

A two-day conference for water managers, end users, and their scientific and legal advisors

COLORADO AQUIFER MANAGEMENT

Groundwater and river flow connections

**RIVER ACCRETIONS DUE TO ARTIFICIAL RECHARGE
STREAM DEPLETIONS DUE TO WELL PUMPING
THEIR IMPACT ON WATER MANAGEMENT POLICY**



[Picture credit: United Nations Environment Programme]

Wednesday November 28 and Thursday November 29, 2012

Holiday Inn Denver East – Stapleton, 3333 East Quebec Street, Denver, CO 80207



Conference Organizer: American Ground Water Trust

In Cooperation with:

International Association of Hydrogeologists Commission on Groundwater for Decision Makers

CO Board of Continuing Legal & Judicial Education - Rule 260 - 17 general credits awarded

Background (Why hold this conference?)

A basic component of the AGWT Mission is to have the best science and leading-edge technologies as the basis for water management and water policy decisions. It seems that there are currently some issues of concern (controversy) regarding the basis for managing the groundwater in the South Platte. These concerns have been exacerbated by drought conditions that have jeopardized agricultural productivity.

This in-depth scientific conference will allow for an exchange of views, information and opinion about the use of current technology to compute stream depletions caused by well pumping and river accretions resulting from artificial recharge. The Conference will discuss how any inaccuracies in these calculations (model results) impact management decisions for an alluvial stream/ aquifer system and how inaccuracies may prevent maximum beneficial use of both groundwater and surface water resources.

The discussions may serve to confirm the validity of current practices or may suggest different approaches to hydrologic calculation of natural conditions, well pumping and artificial recharge impacts. The emphasis for the program will be on the technical/ scientific issues regarding how South Platte hydrology works, is measured and modeled and will include discussion about the accuracy of modeling predictions. There will be some conference time specifically allocated to consideration of the economic, legal and political issues that are the background of the evolution of current management decisions.

What Colorado people have been saying to the American Ground Water Trust:

Achieving "maximum beneficial use for all citizens" seems to be at odds with "protecting vested water rights"

Everything is working just fine – no need for any water management changes

Have case-law decisions unduly impacted administrative processes in managing the waters of the State?

A few good storms and a good winter snow-pack and drought will soon be forgotten

Are we accurately computing accretions and depletions? Is anybody being injured?

Current well administration is necessary to protect downstream senior surface rights

Irrigation well curtailment and increased artificial recharge cause damage from high groundwater levels

Colorado's best interest is to let market forces allocate water to the highest value use

Real-time management of both groundwater and surface water resources could maximize beneficial use

Program objective

Expert presenters will discuss the reliability of techniques used to compute recharge accretions and pumping depletions to river flow that form the basis for water management decisions to maximize the beneficial use of both the groundwater and surface water supplies while protecting vested water rights. Anyone involved with alluvial stream aquifer systems where either well pumping or recharge occurs will benefit from the information-exchange opportunity.

Who should attend?

Water research scientists, geologists and hydrogeologists, hydrologic modelers, water engineers, water resources planners, water district managers, ditch company officers, water attorneys, water court judges or referees, regulatory personnel, State and Federal Agency staff with water responsibilities, environmental organizations, water end-users and interested citizens.

Science as the Basis for Water Policy

American Ground Water Trust (Non-profit education organization)



This is what we do:

- Promote efficient and effective ground water management
- Communicate the environmental and economic value of ground water
- Showcase ground water science and technology solutions
- Increase citizen, community and decision-maker awareness
- Facilitate stakeholder participation in water resource decisions

◆ Aquifer Management Programs ◆

Since 1999, the American Ground Water Trust has convened over 150 conference and workshop programs in the US and Canada. Thirty-two of these events have featured aquifer storage and water management. The Trust's mission-focus on resource sustainability and effective ground water management is the rationale for our promotion of information-exchange on water management issues and our showcasing of aquifer storage technologies.

The AGWT presented aquifer management conference programs in Colorado in 2003, 2004, 2006 and 2007 in addition to organizing seven other Colorado conference/ workshop programs covering geothermal technology, maximizing water well & pump efficiency and training teachers on groundwater issues.

PROGRAM - Wednesday November 28th

7:00 – 7:30 EXHIBITOR set-up

7:30 – 8:30 **REGISTRATION** (coffee)

Session 1 – Introduction

Groundwater is simply that part of the hydrologic system that occurs in a geological environment at a particular point in time. Water molecules do not owe exclusive allegiance to groundwater, surface water or any other part of the hydrologic system. For that reason, management decisions to optimize water resources require an integrated approach. Both models and management can benefit from clear concepts of how the hydrologic system works in three-dimensional space and in time.

Moderator Andrew Stone, American Ground Water Trust, Concord, NH

8:30 – 8:45 Andrew Stone, Executive Director and hydrogeologist, American Ground Water Trust, Concord, NH

◆ ***“Science as the Basis for Water Policy” is the AGWT’s Mission and the Purpose of this Conference***

8:45 – 9:15 Dick Stenzel, Senior Water Resources Engineer, Applegate Group, Denver, CO

◆ ***One hundred and fifty years of South Platte conjunctive use history***

9:15 – 9:45 Bob Longenbaugh, Consultant Water Engineer, Fort Collins, CO

◆ ***What groundwater observation well data & river flow measurements tell us about groundwater management***

9:45 – 10:00 **BREAK**

Session 2 – Stream – Aquifer Modeling and Analytical Solutions

Mathematical equations were developed in the 1960s and groundwater finite difference models followed in the 1980s. In the 2010s we have sophisticated model codes and high-powered computing capabilities. This session will discuss the current modeling technologies that can be used to compute accretions and depletions to the river and the extent to which river flow is impacted by artificial recharge or pumping.

10:00 – 10:30 Gordon McCurry, Senior Hydrogeologist, Geomega Inc., Boulder, CO

◆ ***Overview of modeling methods to estimate stream depletions due to pumping***

10:30 – 11:00 Calvin Miller, Principal Engineer, Miller Groundwater Engineering, Fort Collins, CO

◆ ***Interpretations and use of field data to compute accretions and depletions***

11:00 – 11:30 Luis Garcia, Professor, Department of Civil and Environmental Engineering, CSU, Fort Collins, CO

◆ ***How Analytic solutions and AWAS compute depletions and accretions***

11:30 – 12:00 Tissa H. Illangasekare, AMAX Distinguished Chair and Professor of Civil and Environmental Engineering, Colorado School of Mines. Golden, CO

◆ ***What are the limits of analytical solutions in handling accretions and depletions accounting for spatial and temporal variability?***

12:00 – 12:30

KEYNOTE PRESENTATION

Gregory Hobbs, Justice, Colorado Supreme Court, Denver, Colorado



***Optimum use of both groundwater and surface water:
The challenge of the Prior Appropriation System***

Justice Hobbs has served on the Colorado Supreme Court since May 1, 1996. He earned his J.D. from the University of California at Berkeley, 1971, and has a B.A. in History from the University of Notre Dame, 1966. He practiced environmental, water, transportation, and land use law for 23 years before becoming a member of the Colorado Supreme Court. During his legal career, he worked as a law clerk at the United States Court of Appeals for the Tenth Circuit, an enforcement attorney for the Environmental Protection Agency, a Colorado First Assistant Attorney General for Natural Resources, and a partner with the law firms of Davis, Graham & Stubbs and Hobbs, Trout & Raley. He is Vice-President of the Colorado Foundation for Water Education and a co-convenor of the Western Water Judges educational program, Dividing the Waters.

12:30 -1:30 **LUNCH** (provided on-site)

Session 3 – Field based interpretations of how the hydrology works

To solve mathematical equations used in hydrologic predictions, assumptions about the geology and hydrologic processes impacting the system are made. This session (based on work at the Tamarack Wildlife Area) will include consideration of how these assumptions simulate how Mother Nature controls water movement.

Moderator: Alan Berryman, Northern Colorado Water Conservancy District, Berthoud, CO

1:30 – 2:00 Richard Vail, Water Resources Engineer, Colorado Parks and Wildlife, Denver, CO

◆ ***Tamarack Recharge Project Overview, Decree Provisions and Future Operations***

2:00 – 2:30 Mary Halstead, Chief of Modeling & Decision Support Systems, CO Div. of Water Resources, Denver, CO

◆ ***How field data collection and modeling were used to determine stream impacts for the water court case***

2:30 – 3:00 Chad Wallace, Senior Assistant Attorney General, Colorado Attorney General's Office, Denver CO.

◆ ***Legal aspects of negotiations for the stipulated decree for Tamarack Wildlife Area***

3:00 – 3:30 John Stednick, Professor, Watershed Science, College of Natural Resources, CSU, Fort Collins, CO

◆ ***Using alternative methods to quantify groundwater movement at Tamarack State Wildlife Area***

3:30 -3:45 **BREAK**

Session 4 – Management processes and procedures for water allocations

This session will include explanation of the basis upon which water managers make pumping and recharge allocation decisions in the South Platte and will outline how these protocols are achieving overall management objectives. The water courts enter decrees for augmentation plans which are designed to prevent injury on other vested rights resulting from well pumping. Those decrees include specific accounting forms which compute depletions due to pumping and accretions due to artificial recharge. Those calculated water volumes are used to control well pumping to prevent injury to vested rights.

3:45 – 4:15 Jon Altenhofen, Supervisory Water Resources Engineer, N. CO Water Conservancy Dist, Berthoud, CO

◆ ***How the hydrologic response units and accounting forms are developed in augmentation decrees***

4:15 – 4:45 David Nettles, Division Engineer, Colorado Division of Water Resources, Greeley, CO

◆ ***How the decree requirements are implemented in water administration***

4:45 – 5:15 Dick Wolfe, State Engineer, Colorado Division of Water Resources, Denver, CO

◆ ***Policy Considerations for Water Administration in Colorado***

5:15 – 6:30 **RECEPTION** (Cash-bar)



PROGRAM - Thursday November 29th

7:30 – 8:15 **REGISTRATION** (coffee)

Session 5 – Impacts and consequences of current management strategies

High groundwater levels reported for places in the South Platte may in part result from restricted well pumping and from too much artificial recharge. This session will include end-user accounts of physical and economic consequences.

Moderator: Bob Longenbaugh, Consultant Engineer, Fort Collins, CO

8:15 – 8:45 Don Jones, Farm Manager/ Broker, McFeeders Realty Appraisal & Management, Fort Morgan, CO

◆ *Economic impact of current water management in the South Platte*

8:45 – 9:15 Harry Strohauser, Farmer, La Salle, CO

◆ *Impact of current well administration on farming operations*

9:15 – 9:45 Sean Conway, Chair, Weld County Commissioners, Greeley, CO

◆ *Local government perspective on how best to manage water allocations in drought conditions*

9:45 – 10:00 **BREAK**

Session 6 – Optimum conjunctive use in Colorado river/ aquifer systems

This session will consider the geologic conditions impacting conjunctive use and will include descriptions of successful conjunctive use projects.

10:00 – 10:30 James Jehn, President, Jehn Water Consultants Inc., Denver, CO

◆ *Impacts of geology on groundwater management*

10:30 -11:00 Dan Ault, President, Deere & Ault Consultants, Longmont, CO

◆ *Aurora's Prairie Waters Project*

11:00 -11:30 Gary Thompson, President, W.W. Wheeler & Associates, Englewood, CO

◆ *Real-time management of groundwater and surface water – Widefield Channel*

11:30 – 12:00

KEYNOTE PRESENTATION

Nebraska's experiences with groundwater and surface water management

Dr. Ann Bleed, Consultant Engineer, former Director of Nebraska Department of Natural Resources, Lincoln, NE



Dr. Bleed was one of two negotiators representing the State of Nebraska on a six-member team that settled Nebraska v. Wyoming, a complex interstate water lawsuit, before the U.S. Supreme Court. She served as State Hydrologist for the Nebraska Department of Water Resources, and later Director of the department. Prior to her state service, Bleed taught senior and graduate-level courses in Integrated Resources Management and Natural Resources Policy at the University of Nebraska. She received her B.A. from Earlham College, her M.S. from Penn State, her Ph.D. from the University of Wisconsin, and is P.E. in Civil Engineering with an emphasis on hydrology and water.

12:00 -1:00 **LUNCH** (provided on site)

**Session 7 – Presentations and Panel Discussion:
Success and limitations of model predictive capability**

The session will focus on the predictive capability of models as tools for water administration and will consider the effectiveness of using fixed hydrologic response units incorporated in water court decrees for stream/aquifer systems.

Moderator: Jeris Danielson, (Former Colorado State Engineer)
General Manager, Purgatoire River Water Conservancy District (PRWCD), Trinidad, CO

- 1:00 – 1_30 Catherine Kraeger-Rovey, Owner, Water & Environmental Systems, Denver, CO
◆ **Post pumping depletions: Causes and Quantification**
- 1:30 – 2:00 Jim Yahn, Manager, North Sterling Irrigation District, Sterling, CO
◆ **The importance of replacing depletions and return flows to down-stream water users**
- 2:00 – 2:30 Tim Gates, Professor, Dept of Civil and Environmental Engineering, CSU, Fort Collins, CO
◆ **Finite difference model calibration: The Arkansas Valley experience**
- 2:30 – 3:00 Reed Maxwell, Director, Integrated GroundWater Modeling Center, CSM, Boulder, CO
◆ **Groundwater models: The good the bad and the ugly**
- 3:00 – 3:15 **BREAK**

Session 8 - Where do we go from here?

Would Colorado benefit from any changes to the current water management system? This session will provide discussion about the possible need for, and the likely pros & cons of potential changes to water allocation policy.

Moderator: Andrew Stone, American Ground Water Trust, Concord, NH

- 3:15 – 3:45 Steve Sims, Attorney, Brownstein Hyatt Farber Schreck, Albuquerque, NM
◆ **Legal constraints on maximizing the use of groundwater in storage to meet the State's water needs**
- 3:45 – 4:15 Scott Renfroe, Minority Caucus Chair, Colorado State Senator, District 13 (invited)
◆ **Perspectives on water management: does the legislature need to initiate any changes?**
- 4:15 - 4:45 John Salazar, Commissioner of Agriculture, Colorado Department of Agriculture, Lakewood, CO
◆ **Irrigated agriculture in Colorado: For 80 years well pumping has been allowed to mitigate drought impacts**
- 4:45 **ADJOURN**

Continuing Education Credit

CO Board of Continuing Legal & Judicial Education - Rule 260 - 17 general credits awarded

Check the website (www.agwt.org) for continuing education credit information

Applications for CEU approval have been submitted for several professions

Approvals will be posted when received

Hotel Information

Conference hotel: Holiday Inn Denver East – Stapleton, 3333 East Quebec Street, Denver, CO 80207

Sleeping rooms: A Conference rate [American Ground Water Trust Conference] of \$ \$89.00+ tax per night is available. (Cutoff Nov 5th). Call Sarah Inman, Sales Coordinator, Holiday Inn Denver East-Stapleton, Direct: 303.329.2740

Directions: From I-70 take Quebec/Northfield exit 278. Continue south on Quebec. Hotel is on the right past 35th Ave. Hotel is on the west side of East Quebec Street directly opposite the Northfield Shopping Complex.

Airport: Free Courtesy Shuttle available from Denver Airport.

Parking: No charge

REGISTRATION – AQUIFER MANAGEMENT CONFERENCE – DENVER CO

- Go to www.agwt.org for on-line registration

Two Day

One Day

Nov 28 & 29 Nov 28 or 29

Registration includes: access to exhibits, networking reception, handouts, breaks and lunches

YOU MUST CHECK ONE:

General Conference Registration

\$275

\$165

AGWT Member

\$235

\$145

Government Employee (Municipal, County, State, Federal)

\$235

\$145

Full-Time Student (ID required at Registration)

\$100

\$ 60

CD - (Presentation information from speakers mailed post-event)

\$20

Exhibit Table (You must also register to attend.)

\$300

Total for all checked boxes \$

Check [payable to: American Ground Water Trust]

AMEX Visa MasterCard PO

Credit Card or PO No. _____ Expiration _____

Cardholder Name _____

Registration Name _____

Title/Position _____

Company/ Organization _____

Address _____

City _____ State _____ Zip _____

Phone _____ E-Mail _____

SPONSORSHIP & EXHIBITS
 Showcase company achievements, expertise,
 projects, products & services
 Call 800 423-7748 or visit web-site

REGISTRATION

Mail: AGWT, 50 Pleasant Street, Suite 2
 Concord, NH 03301

Fax: (603) 228-6557

Call: (800) 423-7748

Scan: e-mail to trustinfo@agwt.org

On line: <http://www.agwt.org> (Conf / Workshops)

Cancellation policy: see website (www.agwt.org)