Western Ground Water Law: Overview and Recent Developments

J. David Aiken

Follow this and additional works at: https://scholar.law.colorado.edu/western-water-law-in-transition

Part of the Administrative Law Commons, Animal Law Commons, Aquaculture and Fisheries Commons, Biodiversity Commons, Constitutional Law Commons, Courts Commons, Energy and Utilities Law Commons, Environmental Law Commons, Environmental Policy Commons, Finance and Financial Management Commons, Government Contracts Commons, Hydraulic Engineering Commons, Indian and Aboriginal Law Commons, Legal Ethics and Professional Responsibility Commons, Legal History Commons, Legislation Commons, Natural Resource Economics Commons, Natural Resources and Conservation Commons, Natural Resources Law Commons, Natural Resources Management and Policy Commons, Oil, Gas, and Energy Commons, Property Law and Real Estate Commons, Public Policy Commons, Recreation, Parks and Tourism Administration Commons, State and Local Government Law Commons, Urban Studies Commons, Water Law Commons, and the Water Resource Management Commons

Citation Information

Reproduced with permission of the Getches-Wilkinson Center for Natural Resources, Energy, and the Environment (formerly the Natural Resources Law Center) at the University of Colorado Law School.

Reproduced with permission of the Getches-Wilkinson Center for Natural Resources, Energy, and the Environment (formerly the Natural Resources Law Center) at the University of Colorado Law School.
WESTERN GROUND WATER LAW:
OVERVIEW AND RECENT DEVELOPMENTS

J. DAVID AIKEN
Professor of Agricultural Economics
University of Nebraska

WESTERN WATER LAW IN TRANSITION

A short course sponsored by the
Natural Resources Law Center
University of Colorado School of Law
June 3-5, 1985
WESTERN GROUND WATER LAW:
OVERVIEW AND RECENT DEVELOPMENTS

J. David Aiken*

§I. NATURE OF THE GROUND WATER RESOURCE

See generally, Baldwin & McGuinness, A Primer on Ground
Water (U.S. Geol. Survey 1963); Crosby,"A Layman's Guide to
Groundwater Hydrology," in Corker, Groundwater Law,
Management, and Administration (Nat'l Water Comm'n Legal
Study No. 6, 1971).

A. Ground Water Occurrence.

The ultimate source of ground water is precipitation.
Water percolates through the soil through what is referred
to as the zone of aeration (unsaturated zone) from which
water cannot be withdrawn by well. The water continues to
percolate until it reaches the saturated zone, where all
pore spaces in subsurface materials are saturated with
water. In these saturated zones, which may also be referred
to as ground water aquifers, ground water can be withdrawn
by wells.

A major difference between surface water and ground
water is ground water's much slower rate of movement.
Surface water movement may be measured in miles per day
whereas ground water movement is typically measured in feet
per year. This has led to modification of priority doctrine
as a basis for resolving ground water use conflicts.

A second major difference between surface and ground
water is that surface is renewed annually whereas the latter
is recharged very slowly. (Most western policy makers
mistakenly consider ground water to be a nonrenewable
resource similar to oil and gas.) The slow rate of ground
water recharge is important regarding ground water depletion
policies.

B. Aquifer Types.

A common ground water problem occurs when the pumping
of one well reduces the production of a nearby well. This
well interference effect may be seasonal (temporary) or
"permanent" (i.e. long run. The degree of the well
interference effect will depend on whether the aquifer is
artesian or a water table aquifer. Typically there will be
enough water available for all users but older wells may be
need to be deepened or replaced to maintain previous
production levels.

*Associate Professor of Agricultural Economics (Water
Law Specialist), University of Nebraska.
There are two generalized aquifer types which have different well interference conflict effects: artesian and water table aquifers. A third "type" of ground water body, referred to as an underground stream, will be dealt with at §V below.

1. Artesian Aquifers.

Artesian aquifers are those in which the ground water is under pressure. This typically is the result of an impervious layer (clay, rock, etc.) restricting the upward movement of ground water in part of the aquifer. As water percolates into the aquifer, the pressure in the aquifer increases. A well drilled into an artesian aquifer may flow without being pumped if artesian pressure is great enough. In artesian aquifers well pumps may not be set at the bottom of the well because artesian pressure forces the water closer to the surface, reducing the required pump lift. This can lead to well interference problems as described at §III(A) below.

Ground water level fluctuations can be dramatic in artesian aquifers. The water levels changes here would represent changes in artesian pressure rather than long term water level reductions. Temporary water level declines exceeding 100 feet within several hours of when pumping begins is not unusual in smaller artesian aquifers.

2. Water Table Aquifers.

The second aquifer type is referred to as a water table aquifer. In these aquifers ground water is not under pressure, and changes in water levels are less dramatic than in artesian aquifers, both with regard to how deep the drawdown is and the time it takes for the drawdown effect to be felt by nearby wells.

C. Water Level Fluctuations.

1. Seasonal Water Level Reductions.

As noted above, water level changes can be seasonal (temporary) or "permanent" (long term). (The term permanent is somewhat misleading as ground water levels can be restored through ground water recharge.) Seasonal water level changes occur during period of high ground water use, typically during the summer when irrigation and other water supply requirements peak. Heavy pumping during these periods will draw down water levels, which will recover as soon as heavy pumping subsides. Thus e.g. fall water levels, taken after the end of the irrigation season, typically are lower than spring water levels, because the aquifer has had several months to recover from the temporary effects of heavy pumping.
Seasonal water level reductions may lead to well interference conflicts, both in artesian and water table aquifers.

2. Permanent Water Level Reductions.

As noted earlier, precipitation is the ultimate source of ground water. Natural recharge rates in the West are measured in acre inches per year. (An acre inch is enough water to cover an acre of land to a depth of one foot, or 27,154 gallons.) However, irrigation, the major use of ground water in the West (91% of 1975 ground water consumption) uses from 12 to 36 acre inches per irrigated area annually. Where irrigation (and other high volume water uses) occur, local or regional ground water supplies will be depleted as withdrawals significantly exceed natural recharge.

Seasonal water level recovery typically occurs in areas where local ground water supplies are being depleted. E.g. water levels may fall 20 feet during the irrigation season and recover 15 feet over the winter for a net annual depletion of five feet. That some seasonal recovery is occurring should not obscure, however, that long term depletion is also occurring.

§II. GROUND WATER ALLOCATION DOCTRINES

Ground water allocation doctrines are either common law or statutory. Common law doctrines include the overlying rights doctrines of absolute ownership, reasonable use, and correlative rights. California, Arizona and Nebraska are the only western states following common law allocation principles to a significant degree. Oklahoma, originally a reasonable use jurisdiction, follows a statutory adoption of the correlative rights doctrine. Western ground water statutes are appropriative, 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 virtue of owning "overlying land," i.e. land overlying the ground water supply.

1. Absolute Ownership Doctrine.

Historical Development. 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 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).

The absolute ownership doctrine originally was followed in most western states, including California, Idaho, Kansas, Nevada, New Mexico, Texas, Utah, Wyoming, and (by statute) Oklahoma. Citations are collected in Aiken, Nebraska Ground Water Law and Administration, 59 Neb.L.Rev. 317, 924n19. Today, Texas is the 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).

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 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 Doctrine.

Historical Development. 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. The American rule was adopted at one time in several western states, including Arizona, California, Montana, Nebraska, Oklahoma, Oregon, Utah, Washington and Wyoming. Citations are collected at 59 Neb.L.Rev. 925n27. Arizona and Nebraska now use the American rule as a partial basis for ground water allocation.

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.
Instead, an interfering use is unreasonable 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). Subsequent to FICO the Arizona legislature enacted a statute authorizing municipalities to purchase and retire ground water irrigation appropriations and to transfer the use for municipal use.

Nebraska, the other western reasonable use state, has special legislation authorizing 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 Doctrine.

Development. 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"). 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.

Rights of Use. Overlying landowners can make a reasonable use of ground water. Katz v. Walkinshaw, 141
However, non-overlying landowners can "appropriate" "surplus" ground water not needed by overlying owners. Id.

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

**Ground water depletion.** During shortages, all withdrawals (including prescriptive appropriative withdrawals) are subject to proportional sharing. Pasadena, supra. 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. See Jensen, Allocation of Percolating Water Under the Oklahoma Ground Water Law of 1972, 14 Tulsa L.Rev. 437 (1979).

B.  **Appropriation.**

**Historical Development.** 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 (except non-designated non-tributary ground water); Idaho; Kansas; Montana; Nevada; New Mexico; North Dakota; Oregon; South Dakota; Utah; Washington and Wyoming, fourteen of the seventeen contiguous western states. Citations are collected at 59 Neb.L.Rev. at 927n33.

**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.

Rights of Use. Ground water appropriations are subject to the same restrictions and enjoy the same privileges as surface water appropriations. However, as discussed below, some of these principles are applied differently to ground water circumstances than they would be to surface water circumstances. For example, senior appropriators cannot automatically expect that the state engineer will shut down the offending 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. See §III(C) below.


§III. WELL INTERFERENCE

A. Background.


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.


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).

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 license 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.

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 non-designated non-tributary ground water); Montana (control areas only); New Mexico; Oregon; South Dakota; Washington; and Wyoming (control areas only). Citations are collected at 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 §IV(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. Citations are collected at 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". Citations are collected at 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).


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 absolute preference during dry periods. See 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) at 81.


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. Collections are collected at 59 Neb.L.Rev. 934n74-78.

§IV. GROUND WATER DEPLETION

If more ground water is withdrawn over time than is naturally recharged, ground water supplies will gradually be depleted. See generally 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".

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). GWCDs may regulate well spacing, irrigation runoff, and withdrawals. Id. §§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 the Ogallala: High Plains Ground Water Management Policies (Univ. of Neb. Dep't of Ag. Econ., 1984) 15-18.

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 water control areas and local designation of ground water management areas. Arizona also has established critical area legislation. Installing new high capacity wells is severely restricted, although existing rights can be purchased and converted to industrial or municipal use. Ground water withdrawals will be reduced through regulation and through purchasing and retiring irrigation rights. Arizona officials hope that these measures plus supplemental water from the proposed Central Arizona Project will balance withdrawals and recharge by 2025. See §VII(A).


As noted above, 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. See Aiken, Nebraska Ground Water Law and Administration, 59 Neb.L.Rev. 917, 934-35 (1980).

4. Appropriation.


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. Citations are collected at 59 Neb.L.Rev. 932n58.

1. Designation Procedures.

Usually designation of critical areas is a state engineer responsibility. Citations are collected at 59 Neb.L.Rev. 933nn62-63. In several 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. Citations are collected at 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. Citations are collected at 59 Neb.L.Rev. 933nn70-73. Specific administrative development restrictions include the Colorado 3mile/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. Citations are collected at 59 Neb.L.Rev. 933n74-78.


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.

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 entitles 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). Regarding the San Fernando decision see Gleason, Los Angeles v. San Fernando, 4 Hastings Const.L.Q. 703 (1977); Gleason, Water Projects Go Underground, 5 Ecology L. Q. 625 (1976). Regarding the Glendale decision see 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 process 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. See Aiken, Nebraska Ground Water Law and Administration, 59 Neb.L.Rev. 917, 934-35 (1980).

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. See Aiken, Nebraska Ground Water Law and Administration, 59 Neb.L.Rev. 917, 935nn85-86 (1980).
V. SURFACE-GROUND WATER CONFLICTS

A. Legal classifications of ground water. 937.

1. Hydrologic Background.

In the West many aquifers and streams are physically interrelated. Ground water may drain (discharge) into a stream, or a stream may drain into a ground water aquifer. Wells drilled in alluvial aquifers (aquifers with a close hydrologic connection to a stream) may induce recharge from the stream, reducing streamflow.

2. Legal Classifications of Ground Water.

Where appropriation applies to both surface and ground water, surface-ground water conflicts will be resolved principally on the basis of priority. Where ground water rights are overlying rather than appropriative, the legal characterization of ground water supplies will determine how surface-ground water conflicts are resolved.

Underground Stream v. Percolating Ground Water. The major legal distinction between legal categories of ground water is percolating ground water v. water in an underground stream. An underground stream is a stream flowing underground, the channel of which is reasonably ascertainable from the surface without excavation. Although underground streams occur rarely in the physical world, they appear more frequently in legal decisions, probably because they include the concept of subflow of a surface stream.

The legal significance of of the underground stream doctrine is that water from an underground stream is allocated on the same basis as surface water. Thus where surface water water rights are appropriative, surface-ground water conflicts will be resolved on the basis of priority. The underground stream doctrine is followed in all western states except Kansas, Nebraska, Texas and Wyoming. Citations are collected at 59 Neb.L.Rev. 937n90. Significantly the underground stream doctrine is followed in the overlying rights states of Arizona and California.

Subflow or Underflow of a Surface Stream. The subflow or the underflow of a surface stream (i.e. an alluvial aquifer) is the subsurface flow associated with a river or stream. The ground water may be either entering or leaving the stream. Under the subflow doctrine the ground water is considered to be part of the stream and therefore subject to the same rights of use. The subflow doctrine is followed in Arizona, California, Colorado, Kansas, Texas and Utah. Citations are collected at 59 Neb.L.Rev. 938nn94-95. The subflow doctrine is followed in the overlying rights states of Arizona, California and Texas.
Tributary Ground Water. The concept of tributary ground water is very similar to the subflow doctrine. Ground water is considered to be tributary to a stream if it would reach the stream if not first intercepted by a well. The tributary ground water doctrine is followed in Colorado, Idaho, and New Mexico. Citations are collected at 59 Neb. L.Rev. 938n96. The tributary ground water doctrine is the basis for administering surface and ground water rights in a common source in Colorado.

B. Overlying Rights.

As noted previously, Arizona and California follow the underground stream doctrine, while the subflow doctrine is followed in Arizona, California and Texas. Thus of the western overlying rights jurisdictions Nebraska is the only state that does not rely on appropriation as a basis for resolving surface-ground water conflicts. Nebraska courts would probably follow California decisions correlating the rights of surface and ground water users to use water from a common source. Citations are collected at 59 Neb. L.Rev. 938n94.

C. Appropriation.

1. Before the Fact.

In some states ground water appropriations will be denied if they would impair senior appropriations. E.g. Kan.Stat.Ann. §42-306. In Hall v. Kuiper, 181 Colo. 130, 510 P.2d 329 (1973), the Colorado state engineer denied a permit for a well 13 miles from the Cache La Poudre river because the river was over-appropriated. The ground water moved towards river at rate of 0.3 miles per year. In City of Albuquerque v. Reynolds, 71 N.M. 428, 379 P.2d 73 (1963), the New Mexico state engineer required surface appropriations be retired as a condition of approving a new ground water appropriation tributary to an stream. The state engineer determined that in 75 years half of ground water withdrawals would come from the stream.

2. After the Fact.

Generally. Where appropriation applies to both surface and ground water priorities may be enforced through private litigation or administrative action. Citations are collected at 59 Neb. L.Rev. 939nn104-05.

Colorado administration of tributary ground water. Strict application of the priority doctrine (first in time is first in right) would substantially reduce ground water use, as many western basin streams were completely appropriated before significant ground water development occurred. To protect junior ground water appropriators, the
priority doctrine has been modified, similar to its modification in addressing well interference conflicts.

Colorado has the most detailed law and regulations for dealing with surface-ground water conflicts of any basin state as well as for any western state. Basically Colorado law defines "tributary ground water" as ground water which would reach a stream if it were not first intercepted by a well. Colo.Rev.Stat. §37-92-501. See Hillhouse, Integrating Ground and Surface Water Use in an Appropriation State, 20 Rocky Mtn.Min.L.Inst. 691 (1975).

What constitutes tributary ground water has not been precisely defined but litigation has established that ground water which would take more than 100 years is not tributary, while ground water which would reach a stream in 40 years is tributary. Kuiper v. Lundvall, 529 P.2d 1328 (Colo. 1975); Hall v. Kuiper, 510 P.2d 329 (Colo. 1973). Thus, Colorado water law is concerned with the long term stream depletion effects of tributary ground water withdrawals, rather than mere seasonal interference. In this regard Colorado surface-ground water policy goes beyond well interference type concern to include ground water depletion type concerns.

The Colorado State Engineer has adopted regulations requiring junior ground water appropriators to severely restrict or cease their withdrawals for the benefit of senior surface appropriators, or else to develop approved "plans of augmentation" to deliver replacement water to senior surface appropriators. Junior ground water appropriators in the South Platte basin join private supply augmentation associations, such as ground water users associations or water conservancy districts. These private entities collectively develop supplemental water supplies which are used to supply the needs of senior surface appropriators.

Legally these associations are supplying water to compensate senior surface appropriators for the estimated stream depletion effect of junior appropriators of tributary ground water. Colo.Rev.Stat. §§37-80-120, -92-501. This replacement water may take the form of (1) purchasing and retiring senior surface appropriation, in effect dedicating that water to replacement water use; (2) pumping ground water into streams; and (3) impoundment and other more conventional surface water development activities. These replacement water activities are financed by user charges collected by the associations.

The replacement water is available for use by the division engineer to be used either at his discretion or at his notification of the district to meet the priority calls of senior surface appropriators. On the average junior ground water appropriators must provide approximately five
percent of their annual withdrawals as replacement water to the division engineer. If they do not do so, junior tributary ground water appropriators are prohibited from pumping in the South Platte river basin and can pump only four days a week in the Arkansas river basin.

New tributary ground water appropriators must either (1) have individual augmentation plans (including providing sufficient replacement water to the division engineer) or else (2) join an organization (such as a ground water users' association) which has an approved augmentation plan. Through the plan of augmentation and tributary ground water regulations junior tributary ground water appropriator are required to pay the costs of providing sufficient replacement water to compensate for their long term stream depletion effect. See 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) at 26-33.

Colorado has another feature which helps blunt the effect of the priority doctrine on junior tributary ground water appropriators. Surface appropriators may transfer their surface priority date to a well, in effect substituting a more reliable ground water supply for a less dependable surface supply and retain the early priority date. Colo.Rev.Stat. §§37-92-102(1), -301(3). Accord Templeton v. Pecos Valley Artesian Conservancy Dist., 65 N.M. 59, 332 P.2d 465 (1958). Ground water appropriators with such earlier priority dates generally would not be subject to as many priority calls and the replacement water requirements.

Finally, junior appropriators are not required to stop withdrawing ground water that depletes streamflow if the increased streamflow will not occur soon enough to benefit the senior surface appropriator. Colo.Rev.Stat. §§37-92-501(1), -502, -102(2)(d).

VI. WATER QUALITY ASPECTS

Many sources of ground water pollution, such as surface and subsurface waste disposal, are unrelated to ground water development and use, while other sources potential sources are directly related to them. Improperly constructed wells can result in low quality ground water from one aquifer mixing with and degrading higher quality ground water from a different aquifer. Unsealed abandoned wells can be the means for ground water pollution from surface sources. Ground water withdrawals can cause salt water intrusion in coastal areas or cause concentration of minerals in the ground water left in storage. Applying more irrigation water than crops can use may result in leaching of water soluble agricultural chemicals into ground water supplies.

VII. RECENT DEVELOPMENTS IN WESTERN GROUND WATER LAW

A. 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.

Irrigation ground water development is prohibited in Arizona in active management areas (AMAs) and irrigation non-expansion areas. Ariz.Rev.Stat.Ann. §§45-432, -452. The 1980 ground water act established four initial AMAs which account for 69% of the state's ground water depletion. §45-411. The act also establishes two initial irrigation non-expansion areas. §45-431. Additional AMAs and irrigation non-expansion areas can be established by petition or by designation by the Department of Water Resources director. §§45-412 to -415, 45-432 to -436. One additional irrigation non-expansion area has been designated by the director, but no new AMAs have been designated. Wells for non-irrigation purposes can be obtained essentially only if water is not available from another source at a reasonable cost. §§45-511 to -528.
All ground water withdrawals must be reduced in AMAs, with the goal for the Tucson, Phoenix and Prescott AMAs of withdrawals equalling natural and artificial recharge (primarily from the Central Arizona Project) by 2025. §§45-563, -562.A. The goal for the Pinal AMA is to accommodate new non-irrigation uses and maintain existing irrigation as long as possible. §45-562.B. These objectives will be implemented through a series of management plans which establish water mandatory conservation programs for all ground water users to reduce ground water withdrawals. §45-563.

The irrigation water conservation requirements to be achieved by the end of the first management period 1980-1990 are based on irrigation requirements for historically grown crops with lined ditches, reuse systems, land leveling and efficient water application, but not requiring a change from flood to sprinkler or drip irrigation systems. §45-564.A(1).

The irrigation water conservation requirements to be achieved by the end of the second management period 1990-2000 are based on irrigation requirements for historically grown crops assuming maximum conservation consistent with "prudent long-term farm management practices . . . considering the time required to amortize conservation investments and financing costs." §45-565.A(1). Presumably these requirements could require a change from flood to sprinkler and/or drip irrigation systems.

The irrigation water conservation requirements to be achieved by the end of the third management period 2000-2010 are based the same as for the second management period, except that the director can reduce the highest quarter of irrigation water duties to reflect the average of the middle 50% of irrigation water duties. §45-566.A(1). The director may also include a program for retirement of irrigation ground water rights. §45-566.A(6). Retirement of irrigation ground water rights would be financed by an annual charge of up to $2 per acre foot which can be levied beginning January 2006. §45-611(3). (In addition, annual ground water charges of between $0.50-1.00 per acre foot are established to cover administrative expenses. §45-611(1). Annual ground water charges of up to $2 per acre foot may be established to cover supply augmentation expenses. §45-611(1).)

The irrigation water conservation requirements to be achieved by the end of the forth management period 2010-2020 and the fifth management period 2020-2025 include a new and presumably lower irrigation water duty and may include a retirement of irrigation ground water rights. §45-567.A(1), -567.A(6), -568.A.

-20-
AMA irrigation water use controls are developed administratively by establishing irrigation water duties for each farm in the AMA, based on crops grown from 1975-80. In the Phoenix AMA, the AMA with the most irrigated acres, irrigation water duties are also based on historic irrigation efficiency. Average irrigation efficiency is 60%. If the irrigator's actual irrigation efficiency is 55% or less his water duty is based on 60% irrigation efficiency, which assumes lined ditches, efficient application but no irrigation water reuse systems. For most of these irrigators this represents a substantially reduced ground water allocation. If the irrigator's efficiency was between 55-70%, his water duty was the greater of a 60% efficiency duty or 94% of his prior water use. If the irrigator's efficiency exceeded 70% his water duty was 100% of his prior use. AMA officials estimate that this allocation will reduce irrigation water withdrawals 10% across the AMA. The Tucson AMA is basing its irrigation water duty on 70% irrigation efficiency, which assumes lined ditches, efficient water application and reuse systems. The water duty does not take into account the historic irrigation efficiency of particular irrigators.

Arizona has been reluctant to control ground water depletion: the 1980 act and the prior ground water control both were enacted primarily to assure continued federal participation in the Central Arizona Project (CAP). Without this incentive it is questionable whether Arizona would have squarely faced the issue of ground water depletion. Arizona has the significant ground water management advantage of the availability of CAP water to supplement and recharge depleting ground water supplies. Thus the task becomes one not of adjusting to safe yield (withdrawals equal natural recharge) but safe yield augmented with supplemental CAP water. This significantly narrows the gap between supply and withdrawals, making use restrictions more palatable.

One feature of the Arizona approach which should be considered by other states facing ground water depletion is that its water conservation requirements are relatively fixed and are phased in over a definite time period. This gives irrigators time to plan their adjustment to supply reductions while clearly identifying that those supply reductions will occur. While the time given to implement the irrigation conservation plans may be too generous, at least irrigators appreciate that meaningful controls are being established. In addition, financing the administrative, supply augmentation, and water right retirement programs through withdrawal charges also provide irrigators financial incentives to improve their irrigation efficiency, which would slow depletion.
B. Colorado Non-tributary Non-designated Ground Water.


1. Background.

Legally ground water in Colorado is divided into three categories: (1) tributary ground water, (2) ground water in ground water basins designated by the Colorado Ground Water Commission ("designated" ground water), and (3) nontributary ground water outside of designated ground water basins ("nontributary" ground water). Tributary ground water is ground water that would ordinarily reach a stream if not first intercepted by a well. Rules for allocating nontributary ground water are less clear than for designated and tributary ground water. This is significant as much of the ground water available for Front Range urban development is nontributary ground water (although some of this water may in fact be tributary ground water).

A permit to construct a well is required from the State Engineer regardless of whether the source is tributary, nontributary, or designated ground water. Ground water priorities are adjudicated by the Colorado Ground Water Commission in designated basins and by the water courts for tributary ground water. Permit applications for tributary and nontributary ground water may be denied if the State Engineer determines that the proposed withdrawal would impair senior appropriations, particularly senior surface water appropriations. The permit may be issued, however, if the prospective ground water appropriator proposes an acceptable plan of augmentation which provides for making replacement water available to senior appropriators during water shortages. Existing appropriators may not contest the permit application before the State Engineer, but may contest the appropriation in water court adjudication proceedings.

Permits to construct wells with capacities exceeding 15 gpm to withdraw nontributary ground water are subject to additional limitations. Colo.Rev.Stat. §39-90-137(4). In evaluating such permit applications the State Engineer must consider (1) that only the water underlying the land of the applicant is available for appropriation, (2) that the aquifer has a minimum useful life of 100 years, assuming no substantial artificial ground water recharge occurs; and (3) that no material injury to existing appropriations would occur by issuing the permit.

2. Huston.

Uncertainty existed regarding whether nontributary ground water was subject to prior appropriation. This issue was addressed in Colorado v. Southwest Colo. Water
Conservation Dist., 671 P.2d 1294 (Colo. 1983). In that case the court held (1) that nontributary ground water is not subject to appropriation under the Colorado constitution; (2) that landowners do not own nontributary ground water underlying their lands; (3) that rights nontributary ground water are subject only to State Engineer well permit requirements, (4) that water courts do not have jurisdiction over nontributary well permits, and (5) that the Colorado legislature is free to establish allocation policies for nontributary ground water.

3. S.B. 439.

In 1983 S.B. 439 was enacted to clarify the status of nontributary ground water claims pending before the water courts. S.B. 439 gave water courts jurisdiction to hear appeals from State Engineer nontributary ground water well permit proceedings. S.B. 439 did not address the issue of whether conditional water rights in nontributary ground water could be recognized by the water courts, and did not establish the basis for nontributary ground water rights. To deal with these and additional uncertainties Gov. Lamm established the Groundwater Legislation Committee. Gov. Lamm also indicated concern inter alia regarding whether the 100 year minimum aquifer life was too short a period in allocating ground water for municipal purposes.


The Groundwater Legislation Committee included legislators, state and local water administrators, and representatives of water user groups. The Committee agreed to several issues, including inter alia (1) that the definition of nontributary ground water should be clarified; (2) that the stream depletion effect of nontributary ground water should be compensated for; (3) that holders of nontributary ground water well permits should not be entitled to maintenance of a particular water level or pressure; (4) that the priority concept is generally inappropriate for nontributary ground water administration; (5) that the State Engineer nontributary ground water well permit requirement was appropriate; (6) that the State Engineer should play an important technical role regarding nontributary ground water; and (7) that nontributary ground water allocation policies should recognize regional ground water differences within Colorado. Committee Report at 11-17.

The Committee was unable to agree on several other issues, including inter alia, (1) whether nontributary ground water should be considered a supplemental source rather than a primary water source; (2) methods for establishing nontributary ground water aquifer useful life; (3) appropriate conditions to be established for nontributary ground water well permits, (4) how regional ground water
differences should be taken into account; and (5) who should make nontributary ground water allocation decisions, including the appropriate water court role. Committee Report at 18-24.

The Committee divided into two subcommittees to prepare legislative proposals. One was a minimum change legislative proposal, the other a broader revised Colorado Groundwater Management Act. (The Groundwater Management Act deals with designated ground water basins.) Both subcommittees agreed on a new definition of nontributary ground water as "ground-water which, if withdrawn, would not affect the flow of a natural stream in an annual amount greater than one percent of the maximum amount allowed to be withdrawn, within 100 years of the time withdrawal begins." Committee Report at 25.

The minimum change proposal would inter alia, (1) clarify the definition of nontributary ground water; (2) establish that priority will not be used in resolving nontributary well interference conflicts; (3) require that stream depletion effects of nontributary ground water withdrawals be compensated for; (4) establish no right to maintenance of nontributary ground water level or pressure; (5) establish that forfeiture does not apply to nontributary ground water; (6) make appeals from State Engineer nontributary well permit proceedings de novo; and (7) establish "nonrenewable aquifer" as a new ground water category and designate the Dawson, Denver, Arapahoe, Laramie-Fox Hills, and Dakota formations as nonrenewable. Committee Report at 25-27; Appendix B. Most Committee members supported this proposal. Committee Report at 30-31.

The revised Groundwater Management Act proposal would inter alia (1) extend the Colorado Groundwater Commission's authority from designated ground water to all nontributary ground water, including authority to establish aquifer life; (2) modify the composition of the Groundwater Commission to make it more representative; (3) make basis of a nontributary ground water right a State Engineer permit rather than land ownership; (4) clarify the definition of nontributary ground water; (5) substitute the concept of "designated aquifers" for "designated basins" in the Groundwater Management Act; (6) substitute a "reasonable depletion" rule for the nontributary ground water 100 year aquifer life rule; (7) establish no rights to maintenance of original water levels or pressures; and (8) authorize forfeiture of nontributary ground water permits. Committee Report at 27-30; Appendix C.

Two bills were introduced in the 1985 Colorado legislature based on the Committee report, S.B. 5, the minimum change proposal, and H.B. 1312, patterned after the Arizona ground water management act. S.B. 5 would (1) establish that prior appropriation does not apply to
nontributary ground water; (2) establish land ownership as the basis for allocating nontributary ground water; (3) clarify that there are no rights to maintenance of original water levels or pressures; (4) define nontributary ground water as water having no more than a one percent stream depletion effect in 100 years; (5) retain the 100 year minimum aquifer life for allocation of nontributary ground water; and (6) establish that the stream depletion effect of nontributary ground water not be compensated for.