The Water Report™
Water Rights, Water Quality & Water Solutions in the West

In This Issue:

Water Law & Climate Change 1

Todd Jarvis on Groundwater 10

Desalination In California 17

Water Briefs 25

Calendar 31

Upcoming Stories:

Colorado Water Markets

Federal Policy & Tribal Settlements

Site Remediation

& More!

BENEFICIAL USE & ANTI-SPECULATION

CAN THESE WATER LAW PRINCIPLES MEET THE CHALLENGES OF CLIMATE CHANGE?

by Gregory J. Hobbs, Jr., Justice, Colorado Supreme Court

OVERVIEW

Climate variability, endemic to the vast water-short region of the western United States, gave rise to three fundamental principles of the water law exemplified by the Colorado doctrine of prior appropriation: (1) the public owns the water resource; (2) the states may adopt laws for the allocation, use, and administration of the water; and (3) actual beneficial use of the public's unappropriated water creates a water right that is subject to administration in order of priority vis-a-vis other water rights in times of short supply. Federal law requires enforcement of federally reserved water rights (including tribal rights) and interstate compacts and equitable apportionment water allocations. The capacity of stream systems to sustain the economy and the natural environment is dependent on enforcing a system of water rights that respects the interconnection of tributary groundwater and surface water, and provides for instream flow water rights along with more traditional water rights. Federal, state, and local governments have an on-going fiduciary responsibility to the public for water resource decision-making that addresses continued population growth in the face of erratic climate variation. Enforcement of the beneficial use and anti-speculation principles of the water law is essential to meeting this fiduciary duty.

PUBLIC OWNERSHIP: CONSTITUTIONAL FUNDAMENTALS

ANTI-SPECULATION, BENEFICIAL USE, AND PRIORITY ADMINISTRATION: THE COLORADO EXAMPLE[1]

Any system of water law adopted by a state or nation will necessarily reflect the needs and values of its populace and, most significantly, the supply of water available for use in addressing those needs and values. The premise that birthed prior appropriation[2] water law is that water users in a water-scarce region, undergoing a population increase, must have an actual and continuing "beneficial use"[3] need in order to obtain and retain a share of the public's water resource.[4]

In his brilliant work analyzing the Colorado Constitution's water provisions and nineteenth century Colorado Supreme Court water opinions implementing them, Professor David Schorr demonstrates that prior appropriation water law broke radically from riparian water law in order to prevent moneyed land interests from monopolizing the scarce waters of the arid American West through land ownership of stream banks, a characteristic of riparian law.[5] The premise of using only what you need subject to the prior established use rights of others became institutionalized as a means for distributing water fairly to those who could put it to use.

Water Law & Climate Change

Central Principles

Adjudication & Priority

Beneficial Use

The Water Report
(ISSN 1946-116X)
is published monthly by
Envirotech Publications, Inc.
260 North Polk Street,
Eugene, OR 97402

Editors: David Light
David Moon

Phone: 541/ 343-8504
Cellular: 541/ 517-5608
Fax: 541/ 683-8279
email:
thewaterreport@yahoo.com
website:
www.TheWaterReport.com

Subscription Rates:
$299 per year
Multiple subscription rates available.

Postmaster: Please send address corrections to
The Water Report,
260 North Polk Street,
Eugene, OR 97402

As Professor Schorr explained:

> Colorado was admitted as the thirty-eighth state of the Union in the centennial year of 1876. Article XVI of its new constitution contained four sections dealing with water rights, under the heading of "Irrigation." These constitutional provisions reveal a "radical Lockean" scheme of acquisition based on use and limitations on the aggregation of private property. Present were the by-now familiar rules allowing ditch easements and providing for restraint of corporate power, as well as the priority principle, in what was a decidedly supporting role. Most importantly, the constitution set out clearly for the first time three central principles of the Colorado appropriation doctrine: public ownership of the state's surface waters, the beneficial use requirement, and the complete abolishment of riparian privileges.[6]

Colorado's Constitution spells out the framework for the public's water resource ownership, the creation of non-speculative, beneficial water use property rights in public and private users, and prior appropriation water administration.[7] Shortly after admission to the Union in 1876, the General Assembly took an active role in formulating statutes implementing these constitutional principles.[8]

Adjudication Statutes

The Colorado General Assembly began to adopt a series of adjudication acts designed to restrict water appropriations to the needs of actual users soon after 1876. When the Territorial General Assembly enacted its first water statute in 1861,[9] it mentioned only one type of use: agriculture. In my view, this was due to the essentially non-consumptive character of mining uses along streams in the mountains; hydraulic and sluice-box mining were primarily non-consumptive in nature. Most of the water that was diverted for mining returned to the mountain streams and flowed downstream onto the plains. Wherever it occurred in the state, domestic use of water for drinking and stockwatering was incidentally consumptive, whereas irrigation of cropland to feed the miners required recognition of a law that allocated and protected a consumptive use share of the public's water resource.[10] By the early twentieth century, a rapidly growing municipal and commercial economy was emerging out of farm land, requiring adjudication of all other beneficial uses in order of their decreed priorities. Consequently, in 1903 the General Assembly enacted an adjudication act applicable to all beneficial uses.[11]

The 1881[12] and 1903[13] statutes required district courts in counties throughout the state to issue decrees awarding priority dates to those appropriators who had made actual, beneficial use of the state's water. Because junior appropriations often depend upon return flows from pre-existing uses, case law arising under these adjudication acts required the courts to prevent senior appropriators from enlarging their consumptive use to the detriment of decreed junior rights.[14] The original intent of the appropriator regarding the extent of the acreage to be irrigated governs the scope of the appropriation.[15] Under the 1899[16] and 1943[17] acts, changes in the point of diversion, amount, use, or place of use required adjudication, including protective conditions necessary to prevent injury to other water rights.[18]

In an 1883 case, the Colorado Supreme Court (Court) clearly articulated the fundamental beneficial use principle of prior appropriation law which is that no one can "appropriate more water than was necessary to irrigate his land; and that he could not divert water for the purpose of irrigating lands which he did not cultivate or own, or hold by possessory right or title, to the exclusion of a subsequent bona fide appropriator."[19] In an 1892 case, the Court had stated that "the ownership of the prior right can be acquired originally only by the actual, beneficial use of the water. The very birth and life of a prior right to the use of water is [an] actual *user*."[20]

Late nineteenth- and early twentieth-century Colorado Supreme Court cases consistently iterated that seepage water from ditches and reservoirs, and return flows from the irrigation of crops, are available for appropriation in order of priority by other water rights.[21] Decisions of the Court have since read into every decree an implied limitation that actual beneficial use of the water diverted is the scope, measure, and limit of any water right.[22]

Through a 1919 Act, the Colorado legislature provided for adjudication of all previously undecreed water rights to occur through court filings made within the next two years. If not properly filed on, their original appropriation dates would be presumed abandoned.[23] The 1943 Act provided for supplemental adjudications throughout the state.[24]

The Role of Government

CONSERVING THE PUBLIC'S WATER RESOURCE & ENFORCING ADJUDICATED WATER RIGHTS

In their article published by the University of Colorado's Natural Resources Law Center, Clyde Martz and Bennett Raley articulated government's responsibility to conserve and manage water and protect vested water use rights through priority administration. Citing the federal Mining Act of 1866[25] and the water

Water Law & Climate Change

Trusteeship Role

provisions of the Colorado Constitution, they characterized it as a trusteeship role of government officials for water administration. This responsibility includes conservation of the public's water resource and enforcement of adjudicated water rights:

> Colorado declared that all of the waters of natural streams are the property of the public and dedicated to public use. By such declaration with respect to waters in which it had no proprietary interest, the state assumed a trusteeship role to administer the waters of the state for the benefit of the public. As such, it became responsible not only for minimal administrative functions but also for administration of the kind a trustee owes to the beneficiary of the trust. Its responsibilities include, first and foremost, the conservation of the estate and avoidance of waste; second, the promotion of beneficial use by assisting the appropriator in achieving use objectives to the maximum extent feasible; third, the representation of beneficiaries in a *parens patriae* capacity [literally "parent of the nation"— i.e., the state's power to act as guardian of the public interest] and maintaining the use regimen on the river system; and fourth, the promotion of efficiency and prudence of the kind expected of a trustee.[26]

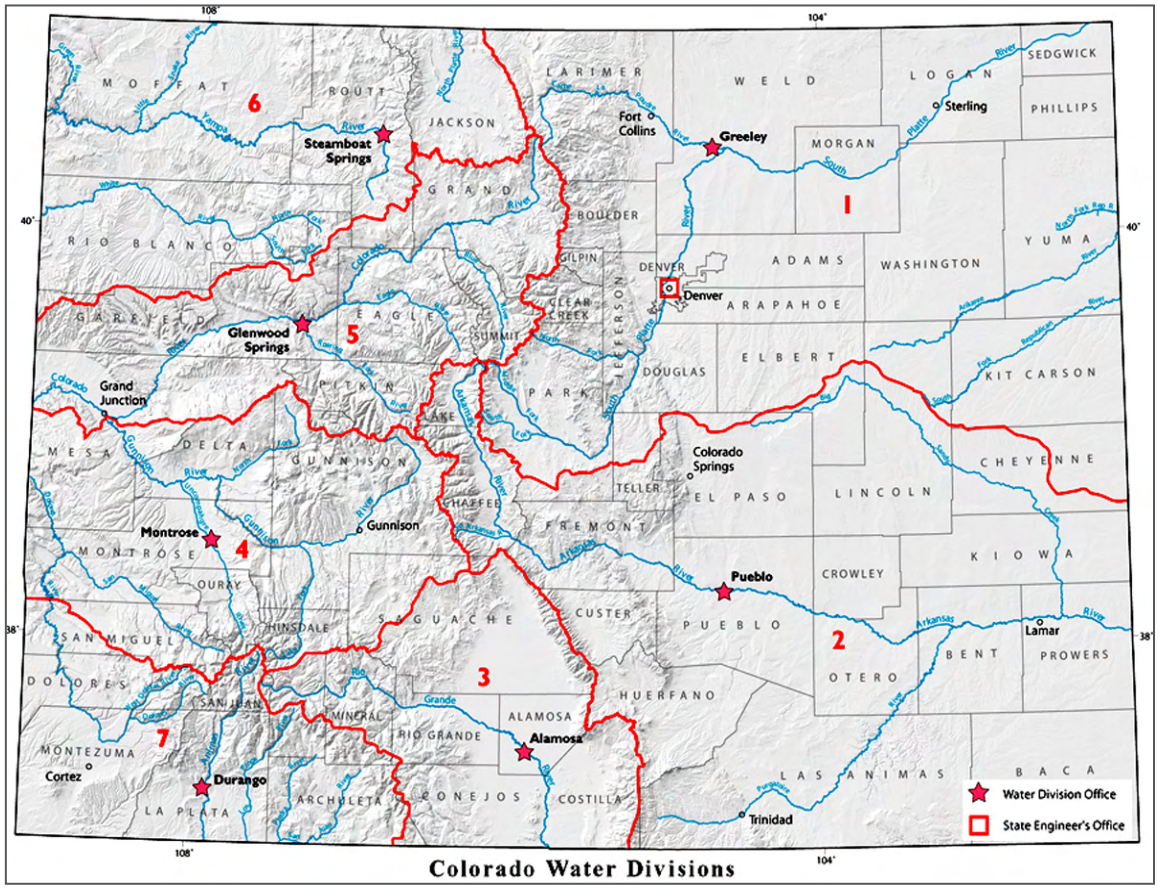
Conjunctive Use

The Colorado General Assembly has defined and implemented such a role for public agencies and officials. It has empowered and directed public officials in the performance of their water duties through numerous statutes, in particular but not limited to the 1969 Water Right Determination and Administration Act (1969 Act). The 1969 Act codified basic tenets of Colorado water law. An important tenet is the integration of tributary groundwater and surface water into the prior appropriation adjudication and administration system.[27] Colorado statutes establish seven geographical water divisions, each having a division engineer and a water judge.[28] These water judges adjudicate water right applications on a case-by-case basis, providing notice to other water users and the public of all newly filed applications through the state's resume notice system published monthly by each of the seven water divisions.[29]

Priority Value

Enforcement Need

The Colorado State Engineer, seven Division Engineers, and local Water Commissioners have the duty to enforce the seven water courts' judgments and decrees.[30] The value of any water right — whether a prior appropriation water right, or federal agency or tribal reserved right — depends on its ranking in order of the decreed priority system in times of short supply.[31] Without enforcement of the priority system, the value of a water right diminishes or disappears and the adaptability of the market to reallocate water to different uses through willing buyer/seller transactions flounders for lack of reliability.[32]



Water Law & Climate Change

Curtailment "Calls"

Transbasin Transfers

Conflicts Muted

Transfer Right

Water Market

Fluid Resource

Water Law Goals

The Role of Reservoirs and Voluntary Water Transfers

The doctrine of prior appropriation is a rule of scarcity, not of plenty. When the call for priority administration is in effect — which is often in most of Colorado's river basins even in average water years — the inevitable demand of a growing population's need for water has pitted water rights holders against each other. Senior water right holders "call out" junior water right holders to have the junior rights curtailed through priority administration. Juniors seek to improve the reliability of their water supply by buying or leasing senior water rights or providing replacement water through exchange, augmentation, or substitute supply plans. This struggle pits the rural economy — which typically holds the senior water rights — against the urbanizing economy, which has sufficient financial resources to purchase senior agricultural priorities. The result is often the dry-up of agricultural lands, which adversely impacts the rural economy.[33]

During the twentieth century, importation of western slope water from the Colorado River basin through the Continental Divide into the Platte and Arkansas River basins ameliorated the impact of over-appropriation of the native waters of these two Front Range basins, where the bulk of Colorado's population resides.[34] The US Bureau of Reclamation constructed reservoir projects in connection with repayment contracts involving local conservancy districts, such as the Colorado-Big Thompson Project serving northeastern Colorado (Northern Colorado Water Conservancy District) and the Frying Pan-Arkansas Project serving southeastern Colorado (Southeastern Colorado Water Conservancy District).[35] Cities such as Denver, Aurora, Colorado Springs, and Pueblo built their own transmountain diversion and storage projects.[36] Supplementing the relatively meager native waters of the Platte and Arkansas River basins, these importations utilized compact-apportioned water available to the state out of its Colorado River interstate apportionment. The additional water was absolutely indispensable to the agricultural, municipal, and commercial economies of the Front Range.[37]

Such importations bridged and muted agricultural and urban conflicts even as irrigated agricultural ground gave birth to the great and growing cities.[38] As the cities have grown, and recreation and the environment have taken their place in prior appropriation adjudication and administration, the market in transferring senior priority agricultural water rights to municipal and environmental uses has accelerated.[39] The long-standing water market in Colorado is more active than ever.

The 1891 *Strickler* decision[40] by the Colorado Supreme Court recognized that the valuable water use property rights of farmers could be transferred to other uses, provided that changes of water rights would be accomplished through the court process without injury to other water rights:

> We grant that the water itself is the property of the public. Its use, however, is subject to appropriation, and in this case it is conceded that the owner has the paramount right to such use. In our opinion this right may be transferred by sale so long as the rights of others, as in this case, are not injuriously affected thereby.[41]

As a result of *Strickler*, Colorado's one-hundred-twenty-year-old water market underscores the value and flexibility of private water use rights. As need and opportunity dictates, water rights can be voluntarily reallocated to other types and places of use, subject to notice and the opportunity to oppose a transfer that does not conform to the applicable legal standards governing a change of water right.

Balancing Land and Water Resources

If any resource is as valuable as the air we breathe, it is water. Water flows where it will and blesses everyone and everything it touches. As Mark Fiege says about Western United States settlement, "…water, deer, and similar commons resources moved, and they moved in relation to the land or a habitat."[42]

Water is the quintessential fluid resource. In the West, proper water management requires a common understanding of how it shall be shared by means of a possessory interest that does not constitute ownership of the resource itself. Good snowpack propels our hope; drought levels our dreams. The great dust bowl drought of the 1930s sobered-up any lingering romantic notions about the amount of water available for use in the hard times.

Susan Schulten describes how the Federal Writers' Project Guide to Colorado restrains the lyric romanticism evident in prior guides that described this state's allures.[43] This newest guide presents a leaner, more factual description of this semi-arid land, its varied peoples, and labor conflicts that spread to the state's irrigated sugar beet fields.

In twenty-first-century Colorado and into the future, we must learn to share between human economies and the environment what is predominantly — save for pockets of unappropriated water here and there — an already-developed water resource. The Colorado General Assembly has declared the goals of the water law to include "optimum use,"[44] sustainability,[45] and protection against injury to existing water rights.[46] Accordingly, the state's policy of water use does not require a single-minded endeavor to squeeze every drop of water out of surface streams and tributary aquifers. Instead, these goals can only be achieved by optimum use through proper regard for "all significant factors, including environmental and economic concerns,"[47]and a "balancing of land and water resources."[48]

Water Law & Climate Change

Major Themes

Supply Constraints

Priority & Flexibility

Groundwater Control

Transfers (Changes)

Municipal Rights

Historical Use

New Tools

BENEFICIAL USE & ANTI-SPECULATION PRINCIPLES

21ST CENTURY COLORADO CASES

Recent Colorado cases illustrating the public ownership, beneficial use and anti-speculation principles are *Empire Lodge*,[49] *Park County Sportsmen's Ranch*,[50] *High Plains*,[51] *ISG*,[52] *Pagosa I and II*,[53] *Burlington Ditch*,[54] and *Rio Grande Subdistrict No. 1*.[55]

Major themes these Colorado Supreme Court decisions illustrate include:

- Public ownership of the water resource
- Allocation and voluntary market-driven reallocation of a scarce water supply to public and private uses
- Integration of tributary groundwater and surface water into the prior appropriation adjudication[56] and administration system
- Application of the beneficial use and anti-speculation doctrines to water transfers as well as to water right claims
- Incorporation of non-consumptive uses such as instream flow and recreational water rights into the water rights system

These are emerging themes throughout the West. Many streams are over-appropriated due to natural and legal constraints. These constraints include: the erratic amount of water available under weather and climatic conditions affected by climate change;[57] interstate water apportionments allocated by interstate compacts[58] and US Supreme Court equitable apportionment decrees;[59] and integration of federal agency and tribal reserved water right priorities into the state's adjudication and administration systems.[60] A stream is considered to be over-appropriated when there is not enough water available to fill the needs of all adjudicated appropriations that have been made absolute by actual usage.[61]

Water has been allocated to Colorado under the applicable nine interstate compacts and two equitable apportionment decrees.[62] *Empire Lodge* teaches that the right to share in a portion of Colorado's public water resource is dependent upon faithful enforcement of water rights in the order of their adjudicated priorities when there is not enough water available to serve all needs. At the same time, innovative methods have emerged to ameliorate strict prior appropriation enforcement. For example, holders of junior water rights that would otherwise be curtailed in times of short water supply can divert out-of-priority by replacing sufficient water to the stream for the protection of senior water rights. Such diversions can occur under either court approved augmentation plans or, under certain circumstances, State Engineer approved substitute supply plans. In this system, priority adjudication and administration applies to interconnected tributary groundwater and surface water.

Park County Sportsmen's Ranch holds that the water-bearing capacity of Colorado aquifers throughout the state belongs to the public's water resource and is not owned by the overlying landowner. This decision illustrates how the water law of Colorado differs remarkably from states, like Texas,[63] that adhere to a common law doctrine of groundwater under which groundwater use is controlled or owned by the overlying or adjoining landowner as part of their land property rights. In Colorado, the public owns all forms of surface water and groundwater; in turn, the Colorado constitution, statutes, and case decisions allocate and define the nature, extent, and interrelationship of public agency and private water use rights.

High Plains and *ISG* demonstrate the interplay between the judicial and legislative branches of Colorado government in applying the anti-speculation and beneficial use principles of prior appropriation water law to water transfer cases. Water courts can decree "changes" of water rights, retaining their senior appropriation dates for use elsewhere, subject to conditions to prevent injury to other water rights and identification of the place and type of use where the water right being changed will be utilized.

Pagosa I and *Pagosa II* stand for the proposition that there is so little unappropriated water remaining to Colorado, under its interstate apportionments, that water rights should remain in the stream unadjudicated until such time as a viable consumptive or non-consumptive water right proves the need for an appropriation. "Conditional water rights" (*see* footnote 2) are placeholders in the priority system and should not be decreed in the absence of proof that the water can and will be placed to actual beneficial use in the amount and for the purpose claimed. Cities seeking to appropriate an additional long-term supply of water must prove that the planning period, population projections, and the additional amount of water they propose to be conditionally decreed are reasonable. These cities must take into account conservation measures and future land use mixes that affect per capita water consumption.

Burlington demonstrates that municipalities and businesses seeking to have the benefit of transferred senior agricultural water rights priorities will be *limited* in a change-of-water-right proceeding to the amount of water historically consumed beneficially over a representative historical period of time (under the decreed water right being changed). Unadjudicated water use practices and undecreed enlargements of water rights will not be recognized because they have not been subjected to the water courts' notice and decree procedure enacted by the General Assembly for the protection of other water rights.

Subdistrict No. 1 teaches that the Colorado General Assembly may fashion new conjunctive use management tools for operation of the surface water and tributary groundwater regime that are consistent with the Colorado Constitution's prior appropriation provisions. Through legislative enactment, sustainability now joins optimum use and protection against injury as goals of water law.

Water Law & Climate Change

Stream Conveyance

Recreational Use

Legislative Power

Public Trust Doctrine

Mono Lake Decision

Colorado & Public Trust Doctrine

Instream and Recreational In-Channel Diversion Flows

INCORPORATION INTO COLORADO'S WATER MANAGEMENT SYSTEM

Colorado law recognizes instream flow[64] and recreational in-channel diversion kayak course[65] water rights appropriated in order of priority by public entities. However, the law does not resort to the public trust doctrine to justify their existence.

The Colorado Supreme Court has ruled that the adjoining property owner owns the bed of the stream subject to others' use of the stream for water conveyance purposes:

> In *People v. Emmert*, we held that the beds of nonnavigable streams in Colorado are not held by the state under a public trust theory; this holding however, did not affect the right of appropriators to conduct their appropriated water through the natural channel across the landowner's property without interference.[66]

The 1979 *Emmert* decision[67] has been a controversial case in Colorado. Landowners seek to invoke it for the proposition that they may exclude rafters from passing over streambeds they own. Rafters counter that they may travel on the public's water. *Emmert* is best read as supporting the proposition that the Colorado Constitution does not address the recreational use of water and that this subject is properly a matter for legislative consideration. The common ground of agreement between the majority and dissent in *Emmert* resides in the majority's statement that "[i]f the increasing demand for recreational space on the waters of this state is to be accommodated, the legislative process is the proper method to achieve this end."[68] Justice Carrigan's dissent agrees with this proposition: "[t]he majority opinion expressly acknowledges that 'it is within the competence of the General Assembly to modify rules of common law within constitutional parameters.'"[69]

While the majority opinion cites the General Assembly's codification of a portion of the common law *cujus* doctrine — i.e., that the space above the land and waters is controlled by the owners of the surface beneath[70] — it also recognizes the right of the General Assembly to change both the common law and statute if it wishes to address the matter of rafters using recreational space on flowing stream waters.

Emmert is clear on the point that title to the beds of nonnavigable streams in Colorado belongs to the adjoining landowners, not the state. Further, the Colorado Supreme Court will not rely on public trust theory to resolve the issue of recreational use of the public's flowing water resources as it runs through the beds and banks of the stream.[71] As a recent United States Supreme Court decision holds, the applicability of the public trust doctrine to nonnavigable streams is a matter consigned to the states under their own laws, subject to the federal power to regulate vessels and navigation under the Commerce Clause and admiralty power.[72] In sum, the US Supreme Court leaves the formulation and applicability of the public trust doctrine to the individual states:

> Under accepted principles of federalism, the States retain residual power to determine the scope of the public trust over waters within their borders, while the federal law determines riverbed title under the equal-footing doctrine.[73]

Unsurprisingly, different States have pursued different courses as concerns their public trust responsibilities.

For instance, the California Supreme Court in its 1983 Mono Lake public trust decision provided for the involuntary, uncompensated, re-allocation of beneficially used water allocated to vested water rights:

> Once the state has approved an appropriation, the public trust imposes a duty of continuing supervision over the taking and use of the appropriated water. In exercising its sovereign power to allocate water resources in the public interest, the state is not confined by past allocation decisions which may be incorrect in light of current knowledge or inconsistent with current needs.

Nat. Audubon Soc'y v. Superior Court of Alpine Cnty., 658 P.2d 709, 728 (Cal. 1983).

This concept of an involuntary, uncompensated, re-allocation of water rights, however, is foreign to Colorado's jurisprudence. Moreover, there has been judicial recognition that the public trust doctrine is fundamentally incompatible with the Colorado Constitution's design for allocation of valuable water use property rights to public entities and private persons in order of their adjudicated priorities. This recognition can be found threaded between the lines of the 1979 *Emmert* decision, Justice Mullarkey's dissent in *Aspen Wilderness Workshop*,[74] and the dissent in the recent public trust ballot title cases.[75] In holding that the Colorado Water Conservation Board must enforce the instream flow water rights it appropriates, the initial majority opinion in *Aspen Wilderness Workshop* contained language referencing the public trust doctrine. However, on rehearing, the majority opinion eliminated this reference and modified

Water Law & Climate Change

Instream Rights

the opinion as follows to enunciate a "unique statutory fiduciary duty" to enforce those rights:

> The Conservation Board has a unique statutory fiduciary duty to protect the public in the administration of its water rights decreed to preserve the natural environment....[B]oth the Board's duty and its authority to appropriate instream flow find their source in the Water Rights Determination and Administration Act of 1969...Thus, we can only view the Board's actions regarding such appropriations as involving water matters reserved for our water courts.[76]

Justice Mullarkey's dissent in *Aspen Wilderness Workshop* emphasizes that Colorado has never recognized the public trust doctrine:

> This court has never recognized the public trust doctrine with respect to water. Furthermore, whatever the nature of the fiduciary duty recognized by the majority in this case, I do not understand the majority to mean that a breach of this fiduciary duty would support a public claim for damages.[77]

Private Appropriation v. State Power

While Colorado does not recognize the public trust doctrine, it nevertheless adheres to a strong, state constitutionally-based public water ownership doctrine. This doctrine serves the public interest by allowing public and private entities to appropriate water for beneficial use, subject to exercise of the state's police power to enact regulatory statutes and administer water rights. The *Park County Sportsmen's Ranch* case illustrates just how much Colorado differs from other states — like Texas with its "Rule of Capture"[78] — that adhere to a common law doctrine of groundwater controlled by or being owned outright by the overlying landowner as part of their land ownership. In Colorado, the public owns the surface water and all forms of groundwater;[79] in turn, the Colorado Constitution, statutes, and case decisions provide for the creation of private use rights to the public's resource.[80]

CONCLUSION

Water Law Resiliency

The resiliency of prior appropriation law harkens back to its founding principles, which include: public ownership of the water resource; establishment of non-speculative actual and beneficial use water rights by public agencies and private persons; and administration of water rights in order of their adjudicated priorities — with provisions for innovative management tools that ameliorate strict priority enforcement in order to optimize use of the available water resources. The integration of federal and tribal reserved and appropriative rights into Colorado's adjudication and administration system through the 1969 Act of the Colorado General Assembly is a hallmark accomplishment. Living within the state's interstate water allocation limits is an ongoing obligation owed by Colorado to downstream states. The continued viability of Colorado water law depends upon the faithful performance by public officials of their constitutional and statutory responsibilities, as well as water users' respect for the rights of others.

Doctrine Flexibility

Colorado's prior appropriation doctrine started off recognizing only agricultural uses of water. Now it embraces environmental and recreational uses, in addition to serving over five million persons, most of who live in urban and suburban areas. The state's population is expected to double over the next fifty years. Serving that population will require more — not less — adherence to the public-spirited principles of prior appropriation listed above. This adherence can provide statutory mechanisms for: water sharing through leases; crop rotational fallowing plans; exchanges; augmentation; substitute supply; and management plans.

Speculation v. Actual Need

Actual — not speculative — need, must be the basis for new water appropriations and water transfers. Sharing the risks of water shortage in times of drought between urban and rural areas, while sustaining stream habitats, will likely become a goal of water law and policy through collaborative agreements spurred by executive and legislative action. Development and use of whatever unappropriated water remains to Colorado under its interstate apportionments will likely occur. Erratic floods and droughts affecting snowpack runoff dictate the need for interconnected infrastructure construction and operation. Increased water conservation at all levels will be a necessity.[81]

For Additional Information:
Justice Gregory J. Hobbs, Jr., Colorado Supreme Court
720-625-5150 or gregory.hobbs@judicial.state.co.us

This article is based on a presentation by Justice Hobbs and his paper submitted for the 33rd Annual ABA Water Law Conference, June 5, 2015, Denver, Colorado.
The Water Report thanks the American Bar Association for its permission to print this article.
The paper was edited and reformatted to fit the format of *The Water Report*.
See also Gregory J. Hobbs, Jr., *Reviving the Public Ownership, Anti-Speculation, and Beneficial Use Moorings of Prior Appropriation Water Law*, 84 U. Colo. L. Rev. 97 (2013) from which this piece is adapted.

BENEFICIAL USE & ANTI-SPECULATION FOOTNOTES

1 *See* Gregory J. Hobbs, Jr., *Reviving the Public Ownership, Anti-Speculation, and Beneficial Use Moorings of Prior Appropriation Water Law*, 84 U. Colo. L. Rev. 97 (2013) from which this piece is adapted.

2 "Appropriation" of water is defined in Colorado as "the application of a specified portion of the waters of the state to a beneficial use pursuant to the procedures prescribed by law; but no appropriation of water, either absolute or conditional, shall be held to occur when the proposed appropriation is based upon the speculative sale or transfer of the appropriative rights to persons not parties to the proposed appropriation, as evidenced by either of the following: (I) The purported appropriator of record does not have either a legally vested interest or a reasonable expectation of procuring such interest in the lands or facilities to be served by such appropriation, unless such appropriator is a governmental agency or an agent in fact for the persons proposed to be benefitted by such appropriation. (II) The purported appropriator of record does not have a specific plan and intent to divert, store, or otherwise capture, possess, and control a specific quantity of water for specific beneficial uses." Colo. Rev. Stat. § 37-92-103(3)(a) (2014). "Conditional water right" is defined as "a right to perfect a water right with a certain priority upon the completion with reasonable diligence of the appropriation upon which such water right is to be based." *Id.* § 37-92-103(6).

3 "Beneficial use" is defined as "the use of that amount of water that is reasonable and appropriate under reasonably efficient practices to accomplish without waste the purpose for which the appropriation is lawfully made, and, without limiting the generality of the foregoing, includes the impoundment of water for recreational purposes, including fishery or wildlife, and also includes the diversion of water by a county, municipality, city and county, water district, water and sanitation district, water conservation district, or water conservancy district for recreational in-channel diversion purposes. For the benefit and enjoyment of present and future generations, 'beneficial use' shall also include the appropriation by the state of Colorado in the manner prescribed by law of such minimum flows between specific points or levels for and on natural streams and lakes as are required to preserve the natural environment to a reasonable degree."*Id.* § 37-92-103(4).

4 *See High Plains A & M, LLC v. Se. Colo. Water Conservancy Dist.*, 120 P.3d 710, 718–19 (Colo. 2005).

5 David B. Schorr, *Appropriation as Agrarianism: Distributive Justice in the Creation of Property Rights*, 32 ECOLOGY L.Q. 3 (2005); DAVID SCHORR, THE COLORADO DOCTRINE, WATER RIGHTS, CORPORATIONS, AND DISTRIBUTIVE JUSTICE ON THE AMERICAN FRONTIER (Yale University Press 2012).

6 *Id.*

7 Article XVI, section 5 of the Colorado Constitution provides, "The water of every natural stream, not heretofore appropriated, within the state of Colorado, is hereby declared to be the property of the public, and the same is dedicated to the use of the people of the state, subject to appropriation as hereinafter provided." Colo. Const. art. XVI, § 5. Article XVI, § 6 of the Colorado Constitution provides, in part, "The right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied." *Id.* § 6. Article XVI, section 7 of the Colorado Constitution provides:

> All persons and corporations shall have the right-of-way across public, private and corporate lands for the construction of ditches, canals and flumes for the purpose of conveying water for domestic purposes, for the irrigation of agricultural lands, and for mining and manufacturing purposes, and for drainage, upon payment of just compensation.
> *Id.* § 7.

8 See Gregory J. Hobbs, Jr., Colorado Water Law: An Historical Overview, 1 U. Denv. Water L. Rev. 1 (1997); Gregory J. Hobbs, Jr., Colorado's 1969 Adjudication and Administration Act: Settling In, 3 U. Denv. Water L. Rev. 1 (1999); Citizen's Guide to Colorado Water Law, Colorado Foundation for Water Education (4th ed. 2015) www.yourwatercolorado.org. These and other water articles and writings by the author are collected in Justice Greg Hobbs, In Praise of Fair Colorado, The Practice of Poetry, History, and Judging (2004); Justice Greg Hobbs, Colorado Mother of Rivers, Water Poems (2005); Gregory J. Hobbs, Jr., The Public's Water Resource, Articles on Water Law, History and Culture (2007); Justice Greg Hobbs, Living the Four Corners, Colorado Centennial State at the Headwaters (2010); and Justice Greg Hobbs, Into the Grand (2012).

9 *See* An Act to Protect and Regulate the Irrigation of Land, 1861 Colo. Territorial Laws § 1, 67.

10 Recognizing that in-house drinking water and sanitation use is a human necessity, Colorado statutory law contains an exemption from administration of the priority system for small capacity wells and rain water harvesting systems for this purpose where a family does not have access to a centralized water system. *See* Justice Gregory J. Hobbs, Jr., *Protecting Prior Appropriation Water Rights Through Integrating Tributary Groundwater: Colorado's Experience*, 47 Idaho L. Rev. 5, 20–21 (2010).

11 *See* 1903 Colo. Sess. Laws 297.

12 *See* 1881 Colo. Sess. Laws 142–46.

13 *See* 1903 Colo. Sess. Laws 278–80, 291–92.

14 *See Ready Mixed Concrete Co. in Adams Cnty. v. Farmers Reservoir and Irrigation Co*., 115 P.3d 638, 642–43 (Colo. 2005).

15 *See Cent. Colo. Water Conservancy Dist. v. City of Greeley*, 147 P.3d 9, 12 (Colo. 2006).

16 1899 Colo. Sess. Laws 235–36.

17 1943 Colo. Sess. Laws 628–29.

18 *See Empire Lodge Homeowners' Ass'n v. Moyer*, 39 P.3d 1139, 1149 (Colo. 2001).

19 *Thomas v. Guiraud*, 6 Colo. 530, 532 (1883).

20 *Combs v. Agric. Ditch Co.*, 28 P. 966, 968 (1892) (emphasis in original).

21 *See, e.g*., *Comstock v. Ramsay*, 133 P. 1107, 1110 (1913).

22 *See Weibert v. Rothe Bros., Inc*., 618 P.2d 1367, 1371 (Colo. 1980).

23 *See* 1919 Colo. Sess. Laws 487–89.

24 *See* 1943 Colo. Sess. Laws 614–18.

25 *See* Act of July 26, 1866, ch. 262, § 9, 14 Stat. 251, 253 (codified at 43 U.S.C. § 661 (2006).

26 Clyde O. Martz & Bennett W. Raley, *Administering Colorado's Water: A Critique of the Present Approach*, *in* Tradition, Innovation and Conflict: Perspectives on Colorado Water Law 41, 42 (1986). Clyde Martz was a distinguished natural resources professor at the University of Colorado School of Law and later a partner of Davis, Graham & Stubbs and Solicitor of the Department of Interior under President Jimmy Carter. Bennett Raley was also a partner of Davis, Graham & Stubbs, served as Assistant Secretary for Water Science in the U.S. Department of Interior, and currently practices water law for Trout, Raley, Montaño, Witwer & Freeman.

27 Colo. Rev. Stat. §§ 37-92-102, 37-80-102, 37-80-105, 37-80-117 (2014).

28 *Id.* §§ 37-92-201, -203.

29 *Id.* § 37-92-302. *See, e.g.*, *S. Ute Indian Tribe v. King Consol. Ditch Co*., 250 P.3d 1226 (Colo. 2011).

30 Colo. Rev. Stat. §§ 37-92-501 to -502, 37-80-102(a) (2011); *Vaughn v. People ex rel. Simpson*, 135 P.3d 721, 723 (Colo. 2006).

31 *Navajo Dev. Co., Inc. v. Sanderson*, 655 P.2d 1374, 1380 (Colo. 1982). *See also Kobobel v. State Dept. of Natural Res*., 249 P.3d 1127, 1130 (Colo. 2011) (stating that one does not own water but owns right to use water within limitations of prior appropriation doctrine).

32 *See* Gregory J. Hobbs, Jr., *Priority: The Most Misunderstood Stick in the Bundle*, 32 Envtl. L. 37, 49–52 (2002).
33 *See generally Colorado's Water Supply Future: Cooperation vs. Competition*, Headwaters, Spring 2009, www.cfwe.org/index.php?option=com_content&view=category&layout=blog&id=49&Itemid=149. (This issue is devoted to Colorado's water planning process commenced through the Colorado Water for the 21st Century Act. *See* Colo. Rev. Stat. § 37-92-101 (2014).
34 *Colorado's Water Supply Future*, at 4–7. See Citizen's Guide to Colorado's Transbasin Diversions, Colorado Foundation for Water Education (2014), www.yourwatercolorado.org.
35 *See* Gregory J. Hobbs, Jr., *Colorado Water Law: An Historical Overview*, 1 U. Denv. Water L. Rev. 1, 13–14 (1997).
36 *Id*. at 15–16.
37 *See* Justice Greg Hobbs, Foreword to Colorado Water Law Benchbook ix (Carrie L. Ciliberto & Timothy J. Flanagan eds., rev. ed. 2012).
38 *Citizen's Guide to Colorado Water Law*, Colorado Foundation for Water Education (4th Ed. 2015) at 20–21, www.yourwatercolorado.org.
39 *See generally A Decade of Colorado Supreme Court Water Decisions: 1996-2006*, Headwaters, Fall 2006, at 12–14, www.cfwe.org/index.php?option=com_content&view=category&layout=blog&id=49&Itemid=149 (discussing recent change of water rights cases).
40 *Strickler v. City of Colorado Springs*, 26 P. 313 (Colo. 1891). In this case, a city successfully obtained recognition of the right to purchase a senior agricultural priority and change it to municipal use subject to protection against injury to other water rights.
41 *Id.* at 316.
42 Mark Fiege, *The Weedy West: Mobile Nature, Boundaries, and Common Space in the Montana Landscape*, 36 The W. Hist. Q., Spring 2005, at 26.
43 Susan Schulten, *How to See Colorado: The Federal Writers' Project, American Regionalism, and the "Old New Western History"*, The W. Hist. Q., Spring 2005, at 63.
44 Colo. Rev. Stat. § 37-92-501(2)(e) (2014).
45 *Id.* § 37-92-501(4).
46 *Id.* § 37-92-501(4).
47 *Alamosa-La Jara Water Users Prot. Ass'n v. Gould*, 674 P.2d 914, 935 (Colo. 1983).
48 *San Antonio, Los Pinos and Conejos River Acequia Pres. Ass'n v. Special Improvement Dist. No. 1 of the Rio Grande Water Conservation Dist*. (*Subdistrict No. 1*), 270 P.3d 927, 952 (Colo. 2011) (en banc).
49 *Empire Lodge Homeowners' Ass'n v. Moyer*, 39 P.3d 1139 (Colo. 2001).
50 *Bd. of Cnty. Comm'rs of the Cnty. of Park v. Park Cnty. Sportsmen's Ranch*, 45 P.3d 693 (Colo. 2002).
51 *High Plains A & M, LLC v. Se. Colo. Water Conservancy Dist*., 120 P.3d 710 (Colo. 2005).
52 *ISG, LLC v. Ark. Valley Ditch Ass'n*, 120 P.3d 724 (Colo. 2005).
53 *Pagosa Area Water and Sanitation Dist. v. Trout Unlimited* (*Pagosa I*), 170 P.3d 307 (Colo. 2007); *Pagosa Water and Sanitation Dist. v. Trout Unlimited* (*Pagosa II*), 219 P.3d 774 (Colo. 2009).
54 *Burlington Ditch Reservoir and Land Co. v. Metro Wastewater Reclamation Dist*., 256 P.3d 645 (Colo. 2011).
55 *San Antonio, Los Pinos and Conejos River Acequia Pres. Ass'n v. Special Improvement Dist. No. 1 of the Rio Grande Water Conservation Dist.* (*Subdistrict No. 1*), 270 P.3d 927 (Colo. 2011) (en banc).
56 Adjudication is the process through which a Colorado Water Court decrees the point of diversion, the amount of diversion, the type of use, and the place of use of a water right. *See High Plains A & M, LLC*, 120 P.3d at 718–19.
57 *See generally Citizen's Guide to Colorado Climate Change,* Colorado Foundation for Water Education (2008) www.yourwatercolorado.org.
58 *See* Colo. Rev. Stat. § 37-61-101 (1921) (Colorado River Compact); *id.* § 37-62-101 (1948) (Upper Colorado River Compact); *id.* § 37-63-101 (1921) (La Plata River Compact); *id.* § 37-64-101 (1968) (Animas—La Plata Project Compact); *id.* § 37-65-101 (1923) (South Platte River Compact); *id.* § 37-66-101 (1938) (Rio Grande River Compact); *id.* § 37-67-101 (1942) (Republican River Compact); *id.* 37-68-101 (1963) (Amended Costilla Creek Compact); *id.* § 37-69-101 (1948) (Arkansas River Compact).
59 *See generally Citizen's Guide to Colorado's Interstate Compacts*, Colorado Foundation for Water Education (2010) www.yourwatercolorado.org.
60 *See, e.g.*, *City and Cnty. of Denver v. United States*, 656 P.2d 36, 38-39 (Colo. 1982); *S. Ute Indian Tribe v. King Consol. Ditch Co.*, 250 P.3d 1226, 1236–67 (Colo. 2011) (holding that Colorado's resume notice and newspaper publication procedure is equally applicable to federal reserved and tribal water rights as it is to Colorado prior appropriation water rights).
61 *See Empire Lodge Homeowners' Ass'n v. Moyer*, 39 P.3d 1139, 1150 (Colo. 2001).
62 *See generally* Interstate Compacts Guide, published by Colorado foundation for water education www.yourwatercolorado.org .
63 *See Edwards Aquifer Auth. v. Day*, 369 S.W.3d 814, 832 (Tex. 2012).
64 Colo. Rev. Stat. § 37-92-102(3)(2014).
65 Colo. Rev. Stat. § 37-92-102(5)(2014).
66 *Park Cnty. Sportsmen's Ranch*, 45 P.3d at 709 n.29 (citing *People v. Emmert*, 597 P.2d 1025, 1027 (Colo. 1979)).
67 *People v. Emmert*, 597 P.2d 1025 (Colo. 1979).
68 *Id*. See generally Cory Helton, *The Right to Float: The Need for the Colorado Legislature to Clarify River Access Rights*, 83 Colo. L. Rev. 845 (2012); *Conflict on the Rocky Mountain Playground*, Headwaters, Fall 2010, www.cfwe.org/index.php?option=com_content&view=category&layout=blog&id=108&Itemid=149.
69 *Emmert*, 597 P.2d at 1033.
70 *See* Colo Rev. Stat. § 41-1-107 (2014); *Emmert*, 597 P.2d at 1097.
71 *See* Colo Rev. Stat. § 41-1-107 (2014); *Emmert*, 597 P.2d at 1027.
72 *PPL Montana, LLC v. Montana*, 132 S.Ct. 1215, 1235 (2012).
73 *Id*.
74 *Aspen Wilderness Workshop Ltd. v. Colo. Water Conservation Bd*., 901 P.2d 1251, 1260 (Colo. 1995). *See also Farmers Water Dev. Co. v. Colo. Water Conservation Bd*., 2015 CO 21, ¶ 22–24, ___ P.3d. ___, (2015).
75 *See*, *e.g.*, *In re* Title, Ballot Title, Submission Clause for 2011-2012 #3, 274 P.3d 562, 570 (Colo. 2012) (Hobbs, J., dissenting); *In re* Title, Ballot Title, Submission Clause for 2011-2012 #45, 274 P.3d 576, 583 (Colo. 2012) (Hobbs, J., dissenting).
76 *Aspen Wilderness Workshop Ltd.*, 901 P.2d at 1260–61.
77 *Id*. at 1263.
78 *See Edwards Aquifer Auth. v. Day*, 369 S.W.3d 814, 832 (Tex. 2012).
79 *State v. Sw. Colo. Water Conservation Dist*., 671 P.2d 1294, 1307 (Colo. 1983); *Bd. of Cnty. Comm'rs of the Cnty. of Park v. Park Cnty. Sportsmen's Ranch*, 45 P.3d 693, 707–08 (Colo. 2002).
80 *Empire Lodge Homeowners' Ass'n v. Moyer*, 39 P.3d 1139, 1147–49 (Colo. 2001).
81 *See, generally*, *Colorado's Water Plan*, *Headwaters* magazine, Colorado Foundation for Water Education (2015) at: www.yourwatercolorado.org.

Groundwater

GROUNDWATER ISSUES

AN INTERVIEW WITH DR. TODD JARVIS
INTERIM DIRECTOR OF THE INSTITUTE FOR WATER & WATERSHEDS AT OREGON STATE UNIVERSITY

Interview conducted by Jakob Wiley, Student Intern at *The Water Report*

INTRODUCTION

Dr. Todd Jarvis

A widely recognized expert on groundwater issues, Todd Jarvis, PhD, is a consulting groundwater hydrologist with over 30 years of experience working for global water/wastewater engineering and groundwater engineering firms. With professional licenses as a Certified Engineering Geologist, Certified Water Right Examiner, and Certified Mediator, he specializes in dispute prevention and conflict resolution related to groundwater resources and water well construction. Since earning his PhD at Oregon State University (OSU) in 2006, he has taught courses in water resources policy and management, water negotiations, and collaborative processes at OSU, as well as internationally as a consultant for the United Nations Educational, Scientific and Cultural Organization (UNESCO). He is also an adjunct faculty member at the University of Oregon Law School teaching Environmental Conflict Resolution and Collaborative Planning and Management for the School of Public Policy, Planning and Management. He served on the licensing boards for professional geologists in the states of Wyoming and Oregon. His new book *Contesting Hidden Waters: Conflict Resolution for Groundwater and Aquifers* is available through Routledge (2014).

Todd Jarvis is the Interim Director of the Institute for Water & Watersheds at OSU — one of the 54 Water Resources Research Institutes located across the United States celebrating over 50 years of being in business thanks to the Water Resources Research Act of 1964.

What are the Top Two or Three Issues Facing Groundwater Supplies in the Pacific Northwest Region?

Abandoned and Orphan Wells

Abandoned Well Impacts

[**Interviewer's Note:** Abandoned wells pose a number of dangers. Other than the danger of personal injury created by an unmarked hole, the abandoned wells can also damage the aquifer in multiple ways. Abandoned wells provide a direct path for pollution from the surface to enter the aquifer. Deep wells with eroded casings provide a path for briny aquifers to contaminate higher, freshwater aquifers. Unused wells also reduce the pressure head of the aquifer by possibly lowering the water table or harming artesian wells. Abandoned and unplugged oil and gas wells pose the same dangers as water wells, but also add the danger of hydrocarbons and/or hydraulic stimulation fluids in the wellbore contaminating shallower groundwater. Open wells also serve as uncontrolled sources for greenhouse gases (methane and carbon dioxide). Properly plugging and capping abandoned wells can alleviate these problems.]

Vast Numbers

Contrary to popular opinions that the big issues focus on groundwater depletion of the Pacific Northwest basalt aquifers or interference with surface water rights due to pumping wells, the orphan and abandoned well situation concerns me. Depending on which state agency you ask and when, there are between 250,000 to 300,000 wells in Oregon and approximately 500,000 wells in Washington. The State of Washington thinks there are between 10,000 and 100,000 wells that are no longer in use; I don't know if Oregon has developed an estimate of orphaned wells. For the bigger picture comparison, the National Ground Water Association estimated about 15 million water wells. Comparable industry estimates in the oil and gas industry puts the number at about 15 million oil and gas wells in the US. In a recent study from Stanford University they estimated there were roughly three million abandoned oil and gas wells in the United States. Extrapolating these estimates for water wells across the US suggests a big problem, but also a big opportunity for the well drilling industry.

Local Inventory Findings

Closer to home, as part of a research project funded by the US Geological Survey Small Grants program at Oregon State University, Linn Benton Community College students inventoried abandoned wells in Linn and Benton counties. The Oregon Water Resources Department (OWRD) files indicated that 19,000 wells were recorded in Linn County; 10,000 wells were recorded in Benton County. A graduate student at Oregon State University determined that approximately 1,828 abandoned wells were located within Benton County or 15% of all wells recorded by OWRD.

A door-to-door canvass was completed by the community college students in neighborhoods where state records yielded tallies of registered wells, as well as legally abandoned wells, all in close proximity to the municipal water service area. While the data distribution are less than ideal, their spot surveys yielded over 100 wells. Of the wells identified to be tapping the valley fill, 79% were considered "improperly abandoned." Of the wells identified at tapping the fractured volcanic rocks, 36% were improperly abandoned. The significance of this data is these wells are in close proximity to both a community college and a land-grant university where water awareness is very high. Imagine the numbers of orphan wells in less "water aware" areas.

Groundwater

Outdated Regulations and Aquifer Recharge/Storage

Pretreatment Standards

The other challenge to groundwater supplies in the Pacific Northwest, and elsewhere in the US, are the Clean Water Act and Safe Drinking Water Act, as well as individual state variations of these regulations — such as Oregon's anti-degradation of groundwater policy — specifically as they relate to Managed Aquifer Recharge and Aquifer Storage and Recovery. While the Pacific Northwest is a leader in the use of Aquifer Storage and Recovery (ASR) and managed recharge, the pretreatment standards requirement prior to underground storage through wells limits the application of this technology to larger areas and increased number of users. The treatment standards are not very flexible and do not recognize that the aquifer where the "manufactured" water is stored also provides treatment. [**Interviewer's Note:** The term "manufactured water" in this case refers to treated water, such as desalinated seawater or brackish water, as well as treated stormwater.] The Australians recognize this through their application of Aquifer Storage, Transfer and Recovery (ASTR) where the artificial recharge occurs in an area distant from the groundwater recovery area, using the aquifer as a medium to store, treat, and transfer the recharged waters. Given the current regulatory environment in the United States, the more efficient ASTR approach cannot be used.

ASR for Household Wells

The various climate change models developed by universities in Oregon and Washington predict an outcome with more rain and less snow. Preliminary results of large multi-year, multi-institutional research programs focusing on water scarcity suggest a surplus of water in some regions. This dictates getting smarter about storage, especially underground storage. Some clever water entrepreneurs have developed methodologies for using individual household wells for ASR, thus acknowledging the distributed impact of thinking globally but acting locally. Individual actions, even by small quantity water users and the access to depleted aquifers through their wells, are increasingly being looked upon as part of the solution.

Lack of Investment in New Groundwater Knowledge

Groundwater Conflicts

State agencies with primary responsibilities for administering water rights are too financially strapped to invest in new groundwater knowledge. Some states have great working relationships with the state water science centers of the US Geological Survey where there is an opportunity to invest in applied research related to groundwater resources, but many of these investments are responding to anticipated or existing conflicts. The cooperative work underway in the Klamath Basin is a good example where OWRD is working with the US Geological Survey in developing computer models of the groundwater system to better define potential conflicts between groundwater pumping and surface water rights. Clearly, this is important work.

Development Account

However, other western states are investing directly in gaining new knowledge of previously-untapped aquifers, deep groundwater, and innovative approaches to exploitation. I was raised, educated, and worked for many years in Wyoming. The state used severance taxes from coal mining to create a water development account in the early 1980s. Each year a portion of these funds are dedicated to groundwater work, from drilling new wells, evaluating the structural integrity of existing wells, re-determining the productivity of various aquifers, and yes, even conducting applied research on the use of artificial stimulation (fracking) for water wells. Utah is another state that invests state funds in comparable work, but not at the same level.

"Play Fairway"

If states do not have the interest or resources to conduct the "Play Fairway" approach to groundwater exploration and development that oil and mining companies use, then there should be changes in western water law to permit private investors to complete this necessary work with the assurances their initial investments will be secure. [**Interviewer's Note:** The "Play Fairway approach" is a method of predicting the location of subsurface features by analyzing data from current wells. In this case, it would be the collection of well data to predict the location of undiscovered groundwater sources.] There is already talk of Canadian mining companies forming a Pacific Aquifer Exploration Syndicate for the purpose of exploring for potable groundwater resources in North America.

What Are the Limits of the Current Management Models? How Will These Have to Change in the Future?

Jurisdictional Boundaries

More attention is currently paid to the allocation of water rather than a holistic approach of paying more attention to the value of the storage in the aquifer, especially in light of the transformative changes in managed recharge of manufactured water and stormwater. To do this effectively, it is time to consider rethinking scale and jurisdictional boundary spanning. [**Interviewer's Note:** An example of "jurisdictional boundary spanning" would be a management organization that operates in two or more states. A single authority over a transboundry aquifer provides more efficient and effective management.] Obviously water management models vary from state to state, even in the western US where the maxim of "prior appropriation" or first in time, first in right serves as the foundation of water law. Nearly every western state, save for Utah, considers the small capacity groundwater user "exempt" from securing a water right before installing a well, based on the notion that management by the state would be too onerous given the de minimis use of water involved. Groundwater issues are becoming increasingly complex and large in geographic extent, almost too large for the traditional centralized management by state agencies.

"Exempt" Wells

Groundwater

Aquifer Governance

Decentralized Approach

"Concurrency Laws"

In the current era of groundwater depletion with simultaneous irreversible damage to aquifer storage, new instruments of groundwater governance must focus not only on process equity and outcome equity, but also on aquifer governance — what to do to preserve and reuse the storage characteristics of the container holding the water. Focus on management of the water alone can overshadow the value of the storage utility of an aquifer. Local control over groundwater management and aquifer uses is best accomplished through aquifer communities composed of local landowners, municipalities, or counties through either formal or informal agreements.

The three California bills comprising the Sustainable Groundwater Management Act of 2014 (SGMA) provide an excellent case study of how the current management models are changing where the state is relying initially on a decentralized approach to groundwater management by counties or water districts (see Aladjem, *TWR* #135).

What Changes are Resulting in a New Paradigm in Groundwater Management?

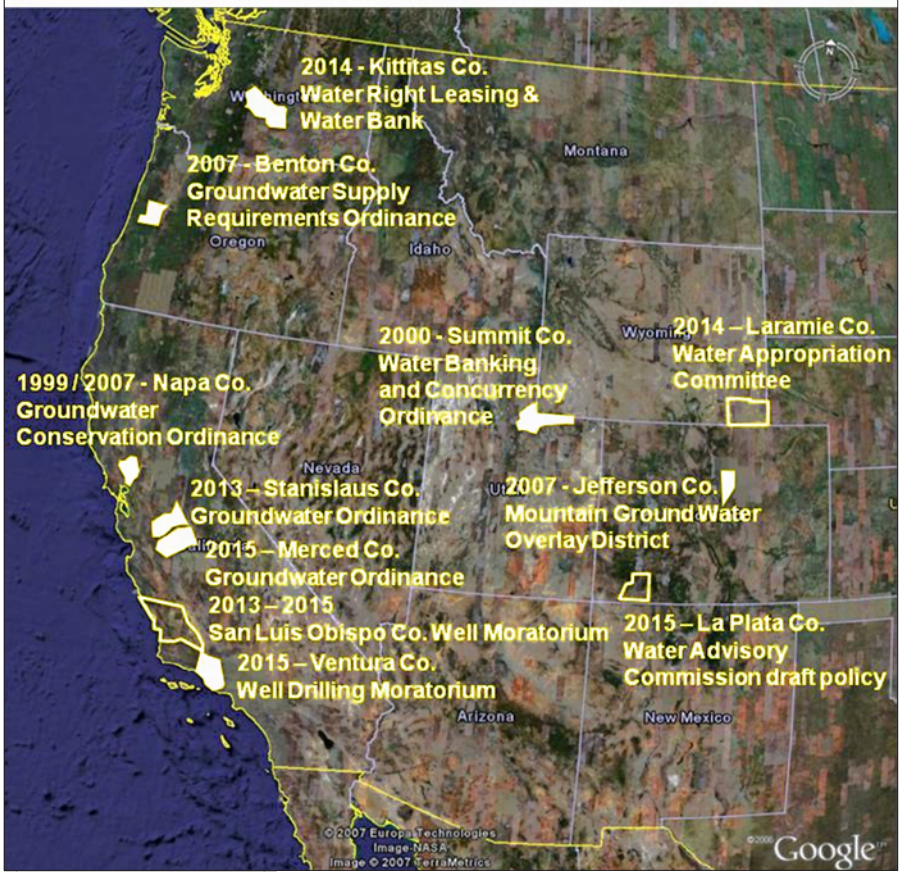
The fragmented nature of water and land use at the state level, due in part to the lack of integration between land use and water laws, is leading to a new paradigm in water planning and management which focuses on a "bottom-up" approach instead of the traditional "top-down" approach. Different "scales" of groundwater governance and management have evolved since 2000.

Concurrency Laws

For example, "concurrency laws" for proposed land use have evolved to address groundwater recoverability and aquifer mechanics. [**Interviewer's Note:** Local level "concurrency laws" govern proposed development in some cities and counties. Developers must show that current public utilities could sustain the proposed development. If there is inadequate infrastructure or resources (e.g., water) the building permit may be denied.] The change in this instrument came about due to highly variable well yields unrelated to groundwater recharge or depletion, but instead due to damaged and lost aquifer storage. An excellent reference on the topic is Strachan, A. (2001) "*Concurrency Laws: Water as a Land-Use Regulation*" — Journal of Land, Resources, and Environmental Law, vol. 21, p. 435.

Concurrency laws are one of the most effective instruments for linking water availability and land use at local jurisdictional scales. I have tracked the development of different approaches to groundwater governance for the past 15 years. As shown on **Figure 1**, several jurisdictions across North America and beyond, usually at the county level rather than at the state level, have crafted policies that specifically require a link between proving water availability for housing developments (California, Colorado, Utah), new agriculture (California), and to minimize interference with senior surface water rights that could result from uncontrolled pumping of groundwater through domestic wells (Washington). The "open" boxes on the map represent counties in California and Wyoming where policies to manage groundwater were started at the county level either by local interest or by state mandate; these programs lapsed due to expiration of ordinances or timelines required by state agencies. I suspect both counties will revisit their groundwater management programs due to either [California's] SGMA or because the physical water situation demands action sooner rather than later.

Figure 1: Decentralized Groundwater Management Programs In The Western United States



Groundwater governance is a global issue with high-level interest and financial investments by The World Bank and the Global Environment Facility. And yet, we see most of the active groundwater management at the grassroots level. For example, the Qinxu

Groundwater

Re-Testing Wells

Decentralization

Sole Source Aquifer Designation

Unitization

"Container" Focus

Pro-Market Approach

Groundwater Management System regulates all groundwater usage in the Qinxu, one of the counties in Shanxi Province in China.

Some counties in the western US require periodic retesting of wells for re-determination of water availability, acknowledging that change is the by-product of aquifer exploitation and needs to be monitored. These policy experiments reflect changing political will, moving beyond "if we build it, the water will come," to "if we have it, you are welcome."

Decentralized Groundwater Management

Decentralized water data collection, use, reuse, underground storage, and treatment are innovative approaches to increasing water security and resiliency. In my opinion, this will eventually lead to decentralized water rights analysis and implementation. Good examples of the decentralized approach to water rights are the Certified Water Right Examiner programs in Oregon and Idaho. I don't think these programs will necessarily replace litigation over complex water rights situations, but rather will free up court dockets and expedite water rights transfers.

The decentralized approach to groundwater management is not limited to groundwater allocations. Protecting groundwater quality for rural communities is limited because the Drinking Water Protection programs administered by western states only protect the areas near wells and springs servicing public drinking water systems. These groundwater protection programs work well for public systems, but few formal protection programs are available to communities reliant on individual wells and onsite wastewater systems. I am seeing a resurgence of interest in the Sole Source Aquifer (SSA) Designation process as outlined by the Safe Drinking Water Act (as amended in 1986). It is a well-established means to develop comprehensive groundwater protection programs for rural communities dependent on individual wells, as well as providing a larger look at protecting groundwater supplies for future development for both urban and rural entities at the scale of an aquifer system.

Anyone can file a petition to the Environmental Protection Agency for an SSA. There are approximately 80 SSAs across the US. Oregon has one SSA located near Florence, Oregon. For comparison, Washington has 12 SSAs and Idaho has three SSAs (two SSAs are transboundary across Washington and Idaho). Another option for decentralized management of groundwater quality for folks that do not desire federal recognition of their groundwater supplies is the Groundwater Guardian, a national program devoted to protecting groundwater quality. The Groundwater Guardian program is part of a non-governmental organization called the Groundwater Foundation, now celebrating 30 years in business.

Unitization of Groundwater & Aquifers

All of these approaches could easily be brought under the notion of "groundwater governance by contract." For the past ten years, my research on groundwater governance has focused on the notion of unitization of groundwater and aquifers. [**Interviewer's Note:** Unitization treats an aquifer or aquifer system as one "unit" and centralizes development and management in a "unit operator," while distributing benefits to other interests in the unit.] Unitization is the well-known joint operation of oil or gas reservoirs by all the owners of rights in the separate tracts overlying the reservoirs that has been in practice for over 100 years. "Pooling" is sometimes referred to as unitization. Unitization as employed in the oil industry is designed to be collectively beneficial, and is practiced in 38 states, in 13 countries, and most recently is the proposed approach for sharing transboundary hydrocarbon resources in the Gulf of Mexico as outlined in the US-Mexico Transboundary Hydrocarbons Agreement of 2012. This is an important development given the recent news of huge sub-seabed aquifers — which beg the question as to how these will be governed: as part of the global commons; through the Law of the Sea; a Law of the Hidden Sea [as described by Lopez-Gunn, E. and Jarvis, W. T. (2009) "*Groundwater Governance and the Law of the Hidden Sea*" — Water Policy, vol. 11, pp 742–762]; or through some form of contract or operating agreement?

The practice of unitization to the subsurface, however, is not limited to oil and gas. Many lawyers and the public conflate unitization of aquifers as somehow privatizing groundwater, or conclude that it could not be applied in western states. However, careful examination of how unitization is applied focuses more on the "container" — the reservoir or aquifer — than what is stored in the container. Other applications of unitization concepts are used for geothermal energy (Oregon and Utah), carbon sequestration (Wyoming), and spirituality and springs (Japan). Utah Attorney Steve Clyde described an attempt to unitize aquifers in western Utah (*see* Clyde, *TWR* #83). Unitization of aquifers is a pro-market approach that could be used as one means to: mitigate the inefficiency of a possession or use-based system of groundwater resources; minimize damage to the storage characteristics of aquifers; promote groundwater exploration and development in underutilized areas; and prevent disputes instead of resolving conflicts over the utilization of aquifers. I think Steve Clyde encapsulated the new paradigm best: "Unitization certainly did work in the oil and gas context. While it was fought by some, it has proven to be the savior of all." *Id.*

Groundwater

Multiple Aquifer Uses

Transboundary Resource

Community-Based Approach

Border Jurisdiction

"Pooled" Rights

Klamath Unitization

Unitization Potential

Litigation Threat

Volunteer Liability

Local Planning

What Are Some Examples of This Paradigm Shift?

At the international level, the Draft Articles of the Law of Transboundary Aquifers that is now annexed to a United Nations General Assembly Resolution details the use of aquifers that extends beyond just groundwater: "utilization of transboundary aquifers or aquifer system *includes extraction of water, heat and minerals, and storage and disposal of any substance*" (emphasis added). This is an important acknowledgement that the available aquifer storage is also an important transboundary resource that must be collectively managed beyond considering the aquifer as just a container for storing recoverable groundwater. The aquifer utilization clause also appears to be consistent with the notion of unitization as practiced by the State of Oregon for development of geothermal resources, and the State of Wyoming for the management and storage of carbon.

From the perspective of decentralized or community-based approaches to conflict management and groundwater uses, the pioneers in this regard are the groundwater users in the Umatilla Basin in northeast Oregon due to the three Critical Groundwater Areas recognized by the Oregon Water Resources Commission. I have presented this case study at many international water conferences. It was such a success that an OSU graduate student made a documentary video of the process — "*Water Before Anything: Crisis and Transformation - Umatilla Groundwater*" that can be viewed on The Water Channel [see: www.thewaterchannel.tv/media-gallery/1891-water-before-anything-crisis-and-transformation-umatilla-groundwater].

Gabriel Eckstein, a law professor at Texas A&M University, has published a paper describing the use of informal agreements regarding local groundwater use by various jurisdictions located along the borders of Canada and Mexico. For the interested reader, I recommend visiting Gabriel's excellent International Water Law Project blog to learn more about these agreements [*see*: www.internationalwaterlaw.org/].

In addition to the attempts at experimenting with unitization in western Utah as described by Steve Clyde (*TWR* # 83), farmers and ranchers in the Escalante Valley of southern Utah faced water level declines over 100 feet that occurred in the past 50 years preceding 2010. Lost aquifer storage was revealed through subsidence, with earth fissures tens of feet in length and up to six to seven feet in depth. While the State of Utah introduced a plan to reduce groundwater use by 90%, the water users found the plan unacceptable and "pooled" their water rights to share in reductions of water use by voluntarily forming a unit — the Escalante Valley Water Users Association.

Unitization concepts are also being used in the Klamath Basin groundwater situation. The Klamath Water and Power Agency voted to include a groundwater program in the 2015 Water Use Mitigation Program so Klamath Project irrigators can volunteer to "pool" their resources to withdraw up to 40,000 acre-feet of groundwater, about 50% less than what was developed in 2014. The groundwater program will reimburse irrigators for energy costs to pump groundwater, plus provide payment per acre-foot.

With the increasing interest in groundwater exploration by entrepreneurs such as the Pacific Aquifer Exploration Syndicate, there will be increased interest in unitization as applied to aquifers through the creation of "voluntary units," or agreements among interested parties that can be undertaken for exploration. This is a common practice in the oil industry. As outlined in my book *Contesting Hidden Waters*, I also suggest that unitization might be applied to "repurposing" the storage space in depleted aquifers, or unitization of contaminated groundwater may provide new opportunities to remediate and market the previously unusable water and storage.

Do You Believe These Local Groups Are Up To The Daunting Responsibility They Have Been Given?

I think so. However, litigation is a constant threat to the viability of groundwater governance programs. A private water company filed a lawsuit against Summit County, Utah, and the county commissioners, among many others (including me) in 2001 following the implementation of a water concurrency ordinance. The odyssey came to an end 2011 with the outcome focusing on water exchanges and sales between the regional water system managed by the county and the private water company.

In 2014, a land developer filed a lawsuit against the Lost Pines Groundwater Conservation District (Lost Pines) and its board members over a decision on groundwater allocation. Lost Pines is one of the many groundwater conservation districts in Texas, which regulates groundwater pumping in Bastrop and Lee counties. While the dispute over groundwater allocation has entered mediation on the amount of water available and the process used to allocate it, Lost Pines, like most groundwater conservation districts, relies on volunteers to serve as board members. The lawsuit has resulted in difficulties convincing people to serve on the boards due to the threat of individual liability.

The California Sustainable Groundwater Management Act of 2014 (SGMA) clearly provides the opportunities for counties to develop Groundwater Management Plans before the state steps in to develop a plan for an area. An important facet of the SGMA was outlined by Aladjem, (*TWR* # 135), where he stated, "Once the groundwater sustainability agency adopts a plan, though, the ability of interests that are

Groundwater

"Black Swans"

dissatisfied with the terms of a groundwater sustainability plan to challenge that plan in court will be quite limited. This provision of the law is extremely important — without it, groundwater sustainability plans would likely be tied up in court for years."

Acknowledging the importance of protecting various interests through litigation, I think one thing that few attorneys or groundwater rights holders understand is that the filing of a lawsuit may slow or stop a process to manage groundwater, but the development of a groundwater system does not stop. This can lead to "Black Swans" — rare events with extreme impact followed by retrospective predictability. "*The Black Swan: The Impact of the Highly Improbable*" by Nassim Nicholas Taleb (2007) brought the concept to popular literature. Good examples of Black Swans include the global economic collapse in 2008. Looking back on the economic collapse, many "experts" indicated the financial world should have seen the bubble bursting based on the unsustainable sub-prime mortgage market.

Aquifer Storage & Development

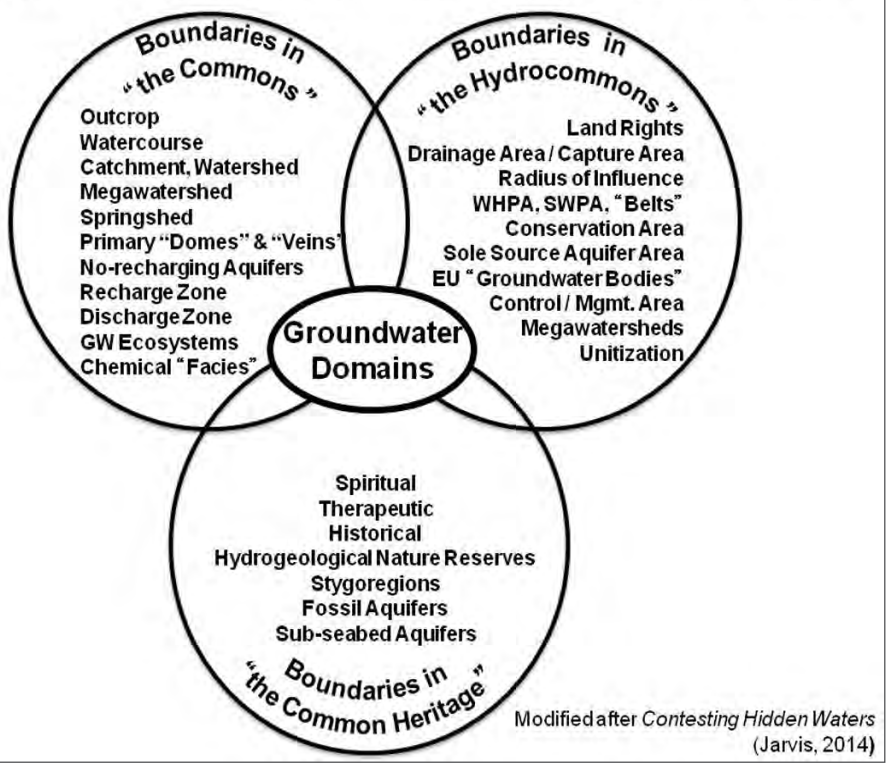
Groundwater depletion and permanent damage to aquifer storage is an example of a "Black Swan." However, the only methods to ascertain whether or not groundwater and aquifer storage depletion are occurring include production and water quality monitoring. In most cases, this takes years of data collection. In some locations such as Utah and California, well and groundwater data may be considered proprietary. Some private water companies and property owners consider the testing and data reporting requirements as monopolizing the water market. While litigation may ultimately prevail in securing a "right" to develop an aquifer, exercising the right to develop an aquifer may not necessarily yield the quantity or quality of water desired over the long term due to the Black Swan situation as it relates to groundwater and aquifers. When the damage is finally recognized, we realize that we should have known better based on experiences elsewhere.

What Implications Does the Shift to Local Groundwater Governance Have for Water Conflicts in the Western United States?

"Fuzzy" Boundaries

Disputes are not just about the allocation of groundwater any longer. I addressed this issue at length in an article published in the American Water Resources Association magazine IMPACT (November 2014), where I indicated the problem of how boundaries are placed around groundwater and aquifers are commonly referred to as "fuzzy" and impossible to undertake with a reasonable degree of certainty because of: the vagaries in where recharge areas are located; the hydrologic connection to surface water resources; and flow and discharge characteristics that are typically only known at a reconnaissance level. Yet the literature is replete with boundaries for groundwater domains. In my book *Contesting Hidden Waters: Conflict Resolution for Groundwater and Aquifers*, I argue that consideration of a transdisciplinary approach to exploring the geopolitics of groundwater yields a typology for groundwater and aquifer boundaries (**Figure 2**). My findings indicate: (1) traditional approaches to defining groundwater domains focus on predevelopment conditions; (2) groundwater development creates new boundaries, where hydrology, hydraulics, property rights, and economics are meshed; and (3) groundwater and aquifer users regularly define boundaries that acknowledge social and cultural values of the resources. Aladjem (*TWR* # 135) also identified the "sleeper" issue to be addressed under the California Sustainable Groundwater Management Act is the question of defining the boundaries of the groundwater basins. I think groundwater and aquifer boundaries will have to focus more on the notions of "problemsheds" and "policysheds" — the boundaries of a particular problem or policy defined by the groundwater and aquifer users.

Figure 2: Groundwater Boundaries — Transdisciplinary Considerations



Groundwater

There Are Many Examples of Unusual Alliances Forming Recently From Historically Opposed Groups to Manage Water Resources. Do You Believe the Trend of Cooperation Will Continue?

Cooperation

Yes, after working on both sides of the table as an expert witness for many years before becoming enlightened as a mediator in water conflict resolution, I adopted the mantra espoused by colleague and mentor Aaron Wolf at OSU that "water management is conflict management." Cooperation preserves relationships, and water resources management is all about relationships — personal, neighbor-to-neighbor, business, and with nature. I also acknowledge a maxim by colleague Mark Zeitoun, a water security expert at the University of East Anglia, that "not all cooperation is pretty." Water management is increasingly relying on technological options to manage groundwater quantity and quality problems that employ water transfers, managed recharge, or conjunctive use that are also connected to the business world. Water resource governance solutions must also include collective or community action — developing instrumental approaches such as treaties, agreements, rights, rules, and prices or other incentives — to preserve the structural and ecological integrity of groundwater systems. The new world order of water resources dictates "cooperate or die."

What Common Ground Has Brought These Groups Together?

"Combat Hydrology"

I could wax rhapsodically about how water creates community, is a spiritual resource to nearly all cultures ranging from sacred springs, hydrogeologic nature reserves, religious shrines, etc., and that it costs a lot to fight over water. However, I won't focus on those obvious issues but instead encourage readers to view the new documentary on the combat hydrology situation in the Klamath River basin: *A River Between Us*. The documentary was co-produced by Jason Atkinson who served in the Oregon State Senate for 14 years representing the Klamath Basin. One party interviewed in the documentary made a statement that encapsulates a succinct answer to your question, "No party has benefited from duking it out." Available at: www.ariverbetweenus.com/.

What are the Biggest Challenges Facing Water Management in the New Paradigm?

Data Availability

Transparency and the availability of groundwater data, even in the most elemental forms such as well logs, is becoming more mainstream. Oregon well driller and Director and Past President of the National Ground Water Research & Educational Foundation, Steve Schneider, compiled an inventory of states that provide online access to well logs and determined that 70% (35 states) have well log databases. At first glance, that looks like a good number, but given that there are over 15 million water wells in the US, there is quite a bit of information that remains relatively inaccessible.

Accessability

However, things are changing quickly. Again, California has woken up to the fact that public access to groundwater data is one large step forward to not only potentially securing additional water supplies during long-term droughts, which may or may not be the new normal, through the passage of the Groundwater Data Bill on June 1, 2015. Having worked in California, I was always surprised that well logs from the state's Department of Water Resources were considered proprietary information, especially in situations where a community water supply was impacted or at risk of contamination. The accessibility of the state's well log database will not take place overnight, but this is a huge step towards locating new aquifers; refining conceptual models of regional hydrogeology; and perhaps more importantly, aid in reducing damage to aquifer storage and the surface landscape by aquifer system compaction and subsidence.

Exploitation Impacts

Another major impediment to managing aquifers is the tacit assumption that the water quantity and water quality of a well or spring discharging from an aquifer will remain relatively consistent once a water right or permit to use has been issued. All aquifers are not created equal with regards to storage. Sand and gravel aquifers store water better than fractured rock aquifers. As noted above, some counties require periodic re-testing of wells for "redetermination" of water availability, acknowledging that change is the by-product of aquifer exploitation and needs to be monitored.

Computer Modeling

Computer models used for groundwater management need to be "ground-truthed" as new data are collected. Computer models of the groundwater system in the Klamath Basin, developed by the US Geological Survey, served as the one of the tools for the Oregon Water Resources Department in investigating the probability or existence of impairment or interference with existing rights of other users to appropriate surface water. During the 2014 Regular Session (77th Oregon Legislative Assembly) House Bills 4044 and 4064 were introduced as a means to provide a third party review before regulatory action on a water right; neither bill made it out of committee. Likewise, computer models were developed by the US Geological Survey and the Oregon Department of Environmental Quality to predict the fate and transport of dissolved nitrate in groundwater underlying Southern Deschutes and Northern Klamath Counties, yet residents relying on individual wells and onsite wastewater systems have challenged the predictions and regulatory decisions based on these computer models.

Groundwater

Adaptation

Periodic Re-Testing

If computer models are used to manage groundwater quantity and quality in areas where the data distribution is less than ideal, it is reasonable to permit challenges by affected landowners, revisit and update the computer models regularly with new data, or with new concepts and conceptual models. I acknowledge these uncertainties and challenges frustrate policy makers and decision makers, but the "multiple working hypotheses" approach has served as the foundation of the field of hydrogeology developed by American geologist Thomas Chamberlain since the late 1890s.

The other challenge facing new approaches to groundwater and aquifer governance is the notion of "dueling experts." Multiple working hypotheses, coupled with the uncertainty associated with the quantitative characteristics of groundwater systems and the unfortunate, but frequent use of professional witnesses, fuels this problem. To combat this problem, there is increased reliance on a "prove-it" approach to assertions of adequate groundwater supplies and water quality issues. But the periodic re-testing of wells for re-determination of water availability and water quality is not only good policy, but good science, too. The hydraulic performance of wells and aquifers changes with time. Where will these differences in opinion ultimately be resolved? My students in conflict resolution at the University of Oregon and OSU are developing methods to resolve disputes over these wicked "science" questions through "Scientific Mediation," a process that sounds rather utopian, but is garnering much interest by conflict resolution "pracademics."

For Additional Information:
Todd Jarvis, Oregon State University, 541/ 737-8052 or Todd.Jarvis@oregonstate.edu

California Desalination

REGULATING SEAWATER DESALINATION IN CALIFORNIA

by J. Tom Boer & Kathryn Oehlschlager, Barg Coffin Lewis & Trapp (San Francisco, CA)

INTRODUCTION

Continuing Drought

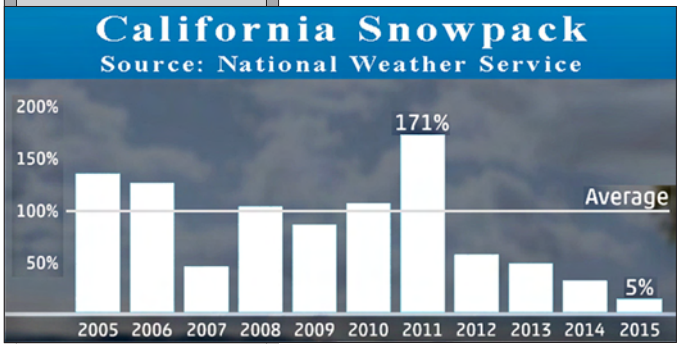
Drought continues to grip California. While Californians are working hard to conserve the limited available water resources, dire long-term projections about the impact of climate change and the possibility of a "mega-drought" have shifted the public's attention to seeking out new sources of water. In other words, policymakers are now focused on how we can "increase the pie" when it comes to water supply. Seawater desalination presents a viable option to provide California with additional water resources. Permitting of desalination facilities in California, however, requires that various local, state, and federal agencies address a multitude of environmental concerns under a broad array of statutes and regulations. An overview of the various regulatory steps associated with the permitting of coastal desalination facilities are discussed below.

BACKGROUND

CALIFORNIA REACTS TO DWINDLING WATER RESOURCES

Resource Demands

For decades, California has faced increasing pressure on its limited water resources due to growing population, agricultural demands, and natural resource protection. Widespread drought in the western United States has recently added substantially to this pressure. After several years of drought conditions, California State Governor Jerry Brown declared a state of emergency in January 2014. Drought conditions have persisted since the emergency declaration, and California's 2014 water year, ending on September 30, 2014, was the third driest in 119 years of record-keeping. It was also the warmest year on record according to the US Geological Service. Measurements taken by the California Department of Water Resources (DWR) in April 2015 found that the Sierra snowpack measured only five percent of historic averages. This is particularly concerning because the runoff from snowpack has historically provided about one-third of the water used by California's cities and farms.



California Desalination

Groundwater Option

Groundwater has served as a dependable renewable resource that can provide backup water supplies in periods of drought. Unfortunately, groundwater has been rapidly depleted in California as pumping has dramatically increased during the drought. Until recently, State policy allowed essentially unlimited groundwater extraction by property owners. As a result of increased groundwater extraction, water tables have reportedly dropped by more than a hundred feet in some locations, ground surface is sinking (subsidence) by as much as a foot per year in other areas, and shallow wells are running dry. Groundwater resources will likely take years to recharge, even with a return to average precipitation levels. Looking further down the road, climate change may further exacerbate the situation, even if drought conditions recede. Projections indicate that climate change will result in less snowfall and adversely change the timing of runoff from the Sierras to earlier in the year.

Confronted with the continuing drought conditions and the decreasing availability of water resources, California has taken statewide action to conserve and recycle water, protect natural resources, and regulate the extraction of groundwater.

Drought Actions

California drought-related actions include:

- Passage of legislation: 2014's Sustainable Groundwater Management Act created a state-wide regulatory scheme for management of groundwater, which will require local and State agencies to regulate groundwater resources in an effort to ensure that California's groundwater supply is sustainable over the long term (*see* Aladjem, *TWR* #135)
- Curtailment of thousands of junior appropriative surface water rights-holders during the 2014 and 2015 dry seasons by the State Water Resources Control Board (State Water Board)
- Adoption of a voluntary cutback program for Delta riparian water rights holders by the State Water Board in early 2015 and the subsequent curtailment of some senior water rights in June 2015
- Issuance of Executive Order B-29-15 by Governor Brown requiring implementation of statewide water saving measures, including a 25% reduction of urban potable water usage through February 2016
- State Water Board implementation of emergency measures to protect natural resources, including enhanced conservation measures and water use reporting in the Russian River watershed to protect salmon species
- Adoption of new building codes to conserve water, including a revised model landscape ordinance by DWR that encourages lower water usage in landscapes and approval of new water efficiency requirements for nonresidential and public school construction by the California Building Standards Commission

"Pie" Expansion

Of course, all of these efforts merely reallocate or conserve the usage of existing water resources. One of the only options available to "expand the pie" — by actually providing additional water for use in California — is the use of desalination technology.

DESALINATION IN CALIFORNIA
PAST & FUTURE

Desalination is currently one of the lowest-volume drinking water sources in the State, and the technology has been relied upon historically only for short periods during times of extreme scarcity. In 1992, following several years of drought, the Santa Barbara Desalination Plant was completed. Once the drought ended, however, the desalination process was no longer cost effective and the facility was decommissioned. As evident in the case of the Santa Barbara facility, the biggest impediment to widespread adoption of desalination is that the technology has been prohibitively expensive compared to available alternatives. According to DWR, however, new technology and potential government cost subsidies appear to be making seawater desalination more cost competitive.

As of 2013, DWR reported three operating ocean water desalinating facilities in California, serving small communities like Santa Catalina, with a total annual capacity of only 562 acre-feet. A much larger facility — the Carlsbad Seawater Desalination Facility — is currently under construction and scheduled to begin operating in November 2015. At least 15 other facilities have also been proposed, and if all of the proposed facilities are constructed, California will see an increase in seawater desalination capacity of more than two orders of magnitude.

California Desalination

Technology

Reverse Osmosis

Though successful completion of all of the proposed desalination facilities would serve only about 5% of California's urban water demand, it would demonstrate the viability of the technology to provide potable water, particularly for California's urban coastal populations.

There are a number of desalination technologies that can transform ocean water into potable water. The oldest is thermal distillation, which can deliver large volumes of high purity water, but thermal distillation facilities have high capital construction costs and require large energy inputs. Although there are large-scale facilities still using thermal distillation in the Middle East, the technology has never been used to produce municipal drinking water in California. Most modern facilities use membrane separation and, more specifically, **r**everse **o**smosis (RO), to desalinate ocean water, a technology that has been rapidly advancing since the 1990s. In an RO facility, seawater is pushed under pressure through a semi-permeable membrane, allowing relatively fresh water to pass through for future use, and leaving high salinity brine behind for disposal.

This article focuses on the regulatory requirements for RO desalination facilities with ocean water intakes on the California coast. Although other technologies are available, and locations away from the coast are feasible (e.g., pumping brackish groundwater), the desalination of ocean water using RO technology has emerged as the preferred approach likely to be used in California to supplement urban water supplies.

Desalination Support

California has recognized the potential for desalination to supplement water supplies and has encouraged development of desalination technology.

California's desalination encouragement has included:

- Passage of AB2717 in 2002 established the California Desalination Task Force, which has issued a series of reports on desalination and a finding "that economically and environmentally acceptable desalination should be considered as part of a balanced water portfolio to help meet California's existing and future water supply and environmental needs."
- Passage of AB314 in 2003, which declared that it is the policy of the State to give the same assistance and funding to desalination projects developed by, or for public water entities as given to other water supply and reliability projects.
- The California Coastal Commission, in its March 2004 Seawater Desalination and the California Coastal Act report, concluded that "desalination will obviously be an important part of California's water future. The question is not whether, but rather how, where, when, by whom, and under what conditions will desalination projects be designed, built, and operated."
- The California Water Plan, most recently updated in 2013 by the Department of Water Resources, identifies desalination as a "one of the few options available to augment California's water supply."
- Governor Brown's 2015 Executive Order B-29-15 directed State agencies to encourage the development of cutting-edge technologies, including "renewable energy-powered desalination."
- Amendment of the Ocean Plan by the State Water Board in May 2015, discussed further below, to provide uniform, statewide guidance for the permitting of operations at desalination plants.

DESALINATION ENVIRONMENTAL ISSUES

Environmental Issues

The construction and operation of desalination facilities raises a host of potential environmental issues unlike those associated with more traditional water sources.

The more significant environmental issues include:

Potentially Sensitive Habitat and Land Use Impacts

Coastal Protections

Seawater desalination facilities must be constructed in close proximity to the ocean. Due to sensitive habitat and limited oceanfront land, the coast is subject to significant protection in California. Construction may harm or displace habitat or sensitive species and placement of facilities may raise various land use concerns, including those related to public access, compatibility, and wetland preservation.

Seawater Intake

Intake Methods

Desalination facilities need to intake seawater. The method of intake can play a critical role in determining potential adverse impacts on habitat and species. There are two general types of desalination intakes: (i) surface intakes, located above the floor of the ocean; and (ii) subsurface intakes, located below the ocean. Surface intakes use screens to minimize impingement (trapping of organisms against the screen by the force of incoming water) and entrainment (when organisms are pulled into the intake). Subsurface intakes draw seawater through wells or seabed infiltration galleries, which consist of intake pipes placed under the ocean floor.

California Desalination

Energy Issue

Brine Disposal

Greenhouse Gas Emissions

RO technology requires significant power to produce potable water. Therefore, if a desalination facility runs on non-renewable energy sources, it will likely generate more greenhouse gas emissions per acre-foot of water produced than alternative water supplies. Regulators may seek to mitigate the impact of increased greenhouse gas emissions associated with a desalination facility via the permitting process.

Brine/Salt Disposal

The desalination process generates high-salinity brine. There are a number of methods to dispose of brine, including: (i) discharge back to the ocean (or another surface water); (ii) subsurface discharge by injection into a deep well to the aquifer; (iii) land application by irrigation; or (iv) solar or thermal evaporation to produce solids for landfill disposal. As discussed below, the preferred disposal method for brine in California is discharge back to the ocean, ideally after being mixed with another source of lower-salinity water. The primary regulatory concern is impact on salinity levels near discharge points because increased salinity can have negative impacts on habitat and species.

As discussed below, the regulatory process in California is intended to address, regulate, and mitigate all of these issues.

REGULATION OF DESALINATION FACILITIES IN CALIFORNIA

Construction and operation of desalination facilities in California triggers multiple regulatory reviews and permitting requirements with local, State, and federal agencies.

State & Local Land-Use Approvals

Zoning

Local Land-Use Permits

There are a variety of local approvals that could be required for a desalination project, including zoning variances and conditional use permits. Though it will vary by jurisdiction, every project will require at least one approval from a local agency, and project proponents will be required to meet local requirements for public notice, hearings, and appeals. Construction may also require building and grading permits. Project proponents would be well-advised to coordinate with local planning staff early in the process to ensure a full understanding of the regulatory requirements.

Coastal Development

Coastal Development Permits

Construction of a coastal desalination plant will require a Coastal Development permit from the Coastal Commission or the local jurisdiction, if it has a certified local Coastal Program. In many areas, the local jurisdiction's approval can also be appealed to the Coastal Commission.

Tidelands Use

State Lands Commission

The State Lands Commission (SLC) has regulatory authority over public trust lands, including tidal and submerged lands. A private company or public entity must apply to the SLC to use sovereign lands for any public trust use. Because intake and outfall structures will likely be on state tidelands, they will likely require a lease from the SLC.

Species-Related Approvals

Federal and State Endangered Species Acts

In many areas off the California coast, potential impacts on protected species will be difficult, if not impossible, to eliminate. Opponents to new desalination facilities often cite species impacts as major concerns, specifically with regard to intake structures and, to a lesser extent, discharge.

ESA Section 7 Consultation

If a project has the potential to impact protected species, it will fall under the state and/or federal Endangered Species Act (ESA), and, potentially, the federal Marine Mammal Protection Act. If a federal approval is required for a particular project and that project may affect a species protected under the federal ESA, that agency will be required to consult with the United States Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service under Section 7 of the federal ESA. If there is no federal approval required but the project has the potential to "take" a federally protected species, the project applicant will be required to obtain an Incidental Take Statement under ESA Section 10. If a project also may affect species that are protected under California law but not the federal ESA, consultation with the California Department of Fish and Wildlife will also be required.

ESA Process Timelines

The ESA process can be onerous, particularly if there is a Section 7 consultation requiring a Biological Opinion, so project proponents would be wise to build a significant amount of time — usually, at least a year — into their timelines for obtaining species-related approvals.

California Desalination

CEQA and NEPA

The California Environmental Quality Act (CEQA) applies to any discretionary approval by a state or local agency that has the potential to have a physical impact on the environment. Because desalination plants require a variety of state and local approvals, CEQA review will be required. If a project also involves a permit from a federal agency, it will also require review under the National Environmental Policy Act (NEPA).

CEQA Lawsuits

CEQA could prove a formidable hurdle to desalination projects in California. CEQA lawsuits have become essentially unavoidable for controversial development projects, and desalination is no exception. Attorneys fees may be awarded under the California Code of Civil Procedure § 1021.5 if the project opponents' case is successful. It is critical that the proponent of a desalination project convene the right team of consultants and lawyers to prepare a detailed and defensible Environmental Impact Report (EIR).

Impacts & Mitigation

CEQA requires a lead agency to identify the environmental impacts of a project and determine whether any impacts will be "significant." If an impact is significant, the lead agency must either impose mitigation that will reduce the impact to a less-than-significant level or issue a Statement of Overriding Considerations (SOC), finding that such impacts are "significant and unavoidable" and that the project will go forward nonetheless. The impacts of a particular desalination proposal will depend on project-specific factors, such as size, location, and technology. That said, there are several impact areas that will likely become pressure points in EIRs for coastal desalination projects.

Energy Impacts

Energy Analysis

One major criticism of desalination is the significant amount of energy required to perform reverse osmosis. In *California Clean Energy Committee v. City of Woodland*, 225 Cal.App.4th 173 (2014), the California Court of Appeal for the Third District arguably increased the burden on project proponents with regard to energy impacts, holding that in-depth analysis of alternative energy sources and transportation energy impacts is required. Project proponents should focus on preparing a robust analysis of energy impacts that closely tracks Appendix F to the CEQA guidelines and follows the guidance in *California Clean Energy Committee*. Appendix F available at: www.urbanxroads.com/wp-content/uploads/2014/12/Appendix-F.pdf.

Consistency with Land Use Plans

Land Use

Land use consistency is likely to be an issue in EIRs for desalination plants, in part because it is difficult to find coastal property that is zoned for industrial use. In addition, the recent Ocean Plan amendments, discussed further below, require consideration consistency with local water management plans, such as urban water management plans, general plans, and integrated regional plans. EIRs will need to clearly explain how a proposed desalination project harmonizes with existing planning documents.

Growth Inducement

Growth Inducement

Growth inducement will also be a key issue in CEQA analysis. In 2004, the California Coastal Commission stated publicly that "[a] desalination facility's most significant effect could be its potential for inducing growth." This is particularly true on California's Central Coast, where development of highly desirable real estate has been precluded for decades as a result of limited water supply. Desalination EIRs will have to address these impacts, which can be difficult to mitigate.

Species Impacts

Species Impacts & Project Design

For the reasons discussed above, species impacts are likely to be the subject of significant controversy in connection with desalination projects. Large-scale desalination involves pumping millions of gallons of seawater per day, and opponents of desalination often cite impacts to species, in the form of entrainment and impingement, as their principal reason for dissenting.

Some species impacts can be mitigated by project design, specifically by replacing traditional surface intakes with subsurface intakes. Surface intakes can be screened to reduce entrainment, but even screens with very small slot size are ineffective at reducing impacts on microscopic organisms. The Ocean Plan states that the Water Board shall require subsurface intakes unless it determines they are not feasible for a particular project, based on a variety of factors. Discharges of reject water, or brine, with high concentrations of salt can also harm species. Brine can accumulate on the sea floor and cause harm to bottom-dwelling environments, and simply increases the salinity of the environment near the discharge point.

It is critical that project proponents adequately analyze and mitigate species impacts resulting from desalination projects.

Impacts Review: *North Coast Rivers Alliance, et al. v. Marin Municipal Water District*

Impacts Review

The importance of a thorough impacts review was evident in the Marin Municipal Water District's (MMWD's) 2013 win in a CEQA dispute for a proposed desalination project. The North Coast Rivers Alliance (NCRA) filed suit against the MMWD, challenging its 2009 EIR for a five million gallon-per-day

California Desalination

reverse osmosis desalination plant that would extract water from San Rafael Bay. NCRA's writ petition in the lawsuit took an "everything but the kitchen sink" approach, challenging the EIR document's analysis of: aesthetics; land use; seismology; hydrology and water quality; biological resources; alternatives; and greenhouse gasses. NCRA also argued that MMWD should have recirculated the draft EIR after adding an additional alternative in response to comments. The trial court agreed with NCRA, finding for the petitioners on all of the issues above.

Litigation Preview

However, the Court of Appeal reversed the trial court on all issues, finding the MMWD had complied with CEQA both procedurally and with respect to the content of the document. It was a significant victory for MMWD, but also a preview of what's to come with respect to litigation over desalination projects. *North Coast Rivers Alliance, et al. v. Marin Municipal Water District Board of Directors* (1st Dist., Div. 4, 2013), 216 Cal.App.4th 614; available at: http://resources.ca.gov/ceqa/cases/2010/Sonoma_County_Water_Coalition_v._Sonoma_County_Water_Agency.pdf.

Federal Clean Water Act & State Waste Discharge Requirement Permitting

California's Ocean Plan

Permitting for the operation of desalination facilities, particularly the intake and brine discharge technology, is regulated by both the federal Clean Water Act and the California Porter-Cologne Water Quality Control Act.

NPDES Program

Section 402 of the Clean Water Act requires the US Environmental Protection Agency (EPA) to administer the National Pollutant Discharge Elimination System (NPDES) program. The program controls water pollution by regulating point sources that discharge pollutants. Any point source discharge of brine, or other wastewater, from desalination facilities to waters of the United States — which include "Territorial Seas" — must operate with an NPDES permit. Although the NPDES permit program is tailored to the regulation of discharges, EPA also evaluates and imposes limitations on intake systems via the same permitting process. EPA has delegated implementation of the federal NPDES program to California, where it is administered via the State and Regional Water Boards.

Ocean Plan (Water Quality)

Two aspects of the Porter-Cologne Act are particularly relevant to the permitting of seawater desalination facilities. First, pursuant to § 13170.2(b) of the California Water Code, and in accord with § 303(c)(1) of the federal Clean Water Act, the State Water Board is responsible for maintaining a Water Quality Control Plan for Ocean Waters of California (the Ocean Plan) that sets water quality standards (see www.swrcb.ca.gov/water_issues/programs/ocean/ for more information). Standards specified in the Ocean Plan provide the general parameters that will guide permitting of desalination facilities by the applicable Regional Water Board. Second, pursuant to § 13260 et seq. of the Water Code, the Regional Water Boards are authorized to prescribe requirements — known as Waste Discharge Requirements (WDRs) — for any proposed discharges to receiving waters in the State.

Discharges

Single Permit

Because implementation of the federal NPDES program is delegated to the State, the Regional Water Boards will issue a single permit to applicants that meets both the NPDES and WDR requirements. The terms of that permit will be guided by the applicable Water Quality Control Plan (known as "Basin Plans") set by each Regional Water Board and the water quality requirements delineated in the Ocean Plan as adopted by the State Water Board.

Desalination Amendment

On May 6, 2015, the State Water Board, recognizing the increasing interest in desalination facilities in response to the drought and limited alternatives to supplement California water resources, approved an amendment to the Ocean Plan that directly addresses permitting of seawater desalination facilities (*see* Desalination Amendment at: www.swrcb.ca.gov/water_issues/programs/ocean/desalination/). The amendments were developed via a multi-year process that included commissioning experts to study potential environmental impacts, conducting an external scientific peer review, and conducting public outreach, including a public hearing. According to a press release from the State Water Board, the amendment will provide: (i) "a consistent framework for communities and industry"; (ii) "direction for regional water boards when permitting desalination facilities"; and (iii) "specific implementation, monitoring, and reporting requirements" for coastal desalination facilities.

Preferred Approaches & Alternatives

The Ocean Plan now provides regulatory requirements applicable to new or expanding desalination facilities. In many instances, including for intake and disposal technology and receiving water salinity limits, project proponents may seek an alternative to the preferred approach identified by the Ocean Plan. The more closely that a project adheres to the preferred alternatives, however, the more likely the permitting process will proceed expeditiously before the Regional Water Board. To the extent that a project departs from a preferred alternative specified in the Ocean Plan, it is advisable to engage early with staff at the Regional Water Board and to prepare a project-specific technical analysis supporting the need for an alternative approach that thoroughly addresses the relevant criteria specified in the Ocean Plan.

California Desalination

Key requirements in the Ocean Plan applicable to seawater desalination facilities include:

Facility Analysis

Alternatives Analysis

The Ocean Plan requires an analysis of any proposed facility: "The regional water board shall first analyze separately as independent considerations a range of feasible alternatives for the best available site, the best available design, the best available technology, and the best available mitigation measures to minimize intake and mortality of all forms of marine life. Then, the regional water board shall consider all four factors collectively and determine the best combination of feasible alternatives to minimize intake and mortality of all forms of marine life." This analysis will be done in consultation with other agencies, including the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife.

Subsurface Intakes (Feasibility)

Intakes

Subsurface intakes are required, unless a determination is made that such intakes are not feasible. The Ocean Plan specifies criteria to evaluate the feasibility of subsurface intakes, including geotechnical data, benthic topography, presence of sensitive habitats and species, design constraints, and project life cycle cost. The Ocean Plan states that subsurface intakes cannot be "determined to be economically infeasible solely because [they] may be more expensive than surface intakes." However, a finding that subsurface intakes render the proposed facility "not economically viable" would potentially open the door for the approval of a surface water intake alternative. The Ocean Plan lists the conditions that would be required for any facility using a surface water alternative.

Wastewater Dilution

Brine Disposal

The "preferred technology for minimizing intake and mortality of all forms of marine life resulting from brine discharge" is to commingle brine with wastewater (e.g., agricultural, municipal, industrial, power plant cooling water, etc.) that would otherwise be discharged to the ocean. As a practical matter, this indicates a regulatory preference for co-locating desalination facilities near coastal power plants. Alternatively, if there is no option to dilute brine with a nearby wastewater source, multiport diffusers (submerged linear structures with spaced ports or nozzles) are identified as the "next best method for disposing of brine." A project proponent can propose an alternative brine discharge technology, provided that it can be demonstrated that the alternative "provides a comparable level of intake and mortality of all forms of marine life as wastewater dilution if wastewater is available, or multiport diffusers if wastewater is unavailable." *See* www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/desalamend_050515.pdf at page 8.

Brine Standard

Receiving Water Salinity

Discharge of brine may not exceed a daily maximum of 2.0 parts per thousand above natural background salinity measured no further than 100 meters horizontally from each discharge point. A project proponent may propose an alternative receiving water limitation for salinity, but any proposal must be supported by toxicity studies and biologic surveys. *See* www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/desalamend_050515.pdf at page 16.

Monitoring

Monitoring and Reporting

Desalination facilities must implement a Monitoring and Reporting Plan, subject to approval by the Regional Water Board, that includes "monitoring of effluent and receiving water characteristics and impacts to all forms of marine life."

Marine Life Mortality

Mitigation

The project proponent must prepare a Marine Life Mortality Report, estimating the mortality to marine life resulting from the construction and operation of the facility. The report must include a "detailed entrainment study" and an analysis characterizing the area where "salinity exceeds 2.0 parts per thousand above natural background salinity" due to discharge of brine. Mitigation for the mortality of all marine life impacted by the facility must be mitigated by either: (i) completion of an acceptable mitigation project; or (ii) payment of a fee in lieu of mitigation, provided that the Regional Water Board determines that an acceptable fee-based mitigation program is available.

Permits Consistency

Several of the elements required in a proponent's permit application to the Regional Water Board, e.g., the alternative analysis and mitigation, will almost certainly be duplicative of issues that must also be addressed via other regulatory avenues, particularly the CEQA process. To expedite the permitting process and reduce exposure to litigation risk, project proponent should ensure consistency across all of their permitting documents and thoroughly cross-check regulatory requirements to ensure that all required criteria and requirements have been addressed.

For additional information about the Ocean Plan, *see*: www.swrcb.ca.gov/water_issues/programs/ocean/desalination/docs/desalamend_050515.pdf.

California Desalination

Potential Regulatory Hurdles

Complex Regulation

Qualified Project Team

Other Potential Approvals

In addition to the permits and approvals listed above, some projects could require approvals from additional entities depending upon the project location and the specific design or technology selected for the facility.

Other potentially involved entities include:

- California Energy Commission, for desalination plants proposing to co-locate at power plants
- The California Public Utilities Commission, with regard to water rates and service areas
- The California Department of Public Health, under the Safe Drinking Water Act
- The Coast Guard, under the Rivers and Harbors Act
- The Army Corps of Engineers, if the site includes any jurisdictional waters (or wetlands) under Section 404 of the Clean Water Act
- Local Port Authorities, depending on location
- Regional regulatory bodies, like the Bay Conservation and Development Commission
- The National Oceanic and Atmospheric Administration or individual sanctuaries, for projects in national marine sanctuaries
- The Department of Parks and Recreation
- The Department of Transportation, for utilities crossing state highways
- Department of Water Resources, for use of state water conveyance facilities
- Local air pollution control districts, utilities, water districts, or other regulatory bodies

CONCLUSION

THE FUTURE OF SEAWATER DESALINATION IN CALIFORNIA

Given California's limited water resources, there is little doubt that seawater desalination will be an important component of meeting future urban water demand. California presents a complex regulatory environment for the construction of large industrial facilities and the nature of desalination plants — e.g., proximity to the coast, large power usage, and large volume intakes and discharges — has the potential to trigger heightened scrutiny under a variety of environmental statutes. Due to the high project cost associated with desalination plants, potentially exceeding $1 billion, any delay caused by third-party challenges can also be expensive or even risk the viability of a project. We therefore advise project proponents to assemble a highly qualified project team, consisting of environmental consultants and counsel, to address the myriad environmental requirements and to proactively coordinate with the various regulators at an early stage. Such an approach can help ensure expeditious review and processing of permit applications and reduce the risk associated with third-party litigation.

For Additional Information:
J. Tom Boer, Barg Coffin Lewis & Trapp, 415/ 228-5400 or jtb@bcltlaw.com
Kathryn Oehlschlager, Barg Coffin Lewis & Trapp, 415/ 228-5400 or klo@bcltlaw.com

J. Tom Boer is a partner at Barg Coffin Lewis & Trapp, LLP. His practice focuses on environmental litigation and compliance counseling under both federal and state environmental statutes, as well as commercial and other litigation matters. Before entering private practice, Tom spent seven years as a Trial Attorney with the US Department of Justice (DOJ) and two and a half years as an attorney with the US Environmental Protection Agency's Office of General Counsel. As an attorney with DOJ, Tom prosecuted cases pursuant to the Clean Air Act, Clean Water Act, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), Oil Pollution Act, and the Park System Resource Protection Act.

Kathryn Oehlschlager is a partner with Barg Coffin Lewis & Trapp, LLP. Her practice focuses on environmental and land use litigation and compliance counseling under federal and state statutes. Kathryn has extensive experience advising clients on compliance with all aspects of environmental and land use law, including CEQA, NEPA, federal and state endangered species laws, and laws regulating solid and hazardous waste.

WATER BRIEFS

TEXAS TAKINGS CASE

PROCEDURAL RULINGS

On June 2, 2015, a US District Court in Texas dismissed a lawsuit brought against the Edwards Aquifer Authority (EAA or Authority) which alleged that EAA's actions in denying a permit for groundwater use resulted in an impermissible taking without compensation of Plaintiffs' rights to groundwater underlying their property. *GG Ranch, Ltd., et al. v. The Edwards Aquifer Authority, et al.*, Case No. SA-14-CV-00848, U.S. District Court, W.D. Tex. (June 6, 2015) (*GG Ranch*).

Although the case was decided on procedural grounds asserted by EAA in Rule 12(b)(6) Motions to Dismiss, the decision was based on EAA's authority and powers to control groundwater use, and its procedure in setting a deadline for submittal of historical claims of water use under the 1993 Edwards Aquifer Authority Act. Notably, the landowners in this case waited more than fifteen years after the deadline set for filing a "Declaration of Historical Use" with EAA to apply for an "**i**nitial **r**egular **p**ermit" (IRP, which are based on the historical use during the period of 6/1/72 - 5/31/93). Those applications were denied by the EAA on the ground that Plaintiffs failed to meet the applicable filing deadline of December 30, 1996.

The US District Court (Court) granted EAA's Motions to Dismiss, finding for the Authority on all three issues raised by the Plaintiffs: an Equal Protection Claim, a Due Process Violation claim, and the Taking Claim. The Court's rationale for its decision provides substantial support specifically for the EAA's authority and in general for the regulation of groundwater in Texas. While discussing the Equal Protection claim, the Court noted, "[T]exas courts have 'long recognized the necessity of legislation that conserves and preserves (the state's) limited water resources.' *Barshop*, 925 S.W.2d at 626. Water management and conservation are uniquely compelling state interests, and failure to protect water supplies could be catastrophic for the economic health of the State of Texas and the welfare of its residents. Simply stated, access to water is necessary to sustain life. Access to oil, gas and other minerals is not." *GG Ranch Slip Op*. at 7.

The Court next discussed the Due Process claims. "There is no violation of federal substantive due process rights if the government action is a rational means of advancing a legitimate government purpose. As discussed herein, the interest of the State of Texas in protecting water resources is legitimate and uniquely compelling. We agree with the Texas Supreme Court's finding that the 'specific provisions of the Act, such as grandfathering of existing users, the caps on water withdrawals, and the regional powers of the Authority, are all rationally related to legitimate state purposes in managing and regulating this vital resource.' A regulatory scheme with respect to the extraction of groundwater is a reasonable, rational means of furthering this interest. Absent a showing the government action was arbitrary and irrational, there is no violation of substantive due process." *Id*. at 9. "Plaintiffs allege the Authority's actions were 'irrational' in light of the lack of similar regulation for oil, gas and other mineral interests. As discussed above, there are legitimate, compelling reasons for protecting water resources. Regulating the removal of groundwater from the Aquifer is a rational and reasonable means of protecting said resources. The fact that oil, gas and other minerals are not similarly regulated does not render such regulation irrational." (citation omitted). *Id*. at 9-10.

Finally, the "takings" claim was dismissed due to Plaintiffs' failure to meet the applicable deadline for filing claims for historical use. "Plaintiffs assert the Authority's denial of their permit applications, which denial prevents Plaintiffs from removing groundwater located beneath their respective properties, constitutes an impermissible taking without adequate compensation in violation of the Fifth Amendment to the United States Constitution, for which redress is available pursuant to 42 U.S.C. § 1983, and Article 1, § 17 of the Texas Constitution. Defendants move pursuant to Rule 12(b)(6) to dismiss both of these claims as time-barred under the applicable statute of limitations." *Id*. at 10. The Court decided that the applicable statute of limitations was 10 years, based on Texas law, the same limitations period that applies to adverse possession claims.

This issue, however, turned on the date the Plaintiffs'action accrued. "Defendants argue the statute of limitations began to run in 1996 when the Act went into effect. Plaintiffs contend the limitations period was not triggered until May 13, 2014 when the Authority denied their motions for rehearing on their permit applications. The general rule under Texas law is that a cause of action accrues 'when a wrongful act causes some legal injury, even if the fact of injury is not discovered until later, and even if all resulting damages have not yet occurred.' *S.V. v. R.V.*, 933 S.W.2d 1, 4 (Tex. 1996). The statute of limitations generally begins to run when 'facts come into existence that authorize claimant to seek a judicial remedy.' *Johnson & Higgins v. Kenneco Energy*, 962 S.W.2d 507, 514 (Tex. 1998). It was in 1996, when the Act went into effect, that Plaintiffs' groundwater rights were irrevocably impacted by government regulation. The restrictions placed on Plaintiffs under the Act took effect on December 30, 1996, and since that date, Plaintiffs rights with respect to the water beneath their properties have been subject to limitation. This is the alleged impermissible taking of which Plaintiffs complain. Therefore, December 30, 1996 is the date on which Plaintiffs' takings claims accrued." *Id*. at 12.

The Plaintiffs argued unsuccessfully that another recent "takings" case in Texas should provide guidance for when the action accrues. "The *Bragg* Court held that the statute of limitations for takings claims by landowners who timely filed their IRP Applications begins to run when the Authority makes its final decision regarding the application. This Court declines to extend this holding to landowners who did not timely file their applications. To find otherwise would effectively negate the concept of a limitations period altogether." *Id*. at 12-13. The plaintiffs in *Bragg* had timely filed their applications for an **i**nitial **r**egular **p**ermit (IRP), while the Plaintiffs in this case were 15 years too late. *See The Edwards Aquifer Authority v. Bragg*, 421 S.W.3d 118 (Tex. App.–San Antonio 2013, pet. denied).

The case has been appealed to the Fifth Circuit Court of Appeals.

For info: Order available upon request from *TWR*: thewaterreport@yahoo.com

WATER BRIEFS

THE POPE TALKS ON WATER

The following is Pope Francis' encyclical on "THE ISSUE OF WATER"

27. Other indicators of the present situation have to do with the depletion of natural resources. We all know that it is not possible to sustain the present level of consumption in developed countries and wealthier sectors of society, where the habit of wasting and discarding has reached unprecedented levels. The exploitation of the planet has already exceeded acceptable limits and we still have not solved the problem of poverty.
28. Fresh drinking water is an issue of primary importance, since it is indispensable for human life and for supporting terrestrial and aquatic ecosystems. Sources of fresh water are necessary for health care, agriculture and industry. Water supplies used to be relatively constant, but now in many places demand exceeds the sustainable supply, with dramatic consequences in the short and long term. Large cities dependent on significant supplies of water have experienced periods of shortage, and at critical moments these have not always been administered with sufficient oversight and impartiality. Water poverty especially affects Africa where large sectors of the population have no access to safe drinking water or experience droughts which impede agricultural production. Some countries have areas rich in water while others endure drastic scarcity.
29. One particularly serious problem is the quality of water available to the poor. Every day, unsafe water results in many deaths and the spread of water-related diseases, including those caused by microorganisms and chemical substances. Dysentery and cholera, linked to inadequate hygiene and water supplies, are a significant cause of suffering and of infant mortality. Underground water sources in many places are threatened by the pollution produced in certain mining, farming and industrial activities, especially in countries lacking adequate regulation or controls. It is not only a question of industrial waste. Detergents and chemical products, commonly used in many places of the world, continue to pour into our rivers, lakes and seas.
30. Even as the quality of available water is constantly diminishing, in some places there is a growing tendency, despite its scarcity, to privatize this resource, turning it into a commodity subject to the laws of the market. Yet access to safe drinkable water is a basic and universal human right, since it is essential to human survival and, as such, is a condition for the exercise of other human rights. Our world has a grave social debt towards the poor who lack access to drinking water, because they are denied the right to a life consistent with their inalienable dignity. This debt can be paid partly by an increase in funding to provide clean water and sanitary services among the poor. But water continues to be wasted, not only in the developed world but also in developing countries which possess it in abundance. This shows that the problem of water is partly an educational and cultural issue, since there is little awareness of the seriousness of such behaviour within a context of great inequality.
31. Greater scarcity of water will lead to an increase in the cost of food and the various products which depend on its use. Some studies warn that an acute water shortage may occur within a few decades unless urgent action is taken. The environmental repercussions could affect billions of people; it is also conceivable that the control of water by large multinational businesses may become a major source of conflict in this century.

For info: http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html

MINING VIOLATIONS ID

CWA SETTLEMENT

The US Environmental Protection Agency (EPA), US Department of Justice, and Hecla Limited (Hecla), owner of the Lucky Friday Mine and Mill, announced on June 1 that they have reached a settlement concerning water pollution violations near the headwaters of the South Fork Coeur d'Alene River. The South Fork (SF) Coeur d'Alene River runs through the heart of North Idaho's "Silver Valley," ambitiously recovering from a century of mining pollution. Hecla will pay a $600,000 penalty as part of the settlement.

Hecla's violations, occurring from 2009-2014 at its Lucky Friday Mine and Mill, cover both effluent limit violations and unpermitted discharges to the SF Coeur d'Alene River and two of its tributaries. Hecla's tailings pond 3 was found seeping metals-laden water that Hecla discharged into Harris Creek. During construction of a tailings pond 4, Hecla failed to install adequate controls to ensure that stormwater runoff was properly managed and soon turbid runoff destroyed a water intake at a downstream fish hatchery. In both cases, Hecla failed to properly report the event to EPA. EPA inspections documented close to 500 combined (effluent limit, unpermitted, and reporting) violations.

The SF Coeur d'Alene River is already severely compromised due to dissolved metals from historic mining activities. Major tributaries are devoid of aquatic life due to high concentrations of dissolved zinc and cadmium, while other areas only partially support fish and other aquatic species, offering migration routes but not spawning and rearing habitat. The Lucky Friday Mine operations are seen as the highest single contributor of metals to the South Fork above Mullan, Idaho.

For info: Mark MacIntyre, EPA, 206/553-7302 or macintyre.mark@epa.gov

EPA FRACKING STUDY US

WATER RESOURCE IMPACTS

On June 4, EPA released its long-awaited "draft assessment" on the potential impacts to drinking water resources from hydraulic fracturing (fracking) activities. Depending on one's point of view, the report either showed that the fears of fracking are overblown or that fracking has led to contamination and represents a significant danger to drinking water in the US. The oil and gas industry pointed to the EPA's own sub headline on their press release which noted in part, "[A]ssessment shows hydraulic fracturing activities have not led to widespread, systemic impacts

to drinking water resources… ." Environmentalists, meanwhile, noted that EPA also stated that "there are potential vulnerabilities in the water lifecycle that could impact drinking water."

The assessment follows the water used for hydraulic fracturing from water acquisition, chemical mixing at the well pad site, well injection of fracking fluids, the collection of hydraulic fracturing wastewater (including flowback and produced water), and wastewater treatment and disposal. "It is the most complete compilation of scientific data to date, including over 950 sources of information, published papers, numerous technical reports, information from stakeholders and peer-reviewed EPA scientific reports," said Dr. Thomas A. Burke, EPA's Science Advisor and Deputy Assistant Administrator of EPA's Office of Research and Development.

According to EPA's press release, its review of data sources available to the agency "found specific instances where well integrity and waste water management related to hydraulic fracturing activities impacted drinking water resources, but they were small compared to the large number of hydraulically fractured wells across the country. The report provides valuable information about potential vulnerabilities, some of which are not unique to hydraulic fracturing, to drinking water resources, but was not designed to be a list of documented impacts. These vulnerabilities to drinking water resources include: water withdrawals in areas with low water availability; hydraulic fracturing conducted directly into formations containing drinking water resources; inadequately cased or cemented wells resulting in below ground migration of gases and liquids; inadequately treated wastewater discharged into drinking water resources; and spills of hydraulic fluids and hydraulic fracturing wastewater, including flowback and produced water."

Also released on June 4 were nine peer-reviewed EPA scientific reports (www.epa.gov/hfstudy). These reports were a part of EPA's overall hydraulic fracturing drinking water study and contributed to the findings outlined in the draft assessment. Over 20 peer-reviewed articles or reports were published as part of this study (*see* www2.epa.gov/hfstudy/published-scientific-papers).

"EPA did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water resources in the United States. Of the potential mechanisms identified in this report, we found specific instances where one or more mechanisms led to impacts on drinking water resources, including contamination of drinking water wells. The number of identified cases was small compared to the number of hydraulically fractured wells. However, this finding may also be due to a lack of data collected, inaccessible information or other limiting factors. These factors include: insufficient pre- and post-fracturing data on the quality of drinking water resources; the scarcity of long-term systematic studies; the presence of other causes of contamination precluding a definitive link between the hydraulic fracturing operation and an impact; and the inaccessibility of some information on hydraulic fracturing activities and potential impacts. These elements significantly limit EPA's ability to determine the actual frequency of impacts." *EPA Overview*.

The study will be finalized after review by the Science Advisory Board and public review and comment. The Federal Register Notice with information on the SAB review and how to comment on the draft assessment was published on June 5, 2015.

For info: Jeff Frithsen, EPA, 703/ 347-8623 or frithsen.jeff@epa.gov; EPA Study website: www2.epa.gov/hfstudy

FRACKING MEETINGS US

SEPTEMBER & OCTOBER

EPA's Science Advisory Board (SAB) Staff Office has announced a public meeting and three teleconferences of the SAB Hydraulic Fracturing Research Advisory Panel to conduct a review of the EPA draft report, Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources, (May, 2015 External Review Draft, EPA/600/R-15/047 — *see* Brief above).

The public teleconferences will be held from noon to 5pm (Eastern Time) on the following dates: Wednesday September 30, 2015; Thursday October 1, 2015; and Monday October 19, 2015.

The public face-to-face meeting will be held on Wednesday October 28, 2015 from 9am to 5:30pm, Thursday October 29, 2015 from 8:30am to 5:30pm and Friday October 30, 2015 from 8:30am to 3pm (Eastern Time). The face-to-face meeting will be held at the Washington Plaza Hotel, 10 Thomas Circle NW., Washington, DC 20005. Teleconference lines also will be available for members of the public unable to attend in person.

For info: Edward Hanlon, EPA, 202/ 564-2134 or hanlon.edward@epa.gov. EPA/SAB website: www.epa.gov/sab

WHOOPING CRANES TX/US

SUPREME COURT DECLINES SUIT

On June 22, the US Supreme Court (Court) declined to hear an appeal of a case by The Aransas Project (TAP) that challenged the Texas Commission of Environmental Quality's (TCEQ's) issuance of new water right permits. TAP alleged that the issuance of the new rights resulted in the deaths of some 23 whooping cranes in the Guadalupe Bay estuary of Texas due to the lack of freshwater inflow to the estuary. Whooping cranes are a species listed as endangered under the federal Endangered Species Act.

The Court's denial leaves intact the ruling of the Fifth Circuit Court of Appeals, which rejected a lower court's decision that TCEQ's issuance of water permits resulted in a "take" of endangered whooping cranes. *The Aransas Project v. Texas Comm'n on Environmental Quality, et alia*., 756 F.3d 801 (June 30, 2014). *See also* Whooping Crane ESA Case: Fifth Circuit Refuses to Reconsider ESA "Take" Challenge by David Moon (*TWR* #131: Jan. 15, 2015).

For info: Fifth Circuit Decision available at: www.ca5.uscourts.gov/opinions%5Cpub%5C13/13-40317-CV0.pdf

WATER BRIEFS

BLM FRACKING RULES US

STAY OF RULES GRANTED

On June 23, a Wyoming federal judge granted a request by four states — Colorado, North Dakota, Utah, and Wyoming — to prevent new hydraulic fracturing rules issued by the federal Bureau of Land Management (BLM) from going into effect. Two industry groups also joined in the request for a stay. The rules would govern hydraulic fracturing on public land nationwide. "We are pleased the court agreed that the new BLM regulations present serious and difficult questions that justified a stay of these rules' effective date," said Colorado Attorney General Cynthia H. Coffman. "We believe these rules intrude on Colorado's sovereign right to responsibly and safely regulate the oil and gas industry within our borders."

The four States asked Judge Scott W. Skavdahl, US District Court - Wyoming, to temporarily delay the effective date of the BLM rule until the court has an opportunity to review the rule's legality. The rule was to take effect on June 24, 2015. Three of the States — Colorado, North Dakota, and Wyoming — previously sent a letter to the federal government asking BLM to delay implementation of the rule until the court could rule on the States' legal challenges. The Department of Interior denied the States' request. According to Colorado Attorney General Cynthia Coffman, the States' lawsuit raises a straightforward legal question: whether BLM can impose its own regulations on hydraulic fracturing, even though federal law does not give it that power, and instead, allows states to regulate in this area.

For more information about the Fracking Rules, see Water Briefs, TWR #134 ("Hydraulic Fracturing").

For info: Erin Lamb, Colorado AG's Office, 720/ 508-6554 or Erin.lamb@state.co.us

CLIMATE CHANGE US

BENEFITS OF GLOBAL ACTION

On June 22, the EPA released "one of the most comprehensive analyses to date on the economic, health and environmental benefits to the United States of global climate action."

The peer-reviewed report, "Climate Change in the United States: Benefits of Global Action," examines how future impacts and damages of climate change across a number of sectors in the US can be avoided or reduced with global action. The report compares two future scenarios: a future with significant global action on climate change, where global warming has been limited to 2 degrees Celsius (3.6 degrees Fahrenheit); and a future with no action on climate change (where global temperatures rise 9 degrees F). The report then quantifies the differences in health, infrastructure and ecosystem impacts under the two scenarios, producing estimates of the costs of inaction and the benefits of reducing global GHG emissions.

THE REPORT'S FINDINGS INCLUDE:

- Global action reduces the frequency of extreme weather events and associated impacts. By 2100 global action on climate change is projected to avoid an estimated 12,000 deaths annually associated with extreme temperatures in 49 US cities, compared to a future with no reductions in greenhouse gas emissions. This is more than a 90% reduction from no action estimates.
- Global action *now* leads to greater benefits over time. The decisions we make today will have long-term effects, and future generations will either benefit from, or be burdened by, our current actions. Compared to a future with unchecked climate change, climate action is projected to avoid approximately 13,000 deaths in 2050 and 57,000 deaths in 2100 from poor air quality.
- Global action on climate change avoids costly damages in the US. For nearly all of the 20 sectors studied, global action on climate change significantly reduces economic damages. Without climate action, EPA estimated up to $10 billion in increased road maintenance costs each year by the end of the century. With action, up to $7 billion of these damages can be avoided.
- Climate change impacts are not equally distributed. Some regions of the US are more vulnerable and will bear greater impacts. Without action on climate change, California is projected to face increasing risk of drought, the Rocky Mountain region will see significant increases in wildfires, and the mid-Atlantic and Southeast are projected to experience infrastructure damage from extreme temperatures, heavy rainfall, sea level rise, and storm surge.
- Adaptation can substantially reduce damages and costs for some sectors. In a future without greenhouse gas reductions, estimated damages from sea-level rise and storm surge to coastal property in the lower 48 states are $5.0 trillion dollars through 2100. With adaptation along the coast, the estimated damages and adaptation costs are reduced to $810 billion.

For info: Enesta Jones, EPA, 202/ 564-7873, jones.enesta@epa.gov or www2.epa.gov/cira

IN-CONDUIT HYDRO CA

LUCIDPIPE PROJECT

LucidPipe in-conduit turbines use the water flowing through pipelines to generate electricity. In January 2015, a four-turbine, 200 kW LucidPipe Power System came online in Portland, Oregon. The system, installed in a Portland Water Bureau pipeline, will generate an average of 1,100 megawatt hours (MWh) of energy per year (*see* Newton, *TWRs* #112 & #132). Riverside Public Utilities in California was the site of Lucid Energy's first commercial LucidPipe installation. The single 42" turbine system has operated continuously for three years.

Another installation of the LucidPipe Power System is occurring in California as a joint venture between Lucid Energy Inc. and Cadiz Inc. — a California land and water resources development company. Lucid Energy will be collaborating with Cadiz to install a LucidPipe Power System in the Cadiz Water Project's planned 43-mile water conveyance pipeline in California. LucidPipe will provide more than 1300 megawatt hours per year of renewable energy for use by the Arizona & California Railroad Company at it's remote, off-the-grid siding location in Rice, California. Providing electric power for lighting, refrigeration, and heating will enable the railroad to expand its transloading operations at the Rice site that serves a railroad line from Cadiz, California to Matthie, Arizona near Phoenix.

The installation will be a component of the Cadiz Valley

WATER BRIEFS

Water Conservation, Recovery & Storage Project that will convey an annual average of 50,000 acre-feet of water through the pipeline under gravity flow. Cadiz is providing power to the railroad as a condition of making the railroad's right-of-way available for the pipeline project.
For info: Jennifer Allen Newton, Bluehouse Consulting Group, Inc, 503/805-7540 or jennifer@bluehousecg.com BusinessWire Press Release at: www.businesswire.com/news/home/20150602006525/en#.VZbZ-t30zzC

CLIMATE & WATER CA

CDWR ADAPTATION BOOKLET

In June, the California Department of Water Resources (CDWR) has released a 28-page booklet summarizing the latest indicators, implications and water management strategies with regard to a changing climate and the water-energy nexus. According to CDWR, "*California Climate and Science Data for Water Resources Management*" contains science and data critical for climate change adaptation and mitigation for water management in California: "The steady march toward warmer global temperatures, greater weather extremes, reduced snowpack, higher sea level, and compromised water supply reliability warrant consideration by water managers in their decision making."
For info: The booklet is available online from: www.water.ca.gov/climatechange/

OIL SPILL FINE MT

EXXON MOBIL PETITION REJECTED

On June 12, the Pipeline and Hazardous Materials Safety Administration (PHMSA) of the US Department of Transportation issued its decision rejecting the petition for reconsideration filed by ExxonMobil Pipeline Company regarding a 2011 oil spill along the Yellowstone River that occurred due to a failure of the Silvertip Pipeline in Laurel, Montana. The PHMSA rejected Exxon Mobil's petition for reduction of its fine, leaving the company responsible to pay a civil penalty assessment of $1,045,000.

As noted in the PHMSA Decision, "[T]he failure occurred during a flood event and resulted in the release of approximately 1,500 barrels of crude oil into the Yellowstone River, causing environmental damage and forcing the evacuation of approximately 42 people." Decision at 1. Following the investigation of the incident by PHMSA, a Notice of Probable Violation proposed a civil penalty of $1,700,000.

After reviewing the assertions of Exxon Mobil, the PHMSA noted the basis of its rejection. "When assessing a civil penalty, PHMSA considers a number of assessment criteria. If a violation is the result of circumstances beyond the control of an operator, PHMSA may find cause to reduce or withdraw the proposed penalty after weighing the other assessment criteria. In this case, Petitioner's failure to complete an appropriate risk analysis and to prepare appropriate emergency response procedures was not the result of circumstances beyond its control. Moreover, these violations contributed to increasing the severity of the consequences of an accident: crude oil drained into the Yellowstone River for 56 minutes after the first alarm indicated a pressure drop at the location of the river crossing, causing significant environmental damage and forcing the evacuation of approximately 42 people. Accordingly, PHMSA finds no reason to reduce the penalty assessed in the Final Order." (footnotes omitted). *Id*. at 6. Exxon Mobil was ordered to pay the civil penalty of $1,045,000 within 20 days of the June 12th Decision.
For info: PHMSA website: www.phmsa.dot.gov/ >> News & Updates

WASTEWATER FINE NM

PROPOSED PENALTIES

On June 11, EPA issued a complaint against the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) for violations of the federal Clean Water Act (CWA). EPA's complaint includes a proposed penalty at $134,000.

The complaint covers violations of the water authority's wastewater discharge permit. EPA inspectors found ABCWUA experienced several sanitary sewer overflows and exceeded its permit limit for the amount of E. Coli bacteria in the discharged effluent. ABCWUA was also cited for discharging about six million gallons of sewage into the Rio Grande on February 27, 2015.

In late March, EPA issued administrative orders to ABCWUA to correct these violations. ABCWUA has an opportunity to pursue a settlement with EPA regarding the proposed penalty.
For info: Jennah Durant, EPA, 214/665-2200, r6press@epa.gov or www.epa.gov/aboutepa/region6.htm

UNDERGROUND TANKS US

NEW EPA REQUIREMENTS

EPA is strengthening the federal **u**nderground **s**torage **t**ank (UST) requirements to improve prevention and detection of petroleum releases from USTs. USTs are one of the leading sources of groundwater contamination in the US. EPA's action will strengthen existing requirements and help ensure all USTs in the United States meet the same release protection standards. The revised requirements will also help ensure consistency in implementing the tanks program among states and on tribal lands.

Secondary containment and operator training requirements of the Energy Policy Act of 2005 will apply to USTs on tribal lands. In addition, these requirements improve EPA's original 1988 UST regulation by closing regulatory gaps, adding new technologies, and focusing on properly operating and maintaining existing UST systems.
The revised requirements include:
- adding secondary containment requirements for new and replaced tanks and piping
- adding operator training requirements
- adding periodic operation and maintenance requirements for UST systems
- removing past deferrals for emergency generator tanks, airport hydrant systems, and field-constructed tanks
- adding new release prevention and detection technologies
- updating codes of practice
- updating state program approval requirements to incorporate these new changes

States and territories primarily implement the UST program. Many states already have some of these new requirements in place. For others, these changes will set standards that are more protective.
For info: EPA UST website: www.epa.gov/oust

WATER BRIEFS

BASIN STUDY ID

LATEST RECLAMATION ASSESSMENT

On June 12th, the US Bureau of Reclamation announced the latest in a series of river basin studies that examine the growing imbalance between available supply, increasing needs and projected demand due to climate change in the western United States.

Previous studies have been completed in the Colorado River Basin, Lower Rio Grande, Milk-St. Mary Rivers, Santa Ana Watershed, Yakima River — and the most recently completed Henrys Fork Basin in southeastern Idaho.

The Henrys Fork of the Snake River, located in eastern Idaho, provides irrigation water for more than 280,000 acres, sustains a world-class trout fishery, and is home for native Yellowstone cutthroat trout.

The purpose of this basin study is to assist state and local planning efforts by exploring options for meeting the complex water supply and management challenges in the basin, meeting the goals of the Eastern Snake Plain Aquifer Comprehensive Aquifer Management Plan and Idaho State Water Plan, as well as identifying risks posed to water supply by climate change and opportunities to mitigate those risks.

Reclamation and the Idaho Water Resource Board prepared the Henrys Fork Basin Study while working with the Henrys Fork Watershed Council. The Henrys Fork Basin Study final report includes alternatives, which provide the Idaho Water Resource Board, and other interested stakeholders including conservation groups, irrigators, and other agencies options to meet the water demands in the future.

This basin study was conducted as part of WaterSMART. WaterSMART is the US Department of the Interior's sustainable water initiative that uses the best available science to improve water conservation and help water resource managers identify strategies.

Basin studies define options for meeting future water demands in river basins in the western United States where imbalances in water supply and demand exist or are projected to exist.

For info: WaterSMART website: www.usbr.gov/WaterSMART/bsp

FRACKING WATER USE US

USGS STUDY

The amount of water required to hydraulically fracture oil and gas wells varies widely across the country, according to the first national-scale analysis and map of hydraulic fracturing water usage detailed in a new US Geological Survey (USGS) study. The research found that water volumes for hydraulic fracturing averaged within watersheds across the United States range from as little as 2,600 gallons to as much as 9.7 million gallons per well.

In addition, from 2000 to 2014, median annual water volume estimates for hydraulic fracturing in horizontal wells had increased from about 177,000 gallons per oil and gas well to more than 4 million gallons per oil well and 5.1 million gallons per gas well. Median water use in vertical and directional wells remained below 671,000 gallons per well. For comparison, an Olympic-sized swimming pool holds about 660,000 gallons.

"One of the most important things we found was that the amount of water used per well varies quite a bit, even within a single oil and gas basin," said USGS scientist Tanya Gallegos, the study's lead author. "This is important for land and resource managers, because a better understanding of the volumes of water injected for hydraulic fracturing could be a key to understanding the potential for some environmental impacts."

Horizontal wells are those that are first drilled vertically or directionally (at an angle from straight down) to reach the unconventional oil or gas reservoir and then laterally along the oil or gas-bearing rock layers. This is done to increase the contact area with the reservoir rock and stimulate greater oil or gas production than could be achieved through vertical wells alone.

However, horizontal wells also generally require more water than vertical or directional wells. In fact, in 52 out of the 57 watersheds with the highest average water use for hydraulic fracturing, over 90 percent of the wells were horizontally drilled.

Although there has been an increase in the number of horizontal wells drilled since 2008, about 42 percent of new hydraulically fractured oil and gas wells completed in 2014 were still either vertical or directional. The ubiquity of the lower-water-use vertical and directional wells explains, in part, why the amount of water used per well is so variable across the United States.

The watersheds where the most water was used to hydraulically fracture wells on average coincided with parts of the following shale formations:
Eagle Ford (within watersheds located mainly in Texas)
Haynesville-Bossier (within watersheds located mainly in Texas & Louisiana)
Barnett (within watersheds located mainly in Texas)
Fayetteville (within watersheds located in Arkansas)
Woodford (within watersheds located mainly in Oklahoma)
Tuscaloosa (within watersheds located in Louisiana & Mississippi)
Marcellus & Utica (within watersheds located in parts of Ohio, Pennsylvania, West Virginia and within watersheds extending into southern New York)

Shale gas reservoirs are often hydraulically fractured using slick water, a fluid type that requires a lot of water. In contrast, tight oil formations like the Bakken (in parts of Montana and North Dakota) often use gel-based hydraulic fracturing treatment fluids, which generally contain lower amounts of water.

This research was carried out as part of a larger effort by the USGS to understand the resource requirements and potential environmental impacts of unconventional oil and gas development. Prior publications include historical trends in the use of hydraulic fracturing from 1947-2010, as well as the chemistry of produced waters from hydraulically fractured wells.

The report is entitled "Hydraulic Fracturing Water Use Variability in the United States and Potential Environmental Implications," and has been accepted for publication in Water Resources Research. More information about this study and other USGS energy research can be found at the USGS Energy Resources Program: http://energy.usgs.gov/default.aspx

For info: Tanya Gallegos, USGS, 703/648-6181 or tgallegos@usgs.gov

CALENDAR

July 15 NM
Hydrology and the Law Seminar, Santa Fe. La Fonda Hotel. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

July 16-17 NM
Natural Resources Damages Seminar, Santa Fe. La Fonda Hotel. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

July 16-18 AK
Rocky Mt. Mineral Law Foundation 61st Annual Institute, Anchorage. Dena'ina Convention Ctr. For info: www.rmmlf.org

July 20 CA
Municipal Water Utility Ratemaking Seminar, Sacramento. Courtyard Mariott Midtown. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

July 22-24 OR
Oregon Assoc. of Clean Water Agencies Annual Conference, Bend. Mt. Bachelor Village Resort. For info: www.oracwa.org

July 26-29 NC
70th Annual SWCS International Conference: Coming Home to Conservation - Putting Science Into Practice, Greensboro. Sheraton Four Seasons Hotel. Presented by the Soil & Water Conservation Society. For info: www.swcs.org/en/conferences/2015_annual_conference/

July 27-28 WA
Washington Water Law Seminar, Seattle. Courtyard Pioneer Square. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

August 4-5 TX
Semiannual Water & Wastewater Short Course: Simple Chemistry for Simple Answers, College Station. Texas A&M. Presented by Global Petroleum Research Institute - Texas A&M. For info: www.gpri.org

August 4-6 CA
Western Water Seminar, Monterey. Hyatt Regency Monterey. Presented by National Water Resources Ass'n. For info: www.nwra.org/upcoming-conferences-workshops.html

August 11 Utah
Snowpack Monitoring for Streamflow Forecasting & Drought Planning Workshop, West Jordan. Jordan Valley Water Conservancy District's Conservation Garden Park Education Center; RSVP to Tim Bardsley, 801/ 524-5130 x336 or wwa.bardsley@gmail.com; 9am-4pm. Presented by Western Water Assessment, National Integrated Drought Information System, Colorado Basin River Forecast Center & Natural Resources Consrevation Service Utah Snow Survey. For info: http://wwa.colorado.edu

August 13 CA
Sustainable Erosion Control: Effective Best of the BMPs Course, Sacramento. Sutter Square Galleria Center, 2901 K Street. For info: UC Davis Extension, https://extension.ucdavis.edu/section/sustainable-erosion-control-effective-best-bmps

August 14 CA
Habitat Conservation Planning Course, Sacramento. Sutter Square Galleria Center, 2901 K Street. For info: UC Davis Extension, https://extension.ucdavis.edu/section/habitat-conservation-planning

August 17-19 CA
Smart H2O Summit: Focus on Technology Solutions to Water Crisis, San Francisco. Mariott Marquis. For info: www.smarth2osummit.com/

August 18-21 SC
Environmental Awareness Bootcamp, Hilton Head. Holiday Inn Resort Beach House. Presented by EPA Alliance Training Group. For info: www.epaalliance.com/environmentalbootcamp-aug15.html

August 19-21 SC
SPCC & Stormwater Compliance Workshop, Hilton Head. Holiday Inn Resort Beach House. Presented by EPA Alliance Training Group. For info: www.epaalliance.com/spccstormwaterworkshop-aug15.html

August 19-21 CO
Colorado Water Congress Summer Conference, Vail. Vail Cascade Resort. For info: www.cowatercongress.org/cwc_events/Summer_Conference.aspx

August 20-21 AZ
Arizona Water Law Conference, Scottsdale. Camelback Golf Club. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

August 21 CA
9th Annual San Bernadino County Water Conference, San Bernadino. California State University. For info: http://sbcwater.com/

August 25-27 NV
WSWC/NARF 14th Symposium on the Settlement of Indian Reserved Water Rights Claims, Reno. Peppermill Hotel & Casino. Presented by Western States Water & the Native American Rights Fund. Symposium begins 8/25, ending with an evening reception. Continues 8/26, followed by a review of the Pyramid Lake Paiute Tribe's settlement, a field trip to view settlement features. For info: www.westernstateswater.org or http://narf.org/water/

August 26-28 CA
Urban Water Institute's 22nd Annual Water Conference, San Diego. Hilton San Diego Resort. Presented by Urban Water Institute, Inc.. For info: www.urbanwater.com/conference/

August 27 WY
Snowpack Monitoring for Streamflow Forecasting & Drought Planning Workshop, Lander. The Inn at Lander. Presented by Western Water Assessment, National Integrated Drought Information System, Wyoming State Engineer's Office, Wyoming Water Ass'n & University of Wyoming Water Resources Data System; 9am-4pm. For info: RSVP to Matt Hoobler, 307/ 777-7641 or Matt.Hoobler@wyo.gov

August 27 CA
Wetlands Regulation & Mitigation Course, Sacramento. Sutter Square Galleria Center, 2901 K Street. For info: UC Davis Extension, https://extension.ucdavis.edu/section/wetlands-regulation-and-mitigation

August 28-29 CA
DesalTech 2015 International Conference: Innovative Research & Approaches for Seawater & Brackish Water Desalination, San Diego. San Diego Convention Ctr. For info: www.desaltech2015.com/

September 2 CA
The New Groundwater Sustainability Plans: What's Required & What's Needed Event, Modesto. DoubleTree by Hilton. Presented by Groundwater Resources Ass'n of California. For info: http://grac.org/sgma090215.asp

September 9 CO
Snowpack Monitoring for Streamflow Forecasting & Drought Planning Workshop, Broomfield. RSVP to Jeff Lukas, 303/ 735-2698 or lukas@colorado.edu; 9am-4pm. Presented by Western Water Assessment, National Integrated Drought Information System, Colorado Basin River Forecast Center, Natural Resources Consrevation Service Colorado Snow Survey & Colorado Water Conservation Board.

September 9-11 CA
Overview of Environmental Statistics Course, Davis. Plant & Environmental Sciences, 387 North Quad. For info: UC Davis Extension, https://extension.ucdavis.edu/section/overview-environmental-statistics

September 13-16 WA
30th Annual WateReuse Symposium, Seattle. Sheraton Seattle. Presented by the WateReuse Ass'n. For info: www.watereuse.org

September 14-15 NM
New Mexico Water Law Conference, Santa Fe. La Fonda Hotel. For info: CLE Int'l, 800/ 873-7130 or www.cle.com

September 14-15 WA
Proving Groundwater Contamination Claims Seminar, Seattle. Courtyard Marriott/Pioneer Square. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

The Water Report
Water Rights, Water Quality & Water Solutions in the West
260 N. Polk Street • Eugene, OR 97402

CALENDAR

(continued from previous page)

September 15-16 FL
The Water Expo: Empowering Water in the Americas, Miami. Miami Airport Convention Ctr. For info: www.thewaterexpo.com/

September 17 CA
Hydrology and the Law Seminar, Los Angeles. TBA. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

September 17-18 CA
Tribal Water in California, Valley Center. TBA. For info: Law Seminars Int'l, 800/ 854-8009, registrar@lawseminars.com or www.lawseminars.com

September 17-18 CA
12th Biennial State of the San Francisco Estuary Conference, Oakland. Oakland Marriott at City Center. Presented by San Francisco Estuary Partnership. For info: www.sfestuary.org/soe/