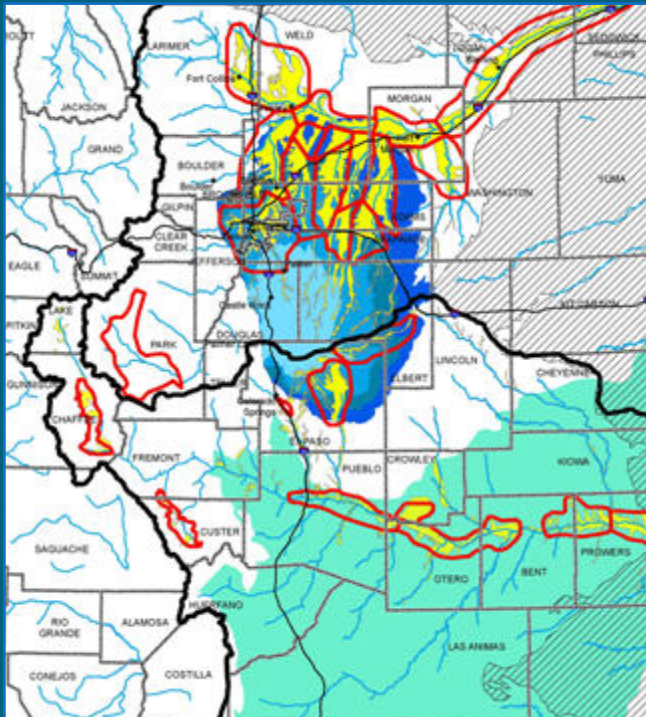


SEPTEMBER, 2007—COLORADO SPRINGS, COLORADO

# Legal and Institutional Opportunities for Aquifer Recharge and Storage in Colorado--An Interactive Forum

What We Heard from Presenters and Participants

Recommendations for Moving Forward



April 2008 Draft Report Reviewed per HJR 07-1017 by:

Harris Sherman, Director  
Colorado Department of Natural Resources

## Final Report December 2008

Made possible by Water Reserve Account Funding granted to the Arkansas Basin Roundtable through the Interbasin Compact Committee and the Colorado Water Conservation Board

# STATE OF COLORADO

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DEPARTMENT OF  
**NATURAL  
RESOURCES**

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Bill Ritter, Jr.  
Governor

Harris D. Sherman  
Executive Director

To: Gary Barber  
Chair, Arkansas Basin Roundtable

From: Harris Sherman   
Executive Director, DNR

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Date: December 22, 2008

**Subject: Aquifer Recharge and Storage Conference Report**

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On September 27-28, 2007 the Arkansas Basin Roundtable sponsored a conference “Legal and Institutional Opportunities for Aquifer Recharge and Storage” in Colorado Springs. The conference was promoted as “an open, interactive forum among experts and stakeholders to address how best to formulate policy that will allow for maximum utilization of Colorado’s ground water resources in alignment with hydrologic reality, engineering capability, environmental needs and legal rights & obligations.”

The conference was held pursuant to House Joint Resolution 07-1017 (Resolution), which encouraged the Arkansas Basin Roundtable to conduct a review of the economic, legal, ecological, and technical feasibility of using alluvial underground storage sites for underground water storage. The Resolution further stated that, prior to the final completion of a report, the Arkansas Roundtable should submit a draft to the Executive Director of the Colorado Department of Natural Resources (DNR) for review.

Upon receipt of the conference draft report, I consulted with staffs from the Colorado Division of Water Resources (DWR), Colorado Geological Survey (CGS) and Colorado Water Conservation Board (CWCB). The draft report documents what was heard during the conference from presenters and participants. It is helpful in framing the issues that must be addressed, but unfortunately no consensus on a path forward emerged from the conference. DNR can use the report to understand the different perspectives and opinions on this important issue. DNR understands the complex problems and unique opportunities provided through a better understanding of potential uses and

problems associated with different uses of ground water. DNR believes that aquifer recharge and recovery is an important element to providing future water supply and is committed to assisting in the creation of information, ideas and suggestions that will enable Colorado to instate policies and law that will facilitate the optimum use of our important ground water resources.

In the *Recommendations for Moving Forward* section of the draft report, it states, “Interested parties are hopeful that this conference and report lead to continued dialogue and, eventually, workable solutions to the opportunities raised.” DNR echoes this sentiment and I will continue to work with staffs from DWR, CWCB, and CGS on a path forward.

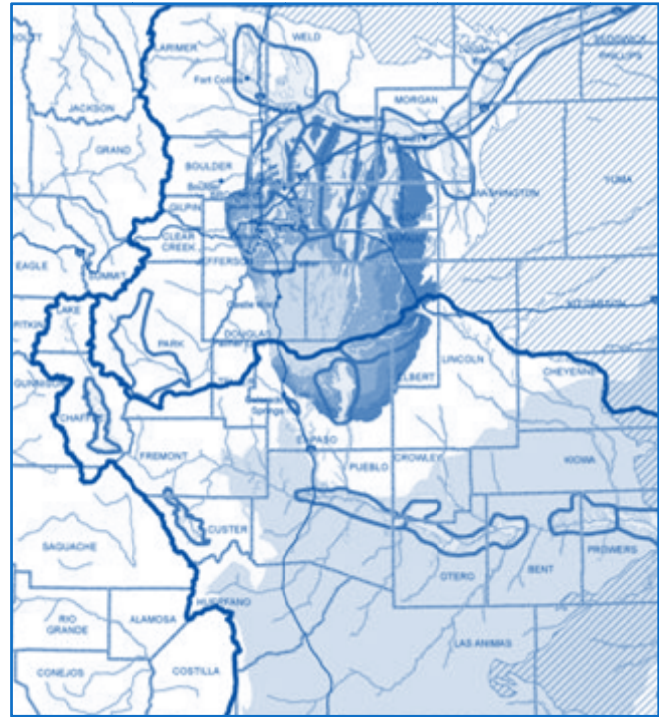
One option we are exploring is organizing a small working group with representatives from different state agencies to look specifically at aquifer recharge and recovery issues. This group would be lead by DWR and meet with the goal of outlining appropriate next steps based on the different perspectives outlined in the report. The group would consist of representatives from DWR, the Ground Water Commission, the Attorney General, CGS and CWCB. Some of the questions the group might address include:

- To what degree can aquifer recharge and recovery projects be implemented in the current regulatory and legislative environment?
- What are the main hurdles to overcome under current laws and regulations?
- Would new rules be helpful in certain situations?
- How might the development of an alluvial recharge and recovery project differ depending on whether the proposed project is in a Designated Basin or not?
- Would a “road map” showing potential steps to be taken by an applicant be useful?
- Would new legislation be helpful?

Thank you for your leadership in the area of aquifer recharge and recovery. I will continue to work with my staffs and the Arkansas Roundtable on addressing these important issues.

## Legal and Institutional Opportunities for Aquifer Recharge and Storage in Colorado – An Interactive Forum

### What We Heard from Presenters and Participants Recommendations for Moving Forward



Compiled and Written by MaryLou Smith, Aqua Engineering, Inc. and  
Gary Barber, Manager El Paso County Water Authority  
Produced by Kendal Perez, Aqua Engineering, Inc.

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September, 2007-Colorado Springs, Colorado

# LEGAL AND INSTITUTIONAL OPPORTUNITIES FOR AQUIFER RECHARGE AND STORAGE IN COLORADO

**An open interactive forum**  
among experts and stakeholders

To address how best to formulate  
policy

To allow for maximum utilization  
of Colorado's ground water  
resources in alignment with

- hydrologic reality
- engineering capability
- environmental needs
- legal rights and obligations

## Questions we posed to presenters and participants

- What can we learn from policy makers in other states where aquifer recharge is a significant part of the portfolio of water management tools?
- If the hydrology and the engineering will work, is water available for recharge the constraint? What are sources of water for artificial recharge?
- Do we need new legislation to facilitate artificial recharge of aquifers for storage? What are the challenges for the General Assembly?
- Do we need rules and regulations to facilitate artificial recharge of aquifers for storage?
- Do you have to maintain “dominion and control” to have an underground storage water right? Who decides how much you get to take out?
- What are some of the legal questions regarding using aquifer recharge as a tool for ground water management in Colorado?
- What are the environmental and water quality concerns related to artificial recharge? Are there perils of excessive recharge to alluvial ground water aquifers?
- What type of water management institutions are needed for successful artificial recharge projects?
- Are there opportunities to better use the aquifers of Colorado?
- What are the impediments to implementing those ideas?
- What steps should we take next?

## How the Conference Came to Be

### El Paso County Water Authority



The idea for the conference came from the El Paso County Water Authority (EPCWA), which provides water to a fast growing population on the front range south of Colorado Springs, primarily by drawing on alluvial and deeprock groundwater. Within their jurisdiction is the Upper Black Squirrel Creek Groundwater Management District, concerned that the Upper Black Squirrel Aquifer is expected to have a useful life of less than 42 years.

### Arkansas Basin Roundtable



Serving as El Paso County Water Authority's manager and as a member of the executive committee of the Arkansas Basin Roundtable, Gary Barber successfully promoted to the roundtable a grant proposal to accomplish two tasks:

- Further study of Upper Black Squirrel Aquifer—one of the sites identified in the SBo6-193 study as being most technologically feasible for aquifer recharge.
- **A Policy Conference to promote the dialogue asked for in the SBo6-193 study—to determine if institutional obstacles stand in the way of implementing underground aquifer water storage in the state.**

### House Joint Resolution



Concurrent to the Arkansas Basin Roundtable and the CWCB granting the requested funding through Water Supply Reserve Account monies, Representative Amy Stephens (District 20) introduced a successful House Joint Resolution calling for the Arkansas Basin Roundtable to conduct a review of the issue and to present findings to the Director of the Department of Natural Resources. HJR 07-1017 suggests a professional peer review prior to the report's final release and offers the opportunity for input from the state engineer, the ground water commission, the state geologist, and the attorney general. In addition, the Arkansas Basin Roundtable is encouraged to submit a preliminary draft for review by the General Assembly's water resources review committee.

### American Ground Water Trust



In keeping with their mission to provide ground water education, Andrew Stone, executive director of the American Ground Water Trust, agreed to combine their plans of staging an aquifer recharge conference in Colorado in 2007 with the plans conceived by the El Paso County Water Authority. The American Ground Water Trust worked hand in hand with the Arkansas Basin Roundtable and El Paso County Water Authority to organize, promote and conduct the conference.



# What We Heard from Presenters and Participants

## Introduction

This Aquifer Recharge Policy Conference was intended to bring together a group of experts and interested parties from Colorado and other western states to investigate whether Colorado needs improved and/or expanded policy to better facilitate the use of aquifer recharge and storage in this state. A diverse group of more than 40 presenters and panelists along with another 200 interested parties from most every facet of Colorado water spent two days exploring that issue.

This report is not intended to reproduce the content of the presentations made at the conference. A DVD of presentations is downloadable from the website of the American Ground Water Trust, [www.agwt.org](http://www.agwt.org). In addition, a summary of the conference was published in the Colorado Water Resources Research Institute's October issue of Colorado Water. That article is appended to this report, along with the conference program which lists all presenters, panelists, exhibitors, endorsers, and sponsors.

*"...the bulk of the report is a series of quotes drawn from presenters and participants..."*

What this report WILL attempt to do is document what we heard from presenters and participants. We have tried to draw a picture of the views they expressed and questions they asked. As such, the bulk of the report is a series of quotes: quotes from presenters and panelists, quotes from comments and questions typed into computers made available during the conference for that purpose, and quotes drawn from the interactive small group lunch session. In addition, after allowing the conference to "soak in" for a few months, we solicited further views from a number of participants. Many of the quotes came from their thoughtful responses.

Together, these sources provide diverse and rich insight. To bring the reader right to the

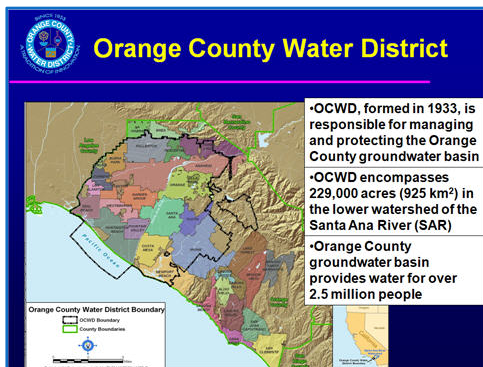
point, we have taken liberty to pull quotes from sometimes longer statements, always seeking to retain the intent. The goal is to avoid polarization, to keep the attention on the views and not the people. We have purposely avoided attribution to individuals and have made no judgments about the accuracy or validity of the statements. Highlighting these individual views draws into focus both the importance and the wide diversity of opinion the topic of aquifer storage generates among an informed audience. The public policy issues are timely and critical to a sustainable water future for Colorado.

## What can we learn from policy makers in other states where aquifer recharge is a significant part of the portfolio of water management tools?

### What We Heard from Presenters and Participants

"Orange County Water District's groundwater replenishment program provides water to 2.5 million people, and the system's natural filtration has saved them \$1.5 billion over traditional filtration. Why can't we learn from California how to make it work in Colorado?"

*"...to determine best practices that would be beneficial for use in Colorado...consider strategies used in, but not limited to...Arizona, Nevada, California..."*



"The presentations by the California and Arizona water managers coupled with the reminder of projects ongoing here in Colorado are evidence that aquifer recharge is viable, efficient, and effective. When we heard from Centennial Water and Sanitation District about their aquifer recharge project we realize that the possibilities that recharge has to offer are not being fully utilized for various reasons."

"Karl Dreher said that Micron Technology in Idaho is a high tech manufacturer which recharges very junior

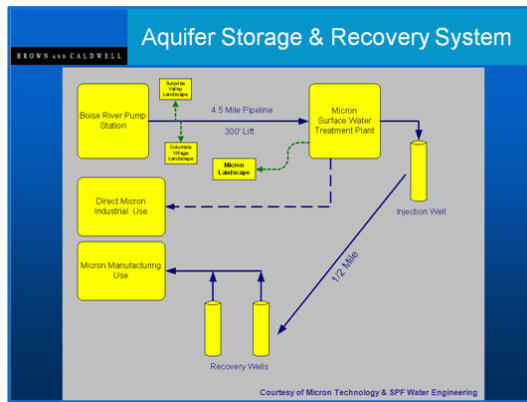
unappropriated water from spring runoff in good years on the Boise River into injection wells. Then they pull out the exceptionally high quality water to manufacture memory devices. Is there anything keeping us from doing that in Colorado?"

"The legal playing field is uncertain. We need to promulgate a legal framework for aquifer storage and recharge. Perhaps the State of Arizona model is a good template with objectives of: optimum utilization of compact entitlements, water supply shortage protection, and sustainability of growth."



"In Arizona, all recharge requires a permit that provides for long-term storage credits, which can be owned/traded."

"Orange County, California has the capacity to recharge 250,000 ac-ft/yr of which 50,000 is stormwater and 70,000 is reclaimed water."



If the hydrology and the engineering will work, is water available for recharge the constraint? What are sources of water for artificial recharge?

### What We Heard from Presenters and Participants

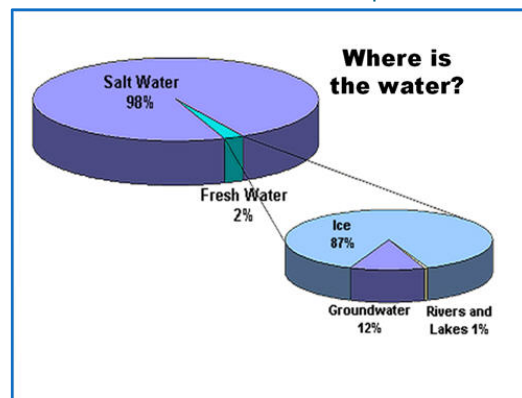
"The conference definitely illustrated that artificial recharge is not a new concept in Colorado. The principal constraint for the expanded use of

artificial recharge is the availability of water for recharge."

"An alternative source of water for recharge includes treated produced water from oil & gas operations."

"The single major issue is water quantity - where will it come from? Without water, the discussion of ASR is moot."

"Due to the over-appropriation of the state's renewable water supplies, the uncertainties of drought and climate change, and the possibility of future inter-state legal water disputes, we need to identify, appropriate, and protect available sources of water for recharge now. Excess storm flow, stormwater runoff, reclaimed water, and produced water are all viable alternative sources of water that need to be pursued."



"Where is the water to be stored going to come from?"

"We need to identify and protect available sources of water for recharge."

We need temporary storage and diversion structures to capture peak flows. One impediment is the lack of any regional, holistic water supply strategy.”

## Do we need new legislation to facilitate artificial recharge of aquifers for storage? What are the challenges for the General Assembly?

### What We Heard from Presenters and Participants

“I believe that the focus for aquifer recharge needs to be galvanizing action for projects, not necessarily changing our laws.”

“Science, not hype and special interests, should drive ASR legislation.”

“To my knowledge, underground storage has never been proposed in a designated basin. The Colorado Groundwater Commission has lots of discretion about how to manage designated basins. Before we think about legislation, we should give the Commission a chance to do its job and see if it can handle such a request under existing law.”

“The Supreme Court continues to put obstacles in the way. The need for legislation should be explored.”

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“My single biggest reaction to the conference is to reiterate my plea that we do not need new legislation at this time.”

“Legislature should take a hard look at water laws and see if any new legislation is needed. Might delegate this analysis to an agency. Either way, any new legislation is likely to be tested in court because of:

- Property issues—trespass or ownership of groundwater recharge
- Discharge issues—water quality
- Water rights issues—injury
- How does the recharge fit into beneficial use requirements?
- Dominion and control of the water?”

“Reference was made by Justice Hobbs and the attorney’s panel to the issue of how does one maintain dominion and control of artificially recharged water in an alluvial aquifer. Even though Justice Hobbs offered eight criteria which he believes must be satisfied to maintain dominion and control, there are a number of current artificial recharge projects and ditch company operations which do not satisfy all those criteria and those entities claim ownership of the water they have placed underground. This issue needs to be reviewed by a legislative Committee and specific legislation passed to clarify who owns the artificially

recharged water, who owns the aquifer where the water is being stored, and what is the Water Court's role in decreeing the right to store or use the water."

"We currently have plenty of tools in our legal toolbox to handle

conjunctive use of groundwater and surface water, while protecting senior water rights. What we need is a period of relative stability while people fully implement the existing tools to meet their ongoing needs.

Every time the legislature changes the law, we go through a period of instability while people adapt to the new or revised rules. A legislative attempt to change the current rules now would only lead to another period of increased instability."

"In many areas of the state we overdeveloped our groundwater resources before we fully appreciated the extent of the interconnection with and impact upon surface water flows. We are now going through a period of adjustment to bring groundwater use back into an appropriate

balance that is more sustainable. New legislation isn't called for."

"At the conference, a panel of many of the state's top legal minds pretty much said that we don't need any new laws. That our water court

system can handle any question that comes up. But closing the conference, Eric Hecox pointed out that many of us are asking the question, "at what cost?" Can we afford the time and money to develop this resource for maximum

beneficial use if every case must go to water court."

"Are changes needed in the public policies governing groundwater? In relation to aquifer

storage projects, I did not hear about any existing policies or laws that are fundamentally opposed to recharge activities."

"I think that if more public/private partnerships could be spawned and more wet water projects generated similar to that described by the Orange County, California water manager, we would move forward more quickly than

*"We have plenty of tools in our legal toolbox...we do NOT need new legislation at this time."*

*"...at what cost? Can we afford the time and money to develop this resource for maximum beneficial use if every case must go to water court?"*

to become mired in legislative idea making. Any public policy changes should be motivated by a real water project ready to push forward as a prototype of what kinds of changes are needed.”

“The Groundwater Management Act of 1965 and the Water Rights Administration Act of 1969 are the twin pillars of our current regulatory scheme for administration of water, but like pillars they are distinct and separate in application. Colorado Supreme Court Justice Gregory Hobbs, in rendering the Gallegos decision in November, 2006, noted: ‘The need to keep the Management Act and the 1969 Act separate and distinct stems from the basic policy differences underlying the two statutes.’ Earlier in the opinion, he had observed: ‘In interpreting the various provisions of both the Management Act and the 1969 Act, our primary purpose is to discern the intent of the General Assembly.’”

*“Aquifer recharge for long-term storage has not been tested in the legal arena in Colorado.”*

## Do we need rules and regulations to facilitate artificial recharge of aquifers for storage?

### What We Heard from Presenters and Participants

“The legal panel said the current water court system works and existing regulations are adequate. They said that SB79-481 provides the only needed definition of underground storage, and that the Sportsman’s Ranch Supreme Court decision outlining the eight criteria for underground storage provides all we need to make future decisions about aquifer recharge and storage. The issue is that this “no problems” perspective only considers the current practice of recharge as augmentation. Aquifer recharge for long-term storage has not been tested in the legal arena in Colorado.”

**“All aquifers in the state of Colorado except bedrock aquifers in the Denver Basin lack rules for artificial recharge.”**

“Should statewide rules and regulations be developed and required in regards to

aquifer recharge? No. Site specific rules are more flexible and appropriate.”

“Since aquifers in the designated basins are being drawn down too fast, why can't we fill them back up with water that comes from sources outside the designated basin? Such as agricultural water from rotational fallowing leases, produced water, recycled city effluent? Without specific rules as to how that can

be done, does each attempt to do it have to be litigated in water court? Why couldn't we give the state engineer's office the authority to

promulgate rules for artificial recharge to reduce the transaction costs of case by case litigation? Couldn't the SEO draw up rules from a scientific base?”

“The State Engineer should be given broader administrative authority to approve and oversee aquifer storage and recovery projects in all the State's aquifers, not just the Denver Basin aquifer system.”

“Do we need institutional change? Rules and regulations? If you are a senior water right's owner, perhaps the law as it now

stands works perfectly. If you are a citizen of the state dependent on creative solutions to meet Colorado's growing water supply needs, perhaps institutional change is desirable. Perhaps if you are from an area of the state where the regional economy is negatively affected because one goal of prior appropriation is being met while the other goal is not being met, you believe institutional change is desirable.”

*“The lack of rules and regulations regarding withdrawal of stored water from alluvial aquifers has the potential to present a serious challenge to implementing underground water storage projects outside the Denver Basin...”*

“The State Engineer has promulgated rules for aquifer recharge and recovery for the bedrock aquifers of the Denver Basin. These rules cover the way water may be injected and

recovered, credits to the aquifer, how much can be pumped back out, frequencies of pumping, who owns it, and so forth. But these rules don't apply to the shallow alluvial aquifers overlying the bedrock aquifers in the Denver Basin. Aquifers like Upper Black Squirrel Creek. Neither do the rules apply to bedrock aquifers outside the Denver Basin—non-tributary aquifers such as the High Plains Aquifer. Without rules, recharging these aquifers puts the recharger at risk of not being able to take the water back out. Without rules, would anyone wanting to recharge one of these aquifers have to

prove in court that he had satisfied the eight “elements of proof to acquire an underground right” handed down by the Colorado Supreme Court in the Park County Sportsmen’s Ranch case?”

“The concept of conjunctive use can only be effectively implemented with 1) non-tributary groundwater, 2) Denver Basin groundwater, or 3) designated groundwater because otherwise it is subject to curtailment on an injury basis. To pump non-tributary groundwater you first must get the state engineer, on a case by case basis, to agree that it is non-tributary. Plus everything is considered tributary if even 1/10<sup>th</sup> of one per cent of the water to be used annually would have reached a stream in 100 years. Denver Basin groundwater is well regulated but some of the aquifers are experiencing significant depletions. That leaves designated groundwater as the best candidate for aquifer recharge, but each management district (directed by volunteers, who are not ground-water professionals) makes its own rules and the overlying Ground Water Commission is poorly understood and not transparent (they don't even have an office).”

*“We don’t need statewide rules and regulations. Site specific rules are more flexible and appropriate.”*

“SB06-193 Underground Water Storage Study—A Study of Potential Underground Water Storage Areas in the South Platte and Arkansas River Basins” was completed in 2007 by Camp Dresser McKee for the Colorado Water Conservation Board (CWCB) as directed by the state legislature. This study

identified sites hydrogeologically suited for aquifer recharge in those two basins, but closes by saying:

“The lack of rules and regulations regarding withdrawal of stored water from alluvial aquifers has the potential to present a serious challenge to implementing underground water storage projects outside the Denver Basin, which has rules regarding underground water storage. It is recommended that the State Legislature, in conjunction with the Colorado Division of Water Resources and interested parties, enter a dialog on this issue with the hope of developing a regulatory framework that encourages underground water storage in all areas of the State.”

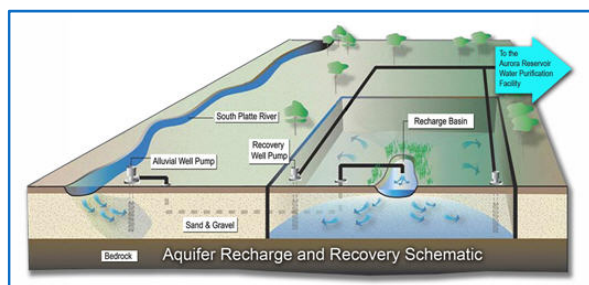


Do you have to maintain “dominion and control” to have an underground storage water right? Who decides how much you get to take out?

### What We Heard from Presenters and Participants

“One of the presenters made the distinction that the nature of aquifer storage is different from how we typically think about surface water storage, in that we tend to think of surface reservoirs in static terms (water placed in storage stays there until released for a subsequent use) or in dynamic terms (water released from storage is almost instantaneously available for use elsewhere.) However, as the presenter pointed out, aquifer “storage” is transitory...rather than being *retained* it is merely *detained*. It is typically constantly in very slow motion and is not very controllable (because it discharges to surface streams according to the natural properties of the medium and the forces acting on it) unless wells are utilized as a means of withdrawal. This simple fact requires sophisticated modeling and accounting mechanisms to monitor and administer schemes to take advantage

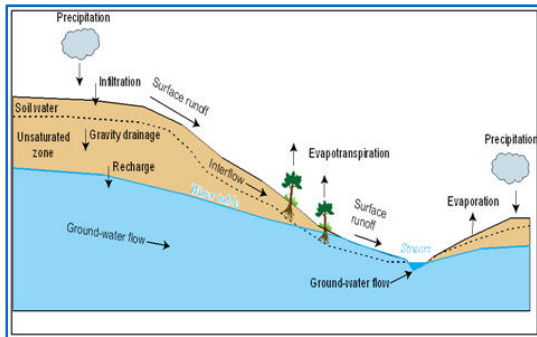
of the concept of retiming water introduced by other than natural means without impacting the interests of those who are entitled to intermingled tributary waters.”



“How do we determine (is the science adequate to determine) the amount of water available for recovery when water is stored in alluvial aquifers?”

“Aurora’s Prairie Waters Project has solved the problem of maintaining dominion and control by building a liner for containment of the groundwater. That helped them meet the criteria laid down by the Court in the Sportsmen’s Ranch case (the first case to apply that criteria since it was written, I believe.) Unfortunately, a natural aquifer doesn’t have the luxury of an expensive liner.”

“The technology associated with groundwater has advanced considerably since the 1965 Groundwater Management Act. Have our institutions kept pace?”



“Without additional and expensive basic research, development of the type of accounting systems that will be needed to utilize the “storage” properties of aquifers for practical administration purposes will be hampered.”

What are some of the legal questions regarding using aquifer recharge as a tool for ground water management in Colorado? What about interstate compacts?

### What We Heard from Presenters and Participants

“How do we justify putting water away when we don’t need it yet, when people who do need it are being turned away?”

“Aquifer storage is a form of water conservation, keeping water from going downstream and out of the state. If

aquifer stored water is part of conservation how do you bring it out of storage and how do you know when to use it?”

“Of concern is the legal status of tributary water when it is introduced into a designated groundwater basin for recharge/storage. How would commingled groundwater (designated/tributary) be accounted for and allocated between the entity supplying the tributary water and the owners of the designated groundwater wells.”

“True aquifer storage in Colorado is found only in the deep injection in Denver Basin bedrock aquifers (a special class of water with specific recharge/extraction rules). But, outside of the Denver Basin, do those who put water in the ground have a right to take it back out? When and where?”

“Does Colorado have adequate statutory framework to address recovery of water after recharge?”

“Is the statutory concept of inquiry adequate to address groundwater impacts?”

“If a groundwater management district were to use an aquifer for storage and charge fees to store the water, how would that be affected by Tabor restrictions?”

"Who owns an aquifer? I may own the beds and the banks of a stream on my land, but the state owns the water in that stream. If the state owns the water that fills the space under my land do I own the space itself."

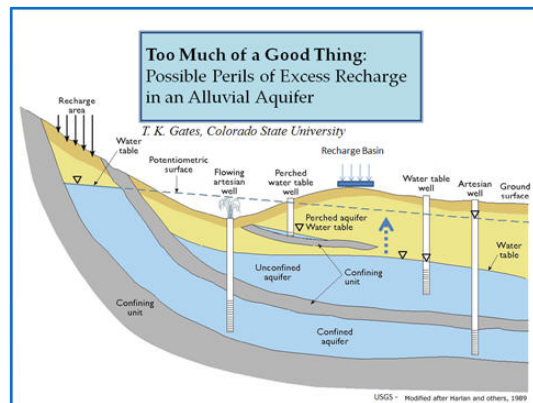
"Does Colorado's water banking statute allow for underground recharge 'deposits' and 'withdrawals?'"

"Not one of the nine compacts Colorado has with its neighboring states mentions ground water. But all of those compacts affect what we can do in using our ground water."

What are the environmental and water quality concerns related to artificial recharge? Are there perils of excessive recharge to alluvial ground water aquifers?

### What We Heard from Presenters and Participants

"The legislative panel was asked: "How is the quality of recharge water regulated under current law? Does the limit in CRS 25-8-104 of the Colorado Water Quality Control Act constrain the water quality standards that can be imposed (because they could limit the amount of water that could be recharged and used by an appropriator)?" There is no clear answer to this. It is less than clear how recharge water is regulated."



"The Orange County approach works because recharge is such a small part of all the water used and because of the long distances and time between point of input and point of extraction. TDS (total dissolved solids) issues were not addressed in the conference but are the single most difficult issue in California.

Demineralization is the solution, but California has an ocean for brine disposal.

Colorado does not. Use of RO (reverse osmosis) is not a near term issue for drinking water suppliers, but may

become such for wastewater dischargers. So there may be an incentive to avoid RO of effluent to remove nutrients and spend the money for recharge of areas not connected to a stream. That could include less comprehensive RO or a slip stream of it to reduce the TDS. But still what to do with the brine? That said, I believe recharge must be significantly increased and become common place."

*"The feasibility of stream aquifer recharge will be determined by the water quality requirements."*

*"Big dams create barriers to fish. Storing water underground does not."*

"One attraction of aquifer storage and recovery (ASR), as mentioned by the first panel, is that the flow through the aquifer material can provide filtration, analogous to porous media filtration in a

water treatment plant. However, it is not clear what process in ASR is analogous to backwashing, which is required in porous media

filtration to ensure continued treatment effectiveness and to prevent clogging.

This presents a possible concern for the sustainability of ASR operations. What do we know about the long-term operational feasibility of ASR?"

"Tim Gates' presentation documented how improper selection of recharge sites and proceeding to recharge without considering the impact of the stored water on existing water tables could result in salinization issues and even increased non beneficial consumptive use of water. Thorough analyses of site specific and down gradient water table and geologic conditions must be undertaken before any artificial recharge project is initiated. Failure to do this could result in serious injury to property

owners and also result in a loss of water to meet future needs. Project funding agencies must assure that thorough site specific studies are complete including the availability of water for artificial recharge before a project is funded."

"Though I do not want to raise false fears, when it comes to aquifer recharge and storage, water quality issues can preclude good intentions. Indeed the fears of well intentioned health experts can frustrate the progress toward developing aquifers. State funding of scientific studies is necessary. No single agency can do the health effects studies necessary. The feasibility of stream aquifer recharge will be determined by the water quality requirements."

"There are still significant issues that are unsettled related to aquifer storage that need to be debated in the process of implementation. For example what should an anti-degradation standard look like? As Karl Dreher points out, in some cases, even maintaining safe drinking quality standards still wouldn't meet a strict anti-degradation interpretation. I do not think that it is appropriate to attempt to suspend all aquifer management efforts until we have all the answers...getting to the answers should be part of the process. That said, I do think that our

policy should very jealously safeguard subsurface storage formations because it is so very difficult to rehabilitate them once polluted."

"Big dams create barriers to fish. Storing water underground does not."

## What type of water management institutions are needed for successful artificial recharge projects? What is the role of the state? Regional authorities?

### What We Heard from Presenters and Participants

"Significant underground water storage projects require collaborative efforts. Region-wide, multi-entity authorities are needed for the management, financing, and implementation of large-scale aquifer storage projects."

"We need regional authorities for management, financing, and implementation of aquifer recharge and storage. Potential existing groups who could take a role and make contributions are water providers, water districts, conservation and conservancy districts, the state, the roundtables, the federal government."

"Should there be a regional watershed agency to control where recharge should occur and whether pumping should be allowed? No. We already have an existing road map that minimizes the amount of regional or state control. What we need most is funding."

"Similar to states like Arizona, I think the State Engineer's office needs to establish a separate group/unit dedicated to reviewing aquifer storage/recovery applications, administering permits, and monitoring facility performance. The personnel in this group/unit should be qualified to review and comment upon groundwater models, recharge tests, pumping tests,

facility designs, monitoring plans, accounting procedures, and water rights implications. This group would partially be funded by application fees."

"The state should fund pilot scale aquifer recharge follow-up studies."

"Due to the increased competition for available water, the state must take a more active role in developing policy that promotes aquifer storage as a water management tool. Neighboring western states have already implemented this strategy."

"States need to enact statutory systems for aquifer recharge and recovery so that those who want to

implement aquifer recharge and recovery don't have such high transaction costs. States need to provide a path through the process."

*"We already have an existing roadmap that minimizes...regional or state control."*

*"States need to enact statutory systems for aquifer recharge and recovery so that those who want to implement it don't have such high transaction costs."*



## How can we better maximize beneficial use of the state's ground water? Make better conjunctive use of ground and surface water?

### What We Heard from Presenters and Participants

"How to broaden utilization of groundwater without harming senior appropriators is a chapter yet unwritten in Colorado."

*"How to broaden utilization of groundwater without harming senior appropriators is a chapter yet unwritten in Colorado."*

"In addition to the dual focus on maximum beneficial use and the protection of water rights, water judges must give consideration to the potential impact of the utilization of water on other resources. Maximum utilization must be implemented so as to ensure that water resources are utilized in harmony with the protection of other valuable state resources." *City of Thornton v. Bijou Irrigation Co., (Colo.1996.)*

*"It's all about respecting both sides of prior appropriation--not just private property rights but also maximum beneficial use."*

"Regarding strict adherence to prior appropriation, we have been crossing the line to allow injury in some cases for years. Case in point: exempt domestic wells in rural areas. So when folks are so adamant about not piercing the veil of "non-injury" they don't have as firm a footing as they may like to think. We don't give up on having highways just because a few people get killed on them every year. We are willing to sacrifice a few for the good of the many."

*"Playing by the rules, taking each case one at a time to prove non-injury, is bankrupting us—preventing us from conjunctively managing the resource."*

"It's all about respecting both sides of prior appropriation—not just private property rights but also maximum beneficial use. In the *Fellhauer* case, the court stated that: 1) along with vested rights, there shall be maximum utilization of the waters of this state and 2) administration of water involves how

maximum utilization of surface water and tributary ground water can be integrated into the law of vested rights.”

“In 1969, there was more cross-pollination between the three branches of government in Colorado—and that allowed more flexibility to solve problems. When the justices asked the legislature to recodify water law to allow for conjunctive use of groundwater with surface water, they were clear in saying—“But don’t kill the well users—the state can’t afford the economy we would lose.”

“Why do we have a system of lawyers fighting for individual clients, instead of use of water for the whole state’s benefit.”

“Our current court system control has hamstrung the concept of maximum beneficial use, by effectively placing self-interests and their attorneys in a position of control in the determination of cases. Myopia reigns powerfully! What a contrast to the purpose and spirit envisioned with the Maximum Beneficial Use concept.”

“...the objective of ‘maximum use’ administration is ‘optimum use’ which can only be achieved with proper regard for all significant factors, including economic and environmental concerns.” Alamosa-La Jara Water Users

Protection Association v. Gould (Colo.1983)”

## What is the role of cooperation and education in promoting aquifer recharge and storage?

### What We Heard from Presenters and Participants

“Can we build on public interest in promoting/requiring cooperative development or use of infrastructure, similar to the old policy of requiring ditches to provide (compensated) carriage for other water?”

“More cooperation and interaction is needed between water providers. For instance, Dillon is currently at bankful. This excess water could be purchased by other water providers to inject and store. If Denver needs more water during drought years, they could purchase back stored recovered water.”

“We should acknowledge that local grassroots cooperation has been very successful in many cases and should be encouraged.”

"The concepts and success stories described at the conference must be passed on to others through public education or through responsible actions by those who attended the conference. Further use of the success stories is needed. Demonstration projects which utilize new technologies or especially demonstrate regional conjunctive use management should be considered. The cooperation between both ground and surface right owners is essential for maximizing the water available for Colorado's citizens."

"A combination of good scientific modeling and an attitude of enlightened self interest lead to a successful resolution of conflict that resulted in the Widefield Channel Recharge Project beneath Fountain Creek in the Arkansas Basin."

"It has been presented at this conference that the Front Range has the underground storage, but where does the water to fill that storage originate? It seems the use of water on the western slope is being

minimized by the assumption that 'we are all in this together.'"

"Suggest that in water court, the terminology be changed from "filing as objector" to "establish party status" as provided elsewhere in Colorado statutes. Might help reduce the adversarial nature of water law."

*"Demonstration projects which utilize new technologies or regional conjunctive use management should be considered."*

Are there opportunities to better use the alluvial aquifers of Colorado?

What are the impediments to implementing those ideas?

### What We Heard from Presenters and Participants

"Global warming may mean more of our moisture will come in the form of rain, or more quickly melting snow. That calls for more storage, but the public doesn't want the perceived downside of dams and reservoirs. Could the answer be underground aquifer storage?"

"Perhaps of all the presenters, John Hendrick came closest to the mark in addressing some of the major objectives of the conference. He described how aquifer recharge is being used as a significant means of water management by extending the useful life of Denver basin aquifers that serve as a primary source of supply for Highlands Ranch. And he described the realities of securing a water supply to overcome one of the potential constraints. It seemed to me that he represented an organization that had put together a total package--a model to be referenced by others."

"Aquifer storage is highly site specific and the Denver Basin offers an opportunity which should be exploited."

"Permits for new ASR facilities could be 'conditional' for a period time, similar to other water rights that aren't yet fully perfected."

"In 1957 the court determined that ALL groundwater is considered tributary unless proven to be otherwise. The problem is that they never considered

the time frame! What if the flow path takes 1,000 years? Then the 1969 Act defined non-tributary ground water as "groundwater, located outside the boundaries of any designated groundwater basin in existence on January 1, 1985, the withdrawal of which will not, within one hundred years, deplete the flow of a natural stream....at an annual rate greater than one-tenth of

one percent of the annual rate of withdrawal." C.R.S. § 37-90-103 (10.5) These definitions are too strict and tie our hands."

"There is no map, book, rule, or statute

that says "the groundwater in this aquifer in this area is non-tributary." It is all determined on a case-by-case, well-by-well basis by the State Engineer."

"The promotion of the misconception that Denver Basin aquifers are a non-renewable resource is a barrier to ASR development."

"Ground water law in Colorado has its basis in surface water rights and their protection. The criteria of establishing non-tributary status is too onerous. Depletions of 1/10<sup>th</sup> of one percent of the amount of annual withdrawal in a 100 year period are not even measurable on the

*"...how aquifer recharge is being used at Highlands Ranch to extend the useful life of Denver Basin aquifers...is a model to be referenced by others."*

flow of a natural stream. Maximum utilization of the public's waters can never be achieved unless this criterion is relaxed. We can protect senior surface water rights without penalizing ground water users."

"Non tributary water is defined as depletions of less than 0.1% after 100 years. In confined aquifer situations (i.e. Dakota sandstone), the storage coefficient, rather than specific yield, must be used in Glover modeling. Very low storage coefficient values, as low as .0005, can result in locations as far as 120 miles from the outcrop/river being found as tributary. This means that the Dakota aquifer under most of the eastern plains is unavailable for non-exempt uses. The legislature designated large areas of the Denver basins as "nontributary" in SB-5, even though these areas were under confined conditions and would have been in actuality tributary. Perhaps similar designations could be made for the Dakota and other aquifers, or perhaps any deep water (for example >2,000) under confined conditions and greater than some distance (for

example 25 miles) from the outcrop/river be designated as "non-tributary."

"All tributary groundwater is burdened by the Prior Appropriation Doctrine. You can only pump tributary groundwater if you augment surface flows. You have to make up all of your consumptive use.

Consequently, millions of acre-feet of groundwater in storage cannot be used unless excess surface water exists for augmentation."

"The cities have the need to store for future droughts and the money to pay for delivering the tributary water and storing/recharging the aquifer; the

farmers have the wells and own the land underlying the aquifer. What can the farmer sell to the cities and how can the farmer benefit from additional water supplies?"

*"The criteria of establishing non-tributary status is too onerous. Depletions of 1/10<sup>th</sup> of one percent of...annual withdrawal in a 100 year period are not even measurable..."*

"Designated basin ground water management districts have the authority to implement aquifer recharge, but lack technical staff and funding."

"How can agricultural users be adequately represented in discussions about aquifer recharge and storage?"

"What about economic feasibility for creating a storage vessel that would only be used during "free river?"

- Need statistics on "free river" conditions to assess economics
- Are there non "free river" uses for such a vessel?
- Could there be legislative incentives to accomplish this?

"Many think we have lots of aquifer recharge and storage in Colorado because they think of augmentation as aquifer recharge and storage. But recharging alluvial aquifers to account for stream depletion due to well pumping satisfies a legal construct. It is replacement not storage. This thinking makes it seem as if we have more aquifer recharge than we do."

*"Many think of well augmentation as aquifer recharge and storage. But...recharging alluvial aquifers to account for stream depletion due to well pumping...is replacement, not storage."*

"Kathy Hare said that the Upper Black Squirrel aquifer is being drawn down way too fast and there are increasing water quality problems from agricultural runoff

and septic systems.

She said the Upper Black Squirrel Management District (UBSCGWMD) wants to recharge the aquifer with treated wastewater, but that other than the

problem of the public perception about drinking reclaimed effluent, all the other problems are institutional. Specifically:

- 1) The county doesn't have a plan for how to use wastewater for aquifer recharge.
- 2) Water/waste water providers aren't cooperating
- 3) Uncertainty about how senior water rights will interface regarding recovering reclaimed water supplies in a designated basin.

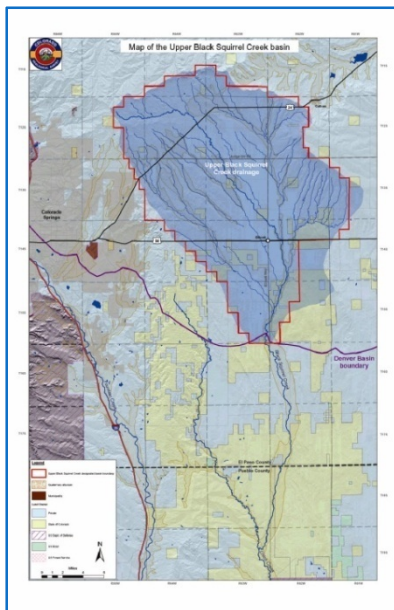
Ms. Hare said the Upper Black Squirrel Management District has also thought about recharging the aquifer with agricultural water from the Arkansas Basin (through rotational fallowing) but that problems with that idea are

- 1) cost of a pipeline



- 2) cost of treating the water to drinking water standards
- 3) uncertainty about banking and recovering water in a designated basin

In both cases, a huge problem is lack of financial resources, especially to hire lawyers."



## What steps should we take next?

### What We Heard from Presenters and Participants

"We must give the state engineer more authority to administer groundwater and surface water conjunctively, in order to maximize the use of the waters of the state and protect our senior water rights.

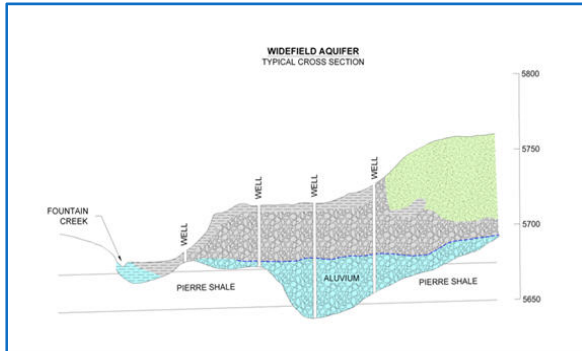
This will require legislation and in order for this legislation to pass there must be sufficient data to support this management concept. The South Platte Decision Support System is the ongoing tool to do this. Hopefully, this is extensive enough to link groundwater models to surface water models allowing the state engineer to manage them together. When the groundwater table is up, the engineer should be able to temporarily relax recharge requirements or turn on augmentation wells that pump into senior diversion ditches, keeping the call off of the river. These activities benefit everyone, senior and junior water rights, and maximize the use of our water."

"State legislators and water officials must find a way to use our valuable ground water resources while protecting senior surface rights. Well augmentation is not the only way to protect senior surface rights. Total aquifer and stream flow management which could maximize the available water would depend upon aquifer recharge as a technique to place excess surface flows into ground water storage."

"We have to figure out how to use stored ground water in dry periods and recharge it during wet periods."

"We must manage TOGETHER a river system that has worked extremely well for over one hundred years. The South

Platte Alluvium is estimated to have 11 million acre feet of water; there must be a way to manage this conjunctively without injury to anyone. Water policy should be more science based and less litigious."



"The State should promulgate rules for aquifer storage/recovery outside the Denver Basin that specify the analyses, testing and demonstrations needed to get a facility approved. It's quite possible that 100% credit for recharged water cannot be granted in alluvial aquifer systems; maybe there's a "loss" to the system? The extraction of Denver Basin groundwater is administered similarly with relinquishment of certain percentages of water based upon its designation - nontributary, not-nontributary (4%, actual), etc. Also, maybe there should be storage duration (aging) limitations placed on ASR projects in alluvial aquifers? After a

*"We have to figure out how to use stored groundwater in dry periods and recharge it during wet periods."*

prescribed period of time, if the operator of the project hasn't recovered the water then it will start to "lose" recharge credits."

"The presentation by Gary Thompson of Wheeler and Associates about the ground and surface water management of the Widefield Channel and Fountain Creek was the best illustration of how local water users have cooperated to develop management strategies (including artificial recharge) which attempt to maximize the water available in that area. We did not hear from Thompson that there was need for legislative changes or that there were even disputes about dominion and control

of artificially recharged waters. All the water users in that area have now recognized the need for basin

management of both the ground water and surface water and arguments over who owns the surface or ground water are behind us. Can the Widefield experience be expanded to other areas in Colorado? Yes, if all the water users and water rights owners in an area come to the bargaining table and are willing to work on management objectives which would result in a benefit to all the parties. If the area

has more water rights owners than can be satisfied by the basins or areas long term average annual sustainable yield, then the junior rights that exceed that sustainable yield will not be supplied. Projects to increase the sustainable yield, and supply the junior water rights owners would be examples of how the regional management approach could benefit the areas water users."

*"The Widefield experience can be expanded to other areas of Colorado...if water users and water rights owners are willing to work on management objectives...of benefit to all the parties."*

"All future municipal and large volume agricultural or industrial wells should be dual purpose, capable of injection as well as extraction."

"South Platte farms should consider crop rotation utilizing rice

and water chestnuts that would allow paddies to be used for recharge to the aquifer as well as a growth medium. Dual purpose fields—crop growth and aquifer recharge."

"Gorden McCurry from CDM reported on his firm's CWCB-funded feasibility study of potential recharge sites in the Arkansas and South Platte Basins. He said we should now

- Identify and fund an organization to coordinate and oversee long-term recharge activities
- Encourage regional cooperation through financial incentives
- Provide regulatory guidance for underground storage
- Identify who pays for projects and who benefits
- Develop methods to capture peak flows (coordinated diversions, temporary storage in existing reservoirs)
- Characterize chosen sites more fully"

Basic Concept

Suggestions for Implementation

- Identify & fund an organization to coordinate and oversee long-term recharge activities (CWCB ? DWR ?)
- Encourage regional cooperation through financial incentives
- Provide regulatory guidance for underground storage
- Identify who pays for projects and who benefits
- Provide public outreach on benefits, methods, opportunities
- Develop methods to capture peak flows (coordinated diversions, temporary storage in existing reservoirs)
- Characterize sites more fully via pilot-scale studies
  - Recharge rates, return flow patterns

## Closing

The dialogue throughout the conference was vigorous, reflecting the sincere interest of both presenters and participants in the topic of aquifer storage and recovery. As presented here, no consensus conclusions emerge. Rather, what does emerge is the energy which diverse interests bring to the dialogue about the role groundwater will play in Colorado's future. Should the conversation continue, oriented around the questions raised and debated at the conference?

The forum began with practical solutions actively applied in our neighboring western states. Challenges here in Colorado, and the collaboration capable of meeting those challenges, were also highlighted. Some participants clearly believe our current approach to groundwater is adequate to meet our needs, while others see public policy as critical to a vision of a sustainable water future for Colorado. Everyone who attended agreed that groundwater usage is a fundamental element of our future water supply, suggesting that this is the beginning, not the end.

## Recommendations for Moving Forward

### Meaningful Dialogue on Dual Goals of Prior Appropriation

We believe that many of these insights of presenters and participants point to a paradox underlying a variety of current water

issues in Colorado, not just the issue of aquifer recharge and storage. That is the paradox which our prior appropriation doctrine has presented to us from the very beginning—the dual goals of protecting water rights holders from injury while maximizing the beneficial use of the water for the entire citizenry to whom it belongs.

Wrestling with that conundrum may well be paramount before we can realistically tackle a number of ground water questions—not just about artificially recharging aquifers but also about how to conjunctively manage waters stored in aquifers through augmentation.

A number of highly regarded individuals have pointed out this paradox.

- In a paper delivered at the Natural Resources Law Center's 2004 Summer Conference — Groundwater in the West—Steven Sims, Veronica Sperling and David Harrison said: "*Over the last 35 years Colorado water officials have struggled to accomplish the twin goals of the 1969 Act, maximum utilization and prevention of injury to senior water users.*"
- Reagan Waskom, Director of CSU's Colorado Water Resources Research Institute, wrote in the October 2007 issue of Colorado Water: "*...dual goals of maximum utilization and preventing injury (to senior water rights holders) can create cognitive dissonance. It takes intellectual discipline to simultaneously hold two apparently*

*contradictory ideas as both being valid and worthy of attainment.”*

- Writing in a February, 2008 editorial to the Denver Post, Neil Grigg, CSU Civil Engineering Professor and author of Colorado's

Water: Science and Management, History and Politics had this to say: *While the appropriation doctrine has advocates and critics, it is here to stay. (But) we must provide water for Colorado in the future. We have hit the limits of new water, and must make choices of where water will be used to maximize benefits to all users. Our system allocates water first to those with senior rights, and that choice can create hardship by leaving others without water during dry periods. Institutional change is needed to go with engineering solutions. Colorado's court-based system of water exchanges is not as flexible as a system where water can be moved flexibly within zones by administrative approvals. Because our water-rights system is here to stay, we need to promote, approve and fund water planning and new technology to promote efficiency in water use and management.*

*“With each change, the suite of possible water management tools is reshuffled, yielding a new order of management priorities...ideally, reflecting an evolving set of public values.”*

- Peter Nichols, Megan Murphy and Doug Kenney, in Water and Growth in Colorado—A Review of Legal and Policy Issues approach the paradox by saying: *“What is best for a particular water provider, therefore, is not necessarily what is best for other water users, or for society as a whole. This problem, typical of mobile resources like water, prompts a steady stream of legal and policy responses that further modify costs and their distribution. With each change, the suite of possible water management tools is reshuffled, yielding a new order of management priorities, tied to a new set of costs, and, ideally, reflecting an evolving set of public values.”*

From the very beginning, it has required flexibility and a certain amount of “gentlemen’s agreement” for prior appropriation to fulfill these dual goals. The drought which woke us up in 2002, followed by the findings of the 2004 Statewide Water Supply Initiative call on us to face the music: we have hard decisions to make about how we will best use our water in the future. Will we rely on the courts or will we devise management schemes which some believe will give us more flexibility and better use of the resource for all? How can we do that and



still preserve individual property rights? Can we use science to help us?

**A Focused Forum, Another Conference, Ideas from Peer Reviewers?**

Many conferences are show and tell opportunities that are soon forgotten with reports ending up on shelves gathering dust. Interested parties are hopeful that this conference and this report lead, instead, to continued dialogue and, eventually, workable solutions to the opportunities raised.

With or without policy progress, aquifer recharge and storage projects are going to move (or inch) forward. Will we rely on existing legal tools to sort out what will be allowed and what will not? Or, do we want to examine a public policy path forward that draws on our collaborative will and creativity? If so, what form would that proactive approach take? Some have suggested we have a second conference or, perhaps, even a smaller forum, drawing on what we learned from the first conversation, focused on the elements we have uncovered and highlighted here. Should a continued dialogue be taken on jointly by the Arkansas, South Platte, and Metro roundtables—perhaps with Water Supply Reserve Account funding?

One participant has gone as far as suggesting this is a chance for select leadership from the legislature to experiment with one of the models for collaboration promoted by some national groups concerned with “new ways to do democracy.” Others anticipate the path

forward requires a demonstration project (or a regional conjunctive management scheme) proposal to drive the discussion.

Whatever format future dialogue takes, the energy of the participants in that dialogue will fuel the endeavor. Many individuals and institutions are ready to “roll up our sleeves and really get to work on this” in a collaborative fashion. To move beyond circular talk, the next step should be carefully designed to build on perspectives and suggestions of the presenters and participants highlighted in this report.

A sustainable future for Colorado includes groundwater. It may even depend on it. The path forward is now ours to define. Your input is welcomed. Contact: MaryLou Smith, [mlsmith@aquaengr.com](mailto:mlsmith@aquaengr.com).



What We Heard from Presenters and Participants

“This conference, partially funded by the Arkansas Basin Roundtable, is a successful example of what the IBCC/Roundtable process was created to do. The conference was designed to allow for active dialogue, not just a series of presentations by experts. The stage is set for the roundtables to move into actively tackling difficult issues like this. Hopefully the process will continue to foster dialogue and reduce the historic tendency for lining up with our respective positions.”



“My overall assessment is that the conference was a very expansive and timely exploration of a not well understood, but potentially beneficial water management practice that should find wider application in the future.”

“This conference will be looked upon in the future as a turning point for aquifer recharge and storage in Colorado.”

## Appendix

- A. House Joint Resolution 07-1017
- B. Conference Program
- C. Summary of the Conference: “Ground Breaking Ground Water Conference Tackles Recharge and Storage Policy Issues” October issue Colorado Water, published by Colorado Water Resources Research Institute
- D. Presenter and Moderator Biographies
- E. Registrant List
- F. Letter Soliciting Further Insights
- G. Aquifer Recharge and Storage Means Different Things to Different People & Eight “elements of proof to acquire an underground right” handed down by Colorado’s Supreme Court in the Park County Sportsmen’s Ranch case
- H. Colorado Ground Water Made Legal. Derived from “An Overview of Colorado Groundwater Law, State Supreme Court Justice Greg Hobbs, 2007



**HOUSE JOINT RESOLUTION 07-1017**

**BY REPRESENTATIVE(S) Stephens, Curry, Gardner C., Hodge, Looper, McKinley, McNulty, Rose, Sonnenberg, Balmer, Benefield, Borodkin, Buescher, Butcher, Cadman, Carroll M., Carroll T., Casso, Cerbo, Fischer, Frangas, Gagliardi, Gallegos, Garcia, Gardner B., Gibbs, Green, Hicks, Jahn, Judd, Kefalas, Kerr A., Kerr J., King, Labuda, Lambert, Levy, Liston, Lundberg, Madden, Marostica, Marshall, Massey, May M., McFadyen, McGihon, Merrifield, Mitchell V., Peniston, Pommer, Primavera, Rice, Riesberg, Roberts, Romanoff, Solano, Soper, Stafford, Summers, Swalm, Todd, Vaad, Weissmann, White, and Witwer;**  
**also SENATOR(S) Taylor, Bacon, Boyd, Brophy, Fitz-Gerald, Gordon, Groff, Harvey, Isgar, Johnson, Keller, Kester, Kopp, May R., McElhany, Morse, Penry, Renfroe, Romer, Sandoval, Schultheis, Schwartz, Shaffer, Spence, Takis, Tapia, Tochtrop, Tupa, Veiga, Ward, Wiens, Williams, and Windels.**

**CONCERNING THE USE OF UNDERGROUND WATER STORAGE STRATEGIES.**

WHEREAS, Conjunctive use is a strategy that uses ground water and surface water in a coordinated and mutually supportive manner; and

WHEREAS, The Colorado geologic survey conducted a study of potential storage capacity of Colorado and identified a need for legal clarity in the rules governing artificial aquifer recharge; and

WHEREAS, Last year the General Assembly enacted Senate Bill 06-193 to direct the Colorado water conservation board to conduct a study of the most economically and technically feasible and ecologically sound underground storage sites located in the South Platte and Arkansas river basins; and

WHEREAS, The report from this study is due to be delivered on March 1, 2007; and

WHEREAS, There remains a need for a review of the legal issues encountered and resolved in other major Western metropolitan areas for the proper administration and management of aquifers, conjunctive use, and artificial recharge; now, therefore,

*Be It Resolved by the House of Representatives of the Sixty-sixth General Assembly of the State of Colorado, the Senate concurring herein:*

1. That the Arkansas basin roundtable is encouraged to conduct a review of the economic, legal, ecological, and technical feasibility of using any underground storage sites in alluvial aquifers identified as being located in division 1 or division 2, whether or not such aquifer is located wholly or in part in any designated ground water basin, for the storage of water in such alluvial aquifers.

2. That, in conducting the review, the Arkansas basin roundtable should engage such consultants as it deems appropriate and consult with other interbasin roundtables and the interbasin compact committee. In addition, the Colorado water conservation board, the state engineer, the ground water commission, the state geologist, and the attorney general, at their discretion may notify the Arkansas basin roundtable that they wish to be included and to participate in the conduct of the review.

3. That, to determine any best practices that would be beneficial for use in Colorado, the Arkansas basin roundtable is encouraged in performing the review to consider similar water storage strategies used in, but not limited to, the following regions: Phoenix, Arizona; Tucson, Arizona; Las Vegas, Nevada; Los Angeles, California; and Orange County, California.

4. That, prior to the final completion of the review, the Arkansas basin roundtable should submit the final draft of the review to the executive director of the department of natural resources for a professional peer review of the methodology, findings, conclusions, and recommendations of

the review, and take into consideration any comments or recommendations made by the executive director before the review is finalized and any public report is released.

5. That, at its discretion, or at the request of the chair of the General Assembly's water resources review committee, the Arkansas basin roundtable may submit a preliminary draft of the review with respect to its peer-reviewed analysis of the review to the water resources review committee for its information and consideration.

*Be It Further Resolved,* That a copy of this joint resolution be provided to each basin roundtable, the interbasin compact committee, the Colorado water conservation board, the state engineer, the ground water commission, the state geologist, and the attorney general.

Colorado Ground Water Management Policy

# FORUM PROGRAM



This Water Forum has been made possible in part by an SB179 Water Supply Reserve Account grant through the Arkansas Basin Roundtable administered through the Colorado Water Conservation Board

## LEGAL AND INSTITUTIONAL OPPORTUNITIES FOR AQUIFER RECHARGE AND STORAGE

*An open interactive forum among experts and stakeholders to address how best to formulate policy that will allow for maximum utilization of Colorado's ground water resources in alignment with hydrologic reality, engineering capability, environmental needs and legal rights & obligations.*



**American Ground Water Trust**



**Arkansas Basin Roundtable**

**Thursday, September 27<sup>th</sup> &  
Friday, September 28<sup>th</sup>, 2007**

**Doubletree Hotel - Colorado Springs, Colorado**



# FORUM SPONSORS



**El Paso County  
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**R.W. Beck**



**Northern Colorado  
Water Conservancy  
District**

## Background

### Aquifer storage and recovery in Colorado Aquifers – What are the issues?

*“We have appropriated more than is available” .....”We need Aquifer Storage as the solution.”*

*“Those who put it in the ground should have the rights to take it out.”*

*“You can’t do it without huge court costs.” .....”We’ve been doing it for years.”*

*“It’s what’s going to save us in the long run.” ..... “Colorado law doesn’t allow it.”*

*“We just don’t have the amount of water we need”*

*“Maximizing use should be the objective”*

*“Litigation has never created a single drop of water.”*

*“What stands between the problem and a solution?”*

## Major Conference Questions

- ➔ Can aquifer recharge become a more significant part of Colorado’s water management toolbox?
- ➔ What can we learn from the experience of policy makers in states where aquifer recharge is a significant part of their portfolio of water management tools .
- ➔ If the hydrology and the engineering will work – is water available for recharge the constraint?
- ➔ Do we need new legislation or rules & regulations to facilitate artificial recharge?

### Program Day 1 – Thursday, September 27<sup>th</sup>

#### 7:30 – 8:30 Registration Open

#### 8:30 – 8:45 Welcome and Introduction to the Conference

- ◆ Betty Konarski, President, El Paso County Water Authority, Colorado Springs, CO
- ◆ Lionel Rivera, Mayor, Colorado Springs, CO
- ◆ Amy Stephens, Colorado State Representative, House District 20, Northern El Paso County

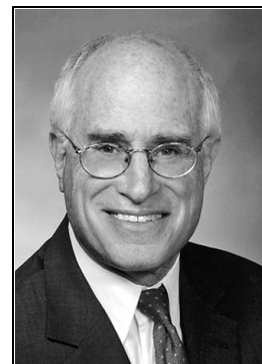
#### 8:45 – 8:50 Introduction of Harris Sherman

- ◆ Alan Hamel, Chairman of the Arkansas Basin Roundtable and Executive Director of the Pueblo Board of Water Works, Pueblo, CO

#### 8:50 – 9:20 SPECIAL GUEST

##### The Importance of Finding Solutions to Colorado’s Ground Water Issues

- ◆ **Harris Sherman, Executive Director,**  
Colorado Department of Natural Resources, Denver, CO



#### 9:20 – 9:30 Water Storage in Aquifers – Basic Concepts and Terminology

- ◆ Andrew Stone, Executive Director, American Ground Water Trust, Concord, NH

**9:30 – 10:45 SESSION 1**

**Session 1: Use of Aquifers for Storage in Other States – Problems Identified and Solved**

- ➔ The “climate of opinion” regarding storage of water in aquifers for later use
- ➔ Legal frameworks for aquifer storage and retrieval
- ➔ Administrative structures that allow for conjunctive use of resources
- ➔ Lessons / templates that could be applied in Colorado

Moderator

- ◆ Denise Fort, Professor, University of New Mexico School of Law, Albuquerque, NM  
Member of National Academy of Sciences Committee on “Sustainable Underground Storage of Recoverable Water”

Presenters

- ◆ Craig Miller, Assistant General Manager, Orange County Water District, Fountain Valley, CA
- ◆ Gregg Houtz, Deputy Counsel, Arizona Department of Water Resources, Phoenix, AZ
- ◆ Karl Dreher, VP, Brown & Caldwell, Golden, CO (former Director of Idaho Department of Water Resources)

**10:45 – 11:15 COFFEE BREAK—brought to you by Colorado Springs Utilities**

(Networking opportunity – meet the exhibitors)

**11:15 – 11:45 The Challenges and Objectives of the Special Legislative South Platte Wells Task Force**

- ◆ Alexandra Davis, Assistant Director for Water, Colorado Department of Natural Resources, Denver, CO

**11:45 – 11:50 Introduction of Senator Fred Anderson**

- ◆ Bob Longenbaugh, Consultant Engineer, Lakewood, CO

**11:50 – 12:20 Background to the 1969 Water Rights Determination and Administration Act**

- ◆ Fred Anderson, Former President of Colorado Senate, Loveland, CO

**12:20 – 1:20 LUNCH**

**1:20 – 1:25 Introduction of Justice Gregory Hobbs**

- ◆ Diane Hoppe, President, Colorado Foundation for Water Education, Denver, CO

**1:25 – 1:55 KEYNOTE PRESENTATION**

**Where we are – Where we have been since 1969**

- ◆ Gregory Hobbs, Colorado Supreme Court Justice, Denver, CO



**1:55 – 3:20 SESSION 2**

**Session 2: Legal Issues and Experiences**

- ➔ Legal parameters for implementing artificial recharge as a tool for ground water management in Colorado
- ➔ What is the difference between "ground water recharge" and "underground storage"?
- ➔ Do you have to maintain "dominion & control" in order to have an underground storage water right?
- ➔ How do Interstate Compacts impact artificial recharge?
- ➔ Who decides how much you get to take out?

**Moderator**

- ◆ Doug Kemper, Executive Director, Colorado Water Congress, Denver, CO

**Presenters**

- ◆ Michael Shimmin, Attorney, Vranesh & Raisch, Boulder, CO
- ◆ David Robbins, Attorney, Hill & Robbins, Denver, CO
- ◆ Melinda Kassen, Attorney, Colorado Trout Unlimited, Boulder, CO
- ◆ Sandy MacDougall, Attorney, MacDougall Wooldridge & Worley, Colorado Springs, CO
- ◆ Steven Sims, Attorney, Brownstein Hyatt & Farber, Denver, CO

**3:20 – 3:40 BREAK**

**3:40 – 5:00 SESSION 3**

**Session 3: Recharge Stories from Colorado**

*Aquifer recharge as a management strategy has been taking place for decades in some parts of Colorado*

- ➔ Where is it done? Why was it done? How is it done?
- ➔ Who pays? Who benefits?
- ➔ Where is the authority vested? Who makes the decisions?

**Moderator**

- ◆ Cortney Brand, R.W. Beck Co., Denver, CO

**Presenters**

- ◆ Gary Thompson, President, W.W. Wheeler & Associates, Englewood, CO  
(**Forty years history of the Widefield Channel Recharge Project - How the initial and subsequent legal challenges have been solved**)
- ◆ Steven Vandiver, General Manager, Rio Grande Water Conservancy District, Alamosa, CO  
(**How the Rio Grand River Compact impacts day to day operation decisions in the San Luis Valley**)
- ◆ Joe Frank, General Manger, Lower South Platte Water Conservancy District, Sterling, CO  
(**The challenges of water right constraints on recharge operations**)
- ◆ John Hendrick, General Manager, Centennial Water & Sanitation District, Highlands Ranch, CO  
(**Recharge of confined aquifers in the Denver Basin**)

**5:00 – 5:15 Summary of Day One - QUESTIONS and ANSWERS**

**Chair of Q & A session**

- ◆ MaryLou Smith, Vice-President, Aqua Engineering, Inc., Fort Collins, CO

**5:15 Cash Bar and Reception**

**8:00 – 8:30 Registration open**

**8:30 – 8:45 Framing the Issues for Day Two**

- ◆ Gary Barber, Recorder, Arkansas Basin Roundtable, Pueblo, CO and,
- ◆ MaryLou Smith, Vice President, Aqua Engineering, Inc., Ft. Collins, CO

**8:45 – 10:00 SESSION 4**

#### **Session 4: Practical Decision-making issues – The Problems**

- ➔ What are the sources of water for artificial recharge?  
Treated wastewater? Spring snow-melt river flow? Stormwater? Produce water from oil & gas?
- ➔ Are there environmental concerns related to the sources of recharge water?
- ➔ Are there currently regulatory or legal constraints to implementing artificial recharge?
- ➔ What type of water management institutions are needed for successful artificial recharge projects?
- ➔ Too much of a good thing? The perils of excessive recharge to alluvial ground water aquifers.

#### **Moderator**

- ◆ Don Shawcroft, Chairman of the Colorado Agricultural Water Alliance and VP of Farm Bureau, Centennial, CO

#### **Presenters**

- ◆ Tim Gates, Professor, Department of Civil and Environmental Engineering, CSU, Fort Collins, CO
- ◆ Lisa Voytko, Senior Project Manager, Stewart Environmental, Fort Collins, CO
- ◆ Kathy Hare, President, Upper Black Squirrel Creek Ground Water Management District, Peyton, CO
- ◆ Valois Shea, Environmental Scientist, EPA Region 8, Denver, CO

**10:00 – 10:15 COFFEE BREAK—brought to you by El Paso County Water Authority**

(Networking opportunity – meet the exhibitors)

**10:15 – 11:30 SESSION 5**

#### **Session 5: What is holding up our moving forward?**

- ➔ What are the opportunities to better use the alluvial aquifers of Colorado?
- ➔ What are the impediments to implementing those ideas?
- ➔ What is the next step to move the concept forward?

#### **Moderator**

- ◆ Deanna Durnford, Professor, Department of Civil and Environmental Engineering, CSU, Fort Collins, CO

#### **Presenters**

- ◆ Ralph Topper, Senior Hydrogeologist, Colorado Geological Survey, Denver, CO
- ◆ Gordon McCurry, Principal, CDM, Denver, CO
- ◆ Dennis McGrane, Associate, Leonard Rice Engineers, Denver, CO

**11:30 – 1:00 WORKING LUNCH SESSION FOR FORUM PARTICIPANTS**

#### **Identifying the Solutions**

- ◆ **Moderator / facilitator, MaryLou Smith, Vice-President, Aqua Engineering, Inc., Fort Collins, CO**

- ➔ Participant opportunity to contribute to the state's artificial recharge discussion
- ➔ Collective ideas from all participants in a table by table discussion over lunch
- ➔ Opportunity for ALL ideas and suggestions to be brought forward without attribution to specific individuals
- ➔ All ideas and suggestions will be incorporated in a post-forum report

**1:00 – 1:30 KEYNOTE PRESENTATION**

**Administration of Artificial Recharge for Maximum Utilization of Colorado's Water Resources**

◆ Dick Wolfe, Assistant State Engineer, Denver, CO

**1:30 – 3:15 SESSION 6**

**Session 6: Colorado Legislators**

- ➔ Ideas from Day 1 & Ideas/Concepts/Proposals from Working Lunch Session: Do any of these take us to a greater utilization of Colorado's groundwater?
- ➔ Do the interstate compacts dictate a different set of rules for each basin for alluvial aquifer management?
- ➔ What does it mean to recharge a designated basin with water subject to the 1969 Act?
- ➔ What are the challenges for the General Assembly?
- ➔ How can Colorado's water professionals assist the legislature?

**Moderator**

◆ Jim Broderick, Executive Director, Southeastern Colorado Water Conservancy District, Pueblo, CO

**Legislators**

- ◆ Kathleen Curry, Colorado State Representative, District 61  
*Chair, Agriculture, Livestock & Natural Resources Committee  
Local Government Committee*
- ◆ Cory Gardner Colorado State Representative, District 63  
*Agriculture, Livestock and Natural Resources Committee*
- ◆ Mary Hodge, Colorado State Representative, District 30  
*Agriculture, Livestock, and Natural Resources Committee  
Chair, Local Government Committee*
- ◆ Marsha Looper, Colorado State Representative, District 19  
*Agriculture, Livestock and Natural Resources Committee*
- ◆ Frank McNulty, Colorado State Representative, District 43  
*Agriculture, Livestock and Natural Resources Committee  
Appropriations Committee  
Transportation & Energy Committee*

**3:15 – 3:45 Update on the Progress of Basin Roundtable Initiatives**

◆ Eric Hecox, Manager, Office of Interbasin Compact Negotiations, DNR, Denver, CO

**3:45 – 4:00 Closing Remarks**

◆ Betty Konarski, President, El Paso County Water Authority, Colorado Springs, CO

**4:00 ADJOURN**



## **American Ground Water Trust**

The American Ground Water Trust is a national, non-profit public education organization that has been providing ground water information, awareness and education since 1986. The Trust's mission

- Promoting efficient and effective ground water management
- Communicating the environmental and economic value of ground water
- Showcasing ground water science and technology solutions
- Increasing citizen, community and decision-maker awareness
- Facilitating stakeholder participation in water resource decisions

## **Arkansas Basin Roundtables**

The Arkansas Basin Roundtable was formed simultaneously with the Interbasin Compact Committee and eight other basin roundtables as mandated by the Colorado legislature in the Colorado Water for the 21<sup>st</sup> Century Act in 2005. The fifty four voting members of the Arkansas Basin Roundtable represent all counties, municipalities and conservancy districts, along with individuals representing agriculture, recreation and the environment, within the Arkansas River basin. The Roundtable is supported by liaisons from the Colorado Water Conservation Board, state and federal agencies, and includes non-voting members who are stakeholders in the basin. The Arkansas Basin Roundtable approved funding for this conference via a grant from the Water Supply Reserve Account to further the understanding of groundwater and aquifer recharge issues in the State of Colorado.

## **Associations and Organizations Endorsing the Forum**

**American Council of Engineering Companies of Colorado**  
**American Public Works Association (Colorado Chapter)**  
**American Society of Civil Engineers (Colorado)**  
**American Water Resources Association (Colorado Chapter)**  
**Arkansas River Basin Water Forum**  
**Colorado Environmental Coalition**  
**Colorado Ground-Water Association**  
**Colorado Institute of Public Policy**  
**Colorado Water Congress**  
**Colorado Water Resources and Power Development Authority**  
**Colorado Water Resources Research Institute**  
**Colorado Watershed Assembly**  
**Colorado Water Well Contractors Association**  
**Colorado Beverage Association**  
**Natural Resources Law Center**  
**Trout Unlimited**  
**South Platte Forum**  
**Western Resource Advocates**  
**Western State College - Colorado Water Workshop**

## Ground Breaking Ground Water Conference Tackles Aquifer Recharge and Storage Policy Issues

by MaryLou Smith<sup>1</sup>, Vice President, Aqua Engineering, Inc.

What do Maryland Blue Crabs in a bushel basket have in common with the Prior Appropriate Doctrine? 250 participants in a ground-breaking ground water conference in Colorado Springs got the answer to that riddle from Gary Barber. Barber is executive director of El Paso County Water Authority, recorder for the Arkansas Basin Roundtable, and the person who had the idea for the conference in the first place.

Aquifer Recharge and Storage Policy was the theme of the conference held September 27 and 28 at the Colorado Springs Doubletree Inn. Not the technology of aquifer recharge and storage, but the politics of it. The legal issues, the management issues. Issues about where to get the water to store in aquifers. How to be sure the entity taking it out is the one entitled to it, and how much they get to take out. What kind of water quality standards should be applied. Whether the state needs a regulatory framework to guide these and a thousand other decisions, or whether the law as it stands gives us plenty of guidance already.

### The Organizers

El Paso County Water Authority has a myriad of problems to solve regarding ground water. They received funds from the Arkansas Basin Roundtable to help them do two things:

1. Study the Upper Black Squirrel groundwater basin and its potential for aquifer recharge.
2. Put on a conference about aquifer recharge and storage policy to try to get some discussion going about what's holding up Colorado using aquifer storage and recharge as actively as some of our neighboring states.

Concurrently, Representative Amy Stephens introduced a successful house joint resolution calling for the findings of the conference to be sent to Harris Sherman, director of the Colorado Department of Natural Resources, for voluntary peer review by appropriate state level officials and the House/Senate joint water resources review committee.

The Arkansas Basin Roundtable is one of the nine roundtables formed as part of the legislature's Colorado Water for the 21st Century Act, commonly known as the HB1177 process or the IBCC/Roundtable Process. It is charged by the state legislature to convene a wide array of stakeholders in the basin to make decisions about how best to meet the water challenges faced by the basin. The legislature has made funds available for the roundtables to support processes and projects to help achieve that goal—subject to approval by the Colorado Water Conservation Board (CWCB.)



Gary Barber visits with Peter Nichols

### The Studies

Organizers staged this conference as a direct “next step” following two pertinent research studies:

- “Artificial Recharge of Ground Water in Colorado—A Statewide Assessment” conducted by Colorado Geological Survey as requested by Greg Walcher, then DNR director, 2004. This study assessed “the best aquifers in Colorado for their artificial recharge potential of ground water based primarily on their hydrogeological suitability.”
- “SB06-193 Underground Water Storage Study—A Study of Potential Underground Water Storage Areas in the South Platte and Arkansas River Basins” conducted by Colorado Geological Survey for Colorado Water Conservation Board as directed by the state legislature. The study identifies sites hydrogeologically suited for aquifer recharge in those basins, but closes by saying “The lack of rules and regulations regarding withdrawal of stored water from alluvial aquifers has the potential to present a serious challenge to implementing underground water storage projects outside the Denver Basin, which has rules regarding underground water storage. It is recommended that the State Legislature, in conjunction with the Colorado Division of Water Resources and interested parties, enter a dialog on this issue with the hope of developing a regulatory framework that encourages underground water storage in all areas of the State.”

<sup>1</sup>MaryLou Smith was hired by El Paso County Water Authority to design and facilitate this conference in conjunction with the American Ground Water Trust.

During his presentation, Ralf Topper, one of the authors of both these studies stated that he thinks the conference “will be looked upon in the future as a turning point for aquifer recharge and storage in Colorado.”

### The Participants

In order to achieve the high expectations for this conference, organizers sought to draw a wide range of participants not just to sit and listen to a slate of speakers, but to actively engage in dialogue. They gained endorsement, sponsorship and participation from members of more than 20 associations, organizations, agencies and businesses, the diversity of which spans from Colorado Water Congress to Trout Unlimited, University of Colorado’s Natural Resources Law Center to Colorado Water Well Contractors Association, from Brown and Caldwell to Northern Colorado Water Conservancy District. (Financial sponsors include El Paso County Water Authority, Brown and Caldwell, Aqua Engineering, Colorado Springs Utilities, Western Resource Advocates, R.W. Beck, and Northern Colorado Water Conservancy District.)

So who came? Who participated in the dialogue? Here’s a sampling that shows the diversity:

- Robert Sakata, Brighton farmer
- Sara Duncan, Denver Water Board
- Manuel Montoya, Farmers’ Reservoir and Irrigation Company
- Jim Miller, Colorado Department of Agriculture
- SeEtta Moss, Arkansas Valley Audubon Society
- Bob Longenbaugh, Consulting engineer
- Peter Nichols, water attorney with Trout, Raley, Montano, Witwer & Freeman
- Mike Stiehl, Fremont County Commissioner
- Chris Treese, Colorado River Water Conservation District
- Mark Sponsler, Colorado Corn Growers
- Steve Witte, State Engineer’s Office
- Chris Woodka, Pueblo Chieftain
- Bea Crandal, Protect Our Wells

### The Presenters

Providing legal history, scientific fact, and experiential accounts was a critical requirement for this conference. Once again, organizers drew broadly and deeply. In addition to Greg Hobbs, Colorado Supreme Court Justice and Harris Sherman, director of the Colorado Department of Natural Resources, presenters included Fred Anderson, who served as president of the Colorado Senate during the years formative ground water legislation was passed. Other presenters:

- Policy makers and practioners from California, Idaho and Arizona and a representative from the EPA.
- Academicians Deanna Durnford from Colorado State University and Denise Fort from University of New Mexico.
- Water attorneys Michael Shimmin, Steve Simms, Melinda Kassen, David Robbins, and Sandy MacDougall.
- On the ground water managers and decision makers in Colorado such as Joe Frank, Lower South Platte Water Conservancy District; Steven Vandiver, Rio Grande Water Conservancy District; John Hendrick, Centennial Water and Sanitation; Gary Thompson, Widefield Channel Recharge Project, Kathy Hare, Upper Black Squirrel Ground Water Management District and Don Shawcroft, Colorado Farm Bureau and Colorado Ag Water Alliance.
- Researchers such as Ralf Topper from Colorado Geological Survey and Tim Gates from Colorado State University.
- Engineering consultants from CDM, Leonard Rice, R.W. Beck, and Stewart Environmental

### The Presentations

Harris Sherman kicked things off by relating a conversation he had with then state engineer Hal Simpson on Sherman’s first week back at the job as DNR director.

Sherman: “Hal, what keeps you awake at night?”  
 Simpson: “Groundwater, groundwater, groundwater”



Senator Fred Anderson discusses the history of the 1969 Act



Colorado Water Congress Executive Director Doug Kemper and his panel of water attorneys

“Now, I have inherited that insomnia,” Sherman told the audience. He went further to say that how to broaden utilization of groundwater uses without harming senior appropriators “is a chapter yet unwritten.” A tangible possibility Sherman raised is that of the state helping communities fund opportunities for recharge, through both CWCB construction funds and the IBCC Water Supply Reserve Account.

Orange County (California) Water District’s groundwater replenishment system provides water to 2.5 million people, according to Craig Miller, and they do it while leaving plenty of water in the ground. He pointed to a \$1.5 billion savings provided by the system’s natural filtration over traditional filtration.

Fred Anderson ruminated on what the atmosphere was like in the state capital 50 years ago when major groundwater bills were passed there in 1965 and 1969. He said there was more cross-pollination between the three branches of government then, which allowed for more flexibility to solve problems. He said when the justices asked the legislature to recodify water law to allow for conjunctive use of groundwater with surface water, they were clear in saying “but don’t kill the well users—the state can’t afford the economy we would lose.” Anderson stated that we store 10.5 MAF of water under the South Platte and then asked, “Why can’t we take out 1 MAF of that each year and put it to good use?”

Colorado Supreme Court Justice Greg Hobbs gave his traditional rundown on Colorado Water Law, pausing heavy

on the ground water chapters, and reminding participants that Colorado water is owned by the people of Colorado. Only the right to appropriate the water for beneficial use is a private property right.

Alexander Davis, DNR assistant director for Water gave a brief summary of the work of Governor Ritter’s South Platte Wells Task Force. She cited two bills that are likely to come out of the work of the task force, and an effort to streamline water court which is being headed up by Rebecca Love Kourlis. Was the task force successful? From the point of view of opening dialogue and educating, it can be seen as a success, she said.

Karl Dreher, now with Brown and Caldwell, earlier director of Idaho’s Department of Water Resources, talked about the Idaho high tech manufacturer Micron Technology and how they recharged very junior unappropriated water from spring runoff on the Boise River into injection wells to provide exceptionally high quality water to manufacture memory devices.

Melinda Kassen of Trout Unlimited reminded participants that “big dams create barriers to fish. Storing water underground does not.” She discussed further the potential for environmental enhancement through groundwater recharge, but cautioned that water quality issues must be carefully monitored.

“Who owns an aquifer?” asked Sandy MacDougal. I may own the beds and the banks of a stream on my land, he



said, but the state owns the water in that stream. If the state owns the water that fills the space under my land, do I own the space itself?

Gary Thompson introduced participants to the successful Widefield Channel Recharge Project beneath Fountain Creek in the Arkansas Basin. The project provides a sustainable and renewable supply of groundwater for municipal and irrigation use. Thompson relayed the history of the project going back to 1975 when well users were embroiled in conflict over shortages related to location and timing. He said that a combination of good modeling and an attitude of “enlightened self interest” lead to a successful resolution of the conflicts and a smoothly functioning project today.

Challenges overcome and remaining were addressed by managers of two different water districts in two different areas of the state. Joe Frank from Lower South Platte Water Conservancy District presented “The Good, the Bad, and the Ugly of Managed Recharge—Lower South Platte Alluvium.” From the other end of the state, Steve Vandiver from Rio Grande Water Conservation District showed a dramatic slide of the San Luis Valley in which the wells in a relatively small area are so dense that all the dots representing the wells blurred together in a solid mass.

Kathy Hare, president of the Upper Black Squirrel Ground Water Management District had a stark set of slides to present as well. She started off by asserting that her district is in dire need of recharge but hasn’t the financial or technical resources required. She cited a 1999 state engineer’s report that said, “Based on the current decline in alluvial saturated thickness, the useful life of the aquifer is estimated to be 41.71 years. However if the proposed municipal use of 7300 acre-feet annually is realized, this useful life will decrease dramatically.”

Assistant state engineer Dick Wolfe cautioned participants that “as more surface water is used, there will be less available for recharge opportunities.”

Asked to speak about aquifer recharge and implications for Colorado’s interstate compacts, David Robbins asserted that not one of the nine compacts Colorado has with neighboring states mentions ground water. However, he said, all those compacts definitely affect what we can do in terms of using our ground water. He brought up the problem of putting water away when you don’t need it yet, when people who do need it now are being turned away.

Mike Shimmin reminded participants that aquifers do not just store water, they conduct water, too. And most aquifers do both continuously. He said “unconfined aquifers are plentiful, but the water is not going to stay put. Alluvial aquifers do not provide secure storage.” Therefore, he said, it is best to recharge only in aquifers where not much movement is happening—unless you can impound the water somehow.

Steve Sims agreed with Shimmins assessment, and followed up by pointing out that Aurora is planning to do just that in its Prairie Waters Project.. They propose to build a liner for containment of the groundwater and at the same time deal with the question “how do you maintain dominion and control?” Water quality is a primary goal of the project, which will include 200 acres of sand infiltration basins.

Colorado State University professor Tim Gates discussed “Too Much of a Good Thing—Possible Perils of Excess Recharge in Alluvial Aquifers” and demonstrated that in some areas of the lower Arkansas basin, rising water tables are contributing to actual loss of water as it comes to the surface and evaporates. Salinity is, of course, a significant problem in these areas.

## The Dialogue

Participants asked a number of highly targeted questions of presenters, which lead to rich dialogue on a number of points. However, one subject of dialogue of particular note is that of whether we need new legislation.

- Do we need new legislation regarding aquifer recharge or are the statutes we currently have doing the job?

Denise Fort, from University of New Mexico’s School of Law and currently serving as a member of the National Academy of Sciences Committee on “Sustainable Underground Storage of Recoverable Water” had this to say: “States need to enact statutory systems for aquifer recharge and recovery so that we don’t have such high transaction (legal) costs.” She said that states need to provide a “path through the process.”

Colorado Geological Survey researcher Ralf Topper called for the “preparation and promulgation of a legal framework for aquifer recharge and storage statewide.” He said that rules currently exist only for the non-designated portions of the Denver Basin and for augmentation plans, and that there is uncertainty regarding legal status and disposition of recharged water. Furthermore, he stated that “existing water laws are inapplicable or biased with respect to recharging groundwater.”

On the other hand, water attorney Mike Shimmin said that we don’t need any new law for aquifer recharge. He said the law is not the source of the problem, the facts are. “How do you implement legal concepts in the real world?” he asked. He answered the question by asserting that the water court system is our mechanism for implementing those concepts. Shimmin contends that the water court provides all the assistance needed, and that the eight “elements of proof to acquire an underground right” handed down by Colorado’s Supreme Court in the Park County Sportsmen’s Ranch case gives us plenty of direction.

Eight “elements of proof to acquire an underground right” handed down by Colorado’s Supreme Court in the Park County Sportsmen’s Ranch case:

1. Must capture, possess, and control the water it intends to put into the aquifer;
2. Must not injure other water use rights, either surface or underground, by appropriating the water for recharge;
3. Must not injure water use rights, either surface or underground, as a result of recharging the aquifer and storing water in it;
4. Must show that the aquifer is capable of accommodating the stored water without injuring other water use rights;
5. Must show that the storage will not tortiously interfere with overlying landowners’ use and enjoyment of their property;
6. Must not physically invade the property of another by activities such as directional drilling, or occupancy by recharge structures or extraction wells, without proceeding under the procedures for eminent domain;
7. Must have the intent and ability to recapture and use the stored water; and
8. Must have an accurate means for measuring and accounting for the water stored and extracted from storage in the aquifer.

### The Legislative Panel

In keeping with the intent of raising issues and promoting potential solutions regarding aquifer recharge and storage policy, organizers invited a number of legislators to participate in a panel moderated by Jim Broderick from Southeastern Colorado Water Conservancy District. As Representative Kathleen Curry pointed out, all panel members were from the House and all are members of the House Ag Committee which she chairs. In his typical “Phil Donahue style” Broderick warmed up the panel by asking their views on education about groundwater. “This conference has been an excellent example of that!” responded Representative Mary Hodge, the only legislator to attend the entire conference from start to end.

The discussion moved to the question of how legislators could become more collaborative, to come up with better solutions. Representative Curry stated that “legislators need to be given authority to be more collaborative.” Committees are a good place to start, she said. She promised to do even more as chairman of the House Ag Committee to create an environment where legislators come to the table ready to work instead of coming with their positions already formed and hoping for a rubber stamp. Representative Marsha Looper praised Curry for her leadership in that direction.

When asked if they could support funding for a statewide aquifer recharge project, most of the legislators answered yes. However, Representative Curry cautioned against the strings that could be attached for a given basin if such a project came about through state funding.



A Panel of Colorado House Representatives discusses compromise and collaboration



When asked by former Colorado secretary of agriculture Don Ament whether they would be willing to give the state engineer more authority/flexibility to put water to beneficial use (but with a number of carefully calculated restrictions in place such as reliance on DSS—decision support systems) Representatives Cory Gardner and Frank McNulty gave a cautiously qualified yes—“if private property rights are respected.”

Not having been present for the first day’s dialogue in regard to the need for more legislation, Representative Curry asked if the conference had resulted in consensus that we need new law regarding aquifer recharge. The answer is “No.” said Eric Hecox, who closed the conference by summarizing the two days. He pointed out that though the conference fostered a healthy dialogue on the subject, some believe that the law is working just fine—“it all comes out in water court”—while some believe transaction costs are too high—“we are spending too much money on water attorneys.” Some think we have a good system in place, and that we just have to look at each project on a case-by-case basis. Others think looking at things on a “case by case” basis is too expensive, and holds things up.

## The Conclusion

Did the conference meet expectations? What will the draft report submitted to Harris Sherman say?

Hecox, who is the manager of the Interbasin Compact Process for the Department of Natural Resources cited the conference as a very successful example of what the Colorado Water for the 21st Century Act—the IBCC/Roundtables process—is trying to accomplish. He said the stage is set for the roundtables to move into actively tackling the difficult issues. He is hopeful the process will continue to foster dialogue, and reduce the historical tendency for lining up with our respective positions. He said the conference in its design and implementation was effective in that it allowed for active dialogue, not just a series of presentations by experts.

Reminding participants that the next step is for conference organizers to work with the Arkansas Basin Roundtable to present a draft report to Harris Sherman, Hecox asked all participants to consider forwarding to him any comments they had for inclusion in the report.

So back to that bushel of Maryland Blue Crabs. What do they have in common with the Prior Appropriation Doctrine? Gary Barber had the crowd listening intently for that answer as he showed a graphic that asserted that perhaps we need to move beyond the concept of winners and losers. And that maybe we need to move, even, beyond the

probably unreachable ideal of both sides coming out winners. (That, he said, requires that you make a bigger pie, something that he doesn’t see happening with Colorado water.) Maybe, he said, we need to aim for a status which he called “not losing.”

He told the story of catching a bushel of Maryland Blue Crabs and being puzzled, while he was waiting for the pot of water to boil in which they would be cooked, that they were not jumping out of the basket. “Don’t we need to put a lid on the basket?” he asked his father-in-law. Turns out that the crabs have a habit of reaching out and grabbing hold of one another which prevents any of them from jumping out of the basket. They have a protective instinct to oppose everything that invades their domain. The result is that they all end up in hot water.

Barber warned that Coloradoans may be in a similar fix. While prior appropriation has worked brilliantly for more than a hundred years, it does rely on an adversarial process. Do we have the courage and the vision to change it to allow us to cooperate and save ourselves from the boiling water?

At the interactive lunch session, in which participants at each table were asked to discuss a series of questions and come up with observations of their own, one group came up with a simple but possibly very useful idea.

They suggested that a water court category be created for a “statement of interest” in new applications, that would allow interested parties to receive all information in the case without having to file as an “objector.” Why automatically set up an adversarial atmosphere when many “objectors” are simply registering in order to be kept informed of the proceedings?

Perhaps this and the one or two hundred other suggestions written on the cards during this small group exercise will play an important part in moving Colorado forward in the arena of aquifer recharge and storage.

As Betty Konarski, president of El Paso County Water Authority said as she wished everyone a safe journey home, we must now act. The “highest and best use of the water resources of Colorado” depends on it.

**AUTHOR'S CORRECTIONS TO THIS ARTICLE:**  
**The SBO6-193 Underground Water Storage Study-A Study of Potential Underground Water Storage Areas in the South Platte and Arkansas River Basins is incorrectly attributed to the Colorado Geological Survey. The study was actually conducted by Camp Dresser & McKee.**

## Presenters and Moderators - Biographical Information

**Fred E. Anderson, Senator:** Senator Anderson was first elected to the Colorado State Senate in 1966. He is a 4th generation Coloradan who was raised and worked on a farm and feeding operation east of Loveland. He served sixteen years in the senate before retiring in 1982. During his service in the senate, he was elected President of the Senate for eight years. The major focus of his legislative work was Colorado water law. He carried a majority of legislation in both water rights and water quality. He served as president of the National Conference of State Legislatures and on the national Commission on Intergovernmental Relations. He was in the State Senate when the Colorado Legislature recodified Colorado water law in 1969.

**Garald L. (Gary) Barber:** Mr. Barber is a graduate of Manitou Springs High School ('72) and the U.S.A.F. Academy ('76). Gary pursued a career in commercial real estate development in the Washington, D.C. area in the mid-80's. That led to a role as Development Manager of a private toll road company in Leesburg, Virginia, where he gained experience in the privatization of public works. Since a return to Colorado in 1993, Gary has been involved in commercial real estate brokerage, water rights brokerage and consulting to government entities on water resource development. He currently represents the El Paso County Water Authority and the Pikes Peak Regional Water Authority. He was active in the Statewide Water Supply Initiative and serves as the Recorder for the Arkansas Basin Roundtable.

**Cortney C. Brand, R.W. Beck, Inc.:** Mr. Brand is a Senior Consultant with R.W. Beck in Denver, Colorado. He previously worked in the Water Supply Department at Colorado Springs Utilities, and as a water resources consultant for URS Corporation. He holds Bachelor's and Master's degrees in Geology, as well as a Master's degree in Business Administration. He specializes in water supply planning and development, water rights, aquifer storage and recovery (ASR), program management, and utility business administration. He previously served as Colorado Springs' representative on the SWSI Phase II Alternative Agricultural Transfers Technical Roundtable and the South Platte Basin Roundtable, and currently serves on the Board of Directors of the Castle Pines North Metropolitan District.

Mr. Brand has been involved with underground water storage projects in several Western states, both as a consultant and as an owner. He has planned and conducted feasibility studies as well as permitted and implemented pilot- and full-scale programs. He is very familiar with groundwater recharge techniques and applications, and understands the water rights and policy-related issues associated with underground water storage.

**James W. Broderick, Southeastern Colorado Water Conservancy District:** Mr. Broderick has over 20 years experience in water. Hired in January 2003 by the Board of Directors to serve the Southeastern Colorado Water Conservancy District as Executive Director, due to his vast knowledge in water. During his tenure with Tucson Water he embraced the titles of Business Administrator, Project Manager, Chief Operation Officer, and Management Coordinator. Mr. Broderick currently serves on the Colorado River Advisory Council, the Arkansas Valley Preservation Committee, Statewide Water Initiative Roundtable Committee, as a Board of Director member of the Colorado River Water Users Association, a member of the National Water Resources Association, a member of the Family Farm Alliance Advisory Committee, Colorado State University's Colorado Water Resource Institute Advisory Committee, and is an Advisory member of the National Water Resources Association's and Family Farm Alliance Bureau of Reclamation's Action Plan for the 21<sup>st</sup> Century Managing for Excellence Program. He received his Masters degree specializing in Public Management and Environmental Resource Planning, and has a Bachelors degree in Public Administration and Policy in Environmental Science, Biology, Chemistry, Economics and Political Science. Mr. Broderick is married to Cindy and has a daughter, Amy.

**Kathleen Curry, House Representative, District 61:** Representative Curry is the Chair of the House Committee on Agriculture, Livestock and Natural Resources. She was elected in 2004 to the house and has served 3 years. Rep. Curry lives in Gunnison when she is not in Denver and has two sons, aged 11 and 14. She and her husband ranch and run a natural beef business. Rep. Curry got her graduate degree at CSU in water management and specialized in irrigation systems. Rep. Curry is a Colorado native and has worked in the water industry her entire career.

**Alexandra Davis, Colorado Division of Water Resources:** Ms. Davis works with the Colorado Division of Water Resources, the Colorado Water Conservation Board, the Division of Wildlife and other state agencies regarding interstate river compacts, state water rights issues and federal reserved water rights.

Ms Davis was the First Assistant Attorney General in Colorado prior to joining the Natural Resources Department. In her previous role, she supervised the attorneys working in the attorney general's water unit. She served as an assistant attorney general, litigating water rights cases for the State Engineer's Office, the Colorado Water Conservation Board and the Division of Wildlife for over 11 years. She spent one year in Billings Montana, as a Special Assistant U.S. Attorney representing the Department of Interior Agencies in the Montana general water rights adjudication.

She is a graduate of Pitzer College in California and the University of Colorado School of Law.

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**Karl J. Dreher, Brown and Caldwell:** Mr. Dreher is Vice President of Brown and Caldwell and has more than 30 years of experience in developing and managing water resources covering a broad spectrum of disciplines including water law, water policy, hydrologic analysis and modeling, environmental issues, interstate negotiations, planning, program and project management, construction management, personnel management, contract negotiations, hydraulic analysis and design, structural analysis and design, water treatment, and permitting for projects. Mr. Dreher has been involved with water resource issues and projects in various countries throughout the world and has served as a consultant to a number of public as well as private organizations engaged in the development and management of water resources. From 1995 through 2006, he was Director of the Idaho Department of Water Resources, and from 2002 through 2004 he was also chairman of the Western States Water Council, an adjunct of the Western Governors Association.

**Deanna Durnford, Colorado State University:** Dr. Durnford is Professor of Civil Engineering at Colorado State University. She has a B.S. from the University of Wisconsin and M.S. and Ph.D. degrees from Colorado State University. Her research concerns are in groundwater contamination, the flow of immiscible organics in porous media, and transport processes in the vadose zone. Specific areas of interest include the physics of gasoline, jet fuel, and other immiscible contaminants in soils; laboratory studies of leaching and hydraulic properties; solute transport processes; and the use of models for pesticide pollution potential. Her work has been funded by the National Science Foundation, the Colorado Water Resources Research Institute, and the U. S. Air Force. Previously, she worked as a consulting engineer and as a faculty member at Cornell University and as a Faculty Fellow at the Environics Laboratory, Tyndall Air Force Base.

**Denise Fort, University of New Mexico:** Dr. Fort is the Director of the Water Resources Administration Program and a member of the faculty at the University of New Mexico's School of Law. She has been a member of the New Mexico Bar since 1976. Ms. Fort has extensive experience in environmental and natural resources law and policy. She currently serves as a member of the National Academy of Sciences Committee on "Sustainable Underground Storage of Recoverable Water",

In the mid 90's she served as chair of the Western Water Policy Review Advisory Commission, a Presidential commission that prepared a report on western water policy concerns. In earlier positions, she served as director of New Mexico's Environmental Improvement Division, as a staff representative to the National Governors Association, as an environmental attorney, and in other capacities concerned with environmental and natural resource matters.

Fort began her career as an environmental attorney with New Mexico Public Interest Research Group and Southwest Research and Information Center then became a special assistant attorney general in the state's Taxation and Revenue Department. When she was 31, she served as cabinet secretary of the state Taxation and Revenue Department. She moved on to head the state Environmental Improvement Division.

In 1991, Professor Fort became director of the Water Resources Administration Program at UNM and also joined the law school faculty at that time. Fort has published extensively and spoken at numerous conferences on water issues. She continues to serve on the boards of a variety of environmental organizations; most recently, she founded the Western Water Alliance, in an effort to bring together people concerned about water issues throughout the West. She received her B.A. from St. John's College and her J.D. from the Catholic University of America's School of Law.

**Joe M. Frank, Lower South Platte Water Conservancy District:** Mr. Frank is the General Manager for the Lower South Platte Water Conservancy District. He has been with the District for nearly four years and has served as the manager for three years. The District serves approximately 400,000 acres in Morgan, Washington, Logan and Sedgwick Counties in Northeastern Colorado. He also represents the District on the South Platte Basin Roundtable, is a board member of Colorado Water Congress, and sits on various committees for the Statewide Water Supply Initiative and the South Platte Decision Support System. He previously worked for JeHN Engineering in Arvada as a Project Manager. He holds a Bachelor's degree in Civil Engineering from the Colorado School of Mines and is a licensed Professional Engineer in the State of Colorado. Mr. Frank also manages the District 64 Reservoir Company, provides augmentation accounting for numerous well users' groups, and provides technical assistance and coordination in developing and operating various augmentation plans and water supply projects.

**Cory Gardner, House Representative, District 63:** Representative Gardner is a fifth generation Coloradan, hailing from the agricultural community of Yuma, Colorado. After graduating from Colorado State University, Cory enrolled in the University of Colorado School of Law. Shortly after graduation from law school, he began working for the National Corn Growers Association, eventually serving as the organization's Director of Communications. In 2002, Cory joined the staff of U.S. Senator Wayne Allard. While in Senator Allard's office, Cory served as Legislative Director and General Counsel. In June 2005, a vacancy committee appointed Cory to the Colorado House of Representatives. He was elected to his first full term in November of 2006. Cory has worked hard to represent rural Colorado and agriculture, passing legislation to increase renewable fuel use and development, increase telemedicine opportunities across the state, to expand renewable energy development and to promote Colorado agriculture. Gardner serves on the House Agriculture and Education committees, as well as on the Water Resources Committee. Representative Gardner has been named legislator of the year by the Colorado Livestock Association, Colorado Corn Growers Association and Champion of Rural Colorado by the Independent Bankers. He

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maintains a private law practice and remains active in the family farm equipment dealership, a business started by his great-granddad in 1915. He and his wife, Jaime, have a three year old daughter, Alyson Grace.

**Timothy K. Gates, Colorado State University:** Dr. Gates is a water resources systems engineer and a Professor of Civil and Environmental Engineering at Colorado State University. Prof. Gates has served on the faculty at CSU for eighteen years where he has taught academic courses in open channel flow, fluid mechanics, hydraulic engineering, hydraulic structures/systems, hydrology, groundwater engineering, and solid dynamics. His research has focused on analysis, design and operation of open channel flow systems; stochastic simulation and optimization of water resources systems; modeling and analysis of shallow groundwater flow and salt transport; management of water quality (especially salinity and selenium) for irrigated agriculture; drainage of salinity affected regions; multi objective river basin planning; and monitoring and evaluation of irrigation and drainage systems.

Prof. Gates has directed or co-directed numerous research and training projects over the last 19 years, including leading an extensive research effort involving field data collection and modeling of the irrigation-stream-aquifer system of the Lower Arkansas River Valley in Colorado for the last 8 years. In addition, he has served as an independent consulting engineer with the United States Agency for International Development; the United Nations Development Program; Camp, Dresser & McKee, Inc.; Keller-Bliesner Engineering; D'Appolonia Environmental Services; the Denver Water Dept., the Governance Committee of the Platte River Cooperative Agreement, Devon Energy, Pennaco, ARCADIS & GM, the Riverside Ditch Company, Greg Lewicki and Associates, and the City of Pueblo Wastewater Department on projects related to irrigation-and-drainage hydraulics, salinization of irrigated agricultural regions, water quality for irrigated agriculture, irrigation-induced pollutant loading to rivers, and river-basin modeling.

He has designed and conducted numerous short courses and special training programs in open channel flow, irrigation and drainage engineering, and groundwater. Prof. Gates spent a total of about four years in Egypt working on various irrigation projects. He also has consulted in India, Sri Lanka, and Australia on irrigation projects.

**Alan Hamel, Arkansas Round Table:** Mr. Hamel was appointed as Executive Director of the Board of Water Works of Pueblo in September of 1982. He began his water career as a student in 1960, when he was employed for two summers before being hired as a fulltime pump station operator in 1962. He held various management positions within the organization before accepting the Executive Director position. Alan earned his bachelor of science degree in Business Administration from CSU-Pueblo. Within the local community, he is currently vice-chair of the Historic Arkansas Riverwalk of Pueblo and from 1994 to 2001 served on the Historic Arkansas of Pueblo Commission (past chair). He has been active since 1993, as an ex-officio Board member of the Pueblo Economic Development Corporation. For sixteen years Alan was a director with the Southeastern Colorado Water Conservancy District (past chair), and he maintains involvement in that group in an advisory capacity. In addition, he serves as a board member with the Colorado Foundation for Water Education. He is actively involved in the Colorado State Interbasin Compact Committee (vice-chair) and its ancillary group, the Arkansas Basin Roundtable (chair). In conjunction with that, he has been a member of the Statewide Water Supply Initiative since its inception. Professionally he is a member of the American Water Works Association (George Warren Fuller awardee in 2003) and its section group, the Rocky Mountain AWWA (Council member, trustee). Alan was appointed by the State Governor to serve on the following: Colorado Water Conservation Board (vice chair) from 1995-1999; Colorado Water Resources Power Development Authority (1993-1997); Front Range Water Forum & Arkansas River Coordinating Committee (1995-1996).

**Cathy Hare, Upper Black Squirrel Creek Ground Water Management District:** Ms. Hare is a writer and journalist for the New Falcon Herald, and serves as President of the Board of the Upper Black Squirrel Creek Ground Water Management District. She graduated from the University of Colorado, Colorado Springs with a major in environmental science. As a long time resident of El Paso County, with concerns about development and resource issues she has taken an active role in promoting water conservation and water management for sustainability, first as a member of the Falcon Property Owners' Association and in recent years as an elected member of the UBSCGWMD Board.

**Eric Hecox, Interbasin Compact Process, DNR:** Mr. Hecox manages the Interbasin Compact Process for the State of Colorado. The Interbasin Compact Process was created in 2005 through the Colorado Water for the 21st Century Act (HB05-1177), a law that recognizes that meeting the state's water needs required a new process for negotiating and managing Colorado's complex water issues. At the heart of this process is the fundamental notion that dialogue and understanding – between users and between basins – is essential to meeting our long-term needs. To implement this process and encourage dialogue, the legislation created the Interbasin Compact Committee (IBCC) and nine Basin Roundtables. Eric manages the implementation of this process and coordinates the activities of the nine Basin Roundtables and the IBCC.

Prior to joining the State, Eric served as a Natural Resource Specialist to the Bureau of Land Management's National Science and Technology Center under a Presidential Management Fellowship. Under the Presidential Management Fellowship program, Eric worked on rotation with DNR where he assisted Director George in researching and developing the idea of interbasin compacts and provided a framework for House Bill 05-1177 "Colorado Water for the 21<sup>st</sup> Century Act."

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As a Presidential Management Fellow with the Bureau of Land Management, Eric provided expertise to federal, state, and field offices on water rights, water quality, water management, and water policy. In this capacity he also taught water rights courses in Montana and New Mexico, compiled state water quality law summaries, and developed an on-line Introduction to Water Law course.

Eric received his B.A. in biology from Lawrence University and prior to graduate school was a Fulbright Scholar at the University of Zimbabwe where he studied community-based natural resource management. He earned a Masters of Science in Environmental Science and a Masters of Public Affairs from Indiana University. As a graduate student, Eric completed a thesis entitled "Collaborative Water Resource Management: Stakeholder Participation in the Colorado River Basin."

**John D. Hendrick, Centennial Water and Sanitation District:** Dr. John Hendrick has been active in water supply development and district management for the 22,000-acre Highlands Ranch development near Denver, Colorado since its beginnings. His experience with Colorado water rights and water development dates from 1967 when he first worked on the Fryingpan-Arkansas Project as a hydraulic engineer with the Bureau of Reclamation in Pueblo. He was instrumental in developing surface water sources to meet the majority of supply for Highlands Ranch in addition to the deep well groundwater system.

John is a registered Professional Engineer and has a Ph.D. degree in civil engineering from Colorado State University, and undergraduate degrees from the University of Illinois and Cornell University.

As a Director and past president of the South Metro Water Supply Authority, he plays a major role in guiding cooperative regional water supply planning. He is also past president of the Rotary Club of Littleton, President of the Metro Denver Water Authority, and a board member of the Douglas County Water Resources Authority. He is the General Manager of the Centennial Water and Sanitation District which serves Highlands Ranch.

**Gregory Hobbs, Colorado Supreme Court:** Justice Hobbs was appointed to the Colorado Supreme Court by former Governor Roy Romer in 1996. Colorado voters retained him for a 10-year term which expires in 2009. He was born in Gainesville, Florida in 1944. He received A.B. in History, Magna Cum Laude, from University of Notre Dame, 1966 and received J.D. from the University of California at Berkeley (Boalt Hall), 1971. After law school, he clerked for Judge William Doyle on the 10th Circuit and took up private practice in San Francisco. He moved back to Denver in October, 1973 where he joined the Environmental Protection Agency doing air pollution enforcement. He then moved to the Colorado Attorney General's Office. He returned to private practice, joining Davis, Graham, & Stubbs in 1979 where he started working for the Northern Colorado Water Conservancy District and became their general counsel.

Justice Hobbs is a Member of the American, Colorado and Denver Bar Associations, American Bar Foundation, Colorado Bar Foundation. Admitted to practice in Colorado and California (inactive). Former Adjunct Professor, Environmental Law, Master's Program in Environmental Policy and Management, University of Denver. He serves as Vice-President of the Colorado Foundation for Water Education; Co-Convener, Dividing the Waters (Western Water Judges Project). Former Vice-Chair, Colorado Air Quality Commission. He taught sixth grade in New York City and served with the Peace Corps in South America.

**Diane Hoppe, Colorado Foundation for Water Education:** Ms. Hoppe has more than 20 year of experience working on water and natural resource issues. Prior to employment as a water resources consultant, she worked in both the public policy arena and private sector before serving eight years in the Colorado General Assembly. Representative Hoppe was the first woman to chair the House Agriculture, Livestock and Natural Resources Committee and in addition to other legislative duties she served in a leadership capacity as the House Minority Whip.

A native of Sterling, Colorado, she is a founding member of the Colorado Foundation for Water Education and is the President of the Foundation's Board of Directors.

**Gregg A. Houtz, Department of Water Resources, State of Arizona:** Mr. Houtz has been with the Arizona Department of Water Resources since 1994. As Deputy Counsel with the Department's Legal Division, Gregg's work includes Colorado River, Arizona Water Banking Authority, tribal water issues and settlements, underground storage and recovery projects, rural planning, and environmental issues.

Prior service includes: legislative counsel to the Secretary of the Interior; minority counsel to the U.S. House of Representatives Committee on Interior and Insular Affairs; district director for Arizona U.S. Congressman Jay Rhodes; and a private consultant. Gregg received his Juris Doctorate from the Georgetown University Law Center, Washington, D.C.

**Melinda Kassen, Trout Unlimited:** Ms. Kassen directs Trout Unlimited's Western Water Project, whose mission is to protect and restore coldwater fisheries and their habitat by ensuring sufficient flows of clean water. Since 1998, in Colorado, the project has helped expand the state's instream flow protection program, successfully defeated several proposed water projects that would have threatened fisheries, preserved the US Forest Service's duty to protect flows during permitting, and issued a number of reports, including most recently *Gone to the Well Once Too Often*, which explains why river

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advocates should care about ground water management. She is the environmental and recreational interest representative on Colorado's Interbasin Water Compact Committee. Her water experience includes working at the Environmental Defense Fund's Rocky Mountain Office, where she was involved in the fight to stop Two Forks Dam and representing water quality and water rights clients with the Colorado Attorney General, including the Water Conservation Board for its instream flow program. Melinda also worked for ICF Kaiser, primarily on the clean up of the Rocky Flats site, was Environmental Counsel to the House Armed Services Committee in the 103rd Congress,, spent a year teaching environmental and administrative law courses at the University of Denver College of Law and started her law career as a prosecutor in Los Angeles. Born and raised in Cleveland, Ohio, she graduated from Dartmouth College *magna cum laude* and from Stanford Law School.

**Doug Kemper, Colorado Water Congress:** Mr. Kemper is the Executive Director of the Colorado Water Congress. He served on the Board of Directors from 1990 through 2003 and was elected CWC President (1994) and Treasurer (1996-2003). Prior to joining the Water Congress, Doug spent 20 years as the Water Resources Manager with Aurora Water. He was responsible for the planning, development, and operation of the city's raw water supply system. His activities included water policy and legislative analysis, acquisition of new water supplies, system modeling, and development of intergovernmental agreements.

Doug began his water resources experience by working for 4 years as an engineer with Rocky Mountain Consultants (now Deere & Ault). His primary duties were analysis of agricultural water use, water supply modeling, dam safety risk assessments, and water quality remediation studies. He holds degrees in Water Resources Engineering from University of Colorado (Masters) and Vanderbilt University (Bachelors) and is a registered Professional Engineer.

**Betty Konarski, El Paso County Water Authority:** Ms. Konarski, Ed.D., is President of El Paso County Water Authority. Betty is the former mayor of the Town of Monument and is Vice President Rampart Realty, Inc. Dr. Konarski has spent her professional life alternating between business and higher education administration. In 1998 she vacated her position as Associate Dean of the School for Professional Studies with Regis University, in Denver, Colorado. Prior to her role with Regis, she directed the Small Business Development Center at Seattle University's Albers School of Business and operated three retail businesses within a shopping center she was part of developing.

While in the Northwest, she served on the Boards of Directors of The Greater Seattle Chamber of Commerce, Seattle/King County Economic Development Council, the Private Industry Council, United Way of King County, and Leadership Tomorrow of Seattle/King County. She has recently joined a group of Tri-Lakes community members to start Tri-Lakes Views, a not-for-profit organization to support the arts and preserve the history of the area.

Dr. Konarski has published and delivered presentations on the topics of small business, the preparation of managers for international assignment, and developing leadership at all levels of an organization. In addition to many presentations across the United States, international presentations include Guongzhou, People's Republic of China, Wanganui, New Zealand, and Brisbane, Australia.

**Robert Longenbaugh, Consultant Engineer:** Mr. Longenbaugh was born in Durango, Colorado and grew up on an irrigated farm northwest of Cortez. He is a registered professional engineer in Colorado and has both BS and MS degrees from the Ag Engineering Department at Colorado State University.

He dedicated his professional career for 19 years at Colorado State University teaching and doing research on ground water hydrology and related topics, followed by 11 years as the Assistant State Engineer for Groundwater issues in the Colorado State Engineer's Office. Since 1991, he has practiced as a part time consultant water resource engineer and donated significant amounts of his time for public and professional education on the many important issues relative to the use and protection of groundwater, one of Colorado's most valuable resources.

Longenbaugh has served on the organization committee for this conference plus previous artificial recharge conferences sponsored by American Ground Water Trust.

**Marsha Looper, State Representative, District 19:** Ms Looper is a former IBM Network Engineer and a Novell Systems Engineer. Marsha started her own company, Computing Solutions Group, in 1993. She is now a partner in Big Sky Realty, and also owns and operates Phoenix & Associates, a small home building and remodeling company.

Marsha is the former Executive Director of a statewide coalition she helped form, Colorado Citizens for Property Rights, and Chair of the Eastern Plains Citizens Coalition, which opposes the Front Range Toll Road. Marsha currently belongs to the local, state and national Associations of Realtors, the NRA, and Pikes Peak Firearms Coalition, and is also a member of the El Paso County Soil and Water Conservation Society

As well as working the family's ranch in Calhan, the Loopers were co-owners of Waterworks Sales, a multi-state water and sewer pipe distribution company which was ultimately purchased by a national corporation, Hughes Supply, Inc. Lynn remains there as branch manager, but finds time to be active with the Pikes Peak Range Riders and to work on their "Pikes Peak Pivots" committee, which promotes our acclaimed Peaks Peak or Bust Rodeo throughout the country.

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**Sandy MacDougall, MacDougall Woldridge & Worley, PC:** Mr. MacDougall has been a student of Colorado Water Law since the 1960s. First inspired by Professor Clyde O. Martz at the University of Colorado Law School, Sandy spent his first year after graduation in 1962 as law clerk to Hon. Jean S. Breitenstein, Judge of the U.S. Court of Appeals for the Tenth Circuit. Judge Breitenstein was a scholar-advocate of Colorado Water Law. In 1963, Sandy was fortunate to land what amounted to on-the-job training as a staff attorney for the Board of Water Commissioners of the City and County of Denver. Chief counsel Glenn G. Saunders was one of the leading water lawyers in Colorado. Sandy left Denver for Colorado Springs in 1968, and now practices with the firm of MacDougall Woldridge & Worley, P.C., where he continues to study and practice Colorado Water Law.

**Gordon McCurry, Camp Dresser & McKee:** Dr. McCurry is a senior hydrologist with Camp Dresser & McKee in Denver, where he has worked since 1985. He is managing the groundwater portion of the South Platte Decision Support System project for the CWCB, which is developing a comprehensive database and groundwater flow model for that basin, and managed the Senate Bill 06-193 Underground Water Storage project that examined aquifer storage in the Arkansas and South Platte River basins' alluvial and bedrock aquifers. Gordon is currently involved with conjunctive use and water resources planning studies in Colorado, New Mexico, California, Oklahoma, Kansas, Texas and Arizona. He has a B.S. from Penn State, a M.S. from West Virginia University and a Ph.D. from the University of Colorado, where he focused on stream-aquifer interactions and water rights. Gordon is a Professional Geologist registered in Texas.

**Dennis McGrane, Leonard Rice Engineers, Inc.:** Mr. McGrane is a Colorado native who graduated from Dartmouth College in 1985. He has gained over 22 years of experience in the consulting business. He is a registered Engineer and Geologist. Over his career, he has worked for Bechtel; Layne Western; and Leonard Rice Engineers, where he is an Associate and leader of the ground water group. He is currently on the AWRA-Colorado section board of directors and on the ASCE Managed Aquifer Recharge standards committee. He enjoys ground water supply evaluations; well design and testing; pumping system design; computer modeling and evaluating the feasibility and performance of recharge feasibilities in Colorado.

**Frank McNulty, State Representative, District 19:** Mr. McNulty was raised in the south metro area. Educated at J.K. Mullen High School, Frank went on to undergraduate studies at the University of Colorado-Boulder. Upon graduation from CU, Frank accepted a position in the Office of Congressman Wayne Allard and continued to work for Allard upon his election to the U.S. Senate.

In 1998, Frank returned to Colorado to pursue his law degree at the University of Denver College of Law, where his studies emphasized natural resources and water law. Frank joined Governor Bill Owens' administration in 2000, and currently serves as Assistant Director for Water with the Colorado Department of Natural Resources. As Assistant Director, Frank is responsible for advising on, and the development of, statewide water policy. In 2005, Frank played a significant role in drafting and advocating for passage of legislation that the Denver Post called "the most significant step toward a rational statewide water policy in the last 50 years."

**Craig Miller, Orange County Water District, CA:** As the Assistant General Manager for the Orange County Water District, Mr. Miller is responsible for overseeing the departments of engineering, operations, hydrogeology, natural resources and resource management. His primary focus at OCWD is the development and operation of programs that sustain and protect the groundwater basin, as well as, maximizing sustainable water production out of the basin.

Prior to his work with the Orange County Water District, Mr. Miller spent three years in the private sector as a civil engineer. Before Mr. Miller's engineering career began, he spent three years traveling the world as a member of the professional tennis tour, playing in the Australian Open, U.S. Open and Wimbledon. His extensive experience at OCWD includes lead the District's pursuit of additional water rights on the Santa Ana River, the development and operation of the Anaheim groundwater replenishment facilities and the Prado Wetlands water quality enhancement facility, which have resulted in enhanced water recharge and reliable water quality for OCWD's recharge program.

Mr. Miller's extensive experience in groundwater recharge and resource management has provided OCWD with consistent, reliable and high quality water that 2.3 million Orange County residents rely on.

**Lionel Rivera, Colorado Springs:** Mayor Rivera was first elected to an at large City Council seat in April 1997 and re-elected again in April 1999. In April 2001 he was elected by his City Council colleagues to serve as Vice Mayor for a two year term. In April 2003, he was elected Mayor. He is the first Hispanic Vice Mayor and Mayor in the history of Colorado Springs.

Mr. Rivera holds a Bachelor's Degree in Microbiology from Texas Tech University and a Master's Degree in Business Administration from Jacksonville State University. He is Vice President of Investments at UBS Financial Services.

Originally from El Paso, Texas, Rivera came to Colorado Springs in 1984 as an Army Captain at Fort Carson. He has served on many community boards including being a founder and past president of the Colorado Springs Hispanic Chamber of Commerce, serving on the Colorado Springs Greater Chamber of Commerce Board and United Way Board of Trustees and Executive Committee and a co-chair of The Springs Community Action Plan. He is also a mentor in the Big Brothers - Big Sisters school based mentoring program and previously was a Big Brother for a one to one match.



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**David W. Robbins, Hill & Robbins:** Mr. Robbins is president and co-founder of Hill & Robbins, P.C., where he specializes in the fields of water and natural resources law, water quality, and environmental law. Mr. Robbins received his B.A. from Stanford University in 1966 and his Juris Doctorate from the University of Wisconsin-Madison in 1969. Prior to entering private practice, Mr. Robbins served in the U.S. Army (Captain, 1969-1972) and with the U.S. Environmental Protection Agency, Region VIII (1973-1974). He then joined the Colorado Attorney General's Office as a First Assistant Attorney General and head of the Natural Resources Section at the (1975-77), and later appointed the Deputy Attorney General (1977-1978). Mr. Robbins represented the State of Colorado in a variety of interstate water matters, and served as counsel to the State Engineer in adjudication proceedings and trials concerning basin-wide rules and regulations. He also represented the Colorado Water Conservation Board, and successfully defended the constitutionality of the state's first instream flow protection law.

Since 1981, Mr. Robbins has served as general counsel to the Rio Grande Water Conservation District, where he has led the efforts to defeat speculative proposals to mine the ground water of Colorado's San Luis Valley (see *AWDI v. City of Alamosa*), which ultimately resulted in Congressional action to create the Great Sand Dunes National Park and Preserve. Since 1985, Mr. Robbins has served as Counsel of Record for the State of Colorado in the U.S. Supreme Court case of *Kansas v. Colorado*, No. 105 Original (October Term, 1985), involving the Arkansas River Compact, both before the Special Master and the Court. For over fifteen years Mr. Robbins has served as Special Counsel to the Southwestern Water Conservation District in matters related to negotiations with the Colorado Ute Indian Tribes and the Animas-LaPlata Project and, since its creation in 2004, as General Counsel to the Republican River Water Conservation District. Mr. Robbins also serves as Outside Counsel to the City of Colorado Springs in the areas of water resources, water quality and landuse.

Mr. Robbins is a former member of the Colorado Water Conservation Board (1980-89) and served as its Chairman in 1985-86. Mr. Robbins served as a member of the Colorado River Salinity Control Forum and the Colorado River Salinity Control Advisory Council, representing Colorado, continually from 1979 to 2003, he served as the Forum's Vice Chairman from 1981 to 1984, and as its Chairman from 1984 to 1990. He is a member of the Colorado Water Congress and has served on its Board of Directors for many years, including a term as President in 2005-6.

Mr. Robbins is a fellow of the American College of Trial Lawyers and the American Bar Foundation. He is a member of the American Bar Association and the Colorado Bar Association and is a past Chairman of the Water Law Section of the CBA. Mr. Robbins is admitted to the State Bars of Colorado and California.

**Don Shawcroft, Colorado Agricultural Water Alliance:** Mr. Shawcroft is the Chairman of the recently formed, Colorado Agricultural Water Alliance, formed to "empower Colorado agricultural producers to make the most informed and viable decisions regarding Colorado water". He is the Vice-President of Colorado Farm Bureau, the largest general farm organization of the state. Don was elected Vice-President in November of 2000, having served on the board 10 of the previous 14 years. A graduate of the Brigham Young University Agricultural Economics Department, Don is continuing his education as a full time student in the Conejos County branch of the "school of hard knocks". He and his wife, Ann, and their six children ranch with his Father and Mother in a family partnership based in Conejos County. Using some of the land originally settled by the Shawcrofts in the late 1800's, the ranch has expanded through the years and includes leases on US forest service and Bureau of Land Management lands. Don is actively involved with his church and is currently the chairman of the board of directors of the Conejos County Hospital and a director of Mountain States Legal Foundation.

**Valois Shea, EPA, Region 8:** Ms. Shea, geologist, has been with the EPA Region 8 Underground Injection Control (UIC) Program for 10 years. Ms. Shea leads the UIC Class V Direct Implementation for program for Colorado, and is involved with reviewing and authorizing injection activities for a number of aquifer storage and recovery projects in Colorado. She was also involved with the of Class V National Study, a technical and regulatory review of all Class V wells types, coordinating the technical review of the volume on Aquifer Recharge/Aquifer Storage and Recovery wells. Ms. Shea is also a member of the EPA National ASR Workgroup which is reviewing current regulatory practices and technical issues related to regulation of ASR wells. She is a graduate of Bryn Mawr, BA; and University of Colorado Boulder, MS.

**Harris Sherman, Colorado DNR:** Mr. Sherman is the Executive Director of the Colorado Department of Natural Resources. He is a member of Governor Ritter's Cabinet and also serves as the Director of the Colorado Interbasin Compact Commission. This is the second time in his career that he has been DNR director, earlier serving under Governor Richard Lamm. As Director, he oversees Colorado's energy, water, wildlife, parks, and state lands programs.

Harris received his B.A. degree from Colorado College and his law degree from Columbia University Law School. As Managing and Senior Partner of the Denver office of Arnold & Porter, his law practice focused on natural resources, environmental, water, public land, real estate, and Indian law. He has also served on a wide variety of public and private agencies and organizations including Chairman of the Colorado Water Quality Control Commission; Chair of the Colorado Mined Land Reclamation Board; Chair of the Denver Regional Air Quality Council; Commissioner of Mines; Commissioner of the Denver Water Board; Trustee of the Boettcher Foundation; and Trustee of Colorado College. For several decades, he has been active in land conservation efforts with the Nature Conservancy, Colorado Open Lands, and the Trust for Public Land.

## Presenters and Moderators - Biographical Information

**Michael D. Shimmin, Vranesh & Raisch, LLP:** Mr. Shimmin has been a full time lawyer for the last 29 years, focusing his practice almost exclusively on water law. Mike's interest in water issues began while growing up on an irrigated farm in northeastern Colorado. He obtained his bachelor's degree from CSU in 1975 and his law degree from CU in 1978. His professional career has included extensive practice before the water courts, the Colorado Groundwater Commission, and the Colorado Supreme Court. He has also worked on legislation involving water issues, and has been a member of the Colorado Water Congress State Affairs Committee since 1985. Mike represents a broad range of clients which include municipalities, special districts, ditch companies, ground water management districts, and individual water users. Mike is an at-large member of the South Platte Basin Roundtable and a member of Colorado's Interbasin Compact Committee.

**Steve n Sims, Brownstein Hyatt Farber Schreck:** Mr. Sims is a Shareholder in Brownstein Hyatt Farber Schreck's Water and Public Lands law and Environmental and Land Use groups. He represents clients in all aspects of Colorado water law, including litigation, appeals, administrative and transactional matters. Mr. Sims is the former Senior Water Counsel and First Assistant Attorney General for the Water Unit of the Colorado Attorney General's Office, where he acted as the primary water law advisor for the State and Division Engineers, the Colorado Water Conservation Board, the Division of Wildlife, the Division of Parks and Outdoor Recreation, and other state agencies with water right issues. He is admitted to practice law before the State of Colorado, the United States District Court for the District of Colorado and the United States Supreme Court. He has degrees from University of Colorado, B.A., 1975 and University of Puget Sound School of Law, J.D., 1979

- He co-lead the U.S. Supreme Court original jurisdiction litigation between Kansas, Nebraska and Colorado concerning wells that use the Ogallala aquifer in the Republican River Basin
- Co-authored the 2004 Groundwater Rules for New Confined Aquifer Wells in the San Luis Valley.
- Lead counsel for the 2002 Amended South Platte Groundwater Rules litigation in both the Water Court and the Colorado Supreme Court
- Negotiated on behalf of the State Engineer for HB 02-1414 and SB 03-73, bills passed by the Colorado General Assembly concerning substitute water supply plans and South Platte well augmentation plans
- Lead counsel for the State of Colorado in the Park County Sportsmen's Ranch case. The issues in this case included a complex recharge and augmentation plan involving a five layer finite difference model
- Co-lead the State Engineer's 1996 Amended Arkansas River Groundwater Rules litigation in the division 2 Water Court. This case utilized the hydrologic-institutional model developed in the *Kansas v. Colorado*, U.S. Supreme Court original jurisdiction litigation

**MaryLou Smith, Aqua Engineering, Inc:** Ms. Smith is vice president of Aqua Engineering, Inc., an irrigation engineering firm based in Fort Collins, where she served as chief financial and human resources officer for 25 years. Currently she heads up the firm's water conflict facilitation and mediation services. Much of her work revolves around group process design and facilitation for various roundtables and work groups of the Interbasin Compact Process, as well as for water conservancy districts, ditch companies, and agricultural and environmental organizations. After growing up on a cotton and alfalfa farm irrigated by wells in the Pecos Valley of New Mexico, MaryLou earned a master's degree in educational psychology from New Mexico State University. She served twelve years on the Fort Collins Water Board, and now serves on a number of boards including CSU's Water Archives Advisory Board. MaryLou writes and speaks widely on the topic of water conflict, for both Colorado water groups and for the irrigation industry.

**Amy Stephens, State Representative, House District 20, Northern El Paso County:** Representative Stephens is from House District 20 - Northern El Paso County. Representative Stephens has lived in Colorado for 16 years working in public policy for ten years and owning her own consulting business, *Fresh Ideas Communication & Consulting*. Representative Stephens was elected to the legislature in 2006 and serves as the ranking Republican on the Business & Labor Committee and serves on the Judiciary Committee. Representative Stephens was appointed by the Governor to the P20 Data Technology Subcommittee on Education. Representative Stephens' House Joint Resolution HJR 1017 co-sponsored by Senator Jack Taylor on the Study of Alluvial Aquifers was the catalyst for the Colorado Groundwater Forum.

**Andrew Stone, American Ground Water Trust:** Mr. Stone is a hydrogeology graduate from London University with additional academic qualifications in education, geography and geology. He has over thirty five years of ground water experience in Africa and the U.S. as a university professor, ground water consultant and ground water advocate & educator. He has first-hand experience of ground water exploration, well design and source protection in a wide variety of geologic environments. As the director of the Trust's education programs he has coordinated over forty conference programs related to aquifer management, Aquifer Storage Recovery, conjunctive use, water banking and well design. From 1990 to 2002, as adjunct professor, he taught an annual course on Ground Water Protection Policy in the Masters Degree Program at Antioch New England Graduate School.

## Presenters and Moderators - Biographical Information

**Gary Thompson, W. W. Wheeler & Associates, Inc.:** Mr. Thompson is a water resources engineer and president of W. W. Wheeler & Associates, Inc., where he has been employed for 33 years. He has B.S. and M.S. degrees in civil engineering from Texas Tech University and a law degree from the University of Denver. Gary has extensive experience in successful development of industrial and municipal water supplies for many entities throughout Colorado and has appeared as an expert witness in Water Court on numerous occasions. For over 20 years, he has acted as the “manager” of the Widefield Aquifer and has provided engineering for most of the entities that rely on this important water source.

**Ralf Topper, Colorado Geological Survey:** Mr. Topper is a ground water advocate. He has 26 years of professional geoscience experience and is currently senior hydrogeologist with the Colorado Geological Survey. Ralf has earned advanced degrees in Geology and Hydrogeology. He is a Certified Professional Geologist, Geological Society of America Fellow, President of the Colorado Ground-Water Association, and an active member of both national and state ground water societies. Ralf has authored numerous papers and publications on Colorado’s ground-water resources including the recently published Ground Water Atlas of Colorado and Artificial Recharge of Ground Water in Colorado. He is a 20 year resident of Conifer, where he lives with his wife and two sons.

**Steve Vandiver, Rio Grande Water Conservation District:** Mr. Vandiver is General Manager for the Rio Grande Water Conservation District in the San Luis Valley whose office is in Alamosa, Colorado. As such he is involved in the operation of the Closed Basin Project, which extracts shallow ground water from a sump area of the San Luis Valley for use in deliveries to meet interstate Compact obligations. Mr. Vandiver was the Division Engineer of the Colorado Division of Water Resources for the Rio Grande Basin from 1981 to 2005, was the Engineer Adviser for Colorado for the Rio Grande Compact for 13 of those years and was on the Recovery team for the endangered Southwest Willow Flycatcher for several years. He holds a Bachelor of Science degree from the University of Colorado. Mr. Vandiver has served on the SWSI team and is a current member the Rio Grande Basin Roundtable and is serving as one of the Rio Grande Basin members to the IBCC.

Mr. Vandiver has been intimately involved in a large transition of irrigation practices and change of water rights that have allowed the recharge of aquifers in the San Luis Valley. He has worked with ditch companies in those proceeding to achieve a legal foundation for using their surface water to recharge the aquifer for later extraction from wells. This confirmed a longstanding practice of using ditch water for supporting the two extensive aquifers in the Rio Grande basin. These activities should be of particular interest to the attendees of the conference.

**Lisa, Voytko, Stewart Environmental Consultants Inc.:** Ms. Voytko has over 20 years of experience in the environmental engineering consulting business. She recently returned to Colorado from Arizona, where she started her career in Phoenix. While working for two large design firms, she designed and managed water reclamation plants and water treatment facilities. For over 7 years, she was President of her own consulting business, providing engineering solutions to municipal, developer and tribal clients. Her expertise is in environmental permitting, wastewater planning and design, reuse and recharge systems. Ms. Voytko graduated with her wildlife biology degree from Colorado State University, and received a Master’s Degree in engineering from Arizona State University. She is a registered Professional Engineer in Colorado, Arizona and Montana.

**Dick Wolfe, Colorado State Engineer’s Office:** Mr. Wolfe is a native of Colorado and was raised on a farm in Weld County. He obtained his BS and MS degrees in agricultural engineering from Colorado State University. Dick was a partner with Spronk Water Engineers for seven years specializing in water resources on various water rights issues in Colorado, Kansas, Arizona and new Mexico. For the past fourteen years Dick has been with the Colorado Division of Water Resources and is currently the Assistant State Engineer.

- end -

# Appendix E

## Participants

Because this conference was an interactive forum of both presentors and participants it is important to give credit to all who participated. Here is a list of registrants.

First Name	Last Name	Job Title	Company	City	State
Tom	Acre	Regional Projects Manager	Metro Roundtable - Commerce City	Commerce City	CO
John C	Akolt	Attorney	Farmers Reservoir and Irrigation Co	Brighton	CO
Wayland	Anderson	Water Resource Engineer	South Adams County Water & Sanitation District	Commerce City	CO
Paul	Anderson	Attorney	MAH	Colorado Springs	CO
Fred	Anderson	Senator	(Former President of Colorado Senate)	Loveland	CO
Stephane	Atencio	Attorney	S W Atencio & Associates PC	Alamosa	CO
Jeffrey	Baker	Principal Engineering Tech	Town of Castle Rock	Castle Rock	CO
Gary	Barber	Recorder, Arkansas RT	El Paso County	Colorado Springs	CO
Rod	Baumgartner	Manager	Henrylyn Irrigation District	Hudson	CO
Kristine	Beatty	Paralegal	El Paso County Attorney's Office	Colorado Springs	CO
Ken	Beegles	President	Headwaters Engineering	Durango	CO
Tick	Benz	Project Manager	Colorado Springs Utilities	Colorado Springs	CO
Elise	Bergsten	Associate	District of Southern Colorado	Colorado Springs	CO
Larry	Bishop	Manager	Triview Metro District	Monument	CO
Gary	Bostrom	Water Supply Manager	Colorado Springs Utilities	Colorado Springs	CO
Cortney	Brand	Senior Consultant	R. W. Beck, Inc.	Denver	CO
Rod	Brauer	Vice President	CH2M Hill	Englewood	CO
Jim	Broderick	Executive Director	Southeastern Colorado Water Conservancy District	Pueblo	CO
Michael	Brown	Owner	B&B Water Well Service	Kimball	NE
William	Burnidge	Water Program Manager	The Nature Conservancy In Colorado	Boulder	CO
Brian	Bush	Chief of Labor Law	USAFA	USAFA	CO
John	Cevette	Advisor	Colorado Corn	Greeley	CO
Don	Chapman	Superintendent	Riverside Irrigation District	Ft Morgan	CO
Robert	Coney	Director, Planning & Developmt	Adams County Government	Westminster	CO
Pete	Conovitz	Water Resource Specialist	Colorado Division of Wildlife	Denver	CO
Jerry	Cordova	GIS Technician	City of Fountain	Fountain	CO
Bea	Crandall		Protect Our Wells	Colorado Springs	CO
Tim	Crawford	Hydrogeologist	Bishop-Brogden Associates, Inc.	Englewood	CO
Helen	Cregger	Vice President	Piper Jaffray & Co	Denver	CO
James	Culichia	Owner	Felt Monson & Culichia	Colorado Springs	CO
Kathleen	Curry	Representative	Colorado State, District 61	Gunnison	CO
Scott	Cuthbertson	Assistant Division Engineer	Division of Water Resources	Greeley	CO
Russell	Dahlgren	President	Dahlgren Consulting, Inc.	Cheyenne	WY
Harry	Dale	Clear Creek County Commissioner		Georgetown	CO
Deb	Daniel	PGWMD & ECGWMD Dist Mgr	Plains & East Cheyenne GWMD	Burlington	CO
Paul	Dannles	District Manager	Castle Pines Metro District	Castle Rock	CO
Lisa	Darling	So Platte River Basin Program Mgr	City of Aurora-Water Resources	Aurora	CO
Alexandra	Davis	Assistant Director for Water	Colorado Department of Natural Resources	Denver	CO
Dan	Dertz	Planner	Douglas County, Community Development	Castle Rock	CO
Tracy	Doran	Manager	Upper Black Squirrel Ground Water Mgmt Dist	Calhan	CO
Dave	Doran	Board Member	Upper Black Squirrel Board	Calhan	CO
Karl	Dreher	Vice President	Brown & Caldwell	Golden	CO
Sara	Duncan	Intergovernmental Affairs Coordinator	Denver Water	Denver	CO
Deanna	Durnford	Department of Civil Engineering	Colorado State University	Fort Collins	CO
Dana	Duthie	General Manager	Donala Water & Sanitation District	Colorado Springs	CO
Leo	Eisel	Executive Engineer	Brown and Caldwell	Golden	CO
M. Cole	Emmons	Assistant County Attorney	El Paso County Attorney's Office	Colorado Springs	CO
Rick	Fendel		Petrock & Fendel	Denver	CO
Mike	Fink	Water Resource Engineer	City of Fountain	Fountain	CO
Linda	Firth	Senior Consultant	Rothberg Tamburini & Winsor	Colorado Springs	CO
Denise	Fort	Professor	University of NM School of Law	Albuquerque	NM
TAD	Foster	Attorney	Law Office of TAD S. Foster	Colorado Springs	CO
Joe	Frank	Manager	Lower South Platte Water Conservancy District	Sterling	CO
Bob	French	Commissioner	Summit County	Breckenridge	CO
Steve	Fuscher	Chief of Contract Law	USAFA	USAFA	CO
Dave	Gardner	Producer/Director/Writer	Visions West	Colorado Springs	CO
Cory	Gardner	Representative	Colorado State, District 63	Denver	CO
Tim	Gates	Professor	Dept of Civil & Environmental Engineering	Fort Collins	CO

First Name	Last Name	Job Title	Company	City	State
Mark	Gebhart	Land Development Code Administrator	El Paso County	Colorado Springs	CO
Les	Gelvin	Owner/Broker	Agri-Enterprises Inc	Ft Collins	CO
Jeanne	Gelvin	Owner/Broker	Agri-Enterprises Inc	Ft Collins	CO
Warren	Gerig, Jr.		Donala Water & Sanitation District	Colorado Springs	CO
Bruce	Gerk	Member	South Platte Roundtable	Julesburg	CO
Bill	Gertner	Vice President-Lending	Premier Farm Credit	Ft Morgan	CO
Melvin	Getz	Member & Rancher	Rio Grande Roundtable & Rancher	Monte Vista	CO
Michael	Gibson	Chair, Rio Grande Roundtable	San Luis Valley Water Conservancy District	Alamosa	CO
Arnie	Good	Ag Producer	Good Farms	Ft Morgan	CO
Kara	Goodwin	Attorney	Timothy R Buchanan PC	Arvada	CO
Brett	Gracely	Planning Supervisor	Colorado Springs Utilities	Colorado Springs	CO
Tim	Grotheer	Assistant Manager	Plum Creek Wastewater Authority	Castle Rock	CO
Jim	Hall	Division Engineer	Division of Water Resources	Greeley	CO
Mary	Halstead	Water Resources Engineer	Colorado Division of Wildlife	Denver	CO
Alan	Hamel	Executive Director	Board of Water Works of Pueblo	Pueblo	CO
Dennis	Hanson	Assistant City Attorney	City of Thornton	Thornton	CO
Kathy	Hare	President	Upper Black Squirrel Board	Peyton	CO
Eric	Harmon	Principal	HRS Water Consultants	Lakewood	CO
Michelle	Hatcher	Water Resource Specialist	Applegate Group Inc	Denver	CO
Reiner	Haubold	Executive Director	CWWCA	Denver	CO
Roy	Heald	General Manager	Security Water & Sanitation District	Colorado Springs	CO
Eric	Hecox	Manager	Office of Interbasin Compact Negotiations	Denver	CO
Michael	Hein	Groundwater Engineer	Division of Water Resources	Greeley	CO
Courtney	Hemenway	President	Hemenway Groundwater Engineering, Inc.	Parker	CO
John	Hendrick	Manager	Centennial Water & Sanitation District	Highlands Ranch	CO
Greg	Hertzke	Public Information Specialist	Central CO Water Conservancy District	Greeley	CO
John	Himmelreich	Geologist	John Himmelreich & Associates	Colorado Springs	CO
Richard	Hirsch	Principal Hydrogeologist	Hirsch Gibney Inc	Parker	CO
Gregory	Hobbs	Supreme Court Justice	Colorado Supreme Court	Denver	CO
Daniel	Hodges	Governmental Affairs Liaison	Colorado Springs Utilities	Colorado Springs	CO
Diane	Hoppe	President	Colorado Foundation for Water Education	Denver	CO
Gregg	Houtz	Deputy Counsel	Arizona Dept of Water Resources	Phoenix	AZ
Tim	Hunker	Manager	Meridian Service Metropolitan District	Greenwood Village	CO
Scott	Ingroldstad	Director of Public Relations	CH2M Hill	Englewood	CO
DJ	Inman		DJ Inman Video Productions	Centennial	CO
Tammy	Ivahnenco	Hydrologist	USGS	Pueblo	CO
David	Jankowski	Attorney	White & Jankowski	Denver	CO
Steven	Janssen	Attorney	Steven L. Janssen P.C.	Boulder	CO
Steven	Jeffers	Attorney	Bernard Lyons Gaddis & Kahn	Longmont	CO
Theresa	Jehn-Dellaport	Principal	Jehn Water Consultants	Denver	CO
Rick	Jenkins	Board Member	Upper Black Squirrel Board	Calhan	CO
Melinda	Kassen	Attorney	Colorado Trout Unlimited	Boulder	CO
Dave	Keeler	Water Commissioner	Division of Water Resources	Denver	CO
Doug	Kemper	Executive Director	Colorado Water Congress	Denver	CO
Kathy	Kitzmann	Water Resources Engineer	City of Aurora-Water Resources	Aurora	CO
Will	Koger	Assistant General Manager	Arapahoe County Water & Wastewater Authority	Centennial	CO
Betty	Konarski	President	El Paso County Water Authority	Colorado Springs	CO
Justin	Korkus		Brown and Caldwell	Golden	CO
Ted	Kowalski	Project Manager	CWCB	Denver	CO
Beverly	Kroeker	Vice President	TZA Water Engineers Inc	Lakewood	CO
Frank	Kugel	General Counsel	Upper Gunnison River Water Conservancy District	Gunnison	CO
Rodney	Kuharich		South Metro Water	Greenwood Village	CO
Paul	Lander	Water Conservation Specialist	City of Boulder	Boulder	CO
Richard	Landreth	Public Works Director	Town of Monument	Monument	CO
Daniel	Law	Executive Director	CO Water & Power Authority	Denver	CO
Troy	Lepper	Instructor	Dept. of Sociology	Fort Collins	CO
Jean	Lever		Aqua Engineering Inc	Ft Collins	CO
Matt	Lindburg	Principal Engineer	Brown and Caldwell	Golden	CO
Bob	Longenbaugh	Engineer	Consultant Engineer	Lakewood	CO
Marsha	Looper	Representative	Colorado State, District 19	Denver	CO
Robert	Lovato	Board of Directors	Cherokee Metropolitan District	Colorado Springs	CO
Olen	Lund	Delta County Commissioner	Delta County	Delta	CO
Sandy	MacDougall	Attorney	MacDougall, Wooldridge & Worley	Colorad Springs	CO

First Name	Last Name	Job Title	Company	City	State
Ray	Magee	Chief Programs Director	USAFA	USAFA	CO
Bobby	Magill	Reporter	The Daily Sentinel	Grand Junction	CO
Don	Magnuson	Director	Northern Colorado Water Conservancy	Berthoud	CO
Rob	Masden	Commissioner	Weld County	Greeley	CO
K.C.	Mason	Freelance Writer		Denver	CO
David	Mays	Assistant Professor	University of Colorado at Denver	Denver	CO
Mick	McAllister	Communications Director	Rocky Mountain Farmers Union	GWV	CO
Thomas	McClernan	Professional Engineer	GMS Inc, Consulting Engineers	Colorado Springs	CO
John	McClow	General Counsel	Upper Gunnison River Water Conservancy District	Gunnison	CO
Bruce	McCormick	Chief Water Services Officer	Colorado Springs Utilities	Colorado Springs	CO
Gordon	McCurry	Principal	Camp Dresser & McKee	Denver	CO
James	McGrady	District Manager	Castle Pines Metro District	Castle Rock	CO
Dennis	McGrane	Project Manager	Leonard Rice Engineers	Denver	CO
Mike	McHugh	Environmental Permitting Coordinator	City of Aurora-Water Resources	Aurora	CO
Grady	McNeill	Manager Wildlife Resource Support S	Colorado Division of Wildlife	Denver	CO
Frank	McNulty	Representative	Colorado State, District 43	Denver	CO
Elizabeth	McVicker	Secretary, South Platte Roundtable	Center of Colorado Water Conservancy District	Denver	CO
Margaret	Medellin	Principal Engineer	Brown and Caldwell	Golden	CO
John	Meininger		Attorney At Law	Denver	CO
Erin	Messner	Engineer	City of Aurora-Water Resources	Aurora	CO
Edward	Meyer	Professional Engineer	GMS, Inc.	Colorado Springs	CO
Jim	Miller	Director of Policy and Initiatives	Colorado Department of Agriculture	Lakewood	CO
Craig	Miller	Assistant General Manager	Orange County Water Dist	Fountain Valley	CA
Doug	Montgomery		City of Lamar	Lamar	CO
Manuel	Montoya	General Manager	Farmers Reservoir and Irrigation Co	Brighton	CO
Andy	Moore	Water Resources Engineer	Colorado Water Conservation Board	Denver	CO
Rick	Moore	Quality/ Safety	Deep Rock Water Company	Denver	CO
SeEtta	Moss	Environmental Rep Arkansas RT Cons	Arkansas Valley Audubon Society	Canon City	CO
John	Murphy	Engineer	City of Aurora-Water Resources	Aurora	CO
Julia	Murphy		Protect Our Wells	Colorado Springs	CO
Liza	Negriff	Project Director	Stillwater Resources Inc	Boulder	CO
Ann	Nichols	District Manager	Forest Lakes Metro District	Coco Springs	CO
Peter	Nichols	Attorney	Trout, Raley, Montano, Witwer & Freeman	Denver	CO
John	Orr	Writer	The Cherry Creek News & Central Denver Dispatch		
Jack	Ostrowski	Vice Chair	Castle Pines Metro District	Castle Rock	CO
Beth Ann	Parsons	Attorney	Carlson Hammond & Paddock	Denver	CO
Larry	Patterson	Utility Director	City of Fountain	Fountain	CO
Kip	Petersen	General Manager	Cherokee Metropolitan District	Colorado Springs	CO
Renee	Picanso	Director	USDA/NASS	Lakewood	CO
Russell	Plakke	Water Treatment Plant Supervisor	Denver Water	Denver	CO
Rodney	Preisser	Manager	United InterCounty Water	Colorado Springs	CO
Pat	Ratliff	El Paso County Water Authority Lobby	Ratliff & Associates Consulting Inc	Colorado Springs	CO
Kevin	Rein	Professional Engineer	Division of Water Resources	Denver	CO
Josh	Rice	Project Engineer	Brown and Caldwell	Golden	CO
Rachel	Richards	County Commissioner	Pitkin County EH/NR	Aspen	Co
Lionel	Rivera	Mayor	City of Colorado Springs	Colorado Springs	CO
David	Robbins	Attorney	Hill & Robbins	Denver	CO
Ellen	Robley	District Administrator	Paint Brush Hills Metropolitan District	Falcon	CO
Kirk	Russell	Loan Program Marketing	Colorado Water Conservation Board	Denver	CO
Robert	Sakata			Brighton	CO
Chris	Sanchez	Principal	Bishop-Brogden Associates, Inc.	Englewood	CO
John	Sandefur	Secretary/Treasurer	Fremont Conservation District	Canon City	CO
Matt	Sares	Chief of Environmental Geology	Colorado Geological Survey	Denver	CO
John	Sanderson	Senior Freshwater Ecologist	The Nature Conservancy	Ft Collins	CO
Brent	Schantz	Water Commissioner	Division of Water Resources	Greeley	CO
Michael	Schaubs	Groundwater Geologistt	Division of Water Resources	Denver	CO
Ted	Schubert	President, Board of Directors	Cherokee Metropolitan District	Colorado Springs	CO
George	Schubert	Vice President	Schubert Ranches Inc	Calhan	CO
Carl	Schueler	Long Range Planning Division Manage	El Paso County	Colorado Springs	CO
Jeff	Schumacher	Vice President-Credit	Premier Farm Credit	Sterling	CO
Chris	Schuyler-Rossie	Planner Hydrologist	Denver Water	Denver	CO
Gail	Schwartz	Senator	Colorado State, District 5	Denver	CO
Edward	Sealover	Reporter	Colorado Springs Gazette	Colorado Springs	CO

<b>First Name</b>	<b>Last Name</b>	<b>Job Title</b>	<b>Company</b>	<b>City</b>	<b>State</b>
John	Shawcroft	Member & Rancher	Rio Grande Roundtable & Rancher	Alamosa	CO
Don	Shawcroft	Vice President	Colorado Farm Bureau	Alamosa	CO
Mark	Shea	Attorney	Colorado Springs Utilities	Colorado Springs	CO
Valois	Shea	Geologist	EPA Region 8	Denver	CO
Harris	Sherman	Executive Director	Colorado Department of Natural Resources	Denver	CO
Michael	Shimmin	Attorney	Vranesh & Raisch	Boulder	CO
John	Shipper	Commissioner	Elbert County	Kiowa	CO
Pete	Sims	Project Manager	Lend Lease Communities	Denver	CO
Steven	Sims	Attorney	Brownstein Hyatt Farber Schreck	Denver	CO
Art	Sintas	Superintendent	Cherokee Metropolitan District	Colorado Springs	CO
Duane	Smith	President	Smith Geotech	Ft Collins	CO
Scott	Smith	Soil Conservationist	USDA-NRCS	Cheyenne Wells	CO
Steve	Smith	Engineer	MWH Americas	Denver	CO
MaryLou	Smith	Vice-President	Aqua Engineering Inc.	Fort Collins	CO
Phillip	Sotel	President	Lost Creek Land & Cattle Company	Roggen	CO
Mark	Sponsler	CEO	Colorado Corn	Greeley	CO
Dennis	Steckel	VP	Upper Gunnison Water Conservancy District	Gunnison	CO
Gary	Steen	Water Resource Engineer	Fountain Mutual Irrigation Company	Colorado Springs	CO
Phil	Steininger	District Manager	Woodmoor Water and Sanitation District	Monument	CO
Amy	Stephens	Representative	Colorado State, District 20	Monument	CO
Dave	Stewart	President	Stewart Environmental	Fort Collins	CO
Mike	Stiehl	Fremont County Commissioner	Fremont County	Canon City	CO
Andrew	Stone	Executive Director	American Ground Water Trust	Concord	NH
Nancy	Stuart	Commissioner	Grand County	Hot Sulphur Springs	CO
Christopher	Sturm	Senior Water Resources Analyst	City of Thornton	Thornton	CO
Mike	Sullivan	Division Engineer	Division of Water Resources	Alamesa	CO
Rose Ann	Sullivan	Environmental Resources Manager	Pitkin County EH/NR	Aspen	CO
Phyllis	Thomas	Owner	Phyllis Thomas Consulting	Centennial	CO
Gary	Thompson	President	Wheeler & Associates	Englewood	CO
Johnny	Tonko	Hydrologist	Colorado Division of Wildlife	Pueblo	CO
Ralf	Topper	Senior Hydrogeologist	Colorado Geological Survey (DNR)	Denver	CO
Alison	Torvik	Litigation Coordinator	Division of Water Resources	Denver	CO
Chris	Treese		Colorado River District	Glenwood Springs	CO
Glenn	Vaad	CO State Representative District 48	State General Assembly	Denver	CO
Sandy	Vana-Miller	Wildlife Biologist	US Fish & Wildlife Service	Denver	CO
Mark	Vanarelli	Professional Engineer	Division of Water Resources	Denver	CO
Steven	Vandiver	Manager	Rio Grand Water Conservancy Dist	Alamosa	CO
Ivan	Walter	Consultant	Ivan's Engineering, Inc.	Centennial	CO
Alan	Ward	Water Resources Administrator	Board of Water Works of Pueblo	Pueblo	CO
Russ	Waring	Surveying Manager	Pentacor Engineering	Westminster	CO
Bejamin	Waters	Government Relations Director	Rocky Mountain Farmers Union	GWV	CO
Ken	Watts	Ground Water Specialist	USGS, Colorado Water Science Ctr	Pueblo	CO
Berten	Weaver	Clear Creek County Roundtable Member		Georgetown	CO
Pat	Wells	Project Engineer	Colorado Springs Utilities	Colorado Springs	CO
Forrest	Whitman	Commissioner	Gilpin County	Central City	CO
John	Wiener	Research Associate	National Center for Atmospheric Research	Boulder	CO
Cliff	Wilson	Manager	H2O Consultants	Centennial	CO
Kent	Wimmer	Director of Shareholder Relations	Western Sugar Cooperative	Denver	CO
Jay	Winner	Executive Director	Lower Arkansas Valley Water Conservancy District	Rocky Ford	CO
Steve	Witte	Division Engineer	Colorado Department of Natural Resources, Divisio	Pueblo	CO
Steve	Witter	Water Resources Engineer	Town of Castle Rock	Castle Rock	CO
Julianne	Woldridge	President	MacDougall Woldridge & Worley	Colorado Springs	CO
Dick	Wolfe	Professional Engineer	Division of Water Resources	Denver	CO
Doug	Woods	Developer	Meridian Service Metropolitan District	Greenwood Village	CO
Ron	Woolsey	Water Department Superintendent	City of Fountain	Fountain	CO
Jay	Yeager	Assistant Superintendent	Rio Grande Roundtable & Rancher	Monte Vista	CO
Shawn	Yoxey	Attorney		Pueblo	CO



# Appendix F

Aqua Engineering, Inc.

4803 Innovation Drive Fort Collins, Colorado 80525  
Telephone (970) 229-9668  
FAX (970) 226-3855



December 12, 2007

Dear Aquifer Recharge Conference Participant:

Two and a half months ago, 250 of us gathered in Colorado Springs to puzzle over aquifer recharge and storage policy in Colorado. We came asking questions. Could/should Colorado make changes in its policy such that aquifer recharge and storage might be employed as a water management tool? If so, how? What about sources of water, water quality and other considerations?

We listened to experts from other western states tell how they are actively using aquifer recharge. We listened to folks here in Colorado—some telling us how they are using aquifer recharge and some telling us how they would like to use aquifer recharge. We heard about the Senate Bill 06-193 study CDM did for CWCB which showed areas of the South Platte and the Arkansas which are technically feasible for aquifer recharge. We heard from Colorado State University professor Dr. Tim Gates that a mismanaged groundwater table can adversely impact water quality – and lose large amounts of water through evaporative “upflux”.

Justice Hobbs reminded us that the water belongs to the people of Colorado, and maximizing its beneficial use is a fundamental component of Colorado water law. A panel of attorneys discussed implications for interstate compacts and such problems as lack of secure storage, generally agreeing that our current court system deals with aquifer recharge appropriately. University of New Mexico School of Law professor Dr. Denise Fort suggested that such case-by-case treatment results in high transaction (legal) costs and called for states to enact statutory systems for aquifer recharge and recovery.

On the second day, over lunch we discussed some important questions regarding groundwater usage in Colorado: Is the one-tenth of one percent injury standard too onerous? Can dominion and control of water exist in the alluvium of a river? Is a statewide regulatory regime appropriate?

Former Agriculture Commissioner Don Ament asked our legislative panel: “Assuming decision support systems and other scientific safeguards were in place, would you *legislators* be willing to give the state engineer greater administrative powers to use the South Platte aquifer conjunctively?”

A question like this raises important public policy issues, which was the goal of our conference. Successful legislation that moves us toward greater use of alluvial storage, if any, will be based on a thorough examination of the impacts of changes to current policy. How might the Groundwater Commission deal with alluvial storage in Designated Basins? Is it even possible to

“store” water in a tributary alluvium? The conference report is intended to capture the public policy debate that occurred at the conference and summarize the outcome.

So, now we must submit our collective conclusions to the Director of Natural Resources, Harris Sherman, for peer review. If you recall, Harris admonished us that we must search for better ways to efficiently use Colorado’s precious water resources.

**The purpose of this letter is to ask you to share your thoughts and suggestions as we prepare our report to Director Sherman.**

- ❖ What message(s) did you take away from the conference?
- ❖ Do you think changes are needed in the public policies governing groundwater?
- ❖ Did we miss something important in the conference that deserves examination?

We invite you to respond without attribution if that is your preference. Our goal is to compile a draft report in January, 2008. Therefore, if you are so inclined, please respond by January 5<sup>th</sup> to this request for input.

Thank you so much for sharing your important insights with us.

Sincerely,

A handwritten signature in cursive script, appearing to read "MaryLou Smith".

MaryLou Smith

## Appendix G

### **Aquifer Recharge and Storage Means Different Things to Different People**

- For Joe Frank, general manager of the Lower South Platte Water Conservancy District, it means keeping the South Platte alluvium full even in times of drought by means of requiring augmentation by well pumpers pumping out of priority.
- For John Hendrick, general manager of Centennial Water and Sanitation District, it means injecting recycled wastewater deep into a bedrock aquifer of the Denver Basin so that it can be drawn out in times of drought to meet the needs of a burgeoning urban population.
- For Craig Miller, assistant general manager of the Orange County (CA) Water District, it means managing a very large groundwater basin as an underground storage reservoir to provide water for 2.5 million people.
- For Steve Sims, attorney representing the City of Aurora in its Prairie Waters Project, it means treating and storing recycled wastewater in lined underground storage facility/recharge basins built just for that purpose.
- For Gary Thompson with W.W. Wheeler and Associates working with participants in the Widefield Aquifer, it means modeling and monitoring the use of an aquifer by multiple pumpers in a cooperative way such that they have reached a point where they are considering moving to an aquifer recharge phase of their operation.
- For Steve Vandiver, general manager of the Rio Grande Water Conservation District, it means trying to form a subdistrict of well pumpers to devise an equitable way of curtailing pumping in order to sustain an aquifer for purposes of meeting the requirements of an interstate compact.
- For Kathy Hare, president of the Upper Black Squirrel Creek Ground Water Management District, it is hoping to figure out a financially and legally feasible way to recharge a drawn down aquifer with recycled wastewater and/or leased agricultural water to provide water for a population currently relying on non-renewable groundwater.

### **Eight “elements of proof to acquire an underground right” handed down by Colorado’s Supreme Court in the Park County Sportsmen’s Ranch case:**

- 1) must capture, possess, and control the water it intends to put into the aquifer;
- 2) must not injure other water use rights, either surface or underground, by appropriating the water for recharge;
- 3) must not injure water use rights, either surface or underground, as a result of recharging the aquifer and storing water in it;
- 4) must show that the aquifer is capable of accommodating the stored water without injuring other water use rights;
- 5) must show that the storage will not tortiously interfere with overlying landowners’ use and enjoyment of their property;
- 6) must not physically invade the property of another by activities such as directional drilling, or occupancy by recharge structures or extraction wells, without proceeding under the procedures for eminent domain;
- 7) must have the intent and ability to recapture and use the stored water; and
- 8) must have an accurate means for measuring and accounting for the water stored and extracted from storage in the aquifer.

# Appendix H

## Colorado Ground Water Made Legal

Derived from “An Overview of Colorado Groundwater Law, State Supreme Court Justice Greg Hobbs, 2007, with review by State Engineer Dick Wolfe and Colorado Geological Survey hydrogeologist Ralf Topper, 2008.

“Do we need new legislation or rules and regulations to facilitate aquifer recharge?” To even discuss that question, we need a clear understanding of how ground water is categorized in Colorado. Hopefully, the writers of this report have contributed to the understanding by charting it in the following manner, with assistance from Greg Hobbs, Dick Wolfe, and Ralf Topper.

Tributary Groundwater	Nontributary Groundwater Outside Designated Groundwater Basins	Denver Basin Bedrock Groundwater	Designated Groundwater	
Groundwater that is part of the “natural stream” subject to the Colorado Constitution’s appropriation provisions	Defined as “groundwater outside of the boundaries of any designated ground water basin the withdrawal of which will not, within one hundred years, deplete the flow of a natural stream at an annual rate greater than one-tenth of one percent of the annual rate of withdrawal”	Denver, Dawson, Arapahoe, Laramie-Fox Hills aquifers	<b>Within the Denver Basin Aquifers</b>	<b>Outside the Denver Basin Aquifers</b>
All groundwater is considered tributary unless shown to be otherwise		Mostly nontributary water, but there is some water that does not meet the statutory definition for “nontributary” and is, therefore, labeled <i>not non-tributary</i> .	Upper Black Squirrel, Lost Creek, Upper Black Sandy, Kiowa-Bijou	Northern High Plains, Southern High Plains, Camp Creek, Upper Crow Creek
Subject to prior appropriation adjudication pursuant to Water Right Determination and Administration Act of 1969	Subject to state engineer permit and may be decreed by the water court for the amount of groundwater underlying the owned surface property of a landowner. That amount may be extracted only at the rate of one percent of the total amount per year, based on a “minimum useful life of 100 years.”	Subject to state engineer permit and may be decreed by the water court for the amount of groundwater underlying the owned surface property of a landowner. That amount may be extracted only at the rate of one percent of the total amount per year, based on a “minimum useful life of 100 years.” If nontributary, requires relinquishment of 2 percent of the amount withdrawn. If not nontributary, requires augmentation; depending on the location, augmentation requirement is four percent of the amount withdrawn on an annual basis or the amount of actual depletions	Subject to designation and allocation by Colorado Ground Water Commission by permit for the amount of groundwater underlying the owned surface property of a landowner. May be extracted only at the rate of one percent per year, based on a “minimum useful life of 100 years.”	Subject to designation and allocation by Colorado Ground Water Commission by permit for beneficial use under a modified prior appropriation permit system

Tributary Groundwater	Nontributary Groundwater Outside Designated Groundwater Basins	Denver Basin Bedrock Groundwater	Designated Groundwater	
			Within the Denver Basin Aquifers	Outside the Denver Basin Aquifers
Those pumping tributary groundwater via wells or diverting through surface structures may do so out of priority only through an approved augmentation plan or substitute water supply plan that replaces otherwise injurious depletions to decreed water rights	Not subject to curtailment on an injury basis	Not subject to curtailment on an injury basis	Not subject to curtailment on an injury basis	Curtailment based upon an injury allegation is subject to the discretion of the Ground Water Commission and the local Ground Water Management Districts.
	Use may be made by, or with consent of, overlying landowner	Use may be made by, or with consent of, overlying landowner		
	Right is vested by drilling a well or obtaining water court adjudication for the amount of water underlying the land	Right is vested by drilling a well or obtaining water court adjudication for the amount of water underlying the land	Regulated by rules of the Colorado Groundwater Commission and local groundwater management districts	Regulated by rules of the Colorado Ground Water Commission and local groundwater management districts
	May be mined regardless of any consideration of recharge	May be mined regardless of any consideration of recharge		Colorado Ground Water Commission charged with permitting economic development while maintaining reasonable pumping levels, so that groundwater won't be mined excessively over rate of recharge.