

Water Law Review

Volume 8 | Issue 1

Article 72

9-1-2004

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Water Law Review

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Water Law Review , Conference Report, Groundwater in the West, 8 U. Denv. Water L. Rev. 328 (2004).

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Groundwater in the West

CONFERENCE REPORTS

GROUNDWATER IN THE WEST

Boulder, Colorado June 16-18, 2004

As a pervasive drought in much of the American West continues to strain surface water assets, groundwater resources have returned to prominence in scientific, legal, and political debate. "Groundwater in the West," the three-day, 25th Annual Conference of the Natural Resources Law Center of the University of Colorado School of Law in Boulder, Colorado, provided an opportunity for lawyers, scientists, policy-makers, and others to share perspectives on one of the West's most vital resources. One major goal of the conference was that the combined knowledge and expertise of such a varied group could generate better management and protection of the West's vital groundwater.

DAY ONE

A PRIMER ON WESTERN GROUNDWATER

Jim Martin, the Director of the Natural Resources Law Center, opened the conference with a welcome to the attendees and introduced David Getches, Dean of the University of Colorado School of Law. Dean Getches also extended a welcome to those present, and emphasized the importance of groundwater as an essential natural resource in the Western States. He explained that the first day, entitled "A Primer on Western Groundwater," would focus first on the science of groundwater, followed by the law of groundwater.

SESSION ONE: GROUNDWATER SCIENCE BASICS

Moderator: Kathryn Mutz, Natural Resources Law Center

SURVEY OF GROUNDWATER SUPPLIES AND THEIR DEPLETION

Alan Burns, of the United States Geological Survey, presented the conference's first scientific description of groundwater. He introduced and defined essential terms such as aquifer, recharge, and discharge. Mr. Barnes also supplied the first explanation of the rudimentary groundwater equation: $I - O = \Delta S$, or Input - Output = Change in Storage. In untouched, natural conditions, groundwater aquifers are in a state of equilibrium; the Input is equal to the Output so that there is no Change in Storage. Mr. Barnes explained that two of the most

common results of over pumping an aquifer are loss in surface water, such as in creeks, streams, and ponds, and land subsidence.

Mr. Burns next discussed the four main aquifers in the western United States, which are as follows: Denver Basin; Rio Grande Basin; Edwards Aquifer; and High Plains Aquifer. He explained how each aquifer is experiencing huge water level declines, aquifer depth confusion, and land subsidence problems. Mr. Burns concluded with a discussion of the Central Valley in California and how the changed groundwater practices in that aquifer allowed both land and water levels to recover.

OVERVIEW OF GROUNDWATER QUALITY AND RELATED MANAGEMENT ISSUES

Mike Wireman, the Regional Groundwater Expert for the Environmental Protection Agency's Region 8, began his presentation by stressing the importance of groundwater to the United States by citing two striking statistics: 50% of the country's population drinks groundwater; and 50 billion gallons per day of groundwater is used for agriculture. Mr. Wireman then proceeded to discuss the quality of the West's groundwater, including both naturally occurring contaminants, such as carbonic acid, bicarbonates, and anions, and human-introduced contaminants, such as cyanide, nitrates, and heavy metals. He outlined the most common sources of groundwater contamination in the West as the following: agriculture, especially from over fertilization of crops; waste disposal; mining, with emphasis on acid mine drainage; and urbanization. The discussion continued with an explanation of the main problems with groundwater management. Groundwater management problems are widespread and include: groundwater management is not aquifer based; groundwater management is highly fragmented and spread between many agencies; there is an inadequate recognition of groundwater/surface water connections and drought impacts; poor coordination between water supply and water quality management; and non-point source contamination. Mr. Wireman then explained that groundwater monitoring is inadequate. Mr. Wireman concluded his presentation by emphasizing the urgency inherent in managing groundwater well now to prevent dangerous and costly contamination of the West's precious underground water supply.

GROUNDWATER – SURFACE WATER INTERACTIONS

Thomas Maddock III, of the University of Arizona's Department of Hydrology presented an in-depth scientific exploration of groundwater and the measured effects of human capture of groundwater through wells. Mr. Maddock began by explaining how taking water out of a stream produces a cone of depression that spreads out; turning on a well produces a new cone of depression and equilibrium. Mr. Mad-

dock used the same equation as Mr. Burns, although he substituted Recharge (R) for Input (I) and Discharge (D) for Output (O), so that the equation appeared as $R - D = \Delta S$. He also explained that for an aquifer in pre-development—before it has been tapped for human use and consumption—the equilibrium can be described as $R = D$, or Recharge = Discharge. However, no direct measurements of capture are available, instead calculations must be used.

SESSION TWO: GROUNDWATER LAW BASICS

Justice Gregory Hobbs, Jr., of the Colorado Supreme Court moderated Session Two, prefacing the afternoon's speakers by stressing the importance of groundwater in the West by quoting poets and novelists.

OVERVIEW OF GROUNDWATER MANAGEMENT LAWS IN THE WESTERN U.S.

Gary Bryner, formerly of the Natural Resources Law Center of the University of Colorado Law School and currently with Brigham Young University, presented a comprehensive survey of water law in the Western States. Mr. Bryner began his discussion with three questions regarding western United States groundwater management laws: what current challenges face western states; how do states currently address groundwater; and what state legal and management practices are most promising? He then discussed the pervasive problems of overdraft occurring in most aquifers. Understanding the surface and groundwater interactions, accounting for surface water diversions and return flows, maintaining water quality, and protecting/creating wetlands are all groundwater management challenges facing states. Next, he emphasized the importance of developing an ecologically sustainable groundwater management system. Creating an ecologically sustainable groundwater management system leads to long-term yields from aquifers, efficient use, groundwater quality preservation, and aquatic life preservation.

Mr. Bryner examined the history of groundwater management in each State, comparing and contrasting the similarities and differences between them. He described the evolution of the legal approach to water in this order: the common law rule of capture; the American variation of capture known as reasonable use; the correlative rights doctrine where landowners have the right to a proportionate share of the water; and the Western doctrine of prior appropriation.

In conclusion, Mr. Bryner stated that the interconnectedness of groundwater and surface water; the designation and maintenance of groundwater basins; regulating groundwater development; aquifer monitoring; recognizing ecosystem values; and injecting water for storage are the most promising state management and legal practices.

FEDERAL GROUNDWATER RIGHTS AND THE FEDERAL ROLE IN GROUNDWATER POLICY

John Leshy, a professor at the University of California Hastings College of Law, continued the afternoon session with a discussion of federal groundwater rights and the federal role in groundwater policy. Mr. Leshy first reviewed the *Winters* doctrine and the *Sporhase* decision, which affirmed Congress' power to create federally reserved groundwater rights. However, as Mr. Leshy explained, federal reserved rights in practice do not extend to groundwater. He then spoke about how regulatory schemes, contractual obligations, and federal use policies affect the ability of the federal government to reserve groundwater. Next, Mr. Leshy addressed the federal government's role in developing a comprehensive groundwater policy. He detailed how the federal government has taken a hands-off approach to groundwater policy, especially under the current Bush administration. Mr. Leshy concluded by stating that both states and the federal government should have an active role in the groundwater management process and how groundwater banking is a progressive tool to promote sensible groundwater management.

SURVEY OF INDIAN GROUNDWATER ISSUES

Rodney Lewis, in addition to being the General Counsel for the Gila River Indian Community, which encompasses two Native American tribes in Arizona, has the distinction of being the first Native American member of the Arizona bar. Mr. Lewis spoke on the unique history of the Gila River area as a centuries-old irrigation project, and the challenges that the Native American Community continues to face as Arizona grapples with the rapid population growth and development in the neighboring Phoenix metropolitan area. He also expressed hope in the possibility of settling the long-standing litigation over rights to the aquifer underneath the reservation and in the Gila River.

MODELING AND EXPERT WITNESSES IN ADVERSARIAL SETTINGS

Arthur Littleworth, a senior partner in the California firm of Best, Best & Krieger LLP, served as the U.S. Supreme Court-appointed Special Master for the dispute between Kansas and Colorado over the Arkansas River Compact. The thirteen-year case included complex computer modeling of the interaction between the Arkansas River and its tributaries with the groundwater aquifers. Mr. Littleworth described the process of reconciling the conflicting models of two litigating parties, and provided the unique perspective of an adjudicator attempting to arrive at the a just outcome through hydrologic models.

POSTER SESSION AND RECEPTION

After a short break, Day One of the conference continued with a Reception, Book Display, and Informal Poster Session. Scientists, hydrologists, researchers, water managers, and others shared their work with the conference attendees by displaying posters detailing their involvement in Western groundwater issues.

KEYNOTE ADDRESS AND BOOK SIGNING

Robert Glennon, a professor at the University of Arizona and author of *Water Follies: Groundwater Pumping and Fate of America's Fresh Water* concluded Day One with a keynote address and a book signing.

DAY TWO

REGIONAL GROUNDWATER ISSUES: PAST, PRESENT, AND FUTURE

SESSION THREE: GROUNDWATER FOR THE INDUSTRIAL WEST

Doug Kenney, a research associate at the Natural Resources Law Center and a Management Team member of the Western Water Assessment at the University of Colorado, moderated Session Three. His research focuses on issues of western water, public lands, and natural resources governance.

BLACK MESA

Harris Sherman, of Arnold and Porter and the Counsel to the 10,000 people of the Hopi Tribe in northeastern Arizona, discussed the legal battle and the lessons learned between the claims of the Hopi and Navajo to the claims of private mining operations on Black Mesa. The Hopi village sits on the top of Black Mesa and is one of the earliest and oldest settlements in North America. Black Mesa also contains high quality coal, which is low in sulfur content and contained in large seams. The Peabody Coal Company negotiated a long term surface coal mine lease with the tribes and the Department of the Interior to extract approximately thirteen million tons of coal per year and slurry for the Mojave power generator in Laughlin, Nevada using water from the Navajo Aquifer. Mr. Sherman emphasized how the economic effect of the contract for both reservations is huge, constituting twenty-five percent of total revenue and 250 jobs for the Hopi tribe and thirteen percent of total revenue and 150 jobs for the Navaho tribe. The Hopi and Navajo claim historical and religious/cultural rights to the high quality Navaho Aquifer below Black Mesa. The aquifer exists under great pressure and is the sole source of drinking water in the area.

However, as Mr. Sherman explained, since Peabody began operation of the coal mine, springs and washes running for centuries dried up and wells levels are dropping precipitously. Peabody blames the drought for the decreasing water levels and stated what is happening would have happened anyway. As counsel for the Hopi, Mr. Sherman worked with the tribe to interpret what constitutes material damages under the lease as one possible solution. Fortunately, a California public utility running the Mojave Station began to negotiate with Peabody and told the company to resolve the Navajo Aquifer issue before it would invest. Peabody considered several options including running a pipeline from Lake Powell, pumping water from the Grand Canyon, or using the Coconino Aquifer which does not contain drinking quality water. For the Navajo Aquifer, there are current efforts to create a water management plan to get the water levels back.

COALBED METHANE: OVERVIEW OF OWNERSHIP AND WATER QUALITY ISSUES

Tom Darin, counsel for the Jackson Hole Conservation Alliance, presented a case study in groundwater management in northeastern Wyoming. That region, known as the Powder River Basin, is a rich source of natural gas, or coalbed methane. The rapid development in mining operations, as well as the predicted continued increase, raises concerns over the impact of this industry on the area's water. The immediate impacts are found in the groundwater, surface water, land subsidence, and air quality. Methane mining involves a dewatering process which extracts large amounts of groundwater. The issue facing Wyoming is how to manage the extraction of this groundwater and its subsequent release into surface streams. One plan is to create thousands of artificial reservoirs to recharge the groundwater through seepage. Mr. Darin pointed out that the water resulting from the methane mining contains contaminant that concentrates in the reservoirs as a result of evaporation, posing a contamination risk for the water that does return to the near-surface aquifers. He urged that these management challenges must be resolved soon by the authorities in Wyoming because it is estimated that approximately 7.5 trillion gallons of water will be pumped out of the groundwater over the next 15 years, and such a large quantity of water must be managed. Mr. Darin concluded by discussing the 2025 Water Initiative created by the Department of the Interior. The Initiative's goal is to implement a desalinization process that treats coalbed methane water before returning the water to the ground.

SESSION FOUR: TRANSBOUNDARY GROUNDWATER ISSUES**WESTERN STATES' COMPACTS: SHOULD GROUNDWATER BE ON THE TABLE?**

Rachel Paschal Osborn and Tom Ring spoke about the Yakima River Basin and the Spokane Basin as an example of how transboundary interstate compacting can work. Ms. Paschal Osborn is a public interest water lawyer focusing on water resources, water quality and ESA issues in Washington and Idaho. Mr. Ring is a hydrogeologist on the staff of the Yakama Nation Water Resources Program in Toppenish, Washington since 1990. After a brief overview of the hydrogeology of the area, they discussed Washington groundwater law under the 1945 groundwater code and prior appropriation which recognizes the surface connection to groundwater. Ms. Paschal Osborn and Mr. Ring discussed the hydrogeology and recharge of the Yakima River Basin, Spokane River Basin, and the Columbia Plateau Regional Aquifer System. Mr. Ring explained the geology of the Yakima Basin consists of basalt layers over the aquifer; the fold paths of which direct all groundwater flow which moves down vertically and leaks into a discharge area. The Yakima River Basin where the Yakama Indian Reservation is located is in the rain shadow of the mountains and significantly drier. The Yakama Nation meets with state ecologists to discuss management of the Yakima River Basin. They sue under timeliness and begin a four year lawsuit. Finally, the state ecologists submit and ask to settle.

In the Spokane Basin, the Rathdrum Prairie Aquifer flows from Idaho into Washington as one of the fastest moving aquifers. The aquifer is fully allocated in Idaho based upon a power plant hearing after the energy "crisis" in 2001. However, the allocation currently depletes stream flow in the Spokane River. Mr. Ring then showed pictures of the Spokane Falls, which were completely dry on September 2003. Ms. Osborn and Mr. Ring discussed how the sovereigns recognize the hydraulic continuity between groundwater and surface water. There is a current bi-state aquifer study and a petition for a moratorium on new groundwater rights in Idaho. Both Washington and Idaho are prior appropriation states and require conjunctive use of surface water, but Idaho continues to issue water rights because it is in a better position for equitable distribution. Overall, the importance of groundwater is being recognized in interstate or tribal compacts due to a new era of water compacting, especially internationally. Ms. Osborn urged that compacts must include all sovereigns including tribes, embrace the restoration model, recognize water as a public trust resource, integrate both water quality and quantity, and include both groundwater and surface water management.

U.S. – MEXICO GROUNDWATER: A SHARED RESOURCE?

Steve Mumme of Colorado State University spoke about groundwater management at the border between the United States and Mexico under NAFTA. Many communities wholly dependent on groundwater include the Columbus-Palmomas between New Mexico and Chihuahua, the Bisbee-Naco, Ambos Nogales, and the Sonoyta-Lukeville between Arizona and Sonora, and the Ambos Tecate between California and Baja California. Overall, progress since IBWC Minute 242 passed is disappointing. Mr. Mumme described Minute 242 and how it included Resolution 5, which sets a limit for pumping within five miles from the Arizona-Sonora border, and Resolution 6, which states that the United States and Mexico should consult with each other. There was an implied commitment to develop a comprehensive groundwater management system along the border areas between the two governments. Currently, there are constraints on bi-national cooperation primarily because of the different legal systems for administration of water as well as the differences in groundwater law between Texas, New Mexico, Arizona, and California. Only New Mexico resembles Mexico's system for groundwater management. Other obstacles are the political decentralization of United States' water policy, the IBWC state agency, and economic variability between water prices. Groundwater is cheaper than surface water near the border.

However, Mr. Mumme pointed out there are also opportunities for further bi-national cooperation because communities are realizing the importance of groundwater due to recent droughts and water shortages, increasing urbanization of border areas, and a changing international context. There is currently a Bi-national Groundwater Database to study different basins along the border and build an infrastructure that protects groundwater. The Good Neighbor Environmental Board is not a bi-national group but consults with Mexico and participates significantly in the process of legitimizing water management between both countries. The IBWC changed its focus to incorporate sustainable development models. Based on all these developments, Mr. Mumme sees more cooperation likely to emerge regarding groundwater management along the border, especially in areas such as the Columbus-Palomas and Ambos Nogales aquifers. Ultimately, it will be the local communities engaged in taking their future into their own hands, where people are one-hundred percent dependent on that groundwater.

SESSION FIVE: REGIONAL PANELS

Moderator: Kathryn Mutz, Natural Resources Law Center

GROUNDWATER RESOURCES OF THE PLAINS: FROM THE EDWARDS TO THE OGALLALA

Ron Kaiser from Texas A&M University and Raymond Supalla from the Department of Agricultural Economics at the University of Nebraska presented information regarding the sustainability standards of aquifers and how to modify the capture rule. Mr. Kaiser presented an overview of groundwater interests between the states sharing the Ogallala Aquifer. Oklahoma's resources are constrained from the north by Nebraska and the south by Texas. In Nebraska, the main problem is conjunctive management due to mining and the impact on stream flow and water quality. The Ogallala Aquifer, mined by Colorado, Kansas, Oklahoma, Nebraska, Texas and New Mexico primarily for agriculture irrigation is declining every year. The key, according to Mr. Kaiser, is how to prevent further depletions. The Water Planning Bill is a good start but still have to figure out the safe yield requirements. A key issue regarding groundwater mining is whether the states should have an obligation to future generations. The best way to control consumptive use is to control access.

Mr. Kaiser then described the bifurcated system of groundwater management in Texas, which still primarily uses the capture rule and allows landowners to draw unlimited amounts of groundwater from beneath their land without liability from surrounding landowners. Because of the use of the capture rule in Texas, there is no incentive to conserve water or consideration for community impacts. The Texas legislature responded by creating local groundwater districts, which have several benefits. The districts are managed locally allowing modification of the capture rule based on the collective interests of the community and avoiding state regulation. However, there are several drawbacks as several districts will exist over a single aquifer and limited funding causes division and competition between communities and groups. Finally, Mr. Kaiser discussed groundwater marketing which is a transfer of water rights between a willing seller and a buyer, exporting groundwater outside the aquifer or groundwater district.

GROUNDWATER RESOURCES OF THE LOWER COLORADO REGION

First, Michael Fife, an attorney at Hatch and Parent, spoke about California groundwater management focusing on the adjudicated groundwater basins in southern California such as the Santa Maria, Central Basin, Main San Gabriel Bains, and the Chino Basin, which are proving successful to developing comprehensive basin management regimes. The Santa Maria, as one example, has 1,000 parties involved.

Here was the first case where overdraft was tried in court and included a big debate about whether the Santa Maria Basin was in overdraft. The court found, without quantifying safe yield standards that the basin was not in a state of hydrologic overdraft. However, the court did not exclude imported water from the California Water Project.

Mr. Fife described several other basins. The Central Basin Adjudication was created by a stipulated judgment in 1962 and contained 148 parties. The San Gabriel Basin is currently dealing with perchlorate CERLA litigation from the South El Monte Operable Unit. In 2004, the defendants filed cross-motions claiming that for over thirty years, the contamination is due to exportation of contaminated water from the Colorado River brought in to recharge the basin.

The second panelist, John Entsminger, deputy counsel from the Southern Nevada Water Authority, spoke about recent efforts to manage groundwater in Nevada where up to 1991, the state was practicing Texas water law and using as much water as possible. Nevada received two percent of water allocation from the Colorado River, which comprises ninety percent of southern Nevada's water supply. The remaining ten percent comes from the groundwater aquifer in the Las Vegas Basin. Prior to the drought, southern Nevada relied on surplus water from the Colorado River, but that is not available due to interim surplus guidelines and banking in Arizona. There is pressure to develop alluvial aquifers and the Carbonate Rock Aquifer in southern Nevada and create pipeline projects into populated areas in the state. However, Mr. Entsminger is encouraged by efforts of the state resource program to focus on long term conservation with a unique opportunity to manage the groundwater basins in Nevada on a regional scale instead of basin by basin.

The third panelist, Timothy Henley, manager of the Arizona Water Banking Authority, discussed the banking project and how it is appropriate for Arizona's water needs and not just retribution to California for stealing water for many years. Arizona's water management focuses on two pieces: (1) there needs to be a way to know who is using what water, and (2) certain areas need more management than others, especially critical basins. Mr. Henley explained how Arizona amended its laws and created a system for groundwater, which included the Water Bank. The Water Bank can do interstate water storage and there is no limitation. Further, it does not market water, but sells it at cost.

DAY THREE**GROUNDWATER: INNOVATIVE SOLUTIONS FOR COLORADO
AND THE WEST****SESSION SIX: A COLORADO GROUNDWATER PRIMER**

Moderator: James Corbridge, professor at the University of Colorado School of Law

GROUNDWATER RESOURCES IN COLORADO: THE GROUNDWATER ATLAS

Mathew Sares, chief geologist from the Colorado Geological Survey, Environmental Geology Section, provided an overview of groundwater in Colorado. He discussed the hydrogeology and annual water balance for the state, and provided information regarding several of the bedrock aquifers and their geology throughout the various regions of Colorado. Primarily, aquifers in Colorado occur in sandstone. However, the complex geology in Colorado created a multitude of aquifers throughout the state. Then, Mr. Sares focused on the Arapahoe Aquifer and the Laramie-Fox Hills Aquifer, both located in the metro Denver area, and explained that high demand is contributing to a significant decline of groundwater within the last ten years. In conclusion, he reiterated that a basic understanding of geology is essential to understand groundwater occurrence in Colorado.

INTRODUCTION TO GROUNDWATER LAW IN COLORADO

David Harrison, an attorney at Moses, Wittemyer, Harrison, and Woodruff PC, presented an overview of groundwater law in Colorado. First, he explained groundwater law evolved in the state since 1965 with a variety of approaches taken for different groundwater basins and different problem situations. Even though there is a presumption that all water is tributary, there are several classifications used including designated groundwater, tributary groundwater, non-tributary groundwater, not non-tributary groundwater, and exempt wells. Under general rules in the state, if groundwater is tributary, prior appropriation applies but a well permit for non-domestic uses is required and any adjudication goes through the Water Courts. Designated groundwater basins are regulated by a Groundwater Commission, however, and groundwater in the basins is generally already fully allocated. For example, the Denver Basin has its own unique set of laws for the five different non-renewable water formations under the basin that are not owned by surface users and contribute significantly to the river water flow. Mr. Harrison then explained how Senate Bill 213 established the one hundred year life rule, which is not a good management rule. Senate Bill 5 then used the one hundred year rule as an

allocation rule, intending to enact a different management rule later. Colorado is also subject to several interstate compacts for the Republican River, Arkansas River, Rio Grand Basin, and Colorado River. Mr. Harrison spoke of reoccurring issues regarding groundwater management including whether surface rights will remain protected, whether groundwater is to be mined or managed for a sustained yield, and whether pressure levels are protected.

SURFACE – GROUNDWATER CONFLICTS ON THE SOUTH PLATTE: EFFECT OF DROUGHT ON LAWS, REGULATIONS, AND WATER USE

Steve Simms from the Colorado Office of the Attorney General discussed issues regarding the South Platte River Basin. First, he gave an overview of the history of groundwater use in the South Platte focusing on the large scale development that occurred after World War II. A long drought in the mid-1950s started well development in the South Platte Basin. However, the wells caused substantial stream depletions five to six years later. Then, he described one of the biggest fights currently going on regarding the groundwater and surface water integration with pressure in the South Platte area to protect investment. Currently, there are over 100,000 exempt wells that have not even been addressed yet. Groundwater use focuses on the concept of maximum utilization, but first in time, first of right does not work because of the lag effect. There was an attempt for rulemaking in the South Platte, which was later reversed in the Colorado Supreme Court in *Empire Lodge*. GASP represents 1,000 wells in the area to create an augmentation plan. Mr. Simms talked about the obstacles to regulating wells, which includes the lag time between pumping and stream depletions. In 2002, the new rules were challenged in the South Platte, even though they were identical to ones approved for management along the Arkansas River. Even though the new rules were challenged, a series of negotiations occurred in order to prevent wells from being shut down by the State Engineer.

GROUNDWATER MANAGEMENT: LESSONS FROM *COLORADO V. KANSAS*

David Robbins, of Hill & Robbins PC, addressed groundwater management lessons learned from ongoing litigation between Kansas and Colorado regarding the affect Colorado wells have on the Arkansas River. Throughout the time of this enduring dispute, the science of groundwater has continued to develop resulting in a greater understanding of the tributary nature of groundwater on surface streams, as well as technology, such as computer models, that help detect adverse groundwater impacts and enable parties to establish proof of depletion in adjudication. Models are widely used today and will generally overcome a *Daubert* challenge. Any computer model is subject to misuse, and courts must be educated about the sufficiency and accuracy of the

data behind any model used in litigation. A court must carefully assess how a model was developed, how it was applied, the sufficiency, and accuracy of the data input into the model, the number and operation of calibration factors used in the model, the number of parameters where estimates are substituted for actual data, the sufficiency of the model's ability to replicate historical conditions, the uniqueness of the model's calibration, the existence of model verifications, and finally, the reasonableness of the conclusions drawn by the model's developer.

The second lesson learned is that failure to document groundwater use and have reliable data will cause disagreements about groundwater management and usage between different parties. Groundwater is essential to agricultural needs in Colorado, and management systems must not only balance in-state needs, but make sure the state is meeting the obligations to its neighbors. The Use Rules, adopted by the Colorado State Engineer, provide standards for owners and users of wells to replace injurious depletions from pumping from their wells. The rules rely on presumptive stream depletion factors to calculate stream depletions from pumping and require a well owner to predict annual depletions from pumping.

The third lesson is that GIS systems provide an invaluable tool for groundwater management by combining geographical mapping with information such as well locations, ownership information, whether a particular field is irrigated with groundwater, and the type of irrigation method used. Finally, groundwater management presents several challenges not predicted at the time the interstate compacts were established, but is essential and attractive resource as a reliable water supply to agriculture, municipalities, and other uses.

POTENTIAL FOR CONJUNCTIVE USE IN THE SOUTH DENVER METRO REGION: OPPORTUNITIES AND CHALLENGES

Patricia Wells, general counsel for Denver Water, discussed the South Metro Denver Water Supply Study comprised of eleven districts throughout Douglas and Arapahoe counties. The area is rapidly growing and population is expected to double by 2025. Currently, seventy percent of water use relies on non-renewable groundwater resources. Ms. Wells explained that the Denver Basin Aquifer has uneven distribution and recoverability, so there is uncertainty about long term aquifer performance to meet growing needs and peak demands. The study precipitated from concerns about the water level dropping thirty feet per year, the realization that declining water levels greatly reduce well productivity, uncertainty about long term aquifer performance, well-to-well interference reduces productivity and ability to meet peak demands, and that costs to extract groundwater will increase significantly over time. There was also concern from the West Slope to ensure that adequate water supply will be available to Summit County and maintain adequate water levels in Lake Dillon.

The goals of the South Metro Study is to develop a cooperative plan between South Metro Water Districts, Denver Water and Colorado River District, maximize the use of local water resources, including regional ground water management, conservation and water reuse, quantify available local groundwater resources and long term pumping responses in Denver Basin aquifers, and meet South Metro water demands through 2050. Ms. Wells then explained the hydrogeology and composition of the various aquifers in the Denver Basin Aquifer and the data regarding declining water levels caused by the “doubling effect” as more wells are put to use.

SESSION SEVEN: THE FUTURE OF GROUNDWATER IN THE WEST

Moderator: Jim Martin, Natural Resources Law Center

Jim Lochhead began Session Seven discussing several major western river basins and the interrelationship between growing groundwater withdrawals, Endangered Species Act (“ESA”) requirements, and the effect of an over-appropriated aquifer on inflows and outflows in nearby rivers. In the Pecos River, parties reached a settlement agreement and saved ten years of litigation. Along the Snake River, which is developed from the top down like the Platte River, there are many demands for water use including reservoirs, hydroelectric projects, and an aquaculture industry. The ESA requires that minimal instream flows insure that fish get back out to the sea from the Snake River, but the burden is on surface users, not groundwater users. Mr. Lochhead briefly mentioned the problems along the Platte River which is exacerbated by unregulated well development in the northeast. He then described how the Colorado River is in good shape with regard to administration, adjudication and compact allocation. Finally, Mr. Lochhead concluded by pointing out several issues needing future resolution including conjunctive management of the Denver Basin regarding the development and growth in Douglas County, the 200,000 domestic wells in Colorado currently exempt from regulation, groundwater recharge and overall sustainable management, continuing obligations to interstate allocation regimes, and environmental loss due to further groundwater development.

The second panelist, Tom Cech of the Central Colorado Water Conservancy District, discussed developments in the Greeley-Fort Collins area regarding groundwater management. As of 1870's, there were two ditches: Greeley # 3 Ditch and one into Fort Collins from the Cache-La Poudre River. From 1980-2000, Connie Woodhouse at NOAA reported the wettest twenty years in Colorado documented history with an average of seventeen percent above normal. Then in 2002, the drought happened. In Fort Lupton, a low income development, the wells dried up and there was no drinking water available. Over 800 wells were permanently shut off causing farmers to lose their

farms. Mr. Cech urged that groundwater cannot be over allocated, but it is hard to decide who is right and, ultimately, what is needed is more fairness and flexibility in the law.

The final panelist was Russell George from the Colorado Department of Natural Resources to discuss SB 222 regarding future rules for the Colorado State Engineer. There are similar issues along the Pecos River and Snake River, where groundwater use is facing more regulation. Most states do not want to regulate exempt wells. Mr. George continued by stating the importance of shifting the current strategy toward groundwater regulation. He suggested a preventive approach combined with a scientific understanding of groundwater. In conclusion, Mr. George emphasized the need for the eastern and western parts of Colorado to work together to find mutually beneficial solutions.

*Blake Johnston
Dara Lum
Susan Curtis*

WATER LAW CONFERENCE AND ANNUAL MEETING

Steamboat Springs, Colorado June 18-19, 2004

Water law frequently changes, especially in Colorado and other Western states. Water law practitioners, judges, and professors need constant updates on the status quo of the river basins and water situation in Colorado, as well as the ever-changing case law and legislation. The annual "Water Law Conference," a two-day conference at the elegant Sheraton resort in Steamboat Springs, Colorado, provided an opportunity for people practicing water law, studying water law, or using water law for agricultural and other purposes to inform one another about legal changes and geographical changes regarding this crucial resource. On day two, the Water Law Conference merged with the Agricultural Law Conference to discuss issues pertinent to both overlapping areas of law.

DAY ONE

WATER LAW ISSUES

SESSION ONE: LEGISLATIVE AND CASE LAW UPDATE

After an introduction from planning committee member David A. Bailey, Peter C. Fleming, the in-house General Counsel of the Colorado River Water Conservation District, commenced the conference with a discussion of legislative and case law updates. He began with the proposition that recent legislation addressing water law is drought-