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

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GROUND WATER & SURFACE WATER CONJUNCTIVE MANAGEMENT CONTENTIONS

DELIVERY CALL LITIGATION IN IDAHO: GROUND WATER USERS' PERSPECTIVE

by Randall C. Budge. Racine, Olson, Nye, Budge & Bailey (Pocatello, ID)

INTRODUCTION

While often used and often an exaggeration, "Water Wars" is unfortunately a fairly apt description of the intransigent battles currently being waged by surface water users with senior water rights against ground water users, with junior water rights, on the Eastern Snake River Plain in Idaho.

The Eastern Snake Plain Aquifer (ESPA) is approximately 170 miles long and 60 miles wide, comprised of more than 10,800 square miles, and is estimated to contain approximately one billion **a**cre-**f**eet (AF) of water. Spring users, surface water users and an irrigation district with a senior ground water right have sought to protect and enhance their senior water rights by gaining control over vast quantities of water stored within and flowing through the ESPA, which is the largest storage reservoir in the state.

Water War actions have already included administrative assaults conducted before the Idaho Department of Water Resources (IDWR), in the Court system, and before the Idaho State Legislature (Legislature). These challenges have so far been successfully defeated by ground water users seeking to protect their water rights and livelihoods, as sanctioned under state law.

THE SENIOR RIGHT HOLDERS IN THIS BATTLE INCLUDE:

- The Surface Water Coalition of irrigators that irrigate below American Falls dam. The Surface Water Coalition members are the A&B Irrigation District (A&B), American Falls Reservoir District No. 2 (AFRD2), Burley Irrigation District (BID), Milner Irrigation District (Milner), Minidoka Irrigation District (MID), North Side Canal Company (NSCC), and Twin Falls Canal Company (TFCC).
- Certain Spring Users in the Thousand Springs area
- The Idaho Power Company

Most of these senior water rights holders rely upon Snake River flows fed in part by the ESPA. In addition, A&B holds a senior ground water right from the area's first major pumping project, which was developed in 1948 by the US Bureau of Reclamation (Reclamation).

These senior right holders work in concert, with a near singular mind set of strictly interpreting the Prior Appropriation Doctrine as a means of curtailing all junior ground water pumping from the ESPA in an effort to enhance their water rights. A central tenet of Western Water Law, the Prior Appropriation Doctrine ("first in time, first in right") imparts priority for water use to those who used the water first. If a senior water user is not receiving all of their rights and needs the water for a "beneficial use," they can "call" for junior users' rights to be shut off.

Conjunctive Use

Aquifer Recharge

Conjunctive Administration

Material Injury to Senior Rights

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The Spring Users see curtailment as a means to achieve their impossible goal of restoring spring discharges to artificially high levels of the 1950s — levels that far exceeded pre-development discharges as they had resulted from half a century of inefficient flood irrigation practices on the Eastern Snake Plain which led to extensive incidental recharge of the aquifer. The Surface Water Coalition seeks to obtain an enhanced supply of both surface and storage water that is greater in certainty and reliability than existed historically at the time their rights were established. Some of these senior right holders generate substantial revenues from the operation of power plants with junior and subordinated water rights and have a large financial incentive to rely upon their senior rights — they seek curtailment of junior ground water users in order to help spin their turbines. A&B seeks curtailment of surrounding ground water pumpers to raise water levels for its own pumping project to the historically unmatched levels that existed when their pumping first began in 1948 (when the water level of the ESPA was at a historic peak and before other pumping commenced).

On the other side are ground water users holding junior water rights. Originating in a bygone age of supposed abundance, these junior rights were issued under state law without objection. The very existence the viable agricultural economy groundwater users created is entirely dependent upon their continued ability to pump ground water from the ESPA. In the years since the hydraulic connection of the ESPA to the river was administratively recognized, these ground water users have been backed into a corner by the ensuing conjunctive administration of ground water and surface water rights, including new rules based in part on the simulated impacts of pumping on the Snake River and springs. One result is that they now must mitigate impacts to senior rights to avoid curtailment. Mitigation has cost $14 million since 2005.

These competing interests to the use of the ESPA have drawn a battle line to determine to what extent ground water pumping from the ESPA causes material injury to senior rights, e.g. a shortage of water needed to raise crops (or grow fish). Ground water users acknowledge and accept responsibility only for those depletions that cause material injury, but not for shortages caused by reduced incidental recharge, changes in irrigation practices, drought-caused conditions, and water uses by senior rights unrelated to irrigation needs — such as flow augmentation leases to "flush" migrating fish and to aid power production (i.e., non-irrigation uses). The results of the pending delivery call cases discussed in this article will determine in which direction the battle line is moved.

HISTORICAL PERSPECTIVE

Without question, both senior and junior water right holders in the area have made immense contributions to the development of the agricultural economy of Idaho. At great expense and considerable risk, all have brought under production vast expanses of land in southern Idaho using irrigation means available at the time to make the "desert bloom." The Surface Water Users' enterprises began in the first half of the 20th century, while the Ground Water Users contribution occurred primarily in the century's second half.

The Surface Water Coalition established water rights with priority dates in the late 1800's and early 1900's followed by the Spring Users and Idaho Power establishing many rights in the 1950 to 1970 period. These users relied upon the Prior Appropriation Doctrine — a principle of law well established in the Idaho Constitution, statutes and case law — to protect their prior rights from interference by junior users. [*See* Constitution of the State of Idaho, Article 15, Section 3, Idaho Code §42-106.]

The Ground Water Users also developed their water rights under the protection of state law. As Justice Schroeder recognized in his April 29, 2008 Opinion in the Surface Water Coalition Delivery Call case at page 2:

> "They are not poachers who sneak through an unlocked door to take away water from Surface Water Users. They entered under state law in the open and have contributed significantly to the economic development of the state and local communities."

The Legislature's authority to limit the right of priority is also rooted in the Idaho Constitution:

> "...priority of right shall be subject to such reasonable limitations as to the quantity of water used and times of use as the legislature, having due regard both to such priority of right and the necessities of those subsequent in time of settlement or improvement, may by law prescribe." Article 15, Section 5.

Conjunctive Use

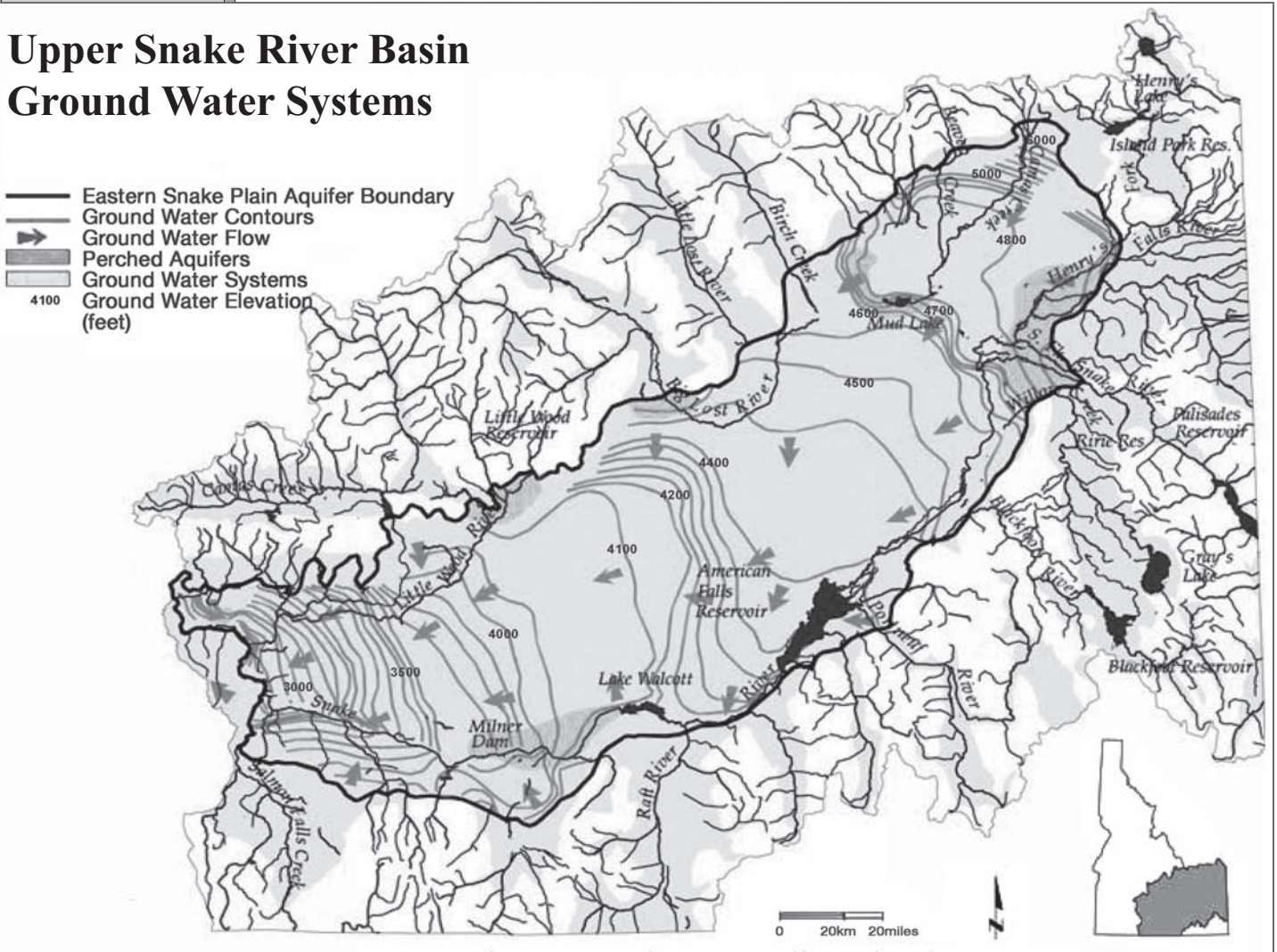
Economic Mandate

On that foundation, the Legislature enacted the Ground Water Act in 1951, I.C. §§ 42-226 et seq., providing as legislative mandate that "while the doctrine of 'first in time is first in right' is recognized, a reasonable exercise of this right *shall not block full economic development of underground water resources*." I.C. § 42-226 (emphasis added). This mandate for full economic development and optimal beneficial use of the State's ground water resources imposes a pragmatic limit on the right of a senior appropriator to curtail beneficial use of Idaho's ground water resources. Though a senior appropriator may be in priority, the right to curtail junior water users ends where such curtailment would unreasonably interfere with full economic development of the resource. I.C. § 42-226; CM Rule 20.03.

Incidental Recharge

In addition to the protections provided under the Ground Water Act, Idaho Power substantially contributed to the rapid expansion of ground water pumping from the ESPA. When Idaho Power constructed the Hells Canyon complex in the 1950s and 1960s it had a surplus of cheap power to sell. Idaho Power's brochure of the day touted an abundant and near limitless supply of ground water which would be pumped by cheap, clean electricity — which Idaho Power stood ready to supply. Those policies stand in stark contrast to the Idaho Power we know today. At that time, it appeared to many (though not all) that ground water supplies were virtually limitless. With this backdrop and pursuant to established State policy a great number of new ground water rights were licensed and ground water pumping dramatically increased from the 1950s through the early 1980s. These increased diversions from the ESPA occurred at the same time that incidental recharge was decreasing due to surface water users conversion from flood irrigation to more efficient sprinkler irrigation throughout the Eastern Snake Plain. This conversion to sprinklers resulted in reduced diversions into canal delivery systems, including the elimination of winter flows into irrigation canals as a part of new "winter water savings" agreements with Reclamation. Reclamation used this "saved" water to help fill new reservoirs (e.g. Palisades Reservoir, built in 1956).

Upper Snake River Basin Ground Water Systems



Source: IDWR

Ground-Water Flow Gradient in the ESPA

Conjunctive Use

Until relatively recently, surface water rights and ground water rights were administered entirely independent of one another. Even after the reality of hydraulic connection between ground water and surface water became generally acknowledged, hydraulic connection was administratively ignored for a significant period of time. This came to an end. We now act with the understanding that water supplies in the ESPA are not limitless. Further, we know that ESPA water levels vary and are highly responsive to normal precipitation variations and changes in irrigation practices.

Swan Falls Agreement

Conjunctive Rules

The reality of the interconnection and impending conflict was first evidenced in Idaho with the Swan Falls Settlement in 1987, followed by the enactment in 1992 of the moratorium on new ground water rights in the ESPA. With the connection and need for conjunctive management then officially recognized, IDWR proceeded to promulgate the Rules for Conjunctive Management of Surface and Ground Water Resources on October 7, 1994 (CM Rules). Thereafter, it was simply matter of time until the next drought created supply shortfalls which senior surface water users would want rectified by means of a "call" to have their senior water rights fully satisfied — thereby curtailing junior ground water rights as deemed necessary. The drought which began in 2000 set the stage for applying the new rules in conjunctively managing Idaho's surface water and ground water resources.

THE DELIVERY CALL CASES

Curtailment Sought

There are presently three major cases involving delivery calls made by senior water right holders under the CM Rules. The first proceeding is known as the "Spring Users Delivery Call" and was initiated by Blue Lakes Trout Farm, Inc., Clear Springs Foods and others seeking conjunctive administration and curtailment of Ground Water Users to enhance spring flows in the Thousand Springs area. The second, known as the "Surface Water Coalition Delivery Call," was brought by canal companies and irrigation districts below American Falls, and also alleges water shortages, asserts material injury and seeks to curtail junior ground water pumpers throughout the Eastern Snake Plain. The third case is the "A&B Irrigation District Call" which again involves a delivery call by senior ground water users against junior ground water users.

2005 Orders

In 2005, IDWR then-Director Karl Dreher issued separate Orders in the Springs Users and Surface Water Coalition cases following extensive analysis, but without any hearing. Both Orders rested on finding material injury to the senior water right holders and ordered curtailment of junior ground water users, absent approval of acceptable mitigation plans. Both sides disagreed with these Orders, petitioned for reconsideration and demanded evidentiary hearings. Administrative hearings and final resolution of these delivery call proceedings was substantially delayed after the Surface Water Coalition brought a separate action in District Court and obtained a ruling finding the CM Rules facially unconstitutional (i.e., unconstitutional as written). Following an appeal, the District Court decision was reversed by the Idaho Supreme Court in a March 2007 Opinion which held the CM Rules valid and constitutional, in the case of *American Falls Reservoir Dist. No. 2 vs. Idaho Dept. Of Water Resources* (*AFRD #2 Decision*), 143 Idaho 862, 154 P.2d 443 (2007). In addition to holding the CM Rules constitutional, the *AFRD #2 Decision* settled a number of legal issues in dispute providing considerable authority and guidance concerning the application of the CM Rules to the administration of surface and ground water and delivery calls.

Hearings Held

The Spring Users Delivery Call case went to hearing in late 2007, the Surface Water Coalition case went to hearing in early 2008 and the A&B case went to hearing in December 2008 — all before retired Supreme Court Justice Gerald F. Schroeder (appointed by the Director with stipulation of the parties).

Spring Users Delivery Call

HEARING OFFICER'S OPINIONS AND THE IDWR DIRECTOR'S (DIRECTOR'S) FINAL ORDERS (2008)

A BRIEF SUMMARY FROM THE GROUND WATER USERS' PERSPECTIVE

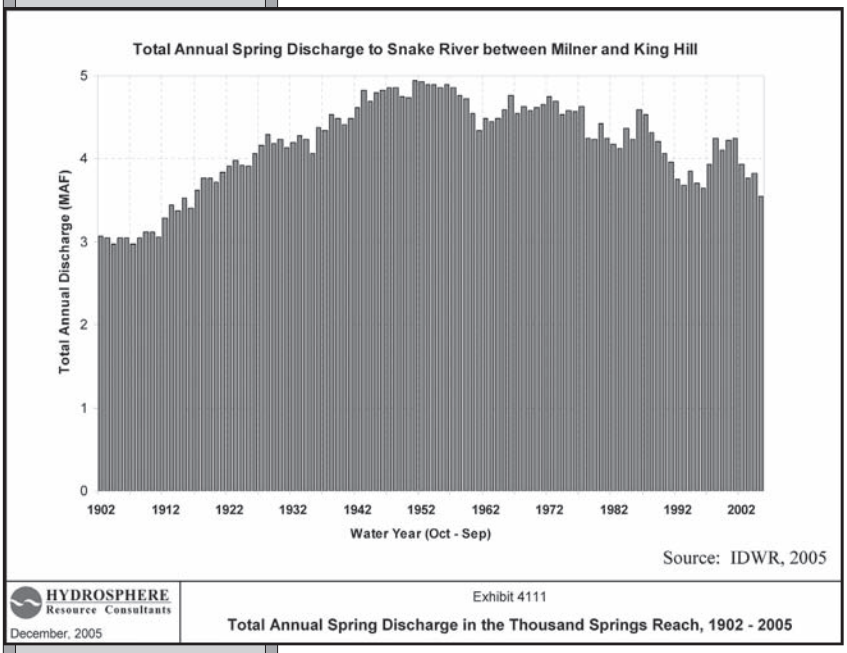
Trout Farm Rights

The Spring Users (Clear Springs Food, Inc. and the Snake River Farm) operate aquaculture businesses and use water flowing from springs in the Thousand Springs reach of the Snake River to raise trout. In 2005, the Spring Users sent letters to the IDWR Director asserting that certain of their early priority water rights were not being met and requesting curtailment of junior ground water rights. Blue Lakes sought administration to protect water rights in Alpheus Creek having priority dates of 1958, 1971 and 1973 totaling 197 **c**ubic **f**eet per **s**econd (cfs). Clear Springs sought curtailment of junior ground water rights to protect the decreed spring rights with priorities ranging from 1933 to 1971 which totaled 117.67 cfs.

Aquifer Model

Without a hearing but following extensive analysis, the Director entered the 2005 Orders finding injury and requiring curtailment of junior ground water pumpers. The **E**astern **S**nake **P**lain **A**quifer **M**odel (ESPAM) was used to simulate the effects of ground water pumping. The Director's Order allowed for phased in curtailment of ground water users in Water Districts 120 and 130 in an effort to balance the economic effect of curtailment with the need to increase the average discharge of springs in the Devil's

Conjunctive Use



Reflections on "Waste" & "Incidental Flow"

WHAT IS BAD IS NOT NECESSARILY BAD

One of the fundamentals that most of us grew up with is that wasting water is wrong and may even be criminal. Consequently, a pre-disposition may well be that if surface water users put more water on the ground to irrigate their crops than is necessary for the full maturity of a crop, that is bad. More efficient sprinkler systems are good. Winter water savings programs that prevent water from running through canals when there are no crops are good. Consequently, it was a bit unsettling to learn that the process of incidental recharge, water seeping into the aquifer from the surface, actually has some beneficial results. The water that enters the aquifer feeds the wells and near the end of the Plain exits into springs that allow trout farms to grow big, good tasting fish. Water rights established at times when the aquifer contained more water may suffer when there is less water in the aquifer. Drought, increased irrigation efficiency, and ground water pumping all affect the aquifer in some way. There is no legal recourse for drought, and irrigators are not obliged to operate inefficiently. That seems to leave the battlefield in the arena of pumping. Lest I step on my tongue or something worse at this point by saying too much, I will stop, except ... Except, a form of mitigation that has been utilized to avoid curtailment is the purchase of stored water to run in canals in excess of the amount necessary for crops in order to have incidental recharge to re-vitalize the amount of water coming from springs. So what is bad sometimes, is not always bad. There are some inevitable mind twisters coming up in the dispute between senior ground water users and junior ground water users where it is clear that all preconceptions must await the science, the evidence and the law.

Excerpt From:
"*Answering The Calls: Life as An Administrative Hearing Officer*"
Presentation to the Idaho Water Users Association, November 18, 2008
by Chief Justice Gerald F. Schroeder

Washbowl to Buhl gauge reach, where Blue Lakes is located, and in the Buhl Gauge to Thousand Springs reach where Snake River Farm is located. The Blue Lakes Order ultimately called for the curtailment of ground water rights with a priority date later than December 28, 1973, affecting 57,220 acres and the Clear Springs Order for Snake River Farm ultimately called for the curtailment of ground water rights with priority dates later than February 4, 1964, affecting 52,470 acres, unless mitigation was provided. The effected ground water users are farmers, dairymen, cities, industries and commercial businesses, most of whom are members of North Snake Ground Water District and Magic Valley Ground Water District (collectively "Ground Water Users").

The Spring Users and the Ground Water Users both objected to the 2005 Orders. Both went into the hearings with the objective of improving their position. However, very little changed and the 2005 Orders stand largely intact. Ground Water Users continue to face curtailment limited by priority date and a 10% "trim line" (see below) necessitating that their mitigation efforts continue to improve spring discharges to avoid curtailment. The clear message from the Final Order is that in administering surface and ground water rights in response to delivery calls, the Director has broad authority and may exercise professional judgment and discretion within the parameters established under the Conjunctive Management Rules.

Both the Hearing Officer's Opinion (January 11, 2008) and Final Order (July 11, 2008) in this case rejected a number of legal arguments asserted by the Spring Users which, had they been accepted, would have lead to a dramatic enlargement of the Spring Users' alleged water shortage and a correspondingly larger curtailment area and mitigation requirement. This would have created an impossible mitigation obligation for Ground Water Users to meet and could have resulted in the curtailment of hundreds of thousands of acres while providing little or no water to the Spring Users within any reasonable time period. For example, the Spring Users asserted that the quantity of water established in their decreed rights was a "guaranteed" amount, not an "authorized" maximum that could be diverted if available. Thus they asserted that it was irrelevant and inadmissible for the Director to consider what water was available at the time their rights were originally established, as well as annual and seasonal fluctuations in water supply caused by changed irrigation practices and/or drought wholly unrelated to ground water pumping. These arguments were soundly rejected by the Hearing Officer, relying substantially on the *AFRD #2 Decision*.

IGWA and the Ground Water Districts supported a majority of the Order's recommendations, which were considered positive.

Conjunctive Use

Cause and Effect

Model Limitations

"Trim Line"

Public Interest

Mitigation Plans

ORDER RECOMMENDATIONS INCLUDED THE FOLLOWING:

- Various factors have contributed to the decline in spring flows, including reductions in incidental recharge as a consequence of improved irrigation efficiencies, drought, and ground water pumping. (Order at 6)
- Ground water users are only responsible for spring flow reductions they have caused and not for reductions resulting from increased surface water irrigation efficiencies. (Order at 8)
- Blue Lakes and Clear Springs cannot require the continuance of inefficient flood irrigation practices, and to the extent that efficiencies have reduced spring flows, the Spring Users are without recourse. (Order at 8)
- The Spring Users' delivery calls failed to follow proper procedure or establish a basis for their claims of material injury. (Order at 9)
- Consideration of information predating Partial Decrees issued in the Snake River Basin Adjudication is proper in responding to a delivery call and does not constitute a re-adjudication of the water right. (Recommended Order at 10)
- There are limitations in the use of the Eastern Snake Plain Aquifer Model ("ESPAM" or "Model") and an error factor should be implemented when curtailment is ordered based on Model predictions. (Recommended Order at 13-14)
- Multiple variables contribute uncertainty to curtailment predictions generated by the Model including non-uniform geology of the ESPA, variations within the Model cells, and the inability of the Model to predict the effect of curtailment on discrete spring flows. (Order at 13)
- The linear analysis used to predict the effects of curtailment on a particular spring is not technically defensible. (Order at 20)
- The use of a "trim line" — which "trims" the geographical extent of the curtailment to exclude areas with little-or-no impact to the senior right — is proper. (Order at 14 and 22)
- The doctrine that "first in time is first in right" is subject to consideration of the public interest and full economic development of the underground water resource. (Order at 17)
- Natural seasonal variations in spring flows must be considered in determining the quantity of water that the Spring Users may be entitled to make a delivery call for. (Order at 18)
- The Spring Users are not entitled to dry up hundreds of thousands of acres when that action may contribute little or nothing in any reasonable time to their shortage. (Order at 23)
- Phased-in curtailment is permissible. (Order at 26)
- Providing replacement water to Spring Users in the amount they would receive under curtailment is permissible. (Order at 26-27)

Clear Springs Snake River Farm

Gain to Buhl-Thousand Springs Subreach from ESPA-wide Curtailment in cubic feet per second

	Curtailment Date				
	1870	1949	1961	1973	1985
Total Acres Curtailed	1,102,000	989,700	664,300	372,000	74,200
Transient Subreach Gain (cfs)					
After 1 year	47	46	35	22	3
After 5 years	67	63	46	28	4
After 10 years	84	77	54	33	5
After 50 years	124	110	74	43	7
After 100 years	133	118	79	46	8
Steady State Subreach Gain (cfs)	137	122	81	47	8

Projected Gain to Snake River Farm (cubic feet per second)

	Curtailment Date				
	1870	1949	1961	1973	1985
Total Acres Curtailed	1,102,000	989,700	664,300	372,000	74,200
Transient Spring Gain (cfs)					
After 1 year	3	3	2	2	0
After 5 years	5	4	3	2	0
After 10 years	6	5	4	2	0
After 50 years	9	8	5	3	1
After 100 years	9	8	6	3	1
Steady State Spring Gain (cfs)	10	9	6	3	1

Mitigation Plan Developments

Because the curtailment contemplated under the Final Order is permanent and ongoing in nature, the Ground Water Users have been required to file mitigation plans providing replacement water to the Spring Users each year.

In the Spring of 2008, North Snake Ground Water District and Magic Valley Ground Water District, ("Ground Water Districts") joined with the City of Twin Falls and the State of Idaho to purchase all of the assets of Pristine Springs, another aquaculture business, which included priority water rights on Alpheus Creek, the same source used by Blue Lakes Trout Co. The Ground Water Users acquired 10 cfs of the water right which has since been delivered on a continuous basis as a permanent mitigation solution to the Blue Lakes Delivery Call.

It has been considerably more difficult for the Ground Water Districts to mitigate their obligations to Clear Springs at its Snake River Farm facility because its location is further downstream in the Buhl Gage to Thousand Springs reach of the Snake River. As part of an ongoing mitigation effort in response to the Director's Orders, on June 13, 2008, the Ground Water Districts filed a mitigation plan which proposed to deliver water directly to Clear Springs from nearby springs, by continuing to deliver surface water to lands previously supplied by ground water (conversion acres), and by continuing the voluntary drying up of acres enrolled in the federal Conservation Reserve Enhancement Program (CREP).

Conjunctive Use

"Money or Fish"

Mitigation Plan

Polarized Parties

Lease of Replacement Water

Storage Carryover

Director's Authority

Scope of Water Rights

Following a number of objections by Clear Springs to the first plan on February 23, 2009, the Ground Water Districts filed a second mitigation plan which offered to Clear Springs money or fish to replace the lost production associated with a 2.67 cfs reduced water supply. These mitigation plans were filed pursuant to CM Rules (IDAPA 37.03.11) which permit injury to the senior right to be mitigated by a mitigation plan which provides "replacement water" or "other appropriate compensation."

On March 5, 2009, the Director issued an order rejecting the "money or fish" mitigation plan and ordered curtailment of some 41,000 acres. Under the threat of imminent curtailment the Ground Water Districts filed a third mitigation plan on March 12, 2009. This plan provides for the delivery of direct replacement water "over-the-rim" (i.e., pumped out over the rim of the Snake River Canyon) to Clear Springs. This will be accomplished by converting approximately 1,000 acres of ground water irrigated land above the Canyon's rim to surface water and pumping the ground water wells to deliver replacement water through a pipeline system over-the-rim to Clear Springs. The Director approved this plan over Clear Springs' continued objections on March 26, 2009, and rescinded the curtailment order, upon the conditions that the conversions and pipeline installation be operating by June 1, 2009, or the Ground Water Districts will face a fine of $10,000 per day.

Next Steps

Oral argument on the appeal occurred April 28, 2009. An order is expected from the District Court by early summer 2009. The parties are likely to appeal that decision to the Idaho Supreme Court.

The present course of continued litigation is not expected to change even with the mitigation plans in place which will fully and permanently mitigate any injury to these Spring Users, who are intent on trying to improve their positions by exhausting all court appeal options. Unfortunately, the parties to this case are polarized in their positions with little communication and no positive dialogue that could reasonably be expected to lead to any compromise settlement.

Surface Water Coalition Delivery Call

Hearing Officer's Opinions and the IDWR Director's (Director's) Final Orders (2008)

A Brief Summary from the Ground Water Users' Perspective

From the perspective of the Ground Water Users, the SWC did not improve its position and achieved little, if anything, by way of its challenge to the Director's 2005 Order.

The Ground Water Users gained two significant things in the Director's Final Order of September 5, 2008: a confirmation that replacement water plans are a necessary and appropriate tool in response to delivery calls of senior water users to avoid curtailment; and, that any predicted amount of shortage to reasonable carryover storage can be provided in the season of need, not the year before. Except in years of extreme and prolonged drought, and if there is not significant change in the methods of determination of material injury and resulting mitigation obligation to senior surface water rights — IGWA expects it will be able to continue to avoid any curtailment of ground water users by implementing mitigation plans which lease replacement water from the reservoir system and deliver it to the head gates of those Surface Water Coalition members suffering material injury. IGWA contemplates filing a permanent Mitigation Plan to accomplish this once the Director has entered a separate and final order detailing his approach for predicting material injury to "reasonable in-season demand and reasonable carryover for the 2009 irrigation season." (Final Order p. 6).

The Final Order (September 5, 2008) and Opinion (April 29, 2008) clearly confirmed the Director's authority over the process and affirmed the Director's discretion in evaluating the scientific and technical information to decide how best to manage competing claims when the water resource is scarce.

Highlights from the opinion and the final order include:

- Except as modified by the Hearing Officer's Opinion, all Findings and Conclusions of the Director in the 2005 and subsequent Orders are accepted. Accordingly, the Director's authority to conjunctively manage surface and ground water and discretion to make final determinations considering many factors and defenses set forth in the Conjunctive Management Rules was clearly upheld. (Opinion. p. 24)
- Twin Falls Canal Company is primarily dependent upon its natural flow rights to meet its needs. All other Surface Water Coalition entities have relatively junior natural flow rights that commonly only provide water during the runoff period between April and June in years of moderate to good snow pack; they rely primarily upon water from their storage contracts with Reclamation. (Opinion p. 10)
- Conjunctive Management is not needed every year. (Opinion p. 29) The system has not run out of water and it appears there will be water available to meet irrigators' needs. (Opinion p. 6)
- The licensed or decreed quantity is a "maximum amount" to which the right holder is entitled — i.e., an authorized but not "guaranteed" amount. The entitlement in priority to a certain amount of water is

Conjunctive Use

Material Injury

Trim Line

"Public Interest"

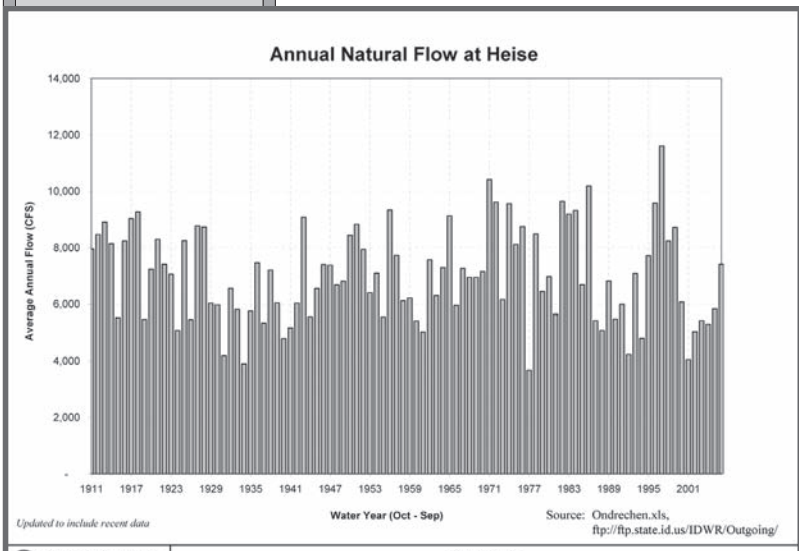
Full Economic Development

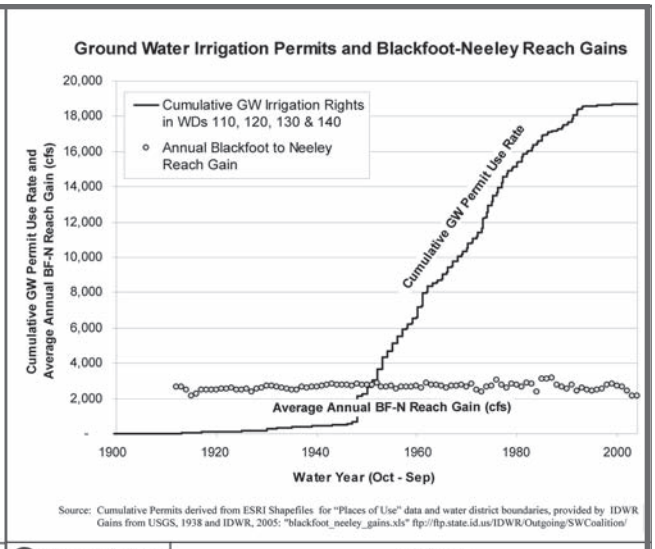
Storage Issues

Replacement Water

"not absolute" and "may be limited or lost" by considerations of the factors in the CM Rules (CMR 42.01). "Application of the water to a beneficial use must be present, not simply a desire to use the maximum right in the license or decree because that simplifies management of the water right." If crop needs are met, there is no material injury and no right of curtailment. (Opinion pp. 26, 31, 39, 40, 51, 52, 67)

- Although ground water pumping reduces the flow of the Snake River, this "does not mean that all water withdrawn from pumping has an adverse effect on surface water users dependent upon the Snake River." (Opinion p. 29)
- The application of a trim line, which limits the geographic scope of any curtailment, is proper to avoid a significant probability that curtailment would extend to ground water users who would suffer significantly without contributing water where necessary to remediate the material injury to the surface water users. (Opinion p. 33)
- The "public interest" is a factor to be considered in water rights litigation that impacts the public. The "actual need for the water and the consequences to the State, its communities and citizens" is important. *Schodde v. Twin Falls Land & Water Co*., 224 U.S. 107 (1912) (Opinion p. 37, 39)
- "First in time is first in right" does not sum up Idaho water law. While the Prior Appropriation Doctrine is acknowledged, other policies apply including the concepts of "reasonable use," "optimum development of water resources," and "full economic development." (Opinion pp. 38-39, CM Rule 20.03)
- Non-irrigated acres should be determined and excluded when determining the irrigation supply necessary for Surface Water Coalition members. IGWA has established that at least 6,600 acres claimed by TFCC in its District are not irrigated. The calculation of the water budget in determining if there will be curtailment should be based on acres, not shares. (Opinion p. 53)
- Historical expectations of filling the reservoirs 2/3 of the time have been met and ground water pumping has not defeated the expectations of storage but has affected the amount of water in storage (Opinion p. 15). There is no precise amount of reasonable carryover storage. Storage needs beyond the next season of need should not be considered. (Opinion p. 62)
- Full head gate delivery for TFCC should be calculated at 5/8 inch instead of 3/4 inch. (Opinion p. 55) [Editor's Note: This factual finding determined the amount of water to be delivered to TFCC versus the amount alleged]
- The right to secure reasonable carryover storage through curtailment does not extend to make up for water that is sold or leased "for uses unrelated to the original rights, e.g., the sale of water for ESA flow augmentation, power production, etc." (Opinion pp. 61, 64)
- Replacement water in season may occur either by IGWA obtaining lease water before the beginning of the irrigation season and transferring the right to the water to the SWC members *or* by underwriting the affected Surface Water Coalition members in their acquisition of the water as needed to be finally settled with a year-end accounting. (Opinion p. 66) (IGWA did this in 2007 by underwriting TFCC's supply)





Conjunctive Use

Storage "Waste"

Material Injury

Adjudication Objections

Management Area Report

No Material Injury Found

- Once a record has been developed, the procedures under CM Rule 43 for a Mitigation Plan should be followed. However, "replacement water plans [are a necessary]...administrative tool...[and]...serve a necessary role in the interim period after a delivery call is filed by a senior water user and before a record is developed upon which juniors can base a mitigation plan." (Final Order p. 3) Had junior ground water users been involuntarily curtailed without the ability to provide replacement water, junior ground water users would have been irreparably harmed prior to a hearing on the delivery call filed by the SWC." (Final Order p. 10)
- Replacement water for reasonable carryover storage shortages "should be provided in the season in which the water can be put to beneficial use, not the season before." (Final Order p. 6) "To order reasonable carryover the year prior to the season of need would result in waste of the State's water resources." (Final Order p. 11)
- CM Rule 42 lists factors that the Director may consider in determining material injury. "Contrary to the assertions of the Surface Water Coalition, depletion does not equate to material injury." (Final Order p. 8)

Next Steps

The Surface Water Coalition and Reclamation have each filed appeals which are pending in Gooding County District Court. The Ground Water Users did not appeal the Final Order but are Respondents in the appeal along with the City of Pocatello and the Idaho Department of Water Resources. Briefing on the appeal concluded May 20, 2009, with oral argument scheduled for May 26, 2009.

We are probably looking at one to two more years for the Final Order to work through appeals to the District Court and the Idaho Supreme Court. Given the *AFRD # 2 Decision,* we seriously doubt that the Final Order will be substantially changed by the Supreme Court on appeal. That will likely bring both parties back to where we are now. While final answers are not yet at hand, they are in sight.

The parties now are at yet another crossroad. They again have the choice of accepting the Decision, continuing on the long and expensive road of contentious litigation by pursuing appeals through the Court system, or sitting down together to work out solutions themselves. With a multitude of pending objections by ground water users and others to the Surface Water Coalition's water right claims, all heading to trial in the Snake River Basin Adjudication (SRBA) Court in late 2009 or early 2010, the time may be ripe for the parties to make a renewed effort to talk with their adversaries and make a good faith effort to negotiate a reasonable settlement on as many issues as possible. However, if past history is an indicator of the future, this may simply be wishful thinking.

A&B Irrigation District's Delivery Call
Hearing Officer's
***Findings of Fact, Conclusions of Law, and Recommendation,* March 27, 2009 (Findings)**
A BRIEF SUMMARY FROM THE GROUND WATER USERS' PERSPECTIVE

A&B Irrigation District (A&B) is located in southeastern Idaho and provides irrigation water to approximately 63,000 acres of lands (in Unit B) from ground water pumping under its primary water right 36-2080 with a priority date of September 9, 1948. A&B is a member of the Surface Water Coalition and participated in their delivery call as a result of which the Coalition also supported A&B's delivery call, each being alternative means of achieving their objective of curtailing junior ground water pumpers.

On July 26, 1994, A&B filed a Petition for Delivery Call requesting that the Director take action to ensure the delivery of ground water to A&B as provided in its water right. The Petition also requested the Director to designate the ESPA as a Ground Water Management Area (GWMA) and to supervise the use of ground water from the GWMA to ensure the full utilization of A&B's water rights.

Proceedings on the Petition for the Delivery Call were stayed under an agreement by the parties and a Pre-Hearing Conference Order dated May 1, 1995. On March 16, 2007, A&B filed a motion to proceed, requesting that the Director lift the stay and proceed "in the administration of the ESPA in such a manner as to provide ground water to A&B under its ground water rights that are being interfered with and materially injured by junior ground water appropriators in the ESPA..."

In response, Director Tuthill issued an *Order Lifting Stay, Setting Hearing Schedules, and Appointing Independent Hearing Officer* on September 20, 2007. A&B filed a writ of mandate in District Court requiring the Director to make a determination of material injury prior to a hearing. Proceedings in the District Court resulted in an Order issued on October 29, 2007, requiring the Director "to make a determination of material injury, if any, in accordance with Rule 42 of the Conjunctive Management Rules..." On January 29, 2008, the Director entered an Order determining that A&B had not suffered material injury as a consequence of junior ground water pumping and denied the request for the designation for the ESPA as a GWMA. A&B requested a hearing on the January 29 Order.

Conjunctive Use

Factual Precedents

Defense to "Call"

Reasonable Pumping Levels

Decline Factors

"Risk" Issue

Aquifer Recharge

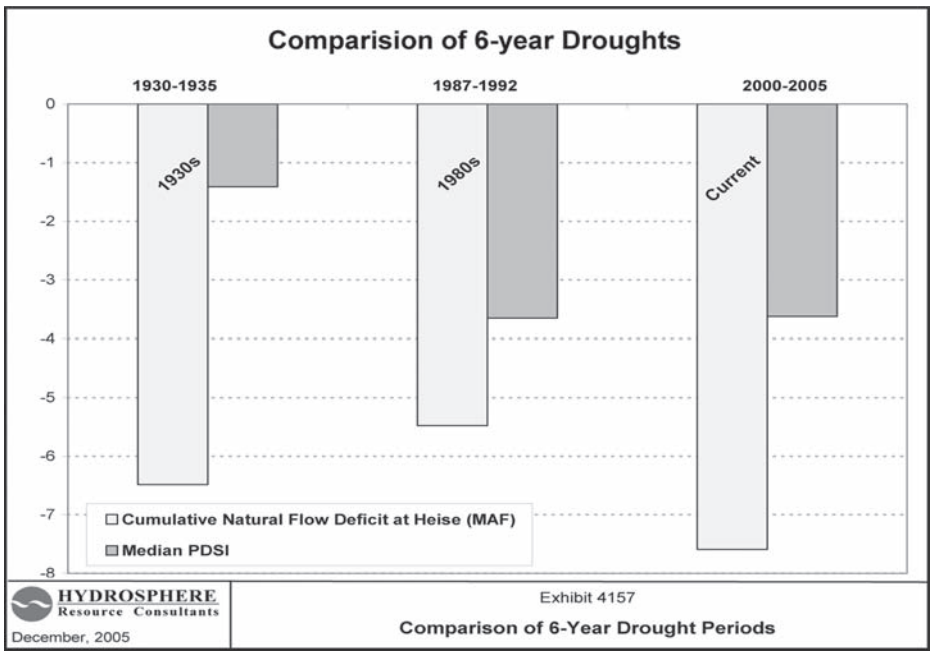
PDSI: Palmer Drought Severity Index

Following the hearing, which commenced December 3 and concluded December 18, 2008, Hearing Officer Gerald F. Schroeder issued a 40-page opinion constituting *Findings of Fact, Conclusions of Law, and Recommendations* (March 27, 2009).

The junior ground water users represented by IGWA and the City of Pocatello prevailed on all major issues that were litigated in the matter. The Hearing Officer affirmed the Director's finding that A&B had not been materially injured and denied the request that the ESPA be designated as a GWMA. The Opinion made many factual findings that will be useful as precedent for junior ground water users. There is no doubt that IGWA and the other junior ground water users, including the City of Pocatello, prevailed and that A&B lost.

This conclusion is based on the following significant rulings in the case:

- The *AFRD #2 Decision* requires that after "the initial determination" of material injury is made the junior has the burden of establishing a defense to the seniors' call, not that the allegation of material injury constitutes that determination. The allegation of material injury under oath invoked the Director's authority and responsibility to develop the facts upon which a well-informed decision could be made as to the existence of material injury and the consequences if there was material injury. (Findings p. 8)
- A&B is not entitled to historic pumping levels and therefore must make efforts to reach water to satisfy its rights until there is a determination that reasonable pumping levels have been reached. (Findings p. 9)
- A&B was developed when levels of the water in the ESPA were near their peak. Actual measurements of ground water level decline indicate that the A&B scenario using the ESPA model exaggerates the impact of ground water pumping and the model run does not substitute for actual measurements of the declines that have occurred. (Findings p. 10) Reclamation underestimated the magnitude of decline in the aquifer for several reasons including the fact that the project was developed at the peak of aquifer levels. Irrigation efficiencies have since developed reducing the amount of water entering the aquifer and extreme drought has occurred. Further, planners of the A&B project likely did not anticipate the extensive growth of pumping from the aquifer under the encouragement of Idaho Power and State policy. "The issue is risk, not fault." Whether or not the re-drill of A&B's wells in the 1960s and 70s were to an adequate depth is a question of risk. "Well informed people made decisions based on the information they had at the time. When those decisions fall short of the desired results the question is whether Unit B should bear the burden of the cost of rectification or whether junior ground water users should bear the burden either through curtailment or contributing to the costs of rectification." (Findings p. 26) Decline in water levels has not resulted in the need to withdraw significant amounts of land from cultivation and increases in crop production have occurred despite water supply difficulties (Findings p. 26-27)
- Recharge of the aquifer far exceeds the depletion from ground water pumping and the ESPA is not being mined. (Findings p. 10, p. 36)



Conjunctive Use

Well Yield

Interconnection of Wells

Curtailment Limit

- "The question of material injury depends on a number of factors beyond the fact that A&B is not receiving 0.88 miner's inches from all well systems in Unit B during the peak period." (Findings p. 11) The Director could consider information prior to the partial decree in considering material injury (Findings p. 12)
- The hydrogeologic setting of the A&B Irrigation District is relevant and the composition of the sub-surface is important because it influences the initial yield of a well and the likelihood of success in increasing the yield by deepening the well. (Findings p. 12 and p. 13) The potential for shortages in the water available from pumping in the southwestern portion of Unit B and the potential need to import water were foreseeable. The potential for greater interconnection of wells was known. (p. 15)
- A&B currently operates 177 wells but is authorized to use 188 wells if needed. A&B's Water Right No. 36-2080 is not tied to a particular well providing water only to particular land. Nor did the license in the partial decree limit the place of use for any one well. (Findings pp. 16-17) The project was designed around the concept of well systems with one or more wells providing water to one or more farm units. It was not designed for all pumps to be interconnected to distribute water to all parts of the project (Findings p. 17) If the entire well system could be interconnected economically, the issue of material injury would be gauged by the total capacity of the system to produce water. The ability to interconnect greater portions of the system remains a question. (Findings p. 18) The rendering of partial interconnections indicates that some of A&B's water short wells are in proximity to Unit B wells that pump over 0.83 inches per acre. It is likely that a greater level of interconnection can be achieved than has been accomplished. (Findings p. 19) A&B should undertake an engineering analysis or other study to determine the feasibility of moving water from a long system to a short system in light of the manner in which the water right was defined in the license and partial decree. IDWR should assist in this effort (Findings p. 19)
- There is an obligation of A&B to take reasonable steps to maximize the use of the flexibility before it can seek curtailment compensation from junior users. (Findings p. 19)

Science & Variability

REFLECTIONS ON ESPAM

the general nature of the aquifer is fractured basalt which may form passageways that allow the relatively free flow of water. But the water is not likely to consistently flow in a defined pattern east to west. It may flow north or south for a time before resuming its path west. It may flow very quickly at times and at other times it may flow very slowly. The pathways of the water may be clogged by sand or other soil that significantly impedes its flow. Changes in the conditions in the upper portions of the aquifer may take decades to be realized and to stabilize. Unlike flow in the Snake River where the path and speed of the water can be tracked with some precision, so the effects of curtailment can be known, effects in the aquifer cannot be seen so quickly or calculated so precisely.

In an attempt to establish a basis for the administration of established water rights in the Eastern Snake Plain a model, the ESPAM, was developed by prominent scientists with extensive opportunities for comment, criticism and correction. The Model divides the Plain into cells to account for and predict variations in the movement of water in the aquifer and to determine how changes in the aquifer will impact surface water and vice versa. The Model appears to be the best science available. However, one must be reconciled to the reality that decisions made based upon the model may not have precisely the effect that is anticipated. With the variability of factors influencing the amount of water in the aquifer and the pathways that exist below our sight a significant period of time may pass following a decision to determine if that decision has the desired result. This is true whether the decision is made in configuring and approving mitigation plans or ultimately a decision by a court or hearing officer when a request for curtailment is made. One must accept that a decision made upon the best science available and testimony of the most qualified experts in the country may be wrong. A subsidiary effect of this process is that what are intended as final decisions may not in fact be final if the science relied upon does not produce the results expected. If the science is wrong and the anticipated results do not occur, there may be an opening for readjudication of what at one point was thought to be final. And, of course, if the earth shifts or debris in the aquifer closes old channels or creates new ones that change the flows, the decisions made upon one set of facts may no longer be applicable. If nature dries up or impedes an adjudicated right, the term would seem to be "tough" regardless of all the science and thoughtfulness of the hearing officer, the Director, and reviewing courts. All recommendations of the hearing officer and subsequent adjudications stand subject to a 7.5 on the Richter Scale that changes the ground and the ground rules. From regulating water that falls from the sky to forming the historic patterns for the flow of that water Mother Nature holds the trump card.

Excerpt From:
"*Answering The Calls: Life as An Administrative Hearing Officer*"
Presentation to the Idaho Water Users Association, November 18, 2008
by Chief Justice Gerald F. Schroeder

Conjunctive Use

Beneficial Use

Curtailment Limitations

Crop Usage

Bottleneck

Burden on Senior

Historic Levels v. Reasonable Levels

- A&B's water right is not a guaranteed maximum. A&B seeks to reach 0.85 to 0.90 miner's inch per acre and A&B is entitled to the 0.88 miner's inch rate of delivery if its delivery system can produce the higher rate and that amount can be applied to beneficial use. "The question of whether A&B suffers material injury as a result of junior ground water users if it cannot produce the higher rate of delivery is a separate question." (Findings p. 25) Failure to secure full extent of the authorized water right does not by itself constitute injury. A&B is not entitled to curtail junior pumpers to reach the full amount of its water right if the full amount is not necessary to develop crops to maturity (Findings p. 31). Curtailment under such circumstances would contravene State policy under the Idaho Ground Water Act that the doctrine of first in time first in right shall not block full economic development of the underground water resources. The amount of 0.75 miner's inches per acre is consistent with A&B's motion to proceed, is an adequate amount to raise crops to maturity, is consistent with the policy of rectification adopted by A&B, and 0.75 is "above the amount nearby irrigators with similar needs consider adequate." (Findings p. 33)
- Evidence showed that farmers outside the A&B project can often raise crops to full maturity on less water than is used on the B Unit land. The private systems offer more flexibility than A&B's system and there is no financial incentive to use less than the three AF to which the irrigators are entitled on the B Unit (Findings p. 29 and p. 30). The delivery rate of 0.75 miner's inches per acre is higher than that of nearby surface water users. Crops may be grown to full maturity on less water than demanded by A&B in its delivery call. Although this may result in increased costs and power to the irrigators, with careful management by A&B and its irrigators, production of crops to full maturity with less water than is demanded by A&B is possible. (Findings p. 30)
- Protection of A&B's water right cannot be based on its poorest performing wells because that would mean subsequent ground water development would be unreasonably limited. "A finding of material injury leading to curtailment or mitigation cannot rest upon what would amount to a bottle neck in the system similar to Schodde's means of diversion. The right to water established in the Partial Decree remains, but that right is dependent upon A&B's ability to reach the water from those wells or to import it from other wells." (Findings p. 36)
- The burden remains on A&B until it is established that it is unreasonable to drill deeper. A&B's efforts of rectification have been largely successful and this indicates there is water available if efforts to secure water are pursued. (Findings p. 36)
- No tangible benefit has been demonstrated to result from the designation of the ESPA as a ground water management area. (Findings p. 39)

At the time these materials were submitted for publication, the deadlines for filing petitions for reconsideration on the Opinion or exceptions to the Director had not yet passed. It is unknown whether A&B will ask for reconsideration or appeal to the District Court.

IGWA Perspective

IGWA is very pleased and fully satisfied with the Opinion confirming the Director's original Order. IGWA is convinced that a substantial factual record was established which bolstered the Department's original determination defeating A&B's claim of injury, which was improperly based on a claimed entitlement to historic pumping levels when the project was developed, rather than reasonable pumping levels as mandated by the Ground Water Act. The Hearing Officer also confirmed that there is no need to designate the ESPA as a Ground Water Management Area which would just add another layer of administrative process. Unlike the opinion in the Surface Water Coalition Delivery Case and the Thousand Springs Delivery Case, where there was a mixture of both positive and negative points, the Opinion in A&B is seen as a clear victory for junior ground water pumpers and thwarts this last major effort to curtail ground water pumpers throughout the ESPA. Because the Opinion is strongly supported by substantial and competent evidence and confirms the Director's original order, it is certain that any petition for reconsideration or appeal will not result in a material change to the Opinion's conclusion that A&B is not suffering material injury. It is IGWA's hope that rather than pursue costly appellate litigation that A&B Irrigation District and the Surface Water Coalition will expend their resources on alternative water supplies as suggested by the Hearing Officer.

Conjunctive Use

Deference to Hearings Officer

Director's Authority & Discretion

Conjunctive Rules

CONCLUSION

The Opinions rendered by the Hearing Officer in each of the delivery call cases have been carefully written and are well reasoned, as one would expect from Chief Justice Gerald Schroeder, an experienced and practical former trial judge and jurist of considerable intellect with unquestionable integrity. These Opinions, which represented the recommendations of the Hearing Officer, have with minor exceptions been fully adopted by the Director who has the sole authority to rendering his Final Orders. Considerable respect and deference can be expected to be given to Chief Justice Schroeder's Opinions by the Director.

These Opinions leave little doubt how the CM Rules will be applied and confirmed that the Director has clear authority over the process and may exercise judgment and discretion in evaluating the scientific and technical information within the boundaries set by the CM Rules to decide how best to manage competing claims between Ground Water Users and Surface Water Users. Viewed from a broad perspective, all three Opinions essentially affirm most, if not all, of the Director's Findings and Conclusions in the initial Orders. Further, the Director's Final Orders in the Spring and Surface Water Coalition cases contain few significant changes to the prior Orders and the Hearing Officer's Recommendations and the same result is certain to occur when the Director's final order is entered in the A&B case. That being the case, all of the parties, and particularly those making the delivery calls, must honestly ask themselves what has been gained so far. The media may have gotten at least one thing right when they reported that only the lawyers and expert witnesses came out winners.

With appeals of the Director's Final Orders in the Spring Users and Surface Water Coalition cases pending before the District Court and the A&B final order and appeal soon to follow, it could well take another one to two years to work through the District Court and Idaho Supreme Court appeals to obtain final decisions. Since the Supreme Court has decided the Conjunctive Management Rules are facially constitutional, it must eventually decide if the rules were properly applied based on the extensive factual record established in each case. From this author's perspective, it seems unlikely that a Supreme Court Decision will change much from where the parties now stand. Hopefully, the Supreme Court decisions will be decided with clarity and certainty, which will enable the battling parties to step back and begin to expend their resources and utilize the substantial technical expertise assembled towards solving critical issues and improving water supplies, instead of racking up legal and expert expenses.

In addition to pursuing the delivery call cases through the Court system, a separate round of expensive and contentious litigation will soon follow as pending objections to the Surface Water Coalition's water rights go to trial in the SRBA Court.

Despite past failures at resolution, perhaps the parties are at another crossroad and the time is ripe to renew efforts to resolve their differences themselves. The Comprehensive ESPA Management Process is making progress and could lead to long-term solutions of stabilizing and enhancing the ESPA if all parties can lend their financial and political support. Unfortunately, the parties seem to have become more polarized during the course of proceedings, with many preferring to build barricades rather than bridges. Regardless of whether the parties choose to continue on the path of litigation or compromised settlement, the numerous disputes over conjunctive management of the State's surface and ground water resources that comprise the subject of "Water Wars" is marching forward.

While we are not at the end, and perhaps not at the beginning of the end, it at last appears that the end is in sight.

For Additional Information:
Randall Budge, Racine, Olson, Nye, Budge & Bailey, 208/ 232-6101 or email: rcb@racinelaw.net

Randy Budge was raised on a cattle ranch along the Bear River in Bear Lake and Caribou Counties, attending school in Soda Springs. He received Business Finance and Economic degrees from Utah State in 1973 and received his Juris Doctorate degree from the University of Idaho College of Law in 1976. Randy is a partner in the law firm of Racine, Olson, Nye, Budge & Bailey Chartered, with 29 lawyers and offices in Pocatello, Boise and Idaho Falls. His areas of practice emphasize water law, real estate, business, estate planning and public utilities. For many years Randy has represented numerous canal companies, farmers and developers on the Snake, Bear, Portneuf and Malad Rivers. His firm represents the Idaho Ground Water Appropriators, Inc (IGWA) and its' seven ground water districts members in SRBA and IDWR administrative proceedings. He also represents the Idaho Irrigation Pumpers Association and Monsanto in electric utility matters. Randy was lead counsel in defending the pending delivery call cases initiated by Blue Lakes Trout, Clear Springs Foods and others in the Thousand Springs area, by the Surface Water Coalition canal companies and irrigation districts below American Falls, and by A&B Irrigation District. These delivery call cases seek the curtailment of groundwater pumping from the Eastern Snake Plain Aquifer and are expected to shape the future of water use and irrigated agriculture in Idaho. Randy is also lead counsel in shaping and filing the Ground Water Districts' mitigation plan efforts. He currently serves on the Idaho Fish & Game Commission.

ASR & EPA

ASR & UIC PROGRAMS

AQUIFER STORAGE RECOVERY & THE EPA'S UNDERGROUND INJECTION CONTROL PROGRAM

REPORT FROM EPA'S "ASR EXPERTS" MEETING, MAY 5-6

by Dr. Cat Shrier, Watercat Consulting LLC (Washington, DC)

INTRODUCTION

On May 5-6, US Environmental Protection Agency (EPA) Underground Injection Control (UIC) program hosted a meeting of "experts" on Aquifer Storage Recovery (ASR) at the EPA Region V office in Chicago. As described in the Federal Register notice that announced the meeting, (Federal Register Document E9-7184, 3/31/09), this meeting was intended to be "an expert-level meeting with an interdisciplinary group of technical and policy experts from a variety of sectors such as Federal, State, private industry, environmental organizations, academia and public water systems" at which experts would be asked to discuss "innovative ideas for Aquifer Storage and Recovery (ASR) operations that would prevent endangerment of underground sources of drinking water." The notice stated clearly that the purpose of the meeting was to "generate innovative ideas and individual input from participants" and that EPA was "not seeking advice, group recommendations or consensus on any matters discussed during the meeting." A copy of the federal register notice and other information on the meeting can be found on a website maintained by the EPA's meeting consultant (www.horsleywitten.com/EPA-ASR). To "encourage productive and creative discussion," the meeting registrants were asked to provide information supporting their "significant ASR experience."

Meeting Purpose

EPA DEFINED "ASR EXPERTS" AS INDIVIDUALS WHO COULD SHOW:

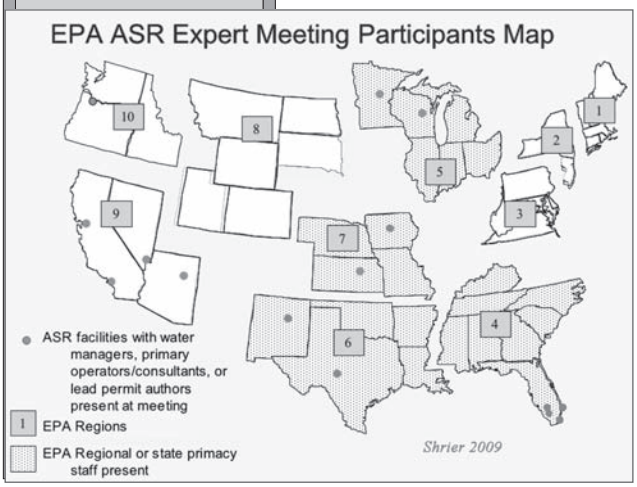
- demonstrated ability to advance ASR knowledge and practices through their work, including, but not limited to, prior presentations at professional conferences or publishing peer-reviewed research
- at least five years of experience performing ASR-related work in operations, site characterization, program implementation, research, or system design
- significant professional experience in managing, supervising, and leading ASR-related projects

Participants

The meeting was assembled with a group of roughly 30 ASR experts from around the country. As shown on the Participants Map below, the meeting included a broad-based representation of water managers, technical experts (researchers and consultants), and permitting staff from many parts of the country, particularly from the Southwest (EPA Region 9), Upper Mid-West (Region 5), Great Plains (Region 7), Mid-South (Region 6), and one water manager from the Northwest (Region 10). There were several participants from Florida (in EPA Region 4), including representatives from the US Army Corps of Engineers, which is leading the development of the Everglades Restoration Project. There were no water managers, consultants, or researchers from the rest of the East Coast nor from the Rocky Mountains (Region 8); however, some of the consultants had prior experience working on projects in those regions.

ASR Option

The resulting meeting provided two days of stimulating discussion on ASR management and permitting practices around the country, scientific explanations of the potential for and causes of water quality concerns that could result in "endangerment" of aquifers, review of UIC authorizing statutory language and rules, and management measures and permitting approaches that have been or could be used to bring together the management and regulation of ASR. This meeting was significant, in part, in that it demonstrated recognition by EPA that ASR constitutes an important water management option to meet the ever increasing demands on our limited water supply. While EPA headquarters staff have until recently suggested that ASR may be viewed as "experimental," and having limited applications, EPA has now recognized ASR as a management approach that is becoming "mainstream" and "national in scope." EPA recognizes the role ASR has played as a means of "augmentation" of water resources in the face of climate change and development pressures. EPA's UIC program was developed originally for oversight of wells that dispose of wastes, including fluids from oil and gas, solution mining, and other industrial wastes. Since the UIC program is administered through EPA regional offices and state agencies (in those states with primary enforcement responsibility or "primacy"), EPA headquarters has had little involvement in the interpretation of the applicable statute and rules to administer UIC to ASR facilitates.



This meeting has raised many questions about potential implications of EPA policy for existing ASR facilities, the manner in which the UIC program has been or could be applied to ASR systems, and the role of EPA in addressing these matters. EPA's summary report on this ASR Experts meeting, along with the findings of EPA's recent internal report on ASR, is expected to become available soon, and to be posted on-line (see "For Additional Information" below).

ASR & EPA

In an effort to provide a broader understanding of the meeting and what was discussed, this article has been prepared as a summary and is based upon the author's notes and meeting materials provided by EPA. Sources of additional information (including references) can be found at the end of the article, including information posted by EPA on the UIC program and on the ASR experts meeting. This article was written by one meeting participant and reflects her own perspective and experiences. It is not intended as a formal meeting summary or statement by EPA or any other organization.

ASR AND EPA'S UIC PROGRAM

WHEN DO UIC REGULATIONS APPLY?

ASR Definition

ASR is a term used to describe the practice of placing water in an aquifer for storage and recovering that water for later use, typically to aid drinking water supply. This water management approach has gained wide acceptance, and is used, in one form or another, in more than half of the states in the US. Some practitioners have provided a fairly rigid definition of the practice: "the storage of water *in a well* during times when water is available, and recovery of the water *from the same well* during times when it is needed" (Pyne, 2007, emphasis added). However, at various sites around the US, the term "ASR" has been used to describe an array of approaches to storage of water underground, including systems that use recharge basins instead of wells, or where separate wells are used for injection and recovery, possibly with consideration of subsurface transport and associated treatment benefits.

Terminology Differences

Other terms have been used for this and similar water management methods, including: **a**quifer **r**echarge and **r**ecovery (ARR); **m**anaged **u**nderground **s**torage (MUS); **m**anaged **a**quifer **r**echarge (MAR); conjunctive water management; and groundwater banking — as is discussed in a recent National Academies of Science study committee report (NAS Report, NRC 2008, pages 16-17). While these differences in terminology may seem trivial, the difference in regulation of various approaches to ASR can be significant, particularly with respect to the applicability of the federal UIC program.

UIC Program Regulation

The UIC program is involved with ASR systems only when aquifer storage uses a method of recharge that includes an injection well, and does not apply to ASR systems that use recharge basins. According to EPA, the UIC program defines an injection well as "a bored, drilled, or driven shaft, or a dug hole that is deeper than it is wide; an improved sinkhole; or a subsurface fluid distribution system." (See: www.epa.gov/ogwdw/uic/basicinformation.html) This would include ASR systems that use the same wells or separate wells for injection and recovery. The EPA UIC program regulates only the injection wells, not the production wells, and is particularly concerned with the potential for endangerment of **u**nderground **s**ources of **d**rinking **w**ater (USDW) by injection activities. Further discussion of the UIC program and its application to ASR was provided (as detailed in the meeting summary below) by Ann Codrington, Prevention Branch Chief in the Drinking Water Protection Division, within the EPA Office of Groundwater and Drinking Water at the Office of Water, headquartered in Washington, D.C. Ms. Codrington's office oversees the UIC program. While EPA has not provided a formal definition of ASR for purposes of UIC regulation, EPA has developed a "working definition" for its internal review of ASR (draft 2007, currently under review) and to guide the discussion at the ASR experts meeting.

"ASR Wells"

EPA HAS DESCRIBED "ASR WELLS" AS:

- a water management tool specifically to inject non-hazardous water for later recovery, even if recovery is from a separate production well
- an approach for augmentation of water resources using well technology to meet current and future water demands by storing water during wet periods or periods of low demand, and recovering it during dry periods or times of high demand
- systems recovering water generally for beneficial use, including, but not limited to, use by a public drinking water facility
- systems injecting water usually treated to meet primary and secondary drinking water standards

MEETING INTRODUCTIONS AND PLENARY PRESENTATIONS

The EPA ASR Experts meeting began with a welcome by Ann Codrington. Ann's office oversees the UIC program. She introduced Jill Dean and Jyl Lapachin, two staff members from her office who have recently been assigned oversight of activities related to ASR.

State Agency Permitting

Ms. Codrington explained that EPA recognizes ASR as "a very good tool for managing drinking water supplies" as finite supplies come under increasing demands. EPA staff have attended several recent meetings and conferences on ASR, and her staff at headquarters and within EPA regional offices have identified specific water quality questions concerning ASR approaches that fall within the UIC program. She noted that the federal program has not taken specific actions with respect to water quality protection and ASR, but that states and individual water utilities and consultants have moved forward with permitting requirements, monitoring and management measures related to ASR and water quality, and that many state permitting agencies have developed specific laws or permitting processes for ASR.

Following introductions by the participants, lead meeting facilitator Bob Wheeler (Triangle Associates Inc.) laid out "ground rules" for the discussion to ensure constructive involvement. He explained that

ASR & EPA

the meeting would begin with three presentations intended to provide a "common knowledge base and terminology" and that the group would then be divided into three discussion groups. The next three sections of this article summarize the three plenary presentations.

SCIENTIFIC AND TECHNICAL OVERVIEW

Jon Arthur, Acting State Geologist from the Florida Geological Survey and a member of the National Academy of Sciences (NAS) Study Committee on Managed Underground Storage of Recoverable Water, provided an overview on the current understanding of science and technology for ASR. This presentation drew from an NAS Report, "Prospects for Managed Underground Storage of Recoverable Water (2008). ASR issues addressed in the NAS Report included:

- Differences in "nomenclature" (e.g., "storage bubble" and "buffer zone" as well as "ASR" itself)
- Hydrogeologic and hydrochemical settings
- Water quality transformations, attenuation, water-rock interactions, and reduction/oxidation reactions
- Project development issues, including monitoring approaches and determination of recovery efficiency

Web-based video presentations on the findings of the NAS report, including presentations by Dr. Arthur and other members of the NAS study committee, are available on-line at www.aquifer-storage.com, and the full report is available through National Academies Press at www.nap.edu. Several participants, including other members of the NAS study committee, noted that this report provided an excellent review of the "state of knowledge" of ASR, although the committee did not consist primarily of practitioners or permit writers. The NAS report was frequently cited as an excellent starting point for understanding the scientific, technical, management, and policy issues associated with ASR.

CURRENT ASR PRACTICES

Erin Cole, Hydrologist for the Las Vegas Valley Water District (LVVWD) Operations, then discussed "current practices" in ASR. LVVWD is the "operator" of an artificial recharge program (the world's largest ASR wellfield) for the Southern Nevada Water Authority. The Authority ensures that the benefits and the resource management goals for LVVWD's operations are shared by all the water agencies in the region.

Ms. Cole provided some overview information on the quantity and location of ASR systems nationwide, referring to data adapted from David Pyne. She suggested distinguishing ASR projects according to their source water. Possible water sources include: treated municipal drinking water (i.e. water delivered from a municipal drinking water facility); treated surface water (which has not been treated at a drinking water facility, although it is treated prior to injection); and reclaimed water (including systems that "blend" treated surface water and reclaimed water). She noted that there are occasionally systems, such as Miami-Dade's, where groundwater is withdrawn from one aquifer, treated, and then injected into a different aquifer for storage. Participants noted that the term "treated" to describe ASR systems is not always clear, with some systems referring to pre-injection disinfection or other pre-treatments to support operations or protection of water quality, and other systems referring to use of a municipal water supply treatment plant.

Ms. Cole explained that municipal drinking water for ASRs is normally treated through multi-stage filtration and disinfection methods. Systems that use reclaimed or treated surface water will treat prior to storage, as needed, to ensure no negative impacts on the storage aquifer, for operational reasons, and for end use purposes (e.g. for total dissolved solids for water to be used for irrigation).

Ms. Cole then provided examples of some "unsuccessful" ASR projects, including projects with clogging and water quality deterioration issues. This led to discussion of how projects get labled "unsuccessful." Don Ellison (Southwest Florida Water Management District) — who had been part of the management of one "unsuccessful" site identified in the presentation — pointed out that the technology and knowledge to "fix" the water quality problems at this site had been available, but the facility owners were uncertain about the feasibility of getting the site permitted and were running out of funds.

Ms. Cole presented several examples of the management measures used by ASR operators to combat well clogging. Well clogging can be caused by: suspended solids in the source water; biofilm production on the well screens; chemical precipitation (e.g. iron and manganese); remobilization of drilling mud or fines; or air entrainment and gas binding. Management measures used in ASR include backflushing and purging. Ms. Cole also noted that the issues regarding acceptable management measures for permitting of sites where arsenic mobilization occurs are still a challenge and are under review.

Ms. Cole finished with an overview of the manner in which the Las Vegas Valley Water District's artificial recharge has served to meet several important resource management goals.

Southern nevada water authority's asr uses include:

- Storage and consumptive use of Nevada's Colorado River allocation
- Maintenance of beneficial use of other groundwater rights through prevention of groundwater depletion
- Prevention of land subsidence

ASR & EPA

Drinking Water Protection

Legal Issues

"Endangerment" Law

Regulation

Well Classifications

POLICY ISSUES AND PERMITTING AUTHORITY

Ms. Codrington next provided a presentation on the policy considerations related to ASR. She explained that the program originated with the federal Safe Drinking Water Act (SDWA). The SDWA was enacted by Congress in 1974, and amended in 1986 and 1996, as a law to protect sources of drinking water, including both surface and groundwater. EPA was required under the SDWA to develop minimum federal requirements to prevent contamination of **u**nderground **s**ources of **d**rinking **w**ater (USDWs) from injection wells. USDWs are regulated by either EPA or by States or Tribes that have been awarded primary enforcement responsibility (or primacy) within their jurisdictions. Regulation by states operating under primacy agreements is required to be at least as stringent as the federal standards and is allowed to be more stringent. As explained by Ms. Codrington, Congress provided the framework for protecting drinking water sources in the SDWA, with EPA rules then "filling in the details" and EPA regions or state primacy programs implementing the program.

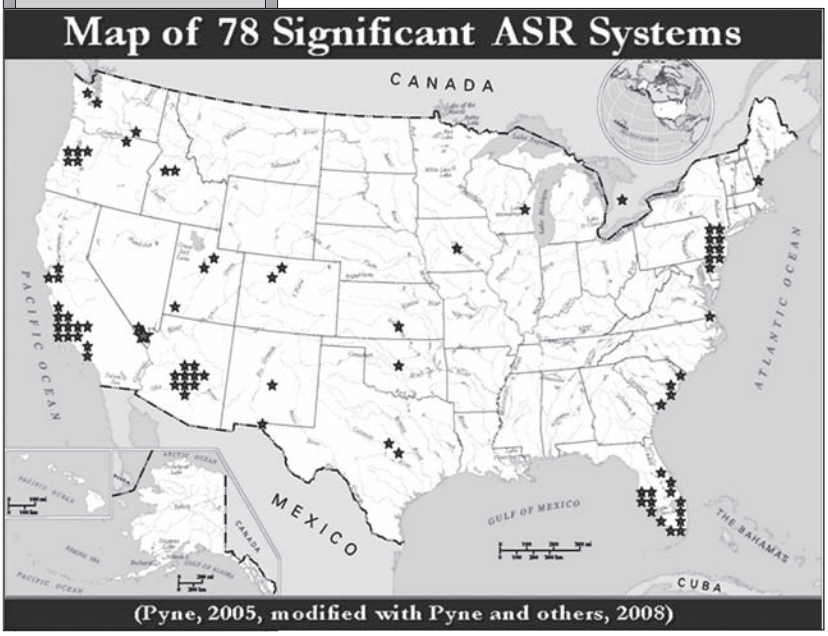
Ms. Codrington provided an overview of some of the key legal issues addressed in SDWA, including the regulations pertaining to the definition of "endangerment." She noted that changing the law would require Congressional action (seen as difficult and unlikely to occur), and changing the regulations would require rulemaking by EPA (also seen as difficult but, as had occurred in the recent carbon sequestration rulemaking process, a more feasible option if warranted).

Law and regulation refining endangerment:

THE LAW: Section 1421(d)(2) of the SDWA defines the term endangerment as follows: "Underground injection endangers drinking water sources if such injection may result in the presence in underground water, which supplies or can reasonably be expected to supply any public water system, of any contaminant, complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons."

THE REGULATION: Developed to implement the requirements to protect USDWs (Part C of the SDWA), the UIC regulations clarify the statutory requirements further and read, at 40 Code of Federal Regulations Section 144.12(a), as follows: "No owner or operator shall construct, operate, maintain, convert, plus, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Part 142 or may otherwise adversely affect the health of persons."

Ms. Codrington noted that ASR injection wells are classified as "Class V" wells, which are defined by the types of fluids they do not receive, such as: industrial or hazardous waste disposal fluids (which are received by Class I wells, and Class IV wells (now banned)); oil and gas production fluids (received by Class II wells); or solution mining fluids (received by Class III wells). (NOTE: Class I, II, and III wells only inject wastes into deep aquifers, "beneath the lowermost USDW.") EPA's UIC program completed a study (1999) on Class V wells and came up with 22 different categories of Class V wells, including ASR and artificial recharge wells.



Under EPA's UIC regulations (and primacy regulations), Class V wells are "authorized by rule" until permitted, so long as: 1) the owner or operator submits inventory information to the regulatory agency; and 2) the injection activity does not allow movement of fluid containing any contaminant, which might cause a violation of primary drinking water standards (or otherwise adversely affect human health), into a drinking water source. If there is potential for endangerment, the UIC regulating agency may ask for additional information and is authorized to take additional actions, in accordance with Section 144.82(a)(2): "If the Director of the UIC Program in your State or EPA Region learns that your injection activity may endanger USDWs, he or she may require you to close your well, require you to get a permit, or require other actions listed in 144(c), (d), or (e)." Sections 144.12(d) and (e) authorize additional actions if the Class V well is otherwise adversely affecting the health of persons or if there is an imminent or substantial endangerment to the health of persons.

ASR & EPA

Injection Wells

Ms. Codrington stated that ASR injection wells are "not prohibited" if the injection activity does not cause "endangerment." Most ASR injection wells receive treated, potable water that meets National Primary Drinking Water regulations at the point of injection. During the 1999 Class V study, EPA found no reported cases of contamination from ASR injection activities, although changes in water quality of the receiving aquifer had been noted, including improvement of ambient water quality (e.g. in brackish aquifers). EPA has noted endangerment issues such as dissolution of metals (including arsenic, manganese, and iron) reported on the East Coast and in the Midwest, and potential issues regarding radionuclides and disinfection by-products.

EPA found a range of ASR measures promugated by primacy agencies , including:

- Detailed permitting processes
- Pilot study, system development, and ASR operation requirements
- Restriction of ASR to municipal systems
- Facility operations
- Prohibition of ASR in certain areas (e.g. where there is agricultural water use)

Operating ASR Wells

OTHER EPA FINDINGS AND ISSUES

Meeting participants were provided with a draft copy of the Executive Summary from an internal review of ASR wells and survey of state programs and ASR facilities, as determined by the EPA regional offices, completed in 2007 and updated in 2009 (still under review). As of 2009, EPA had identified roughly 600 ASR wells currently in operation, which is more than four times the number identified during EPA's 1999 Class V Wells study. These wells were found to be mostly in the southeast, northwest, and southwest, and primarily in coastal states. Based upon data collected from seven of the ten EPA regions, the source waters for the ASR wells included public water supply system water, "untreated" groundwater, and "untreated" surface water.

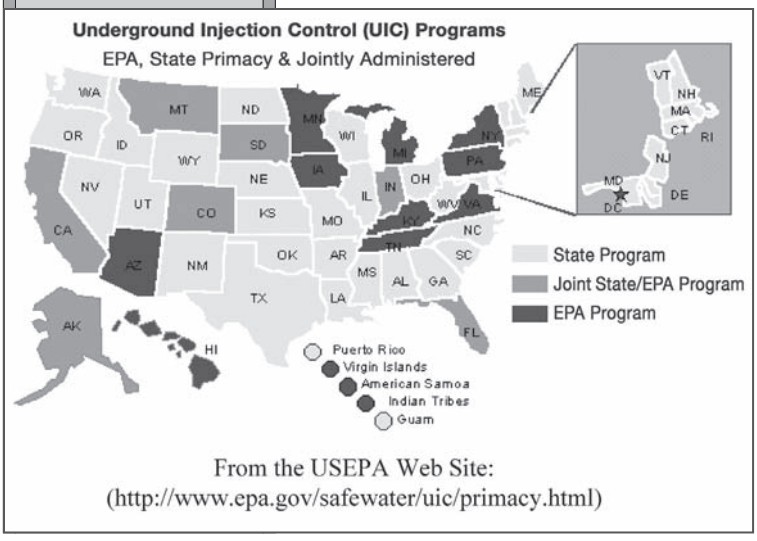
Ms. Codrington identified ASR issues that have been identified by EPA as potentially warranting further inquiry. The EPA ASR experts meeting was intended as one step through which EPA could begin to address some of the questions that have arisen regarding ASR practices and permitting approaches to prevent endangerment of USDWs.

ASR Issues

Ongoing asr issues at epa include:

- Well construction, design, and testing requirements
- Potential failure issues associated with the conversion of wells from drinking water withdrawal wells to ASR
- Potential for particle rearrangement and aquifer porosity alteration in the aquifer due to injection and withdrawal
- Trihalomethane degradation and concentration in aquifers with ASR wells
- Leaching of metals from aquifer materials due to ASR wells
- Gathering and sharing of any additional lessons learned which will help in improving how AR and ASR wells are regulated

Noting that the regulators, operators, and consumers "all want a high quality, reliable source of drinking water," she encouraged the participants to share their experiences with ASR and innovative approaches that result in the safe use of ASRs.



TERMINOLOGY

In the first of three breakout sessions, participants initially focused on some of the terms which had been included in the discussion questions provided by EPA. For example, in the first questions the focus was on "the likelihood of adverse impacts," rather than a more holistic consideration of the water quality impacts from injection, including potential benefits from improvement in aquifer water quality or prevention of further degradation of an aquifer (e.g. from saltwater intrusion or contaminant plume migration, which can be controlled, in part, by ASR operations).

Technical Discussion Questions by Proposed by EPA

- When characterizing a potential ASR site, what level of technical detail is needed to determine the likelihood of adverse impacts of injection on the aquifer?
- What successful operational practices and siting requirements are to be considered for the establishment of BMPs?

ASR & EPA

Sustainable Development

There was also discussion of the need for understanding how states considered the overall "sustainable development" of a site — including water resource management requirements, "water rights" in the West and "capacity use area" designations for aquifers in the East — and how those constraints impacted the management measures that could be used. Considerations included requirements associated with "recovery efficiency" and blending (of source water and existing groundwater); whether ASR facility owners and operators were required to "count the molecules" and recover the same water injected; and how injection and recovery rates, timing, and other operational constraints were associated with prevention of mounding or impacts to other groundwater users, including potential benefits to other users of the same aquifer.

Established Practices

Participants acknowledged that there are established practices for characterizing sites for ASR, and identified the NAS report in particular, as well as and other published resources as providing more detailed information on these matters.

Established practices for characterizing sites for ASR recognized by experts include:

- Baseline studies for an understanding of the hydrogeological and geochemical aspects of the site
- Characterization of the source water
- Understanding the potential for changes in water quality due to interactions between the source water and groundwater

"Baseline" Water Quality

The importance of understanding the "baseline" water quality of the storage aquifer and whether the water quality of the storage zone exceeded **m**aximum **c**ontaminant **l**evels (MCLs) for primary drinking water standards was discussed. Requirements exist for injected water to be treated to meet primary drinking water standards even when placed into storage zones that may fall below those standards. This led to questions in some states about whether "antidegradation" includes improvement of ambient water quality.

BMPs

Discussion groups also considered the applicability of the term "**b**est **m**anagement **p**ractices" (BMPs) in the second discussion question. Some participants emphasized the importance of identifying practices that were, in fact, "best" for an individual site given specific site conditions. Also discussed was the importance of clearly identifying the expectations of the regulating agency, and identifying management practices appropriate to meet those regulatory expectations.

There was discussion of differences in monitoring and reporting requirements and the associated costs. An example was given of a state that required "most stringent enforceable standards," treating the water both as groundwater and as drinking water, which included requiring very expensive monitoring for constituents such as asbestos, despite the fact that there was no indication of asbestos being present in either the source water or the groundwater.

Monitoring Questions

The need for a clear understanding of the monitoring frequency, parameters to be included in monitoring, and the extent to which permitting agencies would have the capacity (staff time, knowledge and associated financial resources) to review required reports, were among important permitting considerations identified. Participants reviewed the process by which various states and EPA regions worked with permit applicants and technical advisory committees to develop permitting approaches, either for individual sites or for more general rules or guidance on ASR permitting, leading to the suggestion to establish "best permitting practices" for a particular state, or for EPA more generally.

Exceedence Issue

Attention was given to the steps taken by a permitting agency if an exceedence was found to occur or was predicted. The question of whether a site would have the opportunity to perform pilot testing or continue operation while incorporating new management measures to ensure that the exceedence is addressed received additional attention. While "emergency powers" language in SDWA authorizes EPA (or primacy agency) to close a site, many permitting agencies have developed approaches through which a water utility and the agency can take steps to adapt the permit to address new water quality considerations as they emerge.

Point of Compliance

In many cases, the management measures and permitting requirements were associated with the concept of a "point of compliance" other than the point of injection. The owner or operator of an ASR facility would integrate management measures within a "zone of attenuation" or other designated area, and would take steps to ensure that MCL exceedences did not occur outside of that designated area. In some cases, the property boundaries were used to determine the point of compliance. Permitting agencies and owners/operators of ASR facilities also recognized that differences in water quality can occur over time, as well as space, and that different management measures and permitting requirements may be associated with different times in the development and operation of a facility. More monitoring was typically required earlier in the life of an ASR facility, with opportunities to reduce the monitoring requirements as agency confidence in the safe operation of the site was established through the site's established "track record" and evaluation of reported data.

Metals Leeching

Another issue concerned whether the metals or other constituents (e.g. nutrients in agricultural areas) could be leached out of the storage zone over time, or whether those constituents would be mobilized into areas outside of a designated area. In many cases, states working with their first ASR facility would have a more intense level of investigation until the agency personnel felt they had developed a better

ASR & EPA

Trade-offs of Benefits

National Impact Issues

Common Problems

Water Quality Protections

understanding of the issues associated with the aquifers in their state, and would then be able to adapt the investigation, monitoring, and reporting requirements over time. ASR system owners and operators, and permitting personnel, recognized the effect of limited costs for permitting and overall site development, and the need to consider potential trade-offs, including benefits from ASR as well as costs, while ensuring that no impacts occurred that could not be mitigated.

Day one of the meeting ended with extensive discussion among the participants, and further questions about the purpose of the meeting and characterization of ASR embodied in the questions. These concerns were communicated to EPA staff and meeting facilitators, who gave serious consideration to the feedback provided, as explained the following morning.

DAY TWO AND EPA'S CLARIFICATIONS AND REVISIONS

Day Two of the meeting began with clarification by Ms. Codrington on the information EPA is seeking and what EPA will do with the information collected, in response to several questions raised, as well as some revisions to the discussion questions and schedule for the remainder of the meeting.

Ms. Codrington noted that "a lot of you have an answer related to a particular problem based on your situation, and a sense of how that problem would be resolved for you." She noted that it was helpful for EPA to hear about those site-specific or state-specific approaches, but encouraged the participants to listen to one another, gain input from participants from around the country, as well as help EPA to determine "where are the commonalities, where are the problems similar, and where are they not similar." While she noted that it would be beneficial to be able to solve individual problems in individual states or regions, she stressed the importance of identifying "problems with national impact." She also pointed out that EPA has greater resources available when addressing national issues. Finally, Codrington stressed that "there isn't room within SDWA for 'a little endangerment'" and encouraged participants to consider different approaches to characterization of management measures taken to ensure that ASR facilities prevent anything that might cause an exceedence of an MCL or impact on human health.

Codrington informed the participants that she and her staff would review their notes and the meeting summary (to be provided by Horsley Witten) and would report back to OGWDW Director Cynthia Dougherty. She noted that Ms. Dougherty would require a thorough analysis of the problems as well as consideration of a full array of potential solutions. Codrington stressed that, where different states had common problems, it would be helpful for the participants to "brainstorm on all of the problems" and "be open to listening to other solutions." Participants from state and EPA regional permitting agencies noted that, while some states have identified an issue as a "problem" which could prevent use of ASR or require action by EPA headquarters, other states and EPA regions have identified those same issues as matters that can be addressed through the permitting process.

CURRENT PRACTICES & APPROPRIATE COMPARISONS

To start the second discussion breakout on "current practices," EPA and the facilitators suggested replacing the discussion questions from the original meeting agenda with development of a series of tables to support appropriate "apples to apples" comparisons of different types of ASR approaches or practices.

Current practices topics proposed by epa (original and revised)

Original discussion topics:

- What are the current ASR practices and what has been their environmental impact on the USDWs?
- What practices are both protecting USDWs and resulting in successful ASR operations?
- What practices are not working? How do practices differ around the country?

Discussion topics as revised

- How to develop tables identifying different types of ASR approaches or practices, along with the specific examples of: sites using each type of facility; environmental impacts associated with each site; and what approaches or practices worked (or did *not* work) at each site and why.

The participants soon recognized the magnitude of the task of developing the initial list of ASR approaches and practices. There was discussion of the term "ASR" and how it has been used, including applications of the term for water management practices that incorporate underground water storage without the use of injection wells (e.g. systems using surface recharge basins). The UIC program is not applicable in cases without injection wells, although other water quality protections are, such as National Pollutant Discharge Elimination System (NPDES) permits issued under the federal Clean Water Act, which is also largely administered by those States and Tribes with primacy. Participants recognized that the permitting requirements were often an integral part of the system operation and design. The pilot and operational phases of a system were typically developed in collaboration with permitting agencies, so that the approaches and practices reflected the permitting requirements at the time.

A true "apples to apples" evaluation of different ASR approaches and practices would include an evaluation of each site on the basis of appropriate parameters. The parameters listed next are a compilation of input from individuals from the different discussion groups, and does not reflect a group "consensus."

ASR & EPA

Parameters

"Residence Time"

Time of Storage

"Water Tax"

MCL Exceedence

Permitting Requirements

UIC Systems

Storage Zone Aquifer

Monitoring Technology

Appropriate ASR comparison parameters may include:

- Source water, including consideration of limits on the source water (e.g. due to water rights)
- Whether the source water is treated at a drinking water treatment facility, and whether there is additional "pretreatment" for specific constituents (e.g. atrazine for water from an agricultural area) or for well operations
- Whether chlorination is used prior to injection, either as part of the drinking water treatment or because it is required by the permitting agency, or whether ozonation or ultraviolet treatment is used to prevent disinfection byproduct production
- Whether the site uses the same well for injection and recovery or how far apart the injection and recovery wells were
- Whether there was a minimum "required residence time" before the stored water can be recovered (particularly for reclaimed water), or a maximum time period for recovery (e.g., a "use it or lose it" requirement in states that do not allow multi-year water storage or "banking")
- Whether water is stored in a freshwater aquifer or a brackish water aquifer, including aquifers that are not used for drinking water but are below the 10,000 milligrams per liter (mg/L) **t**otal **d**issolved **s**olids (TDS) standard for a USDW designation
- Whether water is stored and recovered in the same year, on a regular seasonal basis (e.g. to optimize treatment plant capacity or water rights availability through recharge in peak supply months (typically winter), or recovered in peak demand months (typically summer))
- Whether riverbank filtration wells are used for recovery of "surface water rights" source water, or is water recovered from groundwater for storage in the same aquifer or a different aquifer
- What factors impact the political and economic feasibility of the system
- Whether basalt aquifers are used
- How interactions with surface water, including seeps and springs, are taken into account
- Whether systems are required to leave a portion of the stored water in the aquifer to support water level maintenance or recovery ("water tax to the aquifer")
- Whether the water is stored in a very deep aquifer designated for use for ASR, in brackish storage zones below the 10,000 mg/L TDS limit for a USDW, or in aquifers where drinking water withdrawals may be prohibited due to past uses (e.g. for irrigation) to minimize interactions with other wells
- Whether owners/operators are allowed to continue to operate if they have an MCL exceedence for a limited period of time (e.g. during initial development) while taking steps to come into compliance and ensure that any impacts are mitigated
- Whether the end use is for potable uses or for industrial or environmental uses (e.g. to supply water for habitat restoration)
- What are the permitting requirements (including monitoring, reporting, testing, and operations) associated with each of these parameters, including how system operations and permits address measures that must be taken if there is a "spike" in a particular constituent or other issues emerge; and how much time is allowed for a pilot project to equilibrate or the number of cycles allowed for leaching of constituents

POLICY/LEGAL/REGULATORY CONSIDERATIONS

There was further discussion of the challenges ASR has provided to the UIC program, whether administered by EPA regions or state/tribal programs. Typically, UIC permits are issued for systems intended for disposal of water, as a "one-way ticket" for systems that often are not required to perform ongoing monitoring. For most UIC systems (including the other classes of wells and other Class V non-ASR wells), the injection zone and quality of water being injected treats the "storage zone" as a location that has been selected to remain in isolation, where the injected water would not interact with other wells.

In the case of ASR systems, however, the injected water may be intended to interact with the storage zone aquifer in a beneficial manner. In addition to treating the aquifer as a storage zone, ASR systems are often operated in a manner intended to improve the aquifer quality and sustainability as a source of water supply. ASR systems may be used to: maintain and recover water levels in aquifers that have been drawn down by other groundwater users; to prevent saltwater intrusion; or maintain the gradient of an aquifer to prevent contamination of a storage zone by contaminant plumes (e.g. perchlorates or nitrates). At the same time, the mix of the injected water and the "native" groundwater or aquifer matrix can result in new water quality considerations, such as mobilization of arsenic or other metals, or precipitation of iron or manganese. Whether these water quality changes occur depends upon the quality of the stored water, native water/aquifer, and interactions between the two. How those interactions occur can often be managed and mitigated though various management measures, such as pre-treatment and operations of the injection and recovery.

One issue that was specifically discussed was the level of monitoring technology required, such as "real-time" arsenic monitoring used in the pilot tests at the Everglades Restoration Project in Florida. The question was raised: "Is the technology ahead of the rules?" There was discussion of the availability

ASR & EPA

of other, less costly methods to determine whether there was the potential for endangerment or MCL exceedences, such as the use of native groundwater constituents as an "indicator" of when the injected water had been fully recovered and water was being withdrawn, instead, from the storage aquifer.

EPA & THE WAY FORWARD

States' Role

The final breakout discussion focused on policy, including discussion of state requirements and roles. In place of the original discussion questions that had been posted on the meeting agenda, participants were urged to consider, in particular, the potential role of EPA with respect to ASR. The participants were asked to recognize that EPA's role could include more than just strict involvement in permitting (through EPA regional offices) and rulemaking, but could involve such roles as facilitation, education, data collection and analysis, and research.

The participants noted that a change in the SDWA was unlikely to occur, nor would changes be beneficial to current ASR facilities and developers. Potential rulemaking, clarification of existing legal constraints, and other roles for EPA were addressed. There was greater agreement among the three groups on the final report from this breakout group than the prior discussions. Participants noted that some level of uncertainty and, hence, flexibility was a good thing, and further noted that the term "guidance" could be a loaded term, since guidance from the EPA could be viewed as de facto regulation. Specific policy considerations and EPA roles were identified by the three discussion groups. What follows is composed of input from individuals, and does not reflect a group "consensus."

Policy Topics

Policy discussion topics proposed by EPA (original and revised)

- What have states been advising or requiring in order to allow ASR?
- What state regulatory changes could help facilitate ASR and yet protect groundwater quality?
- What guidance/guidelines should there be for site characterization?

Revised topic:

- What could EPA's role be on ASR permitting

EPA's Role

One area that received significant attention was EPA's potential role in coordinating the way forward. EPA could facilitate discussion between water quality, drinking water, and water quantity agencies (both Western "water rights" and Eastern groundwater management agencies). The focus would be on coordination, not just regulation. Consideration would be given to ASR sites functioning as an overall system (including surface water and groundwater interactions, and transboundary aquifers). EPA's coordination with other federal agencies is important, including coordination on research and water management activities. This holds particularly true for the US Army Corps of Engineers and US Bureau of Reclamation, both of which have been involved with ASR project development (e.g. in the Everglades or the Reclamation groundwater demonstration projects of the 1980s) or projects that provide source water for ASR projects (e.g. from the Colorado River), or where federal actions impact the availability of source water (e.g. federal court decisions and subsequent Bay-Delta activities in California). EPA's UIC program and related SDWA programs should be part of the discussions among federal agencies related to climate change, water security, water and energy, and other multi-agency coordination efforts currently underway.

"Endangerment" Definition

Another aspect of this type of coordination would entail EPA working with the Office of General Counsel on a better definition of "endangerment" — particularly with respect to point of compliance and mobilization of constituents that exceed MCLs — and to clarify the amount of leeway allowed states in developing their permitting approaches and interpretation of UIC regulations as applied to ASR. This legal review may involve general clarification of legislative intent.

Summary

EPA can serve as a national clearinghouse for information on ASR and ASR site data, particularly related to UIC permits. Compilation of a detailed summary and analysis of ASR permitting approaches that have been used throughout the US can allow for an "apples to apples" comparison of sites, permitting requirements, and operations and management measures used to ensure permitting requirements are met. Such a summary would also help to establish ASR as a "national" water management approach and help with the identification of "commonalities." Specific state or site requirements may go into this analysis.

Specific ASR site and permit characteristics that might be addressed in a national summary:

- Point(s) of compliance for monitoring at wellhead, property line, zone of attenuation, etc.
- Whether a site is allowed to exceed MCLs temporarily under consent order during site development and/or whether permit addresses "contingency plan" for steps to be taken if an exceedence should occur, especially during pilot testing
- Residence time or other specific requirements associated with ASR systems using reclaimed water

"Adaptive Management"

- Use of limited licenses, pilot permits, temporary permits, or other measures that allow for "adaptive management" measures in which site issues can be reviewed and addressed, and permits or authorizations can be revised according to a specific timeframe
- Monitoring requirements (frequency, location, constituents) and whether those monitoring requirements change over time as individual sites develop a successful "track record," as the state agency becomes more confident in risks associated with ASR generally and at specific sites, and as technologies for system operation and monitoring improve

ASR & EPA

Public Education

The public education component could also be served with EPA supporting the development of materials and other information intended for public education to provide a greater understanding of ASR and its uses, and help develop a "common lexicon." Holding additional workshops on specific issues, with EPA teaming with other organizations, was suggested. The output forms and notes from the EPA ASR Experts meeting could be used to guide the development of future workshops and input meetings. Specific issues that could be addressed include: technical issues; policy approaches (processes used in various states to develop ASR-specific policies and permit approaches used by various states and EPA regional offices); scientific understanding and identification of research needs; and legal considerations — particularly those related to CFR 144.12 "endangerment" questions.

Developing Technical Advisory Committees was another suggestion and working with organizations such as the Ground Water Protection Council ("GWPC"— the association of state groundwater protection agencies), the National Drinking Water Advisory Council, the American Society of Civil Engineers and other pertinent organizations could move ASR forward.

Support Tools

Participants stated that EPA should work with state primacy agencies and ASR stakeholders (water utilities, consultants, other owners/operators, and other interests) towards the development of flow charts or other decision support tools to identify water quality considerations and management measures associated with specific site conditions, source waters, political constraints (e.g. water rights and capacity use areas), and other conditions commonly found at sites throughout the country. These flow charts could provide profiles of example sites to enable permitting staff and site developers to determine whether conditions at other sites were applicable to their site, and build confidence in site-specific decisions.

Baseline of Practices

A baseline understanding of common practices for management and permitting, to provide regulators with increased confidence, should be developed. EPA's role could include supporting review of the "state-of-the-science," and particularly the availability and effectiveness of various measures to monitor and protect water quality. Land use and its implications for owner/operator constraints (e.g. for ASR systems on smaller properties) was suggested as a consideration that EPA should incorporate where possible.

Research Support

EPA could also provide research support to states, individual sites, university researchers, and EPA's own research and development facilities to address specific research needs. This research could provide information on up-to-date technologies to ensure that the regulatory approaches can "mature with the technology" and remove unnecessary barriers while remaining protective. These technology reviews should occur outside of the discussion of individual permit applications, if possible, for a more "objective" review. Technology reviews should also consider research outside of the US. Specific research questions related to pharmaceuticals and ASR, and the levels of risk associated with specific disinfection byproducts, including cases where pharmaceuticals or other constituents may already be present in the storage aquifer, are important. Some attention was focused on the possibility of EPA developing funds to support demonstration approaches to ASR permitting and ASR applications, such as for small-town water utilities or for states that want to test new monitoring approaches, in which EPA could help absorb costs of research for applications that could benefit the larger public.

Consideration of the **t**otal **d**issolved **s**olids (TDS) threshold value of 10,000 mg/L for the designation of USDWs was requested. Questions raised regarding the TDS threshold included whether the standard should be less stringent for storage in brackish aquifers that were not being used by water by water supply wells. On the other hand, participants also noted that improving desalination technologies could be driving a potential for the TDS threshold value to be increased, as waters above 10,000 mg/L might become treatable sources of drinking water.

Some participants also asked EPA specifically to work towards a solution on issues that have developed in Florida with respect to arsenic mobilization and point of compliance — particularly with respect to the Everglades Restoration Project, a US Army Corps project that has benn identified as an "issue of national concern."

Separate Well Class for ASR

Several participants recommended that EPA consider the development of a separate "Class VII" for ASR wells, involving injection of water intended for later recovery and use. Use of the term "Class VII" was based upon the assumption that carbon sequestration wells would be designated as "Class VI" wells, as currently proposed by EPA. The carbon sequestration rulemaking process, which involved a less established technology than ASR, was seen as a potential model for how EPA may approach rulemaking, with input from various stakeholders (e.g. meetings held through the Ground Water Protection Council with state agency and industry representatives).

CONCLUSIONS & NEXT STEPS

Ms. Codrington thanked the experts and observers for their time, expertise, and emotion, noting the importance of these issues to the participants. She stated that if individuals — or, preferably, groups of individuals or organizations — wanted to discuss matters further, they would be welcome to schedule a meeting with her and her staff. While her office staff has had extensive demands on its time and resources (e.g. from the ongoing carbon sequestration rulemaking and associated tasks), the OGWDW recognizes that there is still much to learn on ASR and the UIC program.

ASR & EPA

Prioritized Envisioning

Identified next steps included:

- Reviewing the notes compiled by the Triangle Associates meeting facilitators during the breakout discussions, and the summary report to be provided by the Horsley Whitten note takers (to be prepared over the coming weeks)
- Developing an overall "vision" of steps that could be taken by OGWDW to be presented to the division director (Cynthia Dougherty)
- Prioritizing recommendations, developing a schedule of activities that can be completed in the coming year or future years, and identifying which steps would require funding
- Setting up a follow-up meeting or meetings with specific stakeholder groups to gain additional input or address specific questions
- Posting a summary of the meeting notes, along with additional meeting materials (e.g. PowerPoint presentation slides and Executive Summary of EPA survey of ASR wells and regulatory programs) on EPA's website

Future Workshops?

Ms. Codrington pointed out the potential need for future workshops that may involve partnerships with specific organizations, with discussions focusing on specific questions relating to technologies, management practices, or permitting practices, and identifying potential partner organizations such as the Association of Municipal Water Agencies (AMWA), American Water Works Association (AWWA), and Ground Water Protection Council (GWPC). She also noted a recent workshop held in conjunction with GWPC for carbon sequestration rulemaking as an example of how EPA can work with other organizations to gain input.

June Meeting

Since the meeting's conclusion, briefings and conference calls to discuss the meeting outcome have been held by or with various organizations, such as the Association of Municipal Water Agencies, American Water Works Association, and Association of California Water Agencies. Your author will be presenting a briefing on the EPA ASR Experts meeting at the Western States Coalition of Arid States (WESTCAS) Meeting on June 25 in San Diego (www.westcas.org).

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202/ 344-7894, email: cat@watercatconsulting.com or website: www.watercatconsulting.com

EPA UIC program website: www.epa.gov/ogwdw/uic/
EPA's summary report on the May 2009 ASR Experts Meeting is expected to be available from this website in the near future.

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Cat Shrier, Ph.D., P.G., has a broad background in public policy, hydrogeology, water planning and systems engineering. She has served as a Senior Water Resources Planner and Engineer with environmental consulting firms in Calgary, Denver, Raleigh, and Richmond. Cat also headed her own independent consulting practice to provide support on water resources regulatory interactions and public involvement on water resources management issues. Since 1984, Cat has worked with and for federal and state legislative offices and regulatory agencies in Washington, DC; New Jersey; Virginia; North Carolina; Colorado; and the Province of Alberta. Her work has involved conjunctive use of groundwater and surface water resources; environmental impact assessments; water and wastewater reuse; multicriteria decision analysis incorporating spatial analysis and knowledge bases; water and watershed planning programs; and water policy. Dr. Shrier served on the National Academy of Sciences Study Committee on Managed Underground Storage of Recoverable Water (e.g. Aquifer Storage Recovery, recharge basins), which published its report in January 2008.

WATER CRISIS

"Unquenchable: America's Water Crisis and What to Do About It"
An Interview with Author Robert Glennon, University of Arizona, Rogers College of Law

by David Moon, Editor

Glennon

Robert Glennon's latest book, *Unquenchable: America's Water Crisis and What to Do About It*, is a must read for anyone dealing with water rights and water quality issues. *Unquenchable*, while not aimed at a technical audience, provides an important new overview of water issues even for those well-versed in the intricacies of the water world. The book is aimed at the educating the lay public and designed to be accessible for all readers, but it is deeply grounded in solid research and includes an extensive list of useful information sources. *Unquenchable* uses very interesting stories to convey a very serious message — the United States is already facing a water crisis that threatens to become a catastrophe.

Raising Awareness

The Water Report interviewed Professor Glennon about the book and its major themes. Raising awareness is a central goal of the book. "People in the country at large are absolutely clueless that the US is facing a water crisis," Glennon stated. "The reason for that is two-fold. First, we have assumed that water is like air — limitless and inexhaustible — when in fact it is finite and very exhaustible. So we have simply misconceived the nature of the resource. Second, water managers in the US have done a heck of a fine job — they continue to provide to consumers, high-quality, clean water for a pittance. For less money than Americans pay for their cell phone service or for cable television, they get a limitless supply of high-quality water when they turn on the tap." Glennon noted the current widespread lack of awareness. "What's the problem when I wake up in the morning and turn on the tap and get good quality water — how can there be a water problem? Only if you start to go down the path of mandatory water rationing, bans on water uses, do people start to think, 'This is affecting me personally.'"

Finite & Exhaustible

Economic Focus

Glennon was adamant in the interview, however, that *Unquenchable* is not simply another environmental call to arms. Rather, his focus is on the economy and the critical impact water use holds for the future. "Water lubricates the American economy, just like oil does. I don't think most people think about it that way. Most people think, 'There's not enough water — that means the salmon are endangered, or the river is drying up.' It is perceived as an environmental issue. I would like to reorient it so that people perceive water as an economic issue." With that in mind, Glennon provides a concise list of several occurrences relating to water where things have "gone wrong" in the last year and a half, "every one of them economic." They ranged from "farmers having fields go dry because the Colorado State Engineer banned them from using their groundwater wells [South Platte area], Central Valley farmers cutting the tops off avocado trees in a desperate attempt to keep them alive, Southern California developers not being able to do projects because there wasn't enough water, Lake Superior being too shallow to float fully-loaded cargo ships, and power plants in four different states not getting power permits due to a lack of adequate water. All of those things are economic. I could have added an equally long list of environmental factors, rivers that are drying up and springs that are depleted, but I was really very conscious about that. I wanted to get the message out that this is not some 'lefty-greenie' thing. This is about the quality of our collective lives and the future of the American economy."

This focus on the crucial economic realities and impacts from water use and water needs permeates the book. Those readers who are not in the water field will be particularly informed by references to water users such as Google and Intel, as well as other nearly mind-boggling statistics about water use in the US.

Market-Based Approach

The solutions offered in *Unquenchable* provide a balanced approach. Glennon argues that we cannot engineer our way out of the problem with the usual fixes or the zany — but very real — schemes to tow icebergs from Alaska or divert the Mississippi River to Nevada. *Unquenchable's* answers require hard choices that are based on a provocative market-based system that values water as a commodity *and* as a fundamental human right. Glennon advocates strongly for a free market approach, "but I don't worship at the shrine of the free market" due to its sometime cruel consequences. Instead, he envisions a "regulated market with state responsibility to protect third parties from potential harm caused by water transfers and to ensure that transfers do not harm the environment." (*Unquenchable* at 310).

THE CRISIS

Illusion of Abundance

We are introduced to the water crisis as Glennon explores the Las Vegas water quandary. "Today, as if in homage to the sacred gift from Lake Mead, water features at casinos on the Strip create the illusion that the City of Las Vegas has an abundance of water." *Id* at 2. For example, the Bellagio has a water fountain show that cost $40 million, with an eight-acre pond that holds 27 million gallons of water. The "stark reality" of water shortages, however, hit Las Vegas back in 2001, leading Patricia Mulroy of the Southern Nevada Water Authority (SNWA) to embrace conservation measures as well as pursuing other water supply

Glennon

True Value of Water

Lawns Obsession

Bottled Water

Ethanol Impacts

Population Growth

Quality & Quantity

Conjunctive Management

Reclaimed Water

alternatives. From water banking in conjunction with the state of Arizona, to funding a new reservoir in California, Mulroy has shown no lack of imagination in finding ways to keep Vegas' "gluttony, glitter, girls and gambling" going. The "Drop 2 Storage Reservoir" in California was funded by SNWA at a cost of $172 million in exchange for the rights to 40,000 acre-feet of water per year for seven years.

The pervasive theme throughout *Unquenchable* is the need for Americans to realize the true value of water. "In the United States, we utterly fail to appreciate the value of water, even as we are running out...Water is a valuable, exhaustible resource, but as Las Vegas did until just a few years ago, we treat it as valueless and inexhaustible." *Unquenchable* at 16-17. Americans' blissful ignorance of value is best illustrated by two water uses highlighted by Glennon: lawns and bottled water. We "spend $40 billion each year and consume 270 billion gallons of water each week, in order to maintain more than 23 million acres of lawn." *Id*. at 171. The obsession with lawns also reflects conflicting mindsets. "Tucson has its problems, but when you drive around Tucson you do not see a lot of places with lawns — you might not see any. If you drive around southern California, all you see is lawns. This is a state facing a very severe drought and they're rearranging the deck chairs on the Titanic. A couple of weeks ago, the mayor of San Diego said that the city was entering a 'new era in water.' What did he mean by that? He meant that residents could *now* only water their lawns three times a week. I'm sorry, Mr. Mayor, this is not worthy of the description — a 'new era.' This is a very, very modest adjustment in landscape use in an area that is basically a desert. L.A. gets three inches of rain a year more than Tucson, but you wouldn't know it by driving around L.A."

Meanwhile, bottled water — "the epitome of a luxury item" — has become ubiquitous even though it is available from the tap and sells for more money than milk, oil, gasoline...or perplexingly, things made with water, such as Coca-Cola..." (*Id*. at 43-44). Another example of the disconnect Americans have concerning water use involves the recent ethanol boom and the failure of the debate over ethanol's energy value to acknowledge another variable: water. Glennon points out that ethanol plants consume more than four gallons of water for every gallon of ethanol produced — and that doesn't include the water required to grow the corn! *Id*. at 53-55.

The West has generally been the area of our country viewed as being obsessed with water shortages. However, in a chapter entitled "Atlanta's Prayer for Water," Glennon illustrates that no section of the US is immune from water woes. In our interview, Glennon sought to "acknowledge the elephant in the room — population growth. It's not that the droughts in Atlanta and California are historic droughts. They, in fact, are not. Hydrologists have studied the precipitation levels currently in those two areas and the historic levels and there have been times in the past when the droughts were just as severe. The California drought from '87 to '92 was just about the same as the drought today. What's different is that the population of California has grown by nine million people since the last drought. That's what the difference is. And it's the same in problem in Georgia — metro Atlanta has grown by 100,000 people a year. Population growth is the source of every environmental problem. Too many of us. You can't name an environmental problem that's not about there being too many people."

REAL & SURREAL SOLUTIONS

Groundwater Reform

Glennon advocates for groundwater reform in *Unquenchable* due to concerns over the overdraft of groundwater impacting surface water flows, in addition to the pollution of groundwater supplies used for drinking water. The quantity of water on earth, after all, is a fixed amount. Contamination of that water supply — with groundwater supplying approximately one-quarter of that supply via the pumping of 83 billion gallons/day in the US — precludes future use. Even when we have the technological capacity to clean up the water, vast sums of money and energy are required to do so.

In the West, all the states are struggling with various forms of "conjunctive management." Yet, as Glennon points out, the issues are not confined to that area. "In large swaths of the East, groundwater is largely unregulated. I was shocked, but last year when Atlanta was in the depths of its drought there were still no restrictions on diversions or pumping. In Georgia, you do not even need a permit to drill a well, unless you're going to drill more than 100,000 gallons per day — then you need a permit. Believe it or not, in the neighboring state of Alabama it is even easier [to use groundwater]."

Reclaimed Water, Toilets and the Water/Energy Nexus

In Chapter 9, the question is posed, "Shall We Drink Pee." Wastewater effluent has until recently been dumped into our rivers or oceans with the sole purpose being to get rid of it as quickly and cheaply as possible. As *Unquenchable* notes, however, water "is too scarce a resource to be disposed of so cavalierly. And wastewater turns out to have so many valuable uses that we've given it a new name, reclaimed or recycled water." Glennon discusses this "viable way to expand our supply" with its inherent advantage of being a "renewable supply that literally increases as the population increases." *Id.* at 163 (See Markus, TWR #59, in regard to Groundwater Replenishment and Reuse).

Another rather mundane appliance receiving additional attention from Glennon is the lowly toilet. "I think it makes all the sense in the world to find an alternative to the flush toilet. What I argue in the book

Glennon

Toilet Enigma

is that Congress needs to take the initiative on this to create a Commission to examine the problem...the American toilet has long outlived any sensible use. [Toilets result in] wasting water, wasting energy and still not protecting the public health because of endocrine disrupters. It's a bad system and we need to figure out something else. Great progress is being made with waterless urinals and also low-flow toilets."

Utilizing reclaimed water and reducing water used by toilets, however, are not the only important part of this equation. There is also "The Enigma of the Water Closet" (Chapter 13). The enigma is that Americans waste vast quantities of water to dispose of human waste on the one hand, and, also treat *all* of our water to potable standards that is sent to residences and businesses. "Treating all water to potable standards makes no sense given that we use only a small fraction of it, roughly 10 percent, for drinking and cooking." Thus, as our country looks to deal with its aging infrastructure, "it makes no sense to simply rebuild the existing wastewater infrastructure." *Id.* at 206 and 213.

Water/Energy Nexus

Addressing this enormous waste of money and energy is key to fashioning our way forward, not only from a water standpoint but also in regard to energy use. "I think what I'd like to link the toilet issue to, and the problem of treating all of our water to potable standards, is the intimate connection between water and energy. That is one of the newsworthy themes of the book — US energy policy has almost totally ignored the water aspects of power generation." Likewise, use of water for purposes that don't require potable water ignores the energy aspects of waste disposal.

The water/energy nexus is finally receiving some long overdue attention regarding all the ways in which it manifests itself. "There is this incredible haste in the last few years — including several pieces of legislation regarding solar power on federal land and massive increases in ethanol production — and never once has Congress paused to think, what's the water supply going to be like; where's this water going to come from for these energy needs?"

A NEW APPROACH

Multiple Solutions

In *Unquenchable*, Glennon emphasizes that multiple solutions to the water crisis are necessary. "We need a portfolio of options; there is no secret, silver bullet. I do think that there is a place for conservation, for reuse of reclaimed water, and for desalinization in certain places. All of those are going to be part of the solution. What the US really has not been done and must do is to use price signals and market forces to encourage conservation and to facilitate the reallocation of water from low-value uses to high-value uses."

Development Requirements

There are several stories in the book that illustrate his major points. "The one that I love is the Geneva Steel case out of Utah, where the water rights were more valuable than all the assets of the steel company combined. [The reason] I like that story is that it shows that the state of Utah has come to terms with the reality that water is finite and the State Engineer has said to the development community that if you want to do deals, you're going to have to bring water to the table." Another prime example mentioned by Glennon involves the Alaskan halibut fishery as a model for how we should regulate water in the US. "The model I think really works nicely is the Alaskan halibut fishery, with the individual fishing quotas. That system invests the user with a property stake in the resource. It encourages the fishers not to abuse the resource because they would end up hurting themselves. And, by golly, that's exactly what they've done. They've acted sensibly and everyone is better off as a result."

Price Signals

Glennon's "New Approach" includes specific instances of ideas he feels must be implemented to address the water crisis, including some of the actions noted above. The approach includes his viewpoint, though, that certain values must also be incorporated. Raising the price of water so that it is closer to its true value would "encourage water conservation through price signals that create financial incentives to conserve." Those "Price signals must be aggressive enough to alter behavior." While he believes that a regulated water market should be instituted and that incentives to modernize should be utilized, he also asserts that "water is an inalienable political and social right and that each person should be guaranteed a 'water lifeline...'" *Id*. at 222, 227 and 229.

Inalienable Rights

The "Privatization of Water" is naturally deserving of a chapter since the commoditization of water has received significant attention throughout the world. Indeed, as Glennon notes, "Water has cultural, spiritual, religious, environmental, and economic value." *Id.* at 245. However, in the US, private companies served only 15% of the American public as of the year 2000. The book discussed some of the drivers of privatization, including the backlog of water infrastructure needs and the huge amount of capital required to update municipal water and sewer systems. Glennon provides a discussion of the topic that provides several suggestions to achieve success, ultimately warning that "In any event, government should retain ownership of the water resources." *Id.* at 251.

Privatization

Transfers

The other part of the market, besides privatization, inevitably involves transfers of water from one type of use to another, often from agricultural users to municipalities. Transfers "strike fear in the hearts of all agricultural water users," yet Glennon asserts that the lesson to be drawn from one example is that "large-scale transfers of water can be successful, not just for the acquiring cities but also for the rural agricultural communities, provided that the process protects innocent third parties and the environment. *Id*. at 264. Later in a chapter on the "Future of Farming," the book turns to the "very disturbing trend" of

Glennon

Future of Farming

Unrestricted Access

Stealing Surface Water

Property Rights

Giant Milkshake

Robert Glennon is the Morris K. Udall Professor of Law and Public Policy at the University of Arizona, Rogers College of Law. He is the author of Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters (Island Press, 2002) and Unquenchable: America's Water Crisis and What to Do About It (Island Press, 2009).

the decline in the number of American farms, which results in the devastation of "rural economies, upsets community cohesion, stimulates the creation of ever-larger corporate farms, and may threaten the nation's food supply." However, Glennon argues that ultimately water transfers won't make these problems worse. "Satisfying new demands for water requires the transfer of only modest quantities of water from relatively unproductive agricultural uses, including the production of non-food crops such as cotton." Id. at 277-278.

WATER RIGHTS & WATER LAW: EXEMPT WELLS

Unquenchable contains several admonitions about the voids that exist in current water laws that have led to developing problems, particularly with a growing population. Glennon maintains that unrestricted access to finite resources encourages abuse and can lead to unsustainable use of our nation's water resources. One of the areas that he believes this has become problematic concerns "exempt wells" that are generally drilled for domestic purposes on small, rural lots.

"Exempt wells are really more an environmental problem rather than an economic problem. Because, the exempt wells — the smaller, domestic wells — tend to be, relatively speaking, shallow wells. And they are dug because there is water there. And what does that suggest? That usually suggests that there is some surface water pretty close by. One of the big problems with exempt wells is that if you look at a map of where they are, you are going to find that the overwhelming number of them are very close to rivers and streams. It makes it real obvious that what you're really doing is stealing water from the river. You are taking water that, but for your pumping, would end up in the river to support either downstream diverters — cities, ranchers and farmers — or fish and the environment [instream uses]." As noted in the book and our interview, 800,000 new wells are being drilled every year. "You get some other issues related to exempt wells — having too many people on septic systems and the problem of leeching. I tell that story in Chapter Four, "Fouling Our Own Nests," about Lake Havasu City. Exempt wells and septic systems are okay if you have a sparsely populated rural population, but that's about the only occasion where they are sensible. They are also a problem because you are outside the regulatory system."

In the interview, Glennon alluded to a common complaint voiced by developers and landowners that "you can't take away my right to drill a well. That's a property right; I own that water." Glennon, however, pointed out at least one fallacy with the argument that every landowner should have a right to drill a well. "Every first-year law student learns that property is represented by the so-called 'bundle of sticks.' One of the essential sticks of the bundle is the right to exclude others. So, if you have a home, I have no right to go on your front porch and sit down and have a glass of lemonade. You can exclude me from your property. The rule in most states for groundwater of "reasonable use" or the rule of capture — there is no exclusion. Your quote 'right' to that groundwater exists only until your neighbor decides to drill a commercial well and dry up your domestic well and burn up your pump motor. That's not a property right — that's a right of mutually assured destruction. That is a kind of circular firing squad with everyone pointing their guns inward at each other."

CONCLUSION: FUTURE CHALLENGES & A BLUEPRINT FOR REFORM

Glennon's simplified version of our water system envisions it as a "giant milkshake" with each well or diversion being another straw in the glass. "What we have done in the past is allow an unlimited amount of straws in the same glass. That's a recipe for disaster and epitomizes the 'tragedy of the commons.' What we need to do is to say to anyone — whether it is a commercial developer or an apartment complex or Google or Intel — if you want to put a new demand on the common supply, if you want to insert a new straw in the glass, then you need to persuade someone else to make do with less. You need to persuade someone else to cancel [their use] or remove their straw from the glass."

The Water Report asked Glennon what he sees as the biggest hurdle to implement *Unquenchable's* version of the future. He stressed the problems of awareness, as well as the potential for apathy. "The path of least resistance is to do nothing. It's easier to keep drilling new groundwater wells. If there is less water available, that's an issue that can be viewed as down the road...The problem is 'Out of sight is out of mind.' The same old thing [for solving our problem] is just not going to happen — we're not building new dams. There might be a couple go up, but the dam-building era in the US is over. Will there be more diversions from rivers? I think there could be. Will there be more groundwater wells drilled? Yes. Right now we're drilling 800,000 new wells every year. This is absolutely unsustainable in many parts of the country. Will the political will be there? Well, it might be there for the big picture, that is, if you were to take a popular vote. But what happens when you have a state that's generally dependent on groundwater use? You've got a constituency there for not only using the water but also abusing water use."

Unquenchable provides an extremely valuable overview of the myriad water problems facing the US, many of which were not touched on here, and also gives us Glennon's blueprint for change. It is full of amazing statistics, insightful stories and thought-providing information. Whether or not Americans can summon up the will and commitment required to deal with the water crisis remains an open question.

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WATER BRIEFS

KLAMATH SETTLEMENT OR/CA

TRIBES/IRRIGATORS WATER ACCORD

The Klamath Tribes (Tribes) of Oregon and water users in the Klamath Irrigation Project (Project) have signed an interim settlement of disputes over water rights in Upper Klamath Lake and the Klamath River. Under the settlement filed May 20th with the Oregon Water Resources Department, Project farmers withdrew their contests against the tribal water rights claims in the Klamath Basin Adjudication. In exchange, the Tribes agreed not to interfere with Project water use at levels agreed to in the proposed Klamath Basin Restoration Agreement (KBRA). The KBRA itself provides for a schedule to lead to a limitation on Project diversions, and a plan to ensure individual irrigators can either irrigate or receive fair compensation if they agree not to irrigate.

The interim settlement, filed in the Klamath Basin Water Rights Adjudication, will become permanent if and when essential elements of the KBRA become effective, including the removal of dams on the Klamath River. In the meantime, the agreement results in putting aside long standing disputes in the Adjudication process. Klamath Tribes' attorney Bud Ullman stated, "This is the exact same water settlement with Project irrigators we would be agreeing to under the KBRA. We found a way to do it in anticipation of the KBRA and still protect everyone's interests. It shows the enormous potential of the KBRA to bring stability to the Basin," . (See Simmons, TWR #49 re: KBRA)

The Tribes' water rights have a time immemorial priority date for non-consumptive uses and a priority date of October, 14, 1864, for consumptive uses. The agreement does not preclude other parties from contesting the Tribes' claims. Luther Horsley, President of Klamath Water Users Association and Trustee of Klamath Drainage District, noted that the agreement does directly benefit many off-Project water users who otherwise would be affected by the Tribes' claims. The Tribes also have claims for flows in tributaries to Upper Klamath Lake, which are not addressed by the settlement with Project water users.

For info: Paul Simmons, Klamath Project Water Users, 916/ 446-7979, or email: psimmons@somachlaw.com; Greg Addington, Klamath Water Users Association, 541/ 883-6100, or email: greg@kwua.org; Carl Ullman, Klamath Tribes, 541/ 783-3081, or email: bullman3@earthlink.net

INSTREAM FLOW CREDIT CO

TAX CREDIT INCENTIVE

House Bill 1067 provides a tax credit that is similar to the credit available for land conservation transactions that will be available for income tax years commencing on or after January 1, 2009, but prior to January 1, 2015. The bill specifies that the Colorado Water Conservation Board (CWCB) will allocate the credits by issuing credit certificates to owners of water rights who donate their water rights to the CWCB for use as instream flow rights.

The law establishes that the value of the water rights must be determined by qualified appraisal. The maximum value of the credit is equal to up to one-half of the value of the water right, with a maximum credit of $250,000 per person. The aggregate sum of the credits allocated on an annual basis will be limited to $2 million. The credit can be carried forward to other income tax years for a maximum of six years, but must be claimed on the earliest possible subsequent tax year. The credit is also transferable, in amounts greater than $5,000; the credit cannot be transferred a second time to another taxpayer. The law does specify that the credit will not be allowed in a particular income tax year if the revenue estimate prepared by the staff of the legislative council indicates that the amount of the total general fund revenues will not be sufficient to maintain the limit on appropriations specified in statute. The law was sent to the Governor for signature on May 19, 2009.

For info: Bill Text is available on Sierra Club website: http://rockymtn.sierraclub.org/tracker/HB%201067.html

"GROUNDWATER" OFFICIAL US

WATER TERM ADOPTED BY USGS

It has been a longstanding practice within the US Geological Survey (USGS) to spell ground water as two words and to hyphenate when ground water is used as a modifier (e.g., ground-water hydrology). In fact, USGS issued a memo 35 years ago that specified that the two-word form should be used (see that memo for an intriguing discussion of the "ill-advised" one word format at http://water.usgs.gov/admin/memo/GW/gw75.03.html). As noted by USGS, "Language evolves, and it is clear that the one-word spelling of groundwater has become the preferred usage both nationally and internationally. The one-word spelling has been used by the Merriam-Webster online dictionary since 1998. Most water-resources publications also use the one-word spelling, as do many technical groups, such as the National Research Council. With the emphasis on interdisciplinary science, many USGS scientists who are not specialists in the field commonly use the one-word form, as increasingly do many hydrologists within the Water Resources Discipline. [Editor's Note: The Water Report adopted the one word version at its inception in 2004. Our readers will note that on occasion "ground water" is still used — this only occurs, however, when we are writing about a state that still uses a two word version or when the two words are used in a quote. We can only hope that we helped make this momentous change.]

INTERSTATE WATER OK/TX

NEW OKLAHOMA LEGISLATION

On May 21, the Oklahoma Senate passed HB 1483 and sent it to the Governor's office to sign. The bill is intended to protect Oklahoma water users from improper proposals to grant water rights to out-of-state interests. The legislation appears to be aimed at a pending water right application by the Tarrant Regional Water District (TRWD) of Texas for the diversion of water from the Red River basin in Oklahoma. As reported in TWR #58 (Dec. 15, 2008), the US Tenth Circuit Court of Appeals recently ruled in favor of TRWD, allowing them to continue

WATER BRIEFS

their lawsuit against individual members of the Oklahoma Water Resources Board (OWRB). TRWD has applied for water rights totaling 460,000 acre-feet per year from tributaries to the Red River. In the federal lawsuit, TRWD seeks to invalidate a series of Oklahoma laws that restrict out-of-state water use. One would assume that HB 1483 will soon become part of that lawsuit as well due to the legislation's potential impacts on out-of-state water diversions.

HB 1483 cites the "necessity to maintain adequate supplies for the present and *future* water requirements of the state..." (emphasis added) and goes on to list several issues that must be examined by OWRB before it grants any out-of-state water use. OWRB must "evaluate whether the water that is the subject of the application could feasibly be transported to alleviate water shortages in the State of Oklahoma." The bill goes on to require a review of any water right granted for out-of-state use every ten years: "Permits and amendments that authorize the use of water outside the state shall be subject to review by the Board at least every ten (10) years after the date of issuance to determine whether there has been a substantial or material change relating to any matters set forth in subsection A of this section." Thus, if there is a later finding that the water "could feasibly be transported to alleviate water shortages" anywhere else in Oklahoma, OWRB "may impose additional conditions as described by Board rules to address any such substantial or material change." The various provisions of HB 1483 will undoubtedly be viewed by TRWD as overly protective of Oklahoma's water resources and the case of *Sporhase v. Nebraska*, 458 U.S. 941 (1982) will be cited once more for its ruling that states cannot impose undue burdens that interfere with the US Commerce Clause in an attempt to protect the state's water.
For info: Jennifer Monies, Press Secretary, Oklahoma Office of House Speaker, 405/ 962-7679 or email: jenniferm@okhouse.gov; HB 1483 text available on Oklahoma House's website: www.okhouse.gov

WATERSHED CENTRAL US

EPAWEBSITE LAUNCHED

EPA has launched a new website, "Watershed Central." Watershed Central has been designed to assist users to develop and implement effective watershed management programs. The site includes guidance, tools, case studies, and data sets to help you share information, analyze data, and identify opportunities to initiate or strengthen your watershed efforts.
For info: EPA website: www.epa.gov/watershedcentral

URBAN RUNOFF REUSE CA

CLIMATE CHANGE MEASURE
HEARING JUNE 17

The California State Water Resources Control Board (State Water Board) will conduct a workshop on June 17 to discuss strategies for implementation an urban runoff reuse measure from the legislatively mandated Climate Change Scoping Plan adopted by the California Air Resources Board (ARB) in December 2008. This workshop is jointly sponsored by the Water-Energy Team of the Cal/EPA Climate Action Team (WETCAT) and the State Water Board as an opportunity to solicit suggestions from stakeholders and the general public regarding implementation of the reuse urban water measure. The workshop will video broadcast live and is available for viewing via the Internet at website: www.calepa.ca.gov/broadcast.

According to the State Water Board, climate change is impacting water availability and use in California and increased levels of **g**reen**h**ouse **g**ases (GHG) in the atmosphere are a significant contributor to global warming. The State of California has assumed a leadership role in efforts to slow global warming. In 2006, the State enacted the California Global Warming Act which, among other charges, established the Climate Action Team (CAT). The Proposed Climate Change Scoping Plan, adopted by the Air Resources Board in December, 2008, contains GHG reduction measures recommended by the CAT. The Scoping Plan is available online at website: www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm

The Scoping Plan includes six GHG reduction measures for the water-energy sector, including Urban Runoff Reuse. The five other water measures include: Water Use Efficiency; Water Recycling; Water System Energy Efficiency; Increasing Renewable Energy Productions and a Public Goods Charge.

The Scoping Plan presents a general description of each GHG reduction strategy and the predicted GHG reduction goal of each strategy. The Scoping Plan does not address how strategies will be implemented, monitored, or determined to be complete.

The purpose of the June 17 workshop is to solicit information and suggestions from stakeholders and the public regarding implementation of the Urban Runoff Reuse measure.

As described in the Scoping Plan, "W-4: Reuse Urban Runoff" entails: "Infiltration, capture and/or storage of urban runoff have the potential to reduce energy use and associated GHG emissions by increasing local water supplies that can reduce the use of water from more energy intensive sources."

This measure proposes that stormwater infiltration and/or capture be implemented to increase local water supplies. Where favorable soil and geologic conditions exist, urban runoff should be infiltrated to increase groundwater supplies. In locations where infiltration is either limited or not recommended, urban runoff should be captured and stored for nonpotable applications.

The State Water Board is creating a webpage to present information and materials relevant to the workshop topics. The public is invited to submit information relevant to the agenda topics for posting (as "Related Resources") on the Board's climate change website at: www.waterboards.ca.gov/water_issues/programs/climate/.
For info: Bob Languell, State Water Board, 916/ 341-5588

CALENDAR

June 10 OR
Energy Summit - Growing a NW Wind Economy: Installation and Beyond, Portland. Oregon Convention Ctr. Sponsors: PGE, ODOE, Bureau of Labor & Industries, OECDD. For info: Conference, 503/ 702-5120 or website: www.nwenergysummit.com

June 11 WA
Salmon & Salmon Habitat Course, Everett. The Northwest Stream Ctr. For info: Streamkeeper, 425/ 316-8592, email: aasf@streamkeeper.org or website: www.streamkeeper.org

June 11-12 AK
Climate Change Litigation & Policies, Anchorage. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

June 14-16 UT
Western Governors' Association Annual Meeting, Park City. Water Issues on the Agenda. For info: WGA website: www.westgov.org

June 14-18 CA
ACE09 Annual Conference & Exhibition, San Diego. Sponsored by American Water Works Ass'n. For info: AWWA website: www.awwa.org/ace09

June 15-16 OR
Oregon Streamflow Duration Assessment Method Training Session, La Grande. USFS Ranger District Office, 3502 Hwy. 30. For info: Scott Clemans, Corps. 503/ 808-4510 or EPA website: http://yosemite.epa.gov/R10/ecocomm.nsf/wetlands/oregonstreamflow

June 15-19 OR
Water Governance & Conflict Management Course, Corvallis. Oregon State University. For info: Lynette de Silva, OSU, 541/ 737-7013, email: desilval@geo.oregonstate.edu or J203website: www.transboundarywaters.orst.edu/training/watergovernance/

June 15-19 MT
Indian Water Law, Missoula. University of Montana. For info: Elizabeth Kronk, UM School of Law, 406/ 243-6781 or email: elizabeth.kronk@montana.edu

June 16-18 WA
Introduction to ArcGIS 9 for Fisheries & Wildlife Biology Applications: NWETC Course, Olympia. Evergreen State College. For info: NWETC website: http://nwetc.org/gis-400_06-09_olympia.htm

June 16-18 WA
Federal Environmental Symposium West: Progress and Transition, Grand Mound. Great Wolf Lodge, 20500 Old Highway 99 SW, 98531. Open to federal employees and contractors currently representing their Federal agencies; focus on federal sustainability initiatives over the past while expanding into new areas new presidential administration. For info: Katie Miller, Office of the Federal Environmental Executive, email: katie.miller@ofee.gov or www.fedcenter.gov/calendar/conferences/symposia2009/

June 17 CA
Climate Change Reuse Impact Runoff Measure Implementation Public Workshop, Sacramento. Cal/EPA Hdqtrs, 1001 I Street. State Water Board Workshop & Internet Broadcast. For info: SWRCB website: www.waterboards.ca.gov/

June 17-20 OR
Sagebrush to Seaweed: Environmental Education Leadership Clinic, Eugene. McKenzie River Conf. Ctr.. Presidential Administration. For info: EEAO website: www.eeao.org/leadership.aspx

June 18-19 OR
Ecosystem Markets: Making Them Work, Portland. DoubleTree Hotel -Lloyd Ctr.. Presented by NW Environmental Business Council & American Forest Foundation. For info: Sue Moir, NEBC, 503/ 227-6361 or website: www.nebc.org

June 18-19 CO
Conservation Easements Seminar, Denver. Ritz-Carlton. For info: CLE International, 800/ 873-7130 or website: www.cle.com

June 18-19 AZ
Law of the Colorado River Seminar, Phoenix. Arizona Biltmore Hotel. For info: CLE International, 800/ 873-7130 or website: www.cle.com

June 18-19 NE
Nebraska Water Law Conference, Lincoln. Cornhusker Marriott. For info: CLE International, 800/ 873-7130 or website: www.cle.com

June 19 CO
Renewable Energy: Legal Challenges & Solutions for the Green Economy, Denver. Hyatt Regency. Sponsored by ABA Environmental Law Committee. For info: ABA website: www.abanet.org/environ/calendar/

June 20-21 CA
SalmonAid Festival, Oakland. Jack London Square. For info: SalmonAid website: http://salmonaid.org/

June 22-23 ID
Summer Water Law & Resource Issues Seminar and Workshop on Swan Falls Settlement Framework, Recharge and Hydropower, Sun Valley. Sun Valley Resort. Sponsored by Idaho Water Users Assn. For info: IWUA, 208/ 344-6690 or website: www.iwua.org

June 22-24 NV
Hydrologic Modeling System Course, Carson City. Sponsored by Floodplain Management Association. For info: Iovanka Todt, 619/204-4380 or website: www.floodplain.org

June 22-26 UT
7th North American Forest Ecology Workshop, Logan. Utah State University. For info: Conference website: www.nafew2009.org/

June 22-26 Czech Republic
Water Policy 2009: Water as a Vulnerable & Exhaustible Resource, Prague. For info: Conference website: www.fzp.czu.cz/waterpolicy2009/index.php

June 23 CA
Innovative Energy Management Workshop, Irwindale. Co-sponsored by EPA Region 9. For info: Conference website: www.epa.gov/region09/water/npdes/energy-workshop/

June 23 WA
Using the Interagency Mitigation Guidance to Review Mitigation Plans Program, Moses Lake. Big Bend Community College. Sponsored by Coastal Training Program (Ecology). For info: CTP website: www.coastaltraining-wa.org/

June 23-26 Iceland
International Hydropower Association 2009 Conference, Reykjavik. For info: IHA website: www.hydropower.org/

June 24-25 WA
Liquid Planet: Exploring Global Water Issues Conference, Seattle. UW Seattle Campus, Walker Ames Rm, Kane Hall. For info: Conference website: http://jsis.washington.edu/ellison/events.php#June%202009

June 24-26 OR
Engineering for Ecosystem Services - Design at the Interface of Human & Natural Systems: Ninth AEES Annual Meeting, Corvallis. OSU. For info: John Bolte, OSU, 541/ 737-6303, email: boltej@engr.orst.edu or website: http://aees2009.bee.oregonstate.edu/

June 24-26 CA
WESTCAS Annual Meeting & Conference, San Diego. Kona Kai Resort. For info: Charlie Nylander email: cdnylander@comcast.net or WESTCAS website: www.westcas.org/

June 29-July 1 UT
Adaptive Management of Water Resources II Conference, Snowbird. Snowbird Resort. Sponsored by American Water Resources Assn. For info: AWRA, 540/ 687-8390 or website: www.awra.org

July 2 CA
Land Conservation: Trends, Techniques & Opportunities, Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, 800/ 752-0881 or website: http://extension.ucdavis.edu

July 7-10 FL
Interdisciplinary Environmental Conference, Daytona Beach. For info: Dr. Kimberly Reiter, Conference Chair, email: kreiter@stetson.edu or IEA website: www.ieaonline.org

July 7-8 MN
Freshwater & Watershed Assessment Course, St. Paul. Continuing Ed & Conf. Ctr. Sponsored by U of Minnesota. For info: Conference website: http://cce.umn.edu/conferences/fluxbathtubworkshop/

July 7-9 IL
2009 UCOWR/NIWR Conference: Urban Water Management - Issues & Opportunities, Chicago. For info: UCOWR website: www.ucowr.siu.edu/

July 9-10 OR
Sustainability and Green Building, Portland. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 9-10 NM
Natural Resources Damages Seminar, Santa Fe. La Fonda Hotel. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

July 10 IL
Climate Change Initiatives Seminar, Chicago. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 10 WA
Collecting & Handling Water Samples for Trace Metal Analysis Training Course, Seattle. Corinthian Yacht Club, 7755 Seaview Ave. NW. For info: NWETC, 206/ 762-1976 or website: http://nwetc.org

July 11-15 MI
Soil & Water Conservation 2009 Annual Conference, Dearborn. Hyatt Regency Dearborn. Sponsored by Soil & Water Conservation Society. For info: SWCS website: http://www.swcs.org/en/conferences/

July 13-17 UT
Stream Restoration Principles: 2009 Short Course (Part I), Logan. Utah State University. For info: Traci Maughan, USU, 801/ 721-6246, email: traci.maughan@usu.edu or website: www.cnr.usu.edu/streamrestoration/

July 14 OR
Environmental Crimes & Penalties, Portland. Governor Hotel. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 15 CA
Land Use & Environmental Planning in the Era of Climate Change, Sacramento. Sutter Square Galleria, 2901 K Street. For info: UC Davis Extension, 800/ 752-0881 or website: http://extension.ucdavis.edu

July 15-16 WA
Construction Site Erosion & Pollution Control Course, Shoreline. For info: Conference website: www.engr.washington.edu/epp/cee/cec.html

July 15-17 UT
Western States Water Council 160th Council Meeting, Park City. For info: Cheryl Redding, WSWC, 801/ 561-5300, email: credding@wswc.state.ut.us or website: www.westgov.org/wswc/meetings.html

July 16 GA
Environmental Initiatives Conference, Atlanta. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

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

CALENDAR

(continued from previous page)

July 17 OR
Water Rights Seminar, Portland. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 17 WA
Solar Power: Projects & Permitting Seminar, Spokane. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 17 WA
Solar Power Seminar, Seattle. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 20-24 CA
3rd National Conference on Ecosystem Restoration, Los Angeles. Westin Bonaventure. Sponsors include USGS, US Army Corps, NRCS & U. of Florida. For info: Beth Miller-Tipton, UF, 352/393-5930, email: bmt@ufl.edu or website: www.conference.ifas.ufl.edu

July 22 WA
Model Toxics Control Act Seminar, Seattle. Washington State Trade & Convention Center. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

July 22 WA
Climate Policy, Carbon Credits & Business Risk Training, Seattle. NWETC Hdqtrs, 650 South Orcas St.. For info: NWETC, 206/ 762-1976 or website: http://nwetc.org

July 23-25 CA
Rocky Mt. Mineral Law Foundation 55th Annual Institute, San Francisco. Grand Hyatt Union Square. For info: Mark Holland, RMMLF, 303/ 321-8100 x106, mholland@rmmlf.org or website: www.rmmlf.org

July 24 IL
Changes in Environmental Law: Recent & Emerging Environmental Regulations Seminar, Chicago. Marriott Downtown. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

July 27-28 CA
The Tuolumne River: Ecology, Resource Management & Whitewater, Groveland. Tuolumne River. For info: UC Davis Extension, 800/ 752-0881 or website: http://extension.ucdavis.edu

July 27-28 AZ
NAU Watershed Research & Education Program - 2009 Policy Workshop, Flagstaff. For info: Joseph Shannon, WREP Director, email: Joseph.Shannon@nau.edu or website: www.watershed.nau.edu

July 28-30 OR
Wetlands Delineation, Regulation & Restoration Training, Troutdale. McMenamins Edgefield Theatre, 2126 SW Halsey St. For info: NWETC, 206/ 762-1976 or website: http://nwetc.org

July 30 OR
Environmental Law Changes in 2009 and Beyond: A Look at Recent and Emerging Environmental Regulations and Their Impact, Portland. World Trade Center. For info: The Seminar Group, 800/ 574-4852, email: info@theseminargroup.net, or website: www.theseminargroup.net

August 2-4 TX
5th Annual Water Issues & Technologies: Process Water, Wastewater & Desalinization Course, College Station. For info: Food Protein R&D Center, Texas A&M website: http://foodprotein.tamu.edu/separations/index.php

August 6-7 NM
New Mexico Water Law Conference, Santa Fe. Eldorado Hotel. For info: CLE International, 800/ 873-7130 or website: www.cle.com

August 10-13 IL
Visions of a Sustainable Mississippi River: Merging Ecological, Economic & Cultural Values Conference, Collinsville. Sponsored by The National Great Rivers Research & Education Ctr.. For info: Conference website: www.conferences.uiuc.edu/mississippiriver/

August 10-14 TX
Environmental Measurement Symposium, San Antonio. Hyatt Regency. For info: National Environmental Monitoring Conference website: http://www.nemc.us

August 10-14 Canada
Water Engineering for a Sustainable Environment Conference, Vancouver, B.C.. Hyatt Regency. RE: 19th Canadian Hydrotechnical Conference. For info: Conference website: http://content.asce.org/conferences/iahr09/

August 10-14 UT
Geomorphology & Sediment Transport in Channel Design: Part II Short Course, Logan. Utah State University. For info: Traci Maughan, USU, 801/ 721-6246, email: traci.maughan@usu.edu or website: www.cnr.usu.edu/streamrestoration/

August 13-14 FL
Gulf Coast Water Quality & Habitat, Tampa. For info: Law Seminars Int'l, 800/ 854-8009, email: registrar@lawseminars.com, or website: www.lawseminars.com

August 13-14 AZ
Arizona Water Law Conference, Phoenix. Arizona Biltmore Resort. For info: CLE International, 800/ 873-7130 or website: www.cle.com