appropriative ground water users occur, overlying users are "paramount" to appropriative users. *Id.* If, however, appropriators have obtained prescriptive rights, their rights are co-equal with overlying users. *Pasadena v. Alhambra*, 33 Cal.2d 908, 207 P.2d 17 (1949). Prescription does not run against competing overlying owners. *Tehachapi-Cummings County Water Dist. v. Armstrong*, 49 Cal.App.3d 922, 122 Cal.Rptr. 918 (1975). Prescription also does not run (by statute) against public entities, including municipalities. *Los Angeles v. San Fernando*, 14 Cal.3d 199, 537 P.2d 1250 (1975). See Tarlock §4.06[3][4].

4. Restatement of Torts (2d)/Eastern Correlative Rights. Under the eastern correlative rights doctrine and the Restatement of Torts (2d) the reasonableness of competing ground water uses may be compared in well interference cases following the criteria of §850A. While these criteria provide wide judicial latitude, they generally favor small users being displaced by new large users.

### C. Appropriation.

The priority doctrine would appear to provide some legal protection to senior appropriators against junior appropriators. However the priority doctrine has been modified regarding well interference conflicts to allow more widespread ground water use than strict application of the priority rule would allow.

1. Before the Fact. An advantage of an administrative system which requires a permit before ground water uses can be initiated is that the impact of a proposed use on existing uses can be evaluated, and appropriate conditions on the new permittee established. This provides an opportunity to anticipate well interference conflicts before they occur or at least to reduce their effect. The same opportunities to avoid future well interference conflicts through permit conditions exist under eastern permit statutes. Nebraska is the only state with statutory well spacing requirements. 59 Neb.L.Rev. at 978-80, 988-92.

Senior appropriators can protest proposed ground water appropriations and can attempt to persuade the state engineer that conditions should be imposed (well spacing or withdrawal limitations, e.g.) to minimize the impacts on senior appropriators. This approach is followed in Colorado (appropriation of non-designated non-tributary ground water); Montana (control areas only); New Mexico; Oregon; South Dakota; Washington; and Wyoming (control areas only). 59 Neb.L.Rev. 929n45; see also Roswell v. Berry, 80 N.M. 110, 452 P.2d 179 (1969). Ground water appropriations may be denied if the effect on existing appropriators would be too severe. Often "critical area" regulations are established to deal with well interference before the fact by limiting or prohibiting new ground water appropriations. See III(B) below.

## 2. After the Fact.

Administrative Protection of Seniors. If well interference occurs, the state engineer in Montana, Nevada, Oregon, South Dakota, Washington, and Wyoming (control areas only) may enforce priorities by reducing or curtailing withdrawals of junior appropriators. 59 Neb.L.Rev. 929n46. In Idaho and Wyoming senior appropriators may request an administrative determination of whether well interference is occurring. Idaho Code §42-237; Wyo.Stat. §41-128.

Reasonable Pumping Depths. In Idaho, Nevada, South Dakota, Washington and Wyoming the state engineer can regulate withdrawals to protect "reasonable pumping depths". 59 Neb.L.Rev. 930n49. The senior appropriators then must deepen the wells at their own expense. Accord, Colorado Springs v. Bender, 148 Colo. 458, 366 P.2d 552 (1961). In Utah, junior appropriators are required to install pumps to replace a senior's head loss. Current Creek Irr. Dist. v. Andrews, 9 Utah 2d 324, 344 P.2d 528 (1959). See also Wayman v. Murray City Corp. 23 Utah 2d 97, 458 P.2d 861 (1969); Tarlock §6.04[3].

Preferences. In three states well interference conflicts are resolved by preferences. In Oregon ground water preferences are absolute, which means the inferior user must curtail pumping for the benefit of the superior user. Or.Rev.Stat. §537.735. In Wyoming domestic users enjoy an absolute preference if they have an "adequate well." Wyo.Stat. §41-128; see Bishop v. Casper, 420 P.2d 466 (Wyo. 1966). In South Dakota water rights commission regulations give domestic wells an absolute preference during dry periods for one year, after which the domestic user must install an "adequate" well. Aiken, Evaluation of Legal and Institutional Arrangements Associated With Ground Water Allocation in the Missouri River Basin States (Univ. of Nebr. Water Resources Center,

Rotation of Pumping. Oregon and Wyoming statutes authorize the state engineer to require rotation in pumping to minimize well interference. Or.Rev.Stat. §537.735; Wyo.Stat. §41-132.

Critical Area Regulation. The statutes of several states authorize creation of "critical areas", within which special regulations may be established to deal with well interference after the fact by limiting withdrawals through enforcing priorities, rotating pumping, or reducing currently authorized withdrawals. 59 Neb.L.Rev. 934n74-78; Tarlock §6.04[2]. See III(B) below. Eastern states that may establish similar "critical area" restrictions include Georgia, Indiana, Mississippi, New Jersey, North Carolina, South Carolina and Virginia. Tarlock §4.09[4].

### III. GROUND WATER DEPLETION

If more ground water is withdrawn over time than is naturally recharged, ground water supplies will gradually be depleted. Aiken, Ground Water Mining Law and Policy, 53 Colo.L.Rev. 505 (1982). The overlying rights and appropriative doctrines do not in and of themselves prevent or control ground water depletion. Thus, most western states have addressed ground water depletion not by following their basic ground water allocation doctrines, but either by regulating ground water development and/or use in "critical areas" or by developing "rescue projects", such as the Central Arizona Project.

#### A. Well Interference Solutions.

1. Absolute Ownership. Under the absolute ownership doctrine there is no legal liability whatsoever to other overlying ground water user for ground water depletion (unless in Texas land subsidence "negligently" occurs). Thus nothing in the absolute ownership doctrine prevents ground water depletion from occurring.

In Texas ground water conservation districts may be established by petition of local landowners. Tex. Water Code Ann title 2 §52.024(a). The state may also identify critical areas with depletion, land subsidence, or pollution problems but creation of a district still must be approved by local voters. §52.051 et seq. GWCDs may regulate well spacing, irrigation runoff, and withdrawals. §§52.114 to -.117. GWCDs have regulated runoff and regulate well spacing depending on the capacity of the existing well and the well to be installed. GWCDs have not, however, regulated ground water withdrawals. See Aiken, Depleting

2. Reasonable Use. Generally an overlying user can pump as much as he wishes without legal liability to other overlying users so long as the water is used without waste on the overlying land. That ground water depletion may be occurring does not affect the reasonableness of the overlying landowner's use. Thus nothing in the reasonable use doctrine prevents ground water depletion from occurring. In Nebraska the reasonable use doctrine has been modified by statute to authorize state designation of ground water control areas and local designation of ground water management areas. Arizona also has established critical area legislation.

3. Correlative Rights. In theory overlying owners will proportionately share the available supply if ground water depletion is occurring. Appropriators uses will be stopped if they conflict with overlying uses, unless they have obtained prescriptive rights against private (not public) overlying users. In fact, however, ground water withdrawals have not been judicially restricted to prevent ground water depletion. Instead, the "safe yield" adjudication process is used to identify how much ground water can be withdrawn free of charge. Withdrawals in excess of the safe yield allocation is considered to be recharged ground water, for which the recharge entity must be compensated. 59 Neb.L.Rev. 934-35.

4. Restatement of Torts (2d)/Eastern Correlative Rights. Under §858(1)(b) of the Restatement of Torts (2d) an overlying pumper use may be considered unreasonable if the withdrawals exceed the proprietor's reasonable share of the annual supply or total store of groundwater. However the comments indicate that ground water depletion should be dealt with by statute rather than by the courts, perhaps along the lines of critical area legislation. Some eastern permit states do attempt in the permitting process to limit total ground water withdrawals to "annual safe yield." Aiken, Evaluation of Legal and Institutional Arrangements Associated With Ground Water Allocation in the Missouri River Basin States (Univ. of Nebr. Water Resources Center, 1984).

5. Appropriation. Generally, preventing new appropriations will not prevent depletion as senior appropriator withdrawals may exceed net recharge. Similarly, limiting junior withdrawals may not prevent depletion. In Idaho, however, an anti-depletion statute authorizes state water administrators to curtail junior withdrawals to the extent they exceed natural recharge. Baker v.

Ore-Ida Foods, Inc., 95 Idaho 575, 513 P.2d 627 (1973).

**B. Critical Ground Water Area Regulations.**

The most common western response to ground water depletion is statutory authorization of special regulation of ground water development and, occasionally, ground water use in designated "critical" areas. Critical area legislation of one sort or another exists in twelve of the seventeen contiguous western states. Those not having critical legislation are: California, Oklahoma, North Dakota, South Dakota and Utah. 59 Neb.L.Rev. 932n58; Tarlock §6.05[2]. Eastern states that may establish similar "critical area" restrictions include Georgia, Indiana, Mississippi, New Jersey, North Carolina, South Carolina and Virginia. Tarlock §4.09[4].

1. Designation Procedures. Usually designation of critical areas is a state engineer responsibility. 59 Neb.L.Rev. 933nn62-63. In several western states ground water users can petition the state engineer to designate a critical area or can establish a critical area by petition and referendum. Id. 933n64. Only in Nebraska and Texas can critical areas not be designated at the state engineer's initiative.

2. Designation Criteria. Criteria for designating critical areas include withdrawals approaching or exceeding natural recharge; water level declines; user conflicts; water quality degradation; and land subsidence. 59 Neb.L.Rev. 933nn65-69.

3. Development Controls. Authorized critical area regulation of ground water development include requiring permits for new wells; and denying installation of new wells through well permit denials, well spacing requirements, and well drilling moratoria. 59 Neb.L.Rev. 933nn70-73. Specific administrative development restrictions include the Colorado 3 mile/40% depletion/25 year rule approved in *Fundingsland v. Colorado Ground Water Commission*, 171 Colo. 487, 468 P.2d 835 (1970) and the New Mexico township/66% depletion/40 year rule approved in *Mathers v. Texaco. Inc.*, 77 N.M. 239, 421 P.2d 771 (1966). See also Aiken, Depleting the Ogallala: High Plains Ground Water Management Policies (Univ. of Neb. Dep't of Ag. Econ., 1984).

4. Use Controls. Authorized critical area regulation of ground water uses include reducing ground water withdrawals by enforcing priorities; reducing previously authorized withdrawal levels; requiring rotation of pumping; enforcing voluntary reduced pumping agreements; and purchasing and retiring ground water rights. 59 Neb.L.Rev. 933n74-78.



5. Arizona Ground Water Management Act. Arizona's 1980 ground water act, the most recent western ground water depletion statute, follows the state control approach. Additional ground water development for irrigation is essentially prohibited, but the act also requires reduced ground water irrigation withdrawals phased in over 45 years. The act's goal is to balance withdrawals and recharge (natural and artificial) by 2025. The Arizona statute also authorizes purchase of irrigated land and retirement of the associated irrigation ground water right, financed by taxes of up to \$2 per acre foot on ground water withdrawals. See Tarlock §6.06[3].

### C. Storing Water Underground.

Where ground water supplies are being depleted, withdrawal rates can be maintained if additional water supplies can be obtained. Supplemental water supply development has been successfully implemented on a large scale only in California, although Arizona and Texas have attempted to obtain supplemental water supplies for areas depleting ground water.

1. California. The supply augmentation option has been pursued in California for many years, resulting in evolving policies for integrating the use of local ground water and imported surface water. A significant component of this integrated management of ground and surface water is the use of the storage capacity of at least partially depleted ground water reservoirs to store imported surface water underground. California Supreme Court decisions have facilitated the evolution of these integrated management policies by recognizing the right of recharge entitlements to control withdrawals of water stored underground. *City of Los Angeles v. City of San Fernando*, 14 Cal.3d 199, 537 P.2d 1250 (1975); *City of Los Angeles v. City of Glendale*, 23 Cal.2d 68, 142 P.2d 289 (1943). See Gleason, Los Angels v. San Fernando, 4 Hastings Const.L.Q. 703 (1977); Gleason, Water Projects Go Underground, 5 Ecology L. Q. 625 (1976); Kreiger & Banks, Groundwater Basin Management, 50 Cal. L. Rev. 56 (1962).

If a water supplier believes it has stored water underground and wishes to charge those withdrawing water stored underground, the water supply entity goes to court to have the ground water rights of all users in the basin adjudicated. If the court determines that the water supplier has recharged ground water supplies, the court will limit withdrawals to each user's proportionate share of the basin's "safe yield". The water supplier then can charge ground water users for water withdrawn in excess of the safe yield allocation. The safe yield adjudication proc-

ess essentially creates a presumption that ground water withdrawn in excess of the safe yield is recharged ground water for which the recharging entity must be paid. 59 Neb.L.Rev. 934-35.

2. Washington. Washington water law also recognizes separate management of water stored underground. Washington statutes define ground water in two separate categories: natural and artificially stored. Wash. Code Ann. §90.44.130. Any person who has stored water underground can file a claim with the Washington Department of Ecology and, if it accepted, the storing entity is granted special rights to use that ground water. Jensen v. Department of Ecology, 102 Wash.2d 109, 685 P.2d 1068 (1984); 59 Neb.L.Rev. 935nn85-86.

3. Arizona. Permits are required from the Arizona Department of Water Resources for underground water storage and recovery. Ariz.Rev.Stat. §45-804. The DWR must maintain storage account records for each underground water storage project. §45-809(A). Water may be recovered only to the extent that storage credits are available. §45-809(B). Credits are granted for water stored underground less natural recharge and less water that could have been used directly. §45-809(C). Debits are calculated as follows: 100% of all sewage effluent withdrawn; 100% of all developed water withdrawn; 110% of all water from a well located within an active management area that is stored underground; and 105% for water withdrawn from all other recharge sources. §45-809(D). DWR permits are required to withdraw water from wells located within the hydrologic impact of an underground water storage and recovery project. The applicant must demonstrate that the ground water sought to be withdrawn would be available if the underground storage project did not exist. §45-812(A). See Tarlock §6.06[3][i].

Nevada has legislation patterned after Arizona underground water storage and recovery statutes. Nev.Rev.Stat. §§534.250-.340.

4. Nebraska. Nebraska recharge statutes authorize existing irrigation districts to obtain water rights for water stored underground incidentally to normal irrigation district operation, e.g. canal leakage and overapplication of irrigation water. Neb. Rev. Stat. §§46-295 to -2,106; sustained in In re Application U-2, 226 Neb. 594, 413 N.W.2d 290 (1987).