

A River of Change

Proceedings of the 18th Annual South Platte Forum

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October 2007

A stylized graphic at the bottom of the page. It features a black outline of a mountain range with several peaks. Below the mountains is a thick, horizontal teal band representing a river. The river has a wavy, irregular top edge. The entire graphic is set against a white background.

Colorado Water

Resources Research Institute

Information Series No. 104

Colorado
State
University

Proceedings of the 18th Annual South Platte Forum

A RIVER OF CHANGE

October 24-25, 2007—Radisson Conference Center—Longmont, Colorado

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Colorado Water Resources Research Institute, Reagan Waskom, Director
Colorado State University, Fort Collins, CO 80523-1033

18th Annual South Platte Forum

A RIVER OF CHANGE

October 24-25, 2007—Radisson Conference Center—Longmont, Colorado

Wednesday, Oct. 24

- 8:00 Registration & Continental Breakfast
- 8:45 **Welcome**
Reagan Waskom, Colo. Water Resources Research Institute
- 9:00 **A Change of Pace**
Prairie Waters Project – Aurora’s Sustainable Development of Locally Available Water Resources
Peter Binney, City of Aurora
ESA Insurance: Like a Good Neighbor, SPWRAP Is There
Alan Berryman, Northern Water
Northern Integrated Supply Project: An Evolution in Project Planning
Carl Brouwer, Northern Water
Colorado Water for the 21st Century: South Platte Basin Roundtable Accomplishments
Lisa McVicker, Center of Colo. Water Conservancy District
- 11:00 **Changing Faces**
Moderator: Richard Vidmar, Aurora Water
Harris Sherman, Colo. Dept. of Natural Resources
John Stulp, Colo. Dept. of Agriculture
- 12:05 Lunch
Friends of the South Platte Award Presentation
Don Ament, Past Colo. Commissioner of Agriculture
Keynote Presentation:
It Must Be In the Water: Extraordinary Leadership from Delph Carpenter and W.D. Farr
Historian Dan Tyler
- 1:30 **Changing Hearts and Minds**
Moderator: Diane Hoppe, Colorado Foundation for Water Education
Get to Know Your H2O: Community and School-Based Outreach and Education
Curry Rosato, Keep It Clean Partnership
What We Learned from Educating the Public
Jill Boyd, Northern Water
A Reservoir of Information (and Services!)
Patty Rettig, CSU Water Resources Archives
- 3:15 **Fields of Change**
The Future of Irrigated Agriculture in the South Platte
James Pritchett, Colorado State University
Sustaining Irrigated Agriculture While Meeting Increasing Municipal Water Demand in Colorado
Frank Jaeger, Parker Water and Sanitation District
Growing Crops with Less Water; Field Studies in the South Platte
Neil Hansen, Colorado State University
- 4:30 **Networking Reception and Poster Session**

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18th Annual South Platte Forum

A RIVER OF CHANGE

October 24-25, 2007—Radisson Conference Center—Longmont, Colorado

Thursday, Oct. 25

8:00 Registration & Continental Breakfast

9:00 **Modeling the Change**

An Updated Denver Basin Ground-Water Model

Suzanne Paschke, U.S. Geological Survey

Modeling the Future of Water Resources

Chris Goemans, Western Water Assessment

South Platte Decision Support System: Help with the Past, Present and Future

Ray Alvarado, Colorado Water Conservation Board

Well Augmentation: From Computers to Satellites

Luis Garcia, Integrated Decision Support Group

11:10 **Change Your Ways—regulations**

Moderator: Steve Gunderson, Colo. Dept. of Public Health and Environment

Emerging Contaminant Changes and Regulations

Patti Tyler, U.S. Environmental Protection Agency

Changing Ammonia Standards: Challenges for Wastewater Treatment Plants

Amy Woodis, Metro Wastewater Reclamation District

Keeping Your Cool with Revised Temperature Standards

Gabe Racz, Trout, Raley, Montano, Witwer & Freeman P.C.

12:30 Lunch

Keynote Presentation:

Moving from Climate Idiots to Savants: Tools for Preparing for the Coming Century of Climate

Brad Udall, CU-NOAA Western Water Assessment

1:45 **An Inconvenient Climate**

Moderator: Jay Skinner, Colo. Division of Wildlife

Water in the West: Squeezing Water from a Stone

Greg McCabe, U.S. Geological Survey

Challenges for Water Suppliers

Marc Waage & Bob Steger, Denver Water

Snowmelt Timing Changes in Colorado

David Clow, U.S. Geological Survey

Climate Change and South Platte Native Fishes

Ashley Ficke, GEI Consultants

3:30 Forum ends

Mark Your Calendar!!

The 19th Annual South Platte Forum

October 22-23, 2008

Location TBA

Wednesday, Oct. 24, 9:00 a.m.

A Change of Pace

Moderator: Reagan Waskom, Ph.D.

Director, CWRRI, CSU, E102 Engineering, Fort Collins, CO 80523-1033, 970-491-6308, Reagan.Waskom@ColoState.EDU

Reagan Waskom is the director of the Colorado Water Resources Research Institute and Colorado State University Water Center. Dr. Waskom is a member of the Department of Soil & Crop Sciences faculty at CSU. He has worked on various water related research and outreach programs in Colorado for the past 20 years and can be reached at reagan.waskom@colostate.edu.

Prairie Waters Project – Aurora’s Sustainable Development of Locally Available Water Resources

Peter D. Binney, P.E.

Director of Utilities, Aurora Water, 15151 E. Alameda Parkway, Ste 3600, Aurora CO, 80012, 303-739-7378, pbinney@auroragov.org

The city of Aurora serves the water and wastewater needs of this community of 300,000 people in the Eastern metropolitan Denver area. Traditionally, the City’s water supplies have been developed in the upper South Platte, Colorado and Arkansas River basins with return flows re-entering the Lower South Platte River through treated wastewater discharges from Metro’s plant, Aurora’s Sand Creek reclamation plant and lawn irrigation return flows. Because of the water rights provenance of these waters, the majority of those return flows can be recaptured and “used to extinction” by Aurora as a future water sources. In 2003, the severe drought conditions resulted in Aurora’s reservoirs being dropped down to 26% of contents and the City initiated a major program to recover the reservoirs and to develop a foundation for future water supply development in the Lower South Platte River basin.

A project named the Prairie Waters Project has been adopted by the City of Aurora to physically recover those available fully consumable return flows and to deliver those to the City. The project will initially operate as a drought-response program but will progressively see its use increase as a firm water supply element of the City’s overall Integrated Water Development Program. The Prairie Waters Project involves a bank filtration well-field, a 34 mile pipeline with three pump stations and a state of the art water purification plant that has the capacity of treating all biological, organic, and chemical contents of the source water to a level that exceeds all state and federal drinking water standards. The project will be able to operate conjunctively with downstream water users – in times of water surplus to the city’s needs, unused water will be allocated to downstream farmers and diverters for augmentation purposes and allow continued operation of alluvial wells in compliance with State’s Appropriation Doctrine. This example of farm-city cooperation is an expansion of similar programs used by Aurora in the Arkansas Valley and promotes effective total management of available water supplies without the traditional conflict of “buy and dry” approaches.

The project represents a \$754 million investment by the City and incorporates industry-leading technologies including advanced oxidation, ultraviolet treatment, granular activated carbon, filtration and disinfection techniques. All costs are being carried by Aurora customers through water sales or tap connection fees with over \$500 million in revenue bond sales to capitalize the project.. The project has required over 500 permits and multi-jurisdictional permitting activities at the private, local, state and federal government levels. The project is scheduled for completion in time for domestic water deliveries in 2011.

Peter Binney, P.E. is the director of Aurora Water and is responsible for the City’s water and wastewater programs. He joined the City in early 2002 after more than 25 years as a private consulting engineer. Since joining the City, he has initiated major water conservation programs, water acquisitions, agricultural leasing for interruptible supplies, and development of a long range capital improvements programs to expand the capacity of these utility systems to serve over 500,000 people by 2030. He oversees an annual operating and capital budget that exceeds \$300 million and a staff of more than 400,

He is a registered engineer, postgraduate engineer from the University of Canterbury and University of Colorado, and is a member of the American Society of Civil Engineers, American Water Works Association, and Society of American Military Engineers.

ESA Insurance: Like a Good Neighbor, SPWRAP Is There

Alan Berryman

Assistant General Manager, Northern Water, 220 Water Ave., Berthoud, CO 80513, 970-532-7700, aberryman@ncwcd.org

Northern Integrated Supply Project – An Evolution in Project Planning

Carl Brouwer, P.E., PMP

Project Manager, Northern Water, 220 Water Ave., Berthoud, CO 80513, 970-622-2298, cbrouwer@ncwcd.org

The Northern Integrated Supply Project (NISP) has been an evolution in project planning. From the days of proposed mainstem dams and hydroelectric power to the present configuration, the Project has evolved to meet changing environmental priorities as well as increasing water values. Presently NISP consists of an off-channel reservoir and system of unique agricultural water exchanges to meet the needs of 15 northern Colorado water providers. This presentation gives a history of the Project, the present configuration of NISP, and on-going challenges faced in the permitting process.

Carl Brouwer is a project manager for Northern Water. He has worked for Northern Water for 17 years and is presently the project manager for NISP. Mr. Brouwer graduated with a bachelor's degree in civil engineering from the University of Michigan and a master's degree in civil engineering from Colorado State University. He and his wonderful wife Jana have three children. In his spare time he enjoys camping, helping with Boy Scouts, and tending a few cows on his mini-farm.

Colorado Water for the 21st Century: South Platte Basin Roundtable Accomplishments

Lisa McVicker, J.D., Ph.D.

Secretary, Center of Colorado Water Conservancy District and South Platte Basin Roundtable, 1221 S. Clarkson Street, Suite 210, Denver, CO 80210, 720-480-9290, mcvicker@qwest.net

The South Platte Basin Roundtable represents the largest of the nine designated basins created by HB 1177, the "Colorado Water for the 21st Century Act." Because of the South Platte's lengthy course and many tributaries, its basin contains extremely rural and extremely urban areas. The 51 currently appointed and elected members of the roundtable were recruited from counties, municipalities, water districts, water rights owners, environmental, recreational, and agricultural interest groups, and water providers from the top of the Rocky Mountains to the border of Nebraska. The Basin encloses the most irrigated acres in the state and also has the highest requirements for irrigation. At the same time, nearly two-thirds of the increase in the state's demand for water to meet the needs of municipal and industrial uses will be in the South Platte Basin. By the year 2030 it is anticipated that the entire South Platte Basin will have a "demand shortfall" of more than 90,000 acre-feet.

Despite the sobering predictions and the formidable challenges that lie ahead, the South Platte Basin Roundtable has kept pace with the objectives and goals of HB 1177 and, most notably, has rallied to the spirit of the Act. The members have come together from a vast array of backgrounds, bringing with them strong interests, opinions, and positions along with a willingness to work for the good of our state and the future of our children. The individuals who have been appointed or elected to this Roundtable include multi-generational farmers and elected representatives, such as county commissioners and board members of municipalities and water districts. Ms. McVicker will present a summary of the projects that are underway thanks to the focus on collaborative problem solving of the Roundtable and the impressive dedication of the Department of Natural Resources and monies dedicated by HB179.

Elizabeth (Lisa) McVicker is the recording secretary of the South Platte Basin Roundtable; she holds her membership position in the Roundtable as a board member of the Center of Colorado Water Conservancy District representing Park County. Ms. McVicker is a practicing attorney in the State of Colorado and holds her J.D. from the University of Denver College of Law. Ms. McVicker received her Ph.D. from New York University, her M.A. from The Johns Hopkins University, and her B.A. from The University of Texas at Austin. She teaches Business Law and Business Ethics at Metropolitan State College of Denver and is an active owner in Image Builders II, Inc., general contractors in residential and commercial construction. Lisa is a Colorado native and spends as much time as possible enjoying the mountains surrounding and waters running through the headwaters of the South Platte River.

Wednesday, Oct. 24, 11:00 a.m.

Changing Faces

Moderator: Richard Vidmar

Water Resources Engineer, Water Resources Division, Aurora Water, 15151 E. Alameda Parkway, Aurora, CO 80012, 303-739-7326, rvidmar@auroragov.org

Richard Vidmar is a water resources engineer for Aurora Water specializing in water rights acquisitions, appropriations and protection in the South Platte Basin. Rich holds a bachelor's degree in civil engineering from Colorado State University. Prior to earning his degree, Rich worked for the U.S. Bureau of Reclamation for six years at the Mt. Elbert power plant's water operations and maintenance division. Rich has been employed at Aurora Water for more than two years working on many different projects including the Prairie Waters Project. Rich grew up in Buena Vista, CO where his father, Tom, is the superintendent of the Homestake Water Project. He enjoys hunting, fishing and spending time with his wife Tracy.

Harris D. Sherman

Executive Director, Colorado Department of Natural Resources, 1313 Sherman St., Rm. 718, Denver, CO 80203, 303- 866-3311

Harris 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. 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.

As a lifelong Colorado resident Harris is an avid hiker, skier, and cyclist. He spends much of his free time at his ranch in Summit County.

John R. Stulp

Commissioner, Colorado Department of Agriculture, 700 Kipling Street, Suite 4000, Lakewood, CO 80215, 303-239-4104, john.stulp@ag.state.co.us

Prowers County farmer and rancher John Stulp has been named commissioner of agriculture by Colorado Governor Bill Ritter. Stulp replaces Don Ament who served in the position for the past eight years.

"I am excited and honored to be asked to lead Colorado's agricultural industry. I have big shoes to fill, and I look forward to the challenge," Stulp said. "Like Bill Ritter, I grew up on a farm. I know the hard lessons of dry-land wheat farming and cattle ranching. I also know the good that the Department of Agriculture can provide to rural Colorado, from assisting with new opportunities like renewable energy to overcoming challenges posed by drought and disease."

Stulp served as a Prowers County commissioner from 1991, when he was appointed to fill a vacancy, until January 2005. He also has served on numerous other boards and commissions, including the state Board of Agriculture (1986 to 1995), state Wildlife Commission (1995-99), the Connect Colorado technology committee (1996), and the Colorado Ag Development Authority & Value Added Board (2005-06).

A member of the Rocky Mountain Farmers Union since 1975, Stulp for the last several years has been a leading proponent of building wind farms in wheat fields as a way to develop new economic opportunities and jobs for Colorado's farmers and ranchers. Stulp's family farming operation is home to the Lamar Light and Power Wind Farm, and Stulp is a principal in Prairie Wind Energy LLC.

Stulp graduated from Yuma High School in 1966, earned his bachelor's degree in veterinary science from Colorado State University in 1970 and his doctor of veterinary medicine from CSU in 1972. He and his wife, Jane, have five children.



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Wednesday, Oct. 24, Noon

Friends of the South Platte Award Presentation

The fourth Annual Friends of the South Platte Award is presented to Don Ament in honor of his dedication and contributions to the South Platte River Basin and the South Platte Forum. See the end of this proceedings for more details on the Friends of the South Platte Award.

Don Ament

28817 County Road 65, Iliff, Colorado 80736, 970-522-8205, d.ament@hotmail.com

Don Ament served as the Colorado Commissioner of Agriculture for eight years under Governor Bill Owens' administration. Don served twelve years in the Colorado General Assembly, chairing the Agriculture, Natural Resources, and Energy Committee and the Capital Development Committee. Prior to his election to the State Legislature Don served for five years on the State Board of Education, four of them as chairman. He also served 14 years on the RE-1 Valley School Board in Sterling, and is a former president of the Colorado Association of School Boards.

Nationally Ament chaired the American Legislative Exchange Council's Task Force on Agriculture and is considered an expert in areas of water and property rights. He served as chair of the National Association of State Departments of Agriculture (NASDA) Natural Resources and Pesticide Management Committee, president of the Western Association of State Departments of Agriculture (WASDA), and is the Governor's appointee as Colorado's representative on the Tri-State Platte River Governance Committee with Nebraska and Wyoming.

Don Ament is a spokesperson for agriculture and natural resources, and an advocate for wise utilization of water and forest resources and property rights. He believes in promoting the importance of the agricultural industry and the role it plays in preserving our quality of life. Don supports innovative ideas to increase and improve production agriculture and the utilization of new technology and alternative energy resources.

Ament has lived his entire life in Colorado, having majored in engineering and minored in instrumental music at the University of Colorado. Don continues to farm and ranch in Northeast Colorado. He and his wife, Patty, have three grown children, and five grandchildren.

Wednesday, Oct. 24, 12:45 p.m.

Keynote Speaker

Dan Tyler

970- 871-4641 rockydan@aol.com

*Dan Tyler is an Emeritus Professor of History at Colorado State University. He grew up on a ranch in Carbonade, Colorado. He served in the air force and taught the history of the American West at CSU with an emphasis on water issues for more than thirty years. His book, *Silver Fox of the Rockies*, carefully describes the origin of interstate river compacts and the critical role they played in dividing the waters of the West. He is also the author of *The Last Water Hole in the West*.*

Wednesday, Oct. 24, 1:30 p.m.

Changing Hearts and Minds

Moderator: Diane Hoppe

Water Resource Consultant, 700 Washington St., #207, Denver, CO 80203, 303-864-1607, dianehop@msn.com

Diane 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. 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.



Get to Know Your H2O: Community- and School-Based Outreach and Education

Curry Rosato

Watershed Outreach Coordinator, City of Boulder, Keep it Clean Partnership, 4049 N 75th Street, Boulder, CO 80301, 303-413-7365, rosatoc@bouldercolorado.gov

The Keep it Clean Partnership educates and involves youth and adults through water protection activities and educational programs. KICP has spent the past five years developing and implementing effective education and outreach programs for residents in Boulder County and parts of Weld County. Curry Rosato, City of Boulder and KICP Watershed Outreach Coordinator, will share tried and true stormwater education and outreach programs as well as outreach tools you can use immediately to reach adults and children in your community. Target audience, partnerships, program implementation and evaluation tools will be addressed.

Curry Rosato has served as the City of Boulder's watershed outreach coordinator since July 2001 and has been in the field of Environmental Education and Outreach for more than twelve years. Earning her undergraduate degree in environmental sciences and her graduate degree in education, Rosato has worked in the field of natural history, recycling and water education. She supports the city of Boulder Water Quality and Environmental Services programs (Water Conservation, Stormwater Quality, Drinking Water and Industrial Pretreatment) and the Keep it Clean Partnership by providing education and outreach activities to residents and students in Boulder County and parts of Weld County.

What We Learned from Educating the Public

Jill Boyd

Public Information Specialist, Northern Water, 220 Water Ave., Berthoud, CO 80513, 970-532-7700, jboyd@ncwcd.org

As Northern Water continues to educate the public we have learned better ways of communicating our message. We are also using methods to teach without being present and at times convenient for the public. Our goal is to make the learning experience memorable and something that people can easily tell others; reinforcing what they have learned. The message is the same but how we deliver that message is changing.

Jill Boyd is the public information specialist for the Northern Colorado Water Conservancy District. Using communication vehicles such as Northern Water's magazine Waternews; presentations to various service, school and water-related organizations; tours; and annual children's water festivals, Jill and Northern Water educate youths and adults about the Colorado-Big Thompson Project, Colorado's water supplies and the need to conserve. Jill previously worked as a journalist. She holds a bachelor of arts degree from Colorado College and is pursuing a master's degree at CU-Denver.

A Reservoir of Information (and Services!): The CSU Water Resources Archive

Patty Rettig

Head Archivist, Water Resources Archive, Colorado State University, Morgan Library, Fort Collins, CO 80523-1019, 970-491-1939, Patricia.Rettig@ColoState.edu

The Water Resources Archive at Colorado State University works to document water history throughout the state. Looking at all aspects of water, including engineering, the environment, law, irrigation, and more, the Archive holds nearly a thousand boxes of rare documents. This presentation will describe some of the key holdings of the Archive as well as services provided.

Patty Rettig joined the Colorado State University Libraries in March 2000. She began working on the Water Resources Archive in July 2001 and is now head archivist. Her duties involve all aspects of archival work including acquiring, organizing, and describing collections; creating exhibits; maintaining websites; teaching classes; writing articles; and making presentations. Patty earned her Master of Library Science from the University of Maryland in 1998 and worked in that institution's Archives and Manuscripts Department for a year. A native of Ohio, Patty enjoys traveling around Colorado to see its water resources firsthand and meet the people involved.

Wednesday, Oct. 24, 3:15 p.m.

Fields of Change

Moderator: James Pritchett

Growing Crops with Less Water: Field Studies in the South Platte

Neil C. Hansen

Associate Professor, Department of Soil and Crop Sciences, 1170 Campus Delivery, Colorado State University, Fort Collins, Colorado 80523-1170, 970-491-6804, Neil.Hansen@Colostate.edu

Colorado State University is leading an extensive research and educational program to develop irrigated cropping systems that can be economically and ecologically viable while consuming less water. Field research sites located throughout the South Platte River Basin are at the core of this project. The project involves the investigation of alternative crops and crop rotations, limited irrigation practices, rotational fallow, and conversion to dryland. This presentation will focus on the crop production aspects and potential water savings from adoption of these systems.

Dr. Neil Hansen is an associate professor of soil science at Colorado State University. Dr. Hansen runs a field-oriented research program focused on Water Limited Cropping Systems with an emphasis on soil and water conservation. He teaches classes in the Soil and Crop Sciences department and advises graduate students in soil science.

Developing A Model To Sustain Irrigated Agriculture While Meeting Increasing Water Demand In Colorado

Frank Jaeger

District Manager, Parker Water and Sanitation District, 19801 E. Mainstreet, Parker, Co. 80138, 303-841-4627 Ext. 201, fjaeger@pwsd.org

With the every growing thirst along the Front Range, innovative ideas are vital in meeting the water needs of the increasing population. Parker Water and Sanitation District is currently constructing Rueter-Hess Reservoir as one water management tool. With advances in agriculture, a quid-pro-quo is achievable between the agricultural communities and municipalities charged with supplying water to the population. The PWSD and Colorado State University model study aims in finding that win/win and use our most precious resource for the benefit of all.

Frank Jaeger has served as district manager for Parker Water and Sanitation District since 1981. Through 26 years of service Mr. Jaeger has been instrumental in bringing together experts in water law, hydrology and engineering to ensure an adequate water supply for Parker's current and future needs. His leadership in innovations such as the use of well injection as a storage option, augmentation of water resources through the capture of AWT treated wastewater, and irrigation return flows, is known throughout the state. The Rueter – Hess Reservoir, currently in the permitting stage, seeking enlargement to provide storage for additional Douglas County residents is another example of Frank Jaeger's commitment to the principles of cooperation and long-term water quality and availability along the Front Range. Mr. Jaeger's most recent endeavors include the promotion of rotational crop management of portions of farms thereby allowing the sharing of water with municipalities and money with the farming communities.

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The Future of Irrigated Agriculture in the South Platte

James Pritchett, Ph.D.

Associate Professor, Colorado State University Department of Agricultural and Resource Economics, B327 Clark Building, Fort Collins, CO 80523-1172, 970-491-5496, James.Pritchett@ColoState.EDU

Irrigated agriculture is experiencing a uniquely profitable year, in part due to the success of biofuels. Colorado farmers, and especially those in the South Platte River Basin, are well positioned as key energy stock producers for commercial biorefining processes. Farmers in the South Platte Basin are among the most efficient and productive in the United States cropping more than one million irrigated acres.

Bioenergy's bright prospects are the result of Colorado's burgeoning population and growing cities; however, municipal development is also a significant competitor for crop inputs, especially water. Rapid urban growth increases competition for water, and agriculture is the primary supplier for increased water demands. Thus, the potential gains from bioenergy cropping must be attractive enough to retain water in irrigated agriculture or else water will flow to municipal consumption. If profits for bioenergy crop production are limited, then outside investment in bioenergy refining is likely to suffer. Alternatively, substantial bioenergy crop profits may result in declining food crop production in the region.

This presentation considers the current status of irrigated cropping in the South Platte Basin and examines the ripple effects of an expanding bioenergy industry.

James Pritchett joined the Department of Agricultural and Resource Economics at Colorado State University in May 2001. Dr. Pritchett's primary research and extension efforts are focused on agribusiness management with special attention on a farm's allocation and use of scarce water resources. He is currently examining the rural economic impacts of water transfers and the economics of limited irrigation. This research is funded through CSU's Agriculture Experiment Station, a grant from the USDA's National Research Initiative Competitive Grants Program, and a grant from the USDA Natural Resources Conservation Service.

Originally from southeast Colorado, Dr. Pritchett attended Colorado State University and obtained a B.S. in agricultural business and an M.S. in agricultural economics. Pritchett was awarded a doctorate in agriculture and applied economics from the University of Minnesota in 1999, and then served as an assistant professor in Agricultural Economics at Purdue University from 1999 to 2001 before returning to Colorado.

Thursday, Oct. 25, 9:00 a.m.

Modeling the Change

Moderator: Suzanne Paschke

South Platte Decision Support System: Help with the past, present and future

Ray Alvarado

CDSS Project Coordinator, Colorado Water Conservation Board, 1313 Sherman St., Room 721, Denver, CO 80203, 303-866-3517, ray.alvarado@state.co.us

The South Platte Decision Support System (SPDSS) is the latest implementation of Colorado's Decision Support Systems (CDSS), which were developed to provide credible information on which to base informed decisions concerning management of Colorado's water resources. CDSS is sponsored by the Colorado Water Conservation Board (CWCB) and the Colorado Division of Water Resources (DWR). Historical water resource information within Colorado is now available via the internet from CDSS. This gives a user the ability to look back in time to see how water was used, allocated and administrated historically. Real-time data is also available through the CDSS to let the user observe the changes in streamflow and selected diversions on a daily basis. Future water resource planning is now made easier by models that simulate surface water (StateMod), groundwater (MODFLOW) and consumptive use (StateCU). All of the tools are intended to help establish a common ground on which water resource managers can make better informed decisions in a timely basis.

Ray Alvarado is group leader for the CWCB's Water Information Group. He is responsible for the direction and implementation of the statewide decision support systems and projects including providing technical planning and support to other CWCB Sections. The Water Information Group is responsible for the Agency's digital imaging program, web development and GIS support. Ray manages the SPDSS and is responsible for operation and maintenance of the decision support systems in place for the Western Slope. He provides technical assistance to the Statewide Water Supply Initiative and the 1177 roundtable process, created under the Water for 21st Century Act of 2006. Ray has a B.S. in watershed management from Colorado State University. Previous to his position at the CWCB, Ray worked for a water resource consulting firm as a hydrologist.

An Updated Denver Basin Ground-Water Model

Suzanne Paschke, Ph.D.

Supervisory Hydrologist, U.S. Geological Survey, Denver Federal Center, MS 415 PO Box 20546, Lakewood, CO 80225, 303-236-4882 x352, spaschke@usgs.gov

Suzanne Paschke is a supervisory hydrologist at the U.S. Geological Survey, Colorado Water Science Center with more than twenty years of hydrogeologic experience. Dr. Paschke's work focuses on hydrogeologic evaluation and modeling and water-quality assessments. Current projects include developing regional computer simulations of ground-water flow and water quality for the Denver Basin, Colorado and evaluation of ground-water quality in the USGS South Platte River basin study unit of the National Water-Quality Assessment Program. Dr. Paschke holds a B.S. in geology from the University of Wyoming and M.E. and Ph.D. degrees in geological engineering from the Colorado School of Mines.

Well Augmentation: From Computers to Satellites

Luis A. Garcia, Ph.D.

Professor of Civil Engineering, Colorado State University; Director, Integrated Decision Support (IDS) Group. Department of Civil and Environmental Engineering, Colorado State University, Fort Collins, CO, 80523, 970-491-5049, Luis.Garcia@Colostate.edu

Throughout the United States new models for computing augmentation requirements are being developed and applied. For the past twelve years, I, along with a research team from the Integrated Decision Support Group (IDS), have had the opportunity to study the data and modeling needs of water users in the Lower South Platte River region in Colorado dealing with agricultural water use and well augmentation. With the active participation of the water users, IDS has prioritized the needs and then collected or generated the data and modeling tools necessary to meet these needs. This approach is based on the premise that the users have a good understanding of what their current and future needs are, and with this in mind, we have developed an interactive and dynamic development process in which the users play an integral part. I refer to this approach as a "user-centered approach." With this approach we have developed several data driven tools that are widely used in the South Platte Basin and other parts of the Western U.S. These tools are collectively called the "South Platte Mapping and Analysis Program" (SPMAP) (www.ids.colostate.edu/projects/splatte). The tools include a Geographic Information System component, a Consumptive Use Model (IDSCU) and an Aquifer Water Accounting Model (AWAS) which calculates the lag time from when a well is pumped or water is recharged to a recharge site and when a depletion or accretion happens in the river. This model has been adopted by the Division of Water Resources as the model to use when calculating depletions or accretions due to well pumping or recharge.

The tools and the process that we have developed are dynamic and adjust to the changing needs. Recently we developed a model to calculate the ET using remote sensing. We have incorporated these ET estimates in our consumptive use model and this is providing us the opportunity to calibrate the traditional ET equations, identify water short areas, and obtain a better estimate of the actual water use that farmers need to augment.

This presentation will give an overview of the model development process and the different components as well as show how the new technology (remote sensing) is being incorporated into the whole process of figuring augmentation requirements.

Dr. Garcia is a professor of civil engineering at Colorado State University. He is also serves as the department head of Civil and Environmental Engineering and the director of the Integrated Decision Support Group (IDS). He obtained his B.S. (1983) and M.S. (1985) from Texas A&M University and his Ph.D. (1990) from the University of Colorado at Boulder, all in civil engineering.

Dr. Garcia's main research interest is in the application of Decision Support Systems (DSS), specifically in applications for water resources, consumptive use, and irrigation and drainage. Dr. Garcia has done extensive work dealing with water issues in the western U.S. Currently Dr. Garcia is involved in work in the South Platte Basin in Colorado dealing with determining irrigation water demand and well water use, in the Arkansas River Basin in Colorado dealing with salinity, and in New Mexico on the development of a DSS for the optimal allocation of water for the irrigation system of the Middle Rio Grande Water Conservancy District. In addition Dr. Garcia is working on the application of Remote Sensing of ET on several areas in the Western U.S. Dr. Garcia has also done international work in the area of water resources in Italy, Netherlands, and Austria and in the area of drainage in Egypt and India. He has been PI or Co-PI on over 65 projects both in Colorado and around the US with a total funding of approximately \$9.0 million.

Modelling the Future of Water Resources: An Overview and Results from the South Platte Regional Assessment Tool

Chris Goemans, Ph.D.

Assistant Professor, Department of Agricultural and Resource Economics, Colorado State University. Western Water Assessment, University of Colorado, 468 UCB Boulder, CO 80309-0468, 303-492-2328, chris.goemans@colorado.edu

Rapid population growth, climate change and recent drought have highlighted the need for a better understanding of how future changes in the basin might affect water users. Despite the social and economic importance of the South Platte basin, a tool explicitly designed for investigating future water management scenarios across the basin has not existed until now. The South Platte Regional Assessment Tool (SPRAT) addresses this planning need. SPRAT models the movement and allocation of water throughout the Basin, allowing users to make relative comparisons of the water supply and demand impacts associated with various population growth, climate/hydrologic, and agricultural land-use scenarios, and by allowing the merits of various water management alternatives (adaptations) and infrastructure changes to be similarly compared. This presentation will provide an introduction to the SPRAT modeling effort including model details, results, and future work.

Christopher Goemans is an assistant professor in the Department of Agricultural and Resource Economics at Colorado State University. He holds a Ph.D. in economics from the University of Colorado. Dr. Goemans is also a member of the joint CU/NOAA sponsored Western Water Assessment (WWA). His current work focuses on various issues surrounding water demand management, the impacts associated with agricultural to municipal water transfers, and the role of information in consumer decision making.

Thursday, Oct. 25, 11:10 a.m.

Change Your Ways

Moderator: Steve Gunderson

Director, Water Quality Control Commission, Colorado Department of Public Health and Environment, OED-OLRA-A5, 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530, 303-692-3468, steve.gunderson@state.co.us

Steve Gunderson has directed the Water Quality Control Division at the Colorado Department of Public Health and Environment since summer 2005. The Division implements and enforces the drinking water and water quality policies and regulations established by the Governor-appointed Water Quality Control Commission. It functions primarily under the auspices of two federal laws: the Clean Water Act and the Safe Drinking Water Act.

Steve joined the Colorado Department of Public Health and Environment in 1989. From 1992 though 1998, Steve was director of the department's Emergency Management Program, which prepared for and responded to public health and environmental emergencies in Colorado. From 1998 to 2005, Steve managed the state's oversight of the environmental cleanup of the former Rocky Flats nuclear weapons plant, located 14 miles northwest of downtown Denver. At a total cost of almost \$7 billion, Rocky Flats is the largest successful site cleanup in the history of the federal Superfund legislation.

Regulatory and Voluntary Options for Addressing Emerging Contaminants

Patti Lynne Tyler

Science Advisor and Science Liaison to the Office of Research and Development, U.S. Environmental Protection Agency, Region 8, Office of the Regional Administrator, 1595 Wynkoop St., Denver, CO 80202-1129, 303-312-6081, tyler.patti@epa.gov

The list of contaminants of emerging concern continues to expand and includes nanoparticles, perchlorate, brominated flame retardants, perfluorinated octanoic acids, prions and the focus of this presentation, pharmaceuticals and personal care products (PPCPs). PPCPs present a challenge across media and jurisdictions. EPA has the potential to regulate emerging contaminants using the regulatory framework under the Clean Water Act or Safe Drinking Water Act, when sufficient information exists. EPA is coordinating emerging contaminants efforts across their program and regional offices and their Office of Research and Development. EPA along with FDA, USGS, and several other federal agencies are engaged in interagency efforts in developing a research and prioritization strategy for pharmaceuticals and endocrine disruption in the environment. National studies are being conducted to better understand the prevalence of PPCPs in fish tissue, influent and effluent sludge and biosolids. Various stewardship activities, voluntary programs and green chemistry initiatives are taking place throughout the country to minimize the design and disposal of these emerging compounds in the environment.

Patti Lynne Tyler is the science advisor for EPA Region 8 and has held that position since February 2001. Her responsibilities include: establishing the Regional Science Council; identifying regional research needs and incorporating them into the Office of Research and Development's research planning process; oversight of regional research projects; planning and conducting national science topic workshops on high priority regional science topics that allow for the technical exchange between Regional staff and Office and Research and Development scientists; and representing EPA Region 8 on national science workgroups such as the National Regional Science Council, Tribal Science Council and Science Policy Council Steering Committee.

With respect to pharmaceuticals and personal care products (PPCP), Patti is a member of the regional Consortium on the Research and Education of Emerging Contaminants (CREEC), assisted with the planning of this summer's AWRA Specialty Conference on Emerging Pollutants and represents Region 8 in the EPA Regional PPCP Network.

Patti relocated to Region 8 after spending 10 years in Region 1 as an aquatic biologist and ecological risk assessor where she served as the co-chair of Region 1's Biological Technical Advisory Group (BTAG) and tri-chair of the national Ecological Risk Assessment Forum (ERAF). Prior to joining EPA in 1991, Patti was an environmental scientist for Roy F. Weston, Inc. She also held a 10 year appointment with the Shoals Marine Laboratory teaching as an adjunct faculty member responsible for teaching a wetlands class and was an environmental scientist aboard the SSV Corwith Cramer. Patti received her bachelor's and master's degrees in science, specializing in the field of botany from Arizona State University

Changing Ammonia Standards: Challenges for Wastewater Treatment Plants

Amy L. Woodis, J.D.

Governmental/Legislative Liaison, Metro Wastewater Reclamation District, 6450 York Street, Denver, CO 80229, 303-286-3240, awoodis@mwrdd.dst.co.us

Earlier this year the Water Quality Control Commission (Commission) adopted revised ammonia criteria to protect aquatic life throughout all basins in the state. These revised standards are based upon the Environmental Protection Agency's 1999 ammonia criteria. The standards adopted by the Commission are expected to have significant impacts on future ammonia effluent limits for municipal wastewater treatment plants. Permittees discharging to warm water segments are likely to receive more stringent ammonia effluent limits, while permittees discharging to cold water segments may receive less stringent effluent limits for ammonia.

Changes to the standards, especially for facilities in the South Platte Basin, could result in the need for significant capital improvements. This presentation will provide an overview of the basis of the new ammonia standards, strategies for meeting the new standards, and how capital improvements might be financed.

Amy Woodis has been at the Metro Wastewater Reclamation District in Denver since 2000. On behalf of the District, she participates in a number of water quality standards development workgroups through the Colorado Water Quality Forum. She also coordinates legislative and regulatory activities on behalf of the District.

Ms. Woodis received her B.A. from Smith College, an M.B.A. from Santa Clara University, and her law degree from George Mason University School of Law. She is a member of the Florida and Colorado bars and is an adjunct lecturer at the Regis University School for Professional Studies in the Public Administration program. She also is a member of the board of directors of the Colorado Wastewater Utility Council.

Keeping Your Cool with Revised Temperature Standards

Gabe Racz, J.D.

Attorney, Trout, Raley, Montano, Witwer & Freeman, PC 1120 Lincoln Street, Suite 1600 Denver, Colorado 80203, 303-339-5834, grac@troutlaw.com

Colorado's water quality standards for temperature were substantially revised in 2007. This presentation will provide background on the reasons for these changes, summarize the new water quality standards, and present issues for the future.

Gabriel Racz is an attorney with the firm of Trout, Raley, Montano, Witwer & Freeman, P.C., where he has practiced for six years in the areas of water law, water quality, and eminent domain.

Thursday, Oct. 25, 1:05 p.m.

Keynote Speaker

Moving from Climate Idiots to Savants: Tools for Preparing for the Coming Century of Climate

Brad Udall

Director, CU-NOAA Western Water Assessment, 325 Broadway R/PSD, Boulder, CO 80305, 303-497-4573, brad-ley.udall@colorado.edu

In the last two years society has very quickly moved from debating the validity of human-caused climate change to debating how we should reduce greenhouse gas emissions as well as adapt to the likely impacts. What tools, data, and knowledge do we all need in order to adequately prepare for these potentially significant changes?

Brad Udall is a member of the research faculty at the University of Colorado where he serves as the director of the CU-NOAA Western Water Assessment, one of eight regionally focused NOAA-funded projects designed to connect decision makers with the latest in climate science. His research interests include the impacts of climate change on the Colorado River. In June he testified at a Senate Energy and Natural Resources Committee hearing on climate change impacts on water resources. He is one of six co-authors on a pending report for the Bureau of Reclamation on how to incorporate climate change information into future Colorado River planning studies. Brad is a former consulting engineer and has degrees from Stanford and Colorado State.

Thursday, Oct. 25, 1:45 p.m.

An Inconvenient Climate

Moderator: Jay Skinner

Colorado Division of Wildlife, 6060 N. Broadway, Denver, CO 80216, (303) 291-7260, jay.skinner@state.co.us

Jay Skinner has just completed his 22nd year with the State of Colorado; 19 of which have been with the Colorado Division of Wildlife. He spent 16 years working on various aspects of the state's Instream Flow Program. The DOW is the primary agency that provides biological support to the Colorado Water Conservation Board; the DOW is one of several state and federal agencies that quantify and recommend instream flows for formal action by the Colorado Water Conservation Board. For the past 3 ½ years, Jay has been in a management position for the Division's Water Resources Unit in the Wildlife Conservation and Resource Support Sections. He oversees all Division activities in water resources including water rights, water quality, instream flow, and statewide water resource management on the Division's properties and hatcheries. Jay has been actively involved in the South Platte Forum for the past 8 years. Jay lives in the outskirts of Parker in what remains of rural Douglas County, is married and has two teenage daughters.

Water in the West: Squeezing Water from a Stone

Gregory J. McCabe, Ph.D.

U.S. Geological Survey, Denver Federal Center, MS 412, Denver, CO 80225, 303-236-7278, gmccabe@usgs.gov

David M. Wolock

U.S. Geological Survey, Lawrence, Kansas

The Colorado River basin is one of the largest and most important sources of water in the western United States. The high demand for water in the basin and the recent multiyear drought have raised questions about the long-term sustainability of water supply in the Colorado River basin; projections of global warming have brought out even more concerns regarding the viability of the Colorado River water supply. In this study the potential effects of specific levels of atmospheric warming on water-year streamflow in the basin are evaluated using a water-balance model, and the results are analyzed within the context of a multi-century tree-ring reconstruction (1490-1998) of streamflow for the basin. The results indicate that a continuation of the twentieth century warming trend measured in the Upper Colorado River Basin (0.86oC per 100 years), with no change in precipitation, would produce a century of streamflow that is similar to the driest century since 1500. A 2oC warming over the next century (with no change in precipitation) would result in a 100-year period of flow that is drier than any century in the reconstructed record. If future warming occurs in the basin and is not accompanied by increased precipitation, then the basin is likely to experience increased frequency of water supply shortages and an increased likelihood of failure to meet the water allocation requirements of the Colorado River Compact.

Greg McCabe is a research scientist with the Water Resources Discipline of the U.S. Geological Survey and is an adjunct professor at the University of Denver and the Metropolitan State College of Denver. He also is a research affiliate with the Institute of Arctic and Alpine Research at the University of Colorado. He received a bachelor's and master's degree from the University of Delaware and a Ph.D. from Louisiana State University. He is chief of the Hydroclimatic Processes and Hazards project within the National Research Program of the Water Resources Discipline. His research interests include hydroclimatology, climate variability and change, synoptic climatology, climate teleconnections, and hydrologic modeling.

Changes in the Timing of Snowmelt Onset in the Colorado Rocky Mountains

David W. Clow, Ph.D.

Research Hydrologist, U.S. Geological Survey, Colorado Water Science Center, Denver Federal Center MS415, PO Box 25046, Lakewood, CO 80225, 303-236-4882 X294, dwclow@usgs.gov

The annual hydrograph of most rivers in the mountains of the western United States is driven by the melting of deep seasonal snowpacks. A recent study documented significant trends in snowmelt timing in the west between 1950 and 2000, with runoff generally occurring earlier than it has in the past (Stewart and others, 2004). The study indicated changes were most pronounced in the Sierra Nevada, Cascades, and northern Rocky Mountains, and were hypothesized to be caused by changing climate. Only minor changes were identified in Colorado, suggesting that the state was relatively immune to climate change due to the state's cold snowpacks and high elevations. The study raised important issues about the effects of climate change on water supplies in the west, but the results for Colorado were somewhat puzzling given local perceptions that recently, melt has been occurring earlier in Colorado as well. In addition relatively few sites were in Colorado, and the study focused on medium to large rivers, which could be affected by diversions. Furthermore, the previous studies inferred earlier snowmelt based on changes in runoff timing, rather than by analyzing actual snowpack data.

The USGS Colorado Water Science Center is conducting a study of changes in snowmelt timing in Colorado during 1978–2004 using snowpack data from 72 SNOTEL sites in Colorado. Results were compared to trends in the timing of runoff at 40 headwater streams with minimal diversions. The data indicate that snowmelt is occurring earlier at all of the SNOTEL and streamflow sites that were analyzed, with an average change of 0.5 days per year. There appear to be important regional variations in the snowmelt- and runoff-timing trends; the strongest trends are in the western and southern parts of the State. Changes in snowmelt timing were strongly correlated with increasing springtime air temperatures, which showed strong positive (warmer) trends during the study period. These results indicate that there has been a recent shift in the timing of snowmelt and associated runoff in Colorado that is related to springtime warming. There may be important implications for water-resource management and availability in the State.

Dave Clow is a research hydrologist with the USGS in the Colorado Water Science Center. He has been working in the field of alpine hydrology and geochemistry since 1983 when he received a master's degree in geochemistry from California State University, Fresno. He was hired by the USGS Colorado Water Science Center in 1990 to work on climate and geochemical processes affecting water quality and quantity in Colorado mountains. David obtained a Ph.D. in Geochemistry in 1992 from the University of Wyoming. Recent research suggesting that Colorado may not be influenced as much as other western states by climate change led David to begin a study of snowmelt timing in Colorado.

Adapting to Climate Change: Challengers for Water Suppliers

Marc D. Waage

Manager of Raw Water Supply, Denver Water, 1600 West 12th Avenue, Denver, CO 80254, 303-628-6572, marc.waage@denverwater.org

Marc Waage is manager of Raw Water Supply for Denver Water. Marc and his team are responsible for directing the operation of the water department's extensive water collection system. Marc works in many areas of water resources engineering, planning, and operations including leading Denver Water's climate change planning. Marc has been with Denver Water for 20 years. He also worked briefly for the Bureau of Reclamation and the Bureau of Indian Affairs. He has bachelor's and master's degrees in civil engineering from CSU.

Climate Change and South Platte Native Fishes: Potential Effects and Mitigation Opportunities

Ashley Ficke

Fisheries Ecologist, GEI Consultants, 5575 S. Sycamore St., Suite 100, Littleton, CO 80120, 720-283-1314, aficke@geiconsultants.com

This presentation will provide a brief introduction to the ecology of the South Platte's native fishes. Based on current climate change predictions, potential effects on the South Platte's aquatic systems and their inhabitants will be discussed. Climate change will not act singly; instead, it will interact with other stressors (natural and anthropogenic) to produce a new set of environmental challenges for fish populations. It appears that climate change will continue to exert its effects, even if we dramatically reduce greenhouse gas emissions. Therefore, we should take the opportunity to remove the limiting factors that we can control so that fish populations can better adjust to a changing climate.

Ashley Ficke received a bachelor's degree in wildlife and fisheries biology from UC Davis in 1996 and a master's degree in fish, wildlife, and conservation biology from Colorado State University in 2006. She has worked for the U.S. Forest Service and the Colorado Division of Wildlife and is particularly interested in studying Colorado's lesser-known "little fishes." Ashley is currently working as a fisheries ecologist for the Chadwick Ecological Division of GEI Consultants.

Poster Abstracts

Residential Demand Management as a Drought Coping Tool: Lessons from Aurora

Doug Kenney

Water Assessment, UCB 401, Boulder, CO 80309-0401; douglas.kenney@colorado.edu.

Chris Goemans

Assistant Professor, Department of Agricultural and Resource Economics, Colorado State University. Western Water Assessment, University of Colorado, 468 UCB Boulder, CO 80309-0468, 303-492-2328, chris.goemans@colorado.edu

Bobbie Klein

Western Water Assessment; Managing Director, Center for Science and Technology Policy Research, 1333 Grandview Ave., Campus Box 488, Boulder, CO 80309-0488, 303-735-3751, bklein@colorado.edu

Kevin Reidy

Water Conservation Supervisor, Aurora Water

Municipal water providers are always searching for cost-effective and politically viable strategies for coping with drought conditions, especially in this era of rapid population growth and global climate change. During the 2002-2005 drought period, Aurora utilized a variety of residential demand management programs, including: drought restrictions (i.e., limits on outdoor water use); incentive programs; introductions of new technologies; and multiple changes in billing structures and rates, culminating in the adoption of an increasing block rate pricing structure with individualized (household-specific) water budgets adjusted annually in response to consumption levels, water storage conditions, and revenue considerations. Collectively, these programs were highly successful, reducing total annual deliveries in 2002 and 2003 by 8 and 26 percent, respectively, relative to average deliveries in the 2000-2001 period.

Over the past 3 years, Aurora Water has partnered with researchers at the University of Colorado's Western Water Assessment to quantify and assess the savings associated with the various demand management program elements. The research team has utilized regression techniques to analyze the monthly consumption records of approximately 10,000 households from 1997-2005 to expand the understanding of residential demand in at least three salient ways: first, by documenting that pricing and outdoor water restriction policies interact with each other ensuring that total water savings are not additive of each program operating independently; second, by showing that the effectiveness of pricing and restrictions policies varies among different classes of customers (i.e., low, middle and high volume water users) and between pre-drought and drought periods; and third, in demonstrating that real-time information about consumptive use (via the Water Smart Reader) helps customers reach water-use targets.

Barr Lake and Milton Reservoir Watershed Association – Watershed Management to Improve Water Quality in Hyper-Eutrophic High Plains Reservoirs

Jill Piatt-Kemper

Information/Education Committee Chair, Barr Lake and Milton Reservoir Watershed Association, P.O. Box 9892, Denver, CO 80209, (303) 404-2944 ext. 13, awood@integral-corp.com

Alice Wood

Watershed Association Coordinator, Barr Lake and Milton Reservoir Watershed Association

In 2002, the Barr Lake and Milton Reservoir Watershed (BMW) Association was formed to encourage cooperation, outreach, and awareness of all interested parties in a collaborative effort to improve the water quality of Barr Lake and Milton Reservoir, located NE of Denver, CO. Stakeholders include city and county agencies, major wastewater treatment facilities, drinking water providers, agricultural water users, developers and recreational groups. Water quality issues include heavy nutrient loading, algal blooms, and high pH. Both reservoirs are included with medium priority on the 2004 Colorado 303(d) list for exceeding the upper pH aquatic life criteria of 9.0. The BMW Association members developed the 2006 Barr Lake and Milton Reservoir Watershed Management Plan to provide water quality management-related information to all organizations, governments, agencies, and individuals with an interest in the water quality of Barr Lake and Milton Reservoir. The 2006 Barr Lake and Milton Reservoir Watershed Management Plan covers the following topics:

- An overview of the hydrologic, geophysical, and biological setting of the watershed, and the associated human uses/impacts, including extensive GIS mapping;
- Current and potential future water quality concerns;
- The history and key regulatory guidelines pertinent to the watershed and the BMW Association;
- Strategies and timeline to model and quantify sources of water quality contaminants and to identify the best management practices available to mitigate water quality impacts through a pH total maximum daily load (TMDL);
- Technical and other resources needed to develop and implement a pH TMDL; and,
- Information and education program plans to broaden stakeholder involvement and encourage public awareness of watershed issues.

The BMW Association poster display presents information from the 2006 Barr Lake and Milton Reservoir Watershed Management Plan, with a particular focus on presenting GIS map and pH modeling strategies.

Emerging Contaminants in Wastewater: As Mounting Evidence Points to a Potential Environmental Problem, Where Do We Go From Here?

Aaron Gutierrez

University of Denver Environmental Policy & Management Program; Graduate Student Intern, Institute for Environmental Solutions, 761 Newport St. Denver, CO 80220-5554, 303-388-5211, aaronpgutierrez@yahoo.com

Carol E. Lyons

Executive Director, Institute for Environmental Solutions

Kelle Karp

Institute Associate, Institute for Environmental Solutions

Andrew Britton

Graduate Intern, Institute for Environmental Solutions

Over the last few years, information on emerging contaminants (ECs) has proliferated into journals and professional conferences. Academic institutions, engineering and consulting firms, and government officials are studying the fate and transport of selected ECs, their effects on specific species of aquatic life, and advanced wastewater treatment techniques for removing ECs. Although we know ECs are numerous and that over one hundred compounds that originate from a variety of sources have been identified as ECs, only a select few are being investigated. This leads to a large gap in the knowledge base of this broad and ever-growing topic. Since many of these contaminants mimic steroidal hormones in the biological systems of living beings and ECs appear to be predominantly found in bodies of water, there is a growing concern about potential detrimental effects on the environment and human health. The South Platte watershed experiences disruptions in the endocrine systems of fish and other aquatic species that live downstream of wastewater treatment plants. The sources of ECs are numerous and varied, and are typically non-point sources of water pollution. As a result, the process of identifying effective pollution abatement strategies for ECs is particularly challenging. However, these very challenges also provide a unique opportunity to determine the efficacy of pollution prevention and abatement strategies, to provide policy makers with the resources to implement those strategies that really make a beneficial difference.

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This poster presentation will illustrate the first phase of the Institute for Environmental Solutions' (IES') proposed project to address the challenge of ECs. The purpose of the project is to connect sound science to the development of effective public policy. We will accomplish this by bringing together disparate members of Colorado's society in a hub-and-spoke stakeholder model in a manner that fosters meaningful participation so that effective, scientific solutions can be achieved. Consequently, this process will keep the focus of the project properly contextualized and will ward against the perils of groupthink. Phase 1 of the project will include design of scientific pilot test programs to address EC contamination., They will be accompanied by pre- and post-project environmental quality measurements for cost-benefit analyses necessary to measure the overall efficacy of any pilot project undertaken.

IES recognizes that many government and private organizations are studying this emerging environmental problem of trace contaminants in Colorado's wastewater and working towards addressing the known problems. We propose this pilot project to find, test, and implement sound cost-effective solutions to this nascent issue. IES programs offer a neutral non-advocacy forum, committed to inclusion of non-traditional, yet vital, stakeholders along with established researchers and organizations. By addressing environmental issues with a multi-disciplinary technical approach, we can prevent waste and unwanted side effects, and provide opportunities to optimize environmental improvements. In presenting this poster, IES looks forward to meeting other South Platte Forum participants, and furthering our mutual goals in tackling this complex issue.

Implementation of Actuated and Flow-Measuring Gates on the Greeley No. 2 Canal in Northeastern Colorado

Donald O. Magnuson

Superintendent, New Cache La Poudre Irrigating Company, Lucerne, Colorado

Stephen W. Smith

Chairman, Aqua Engineering, Inc., 4803 Innovation Drive, Fort Collins, CO 80525, 970-229-9668, swsmith@aquaeogr.com

New Cache La Poudre Irrigating Company (<http://www.newcache.com/>) began the first phases of modernizing the 114-year-old canal in recent years. The Company has built new equalizer reservoirs, a 30 CFS pump station, and a new 3,000 acre foot storage reservoir using concessionary loans available from the Colorado Water Conservation Board. Further, the outlet works out of the Company's long-time equalizer reservoir has been replaced and modernized. As an integral part of the overall canal modernization, various approaches to actuating gates, measuring flows, and initiating SCADA were evaluated. The Company studied and toured SCADA installations in four states. Ultimately, Rubicon gates were selected and eight gates have been installed on the canal in the past two years. Portions of the Greeley No. 2 canal, the river diversion on the Cache La Poudre River, and the discharges from two reservoirs can now be monitored and controlled from the Company's office in Lucerne, Colorado.

The process of evaluating SCADA and actuated gates will be described as well as current operations. Further expansion of the system is anticipated in the future that will lead the Company toward full canal automation at some point in the future. The strategy for future expansion of the system will be described.

South Platte Decision Support System GIS and Software Tools

Graeme Aggett

GIS Group Leader, Riverside Technology, Inc., 2290 East Prospect Road, Suite 1, Fort Collins, CO, 80525, gra@riverside.com

Steve Malers

Software/Systems Engineer, Riverside Technology, Inc., 2290 East Prospect Road, Suite 1, Fort Collins, CO, 80525, sam@riverside.com

The Colorado Water Conservation Board and Division of Water Resources have been developing decision support system (DSS) tools for Colorado's major river basins, including the Colorado and Rio Grande. The South Platte Decision Support System (SPDSS) is currently being developed, with Riverside Technology, Inc.'s role focusing on GIS, software development, and system integration. Key developments in these areas include:

- Irrigated lands mapping using remote sensing and GIS.
- User-friendly database tools for the State of Colorado's HydroBase database.
- Web-based mapping tools to facilitate viewing and analysis of geographic and associated HydroBase data.

- Automated data processing tools to facilitate preparation and quality control of large model data sets, including estimating data in years without observations.
- Graphical user interfaces for model data and results.
- Standard modeling procedures to facilitate consistent modeling approaches.

Similar tools and procedures may be appropriate for other work in the South Platte basin.

Hydrologic Modeling Solutions for Managing Water in the South Platte

Steve Malers

Software/Systems Engineer, Riverside Technology, Inc., 2290 East Prospect Road, Suite 1, Fort Collins, CO, 80525, sam@riverside.com

Graeme Aggett

GIS Group Leader, Riverside Technology, Inc., 2290 East Prospect Road, Suite 1, Fort Collins, CO, 80525, gra@riverside.com

The challenges of understanding and balancing water demand and supply throughout Colorado have increased with changes in population, climate, and economy. Surface and ground water use in the South Platte must be managed using innovative solutions, in order to allow critical decisions to be evaluated and made as soon as possible. Riverside Technology, Inc., continues implementing hydrologic modeling solutions contributing to a better understanding of water supply and demand in the South Platte. These modeling solutions include:

- Irrigated lands mapping and water allocation modeling (Colorado Water Conservation Board and Division of Water Resources).
- Streamflow forecasting (Northern Colorado Water Conservancy District and the National Weather Service).
- Ditch efficiency and land use change (North Poudre Irrigation Company).
- SNODAS snow data evaluation (Colorado Water Conservation Board).
- Physically-based monitoring of ET using remote sensing (NASA).

A summary of projects is presented to facilitate discussion of water resources issues in the South Platte.

The Colorado State University Water Resources Archive

Patty Rettig

Head Archivist, Water Resources Archive, Colorado State University, Morgan Library, Fort Collins, CO 80523-1019, 970-491-1939, Patricia.Rettig@ColoState.edu

The Water Resources Archive at the Colorado State University Libraries collects and makes available unique materials concerning the history of water in Colorado. The Archive's mission is to "provide access to, promote and preserve the water heritage of Colorado." This means documenting the state's water in all of its aspects, including as it relates to engineering, the environment, law, recreation, and more.

Among the Archive's collections are those from prominent individuals and significant organizations. Collections of individuals include Delph E. Carpenter, drafter and negotiator of the Colorado River Compact; Ival V. Goslin, first executive director of the Colorado Water Resources and Power Development Authority; and Robert E. Glover, civil engineer for the Bureau of Reclamation and later professor at Colorado State University. Organizations documented include the Godfrey Ditch Company, the Platte River Whooping Crane Maintenance Trust, and the Colorado Water Resources Research Institute.

These collections contain documents as diverse as correspondence, diaries, meeting minutes, reports, data, photographs, charts, maps and audiotapes. Much of what is in the Archive can be found nowhere else in the world; yet it is essential to understanding Colorado's water past and for informing decisions for the future.

The Archive's holdings are freely available to all, and research assistance is available. Collections can be accessed in person at CSU's Morgan Library (Archive hours: 8:30 am to 4:30 pm, Monday through Friday, or by appointment). A small selection of documents is available digitally over the Internet (<http://lib.colostate.edu/archives/water>). Additionally, photocopies and scans can be sent to remote patrons (for a fee).

For more information about holdings and services, visit the Water Resources Archive website (<http://lib.colostate.edu/archives/water/>) or contact Patty Rettig, head archivist for the Water Resources Archive.

Water Resource Challenges in the South Platte Basin

James Pritchett, Ph.D.

Associate Professor, Colorado State University Department of Agricultural and Resource Economics, B327 Clark Building, Fort Collins, CO 80523-1172, 970-491-5496, James.Pritchett@ColoState.EDU

Colorado State University, USDA-ARS and USDA-CSREES have formed a team to address water resource challenges in the South Platte Basin. This poster presentation will update progress in the area of limited irrigation strategies, water leases and regional economic impacts on rural communities.

Trends in Reference: Evapotranspiration in the South Platte Basin

Nolan Doesken and W. Austin Clifford

Colorado Climate Center, Department of Atmospheric Science, Colorado State University, Fort Collins, CO 80523

Since the early 1990s, the Colorado Agricultural Meteorological Network (COAGMET) has been gathering hourly and daily data on temperature, humidity, solar radiation and wind. These climate elements can be combined to model and estimate reference evapotranspiration rates. Then, through the use of crop coefficients and crop calendars, actual ET can be estimated. Now with 15 years of data available in some areas, we are able to assess year to year variations in reference ET as well as spatial variations. While 15 years is too short for meaningful trend analysis, it is sufficient to assess if the quality and quantity of data being collected today will support the computation of ET estimates in the future with sufficient accuracy to detect future trends. Preliminary results of this research will be presented.

A Review of the 2007 Water Year in Colorado

Nolan Doesken and Odie Bliss

Colorado Climate Center, Department of Atmospheric Science, Colorado State University, Fort Collins, CO 80523

This poster summarizes climatic conditions during the 2007 water year in Colorado (October 2006 - September 2007). Following the hot, dry summer of 2006 over northeast Colorado, October brought significant and beneficial rains. One of the hardest winters in years then followed with deep, long-lasting winter snow cover. Very cold air settled into the South Platte Valley producing much below average temperatures in January and February. Spring conditions were generally warm and dry, but the snow melt from the winter storms provided adequate soil moisture in many areas east of the mountains. Summer temperatures were warmer than average, but high humidity from late July into early September fueled frequent and locally heavy rainfall amounts. Water year snowpack, precipitation totals and temperature patterns will be shown with respect to long-term averages.

Walking Through the Water Year -- First Steps

Nolan Doesken

Colorado Climate Center, Department of Atmospheric Science, Colorado State University, Fort Collins, CO 80523

Reagan Waskom

Director, CWRRI, CSU, E102 Engineering, Fort Collins, CO 80523-1033, 970-491-6308, Reagan.Waskom@ColoState.edu

This poster is an introduction to a new water education initiative in Colorado called "Walking Through the Water Year." The idea behind this effort is the fact that Colorado's water monitoring, research and management professionals all track water resources on a water year basis where winter snow accumulation, spring snow-melt and summer irrigation and water use dominate the annual cycle. The changing weather patterns through the seasons deliver the storms that become our water supply.

This annual cycle compliments the hydrologic cycle and becomes an ideal way to talk about Colorado water both to children and adults. With the help of a grant from the US Bureau of Reclamation, we are currently pilot testing this idea in the Poudre School District in Fort Collins. Students and teachers, working with the professional water community, are producing monthly TV broadcasts throughout the water year which will be provided to local schools and also shown publicly on cable TV. In addition to the Poudre School District partnership, we are also teaming with CSU's Little Shop of Physics and Project WET to enhance water education.

The Colorado Watershed Assembly

Jeff Crane

jeffcrane@paonia.com

The Colorado Watershed Assembly is a non-profit coalition of 60 local watershed groups that undertake very different activities, and even have memberships that differ widely in their sociopolitical and economic makeup, but share a commitment to solving problems within watersheds based upon consensus, cooperation and on-the-ground projects. They are formed by concerned citizens working cooperatively with government agencies, regional water districts and community organizations to better understand the “threats to their watersheds” and address a myriad of problems including water quality, water supply, environmental degradation, community education and outreach, recreation, agricultural diversions, water conservation, compact compliance and quality of life concerns.

Back when watershed groups didn't exist, communities were often frustrated by the condition of their streams and decisions that were made in backrooms by the species known as Water Buffalos. Today, barely a decade later, environmental and recreational needs for water are recognized for their intrinsic and economic values alongside domestic, industrial and agricultural uses. We in watershed groups have played a major role in that awareness and not only pushed local concerns to the forefront but have become partners in implementing many projects developed on the ground. We have built consensus at the local levels, and we are using the power of this agreement to advance community concerns.

Development pressures due to rapid population growth have increased competition for limited water resources for agricultural, municipal, industrial, environmental and recreational uses. Civic engagement in governmental decision-making is one of today's greatest challenges for both state agencies and citizen groups alike. The Assembly is developing a web-based to develop a convenient, sustainable, open and continuous dialogue that encourages community and stakeholder collaboration and motivates citizen groups in development and natural resource decisions. The new Roundtable process is a good example of the many needs for outreach throughout state government. These roundtables are permanent structures set up to facilitate discussions on water management issues and to encourage locally driven collaborative solutions. A system that connects members of local watershed groups to the roundtables and other natural resource agencies will help allow democratic decision making around water and watersheds to flourish as it never has before. As a result, the coalition of watershed groups is poised to create a democratic infrastructure that advances the interest of the under-represented.

Local watershed groups across Colorado have consistently demonstrated innovative improvement and/or restoration of water quality in threatened or impaired water bodies when given the opportunity. This project will provide another important tool to not only assist groups with current information but to further empower citizens to develop new policies and programs that would lead to additional water quality enhancing projects.

HAVE YOUR poster on display AT THE NEXT SOUTH PLATTE FORUM

If you have a poster you would like to present at the 2008 South Platte Forum,
Oct. 22-23, 2008, email a one-page abstract to Jennifer Brown,
jennifer@jbbrown.com, by Aug. 1, 2008.

Include your name, organization, address, phone number and email address.

See You Next Year!!

The 19th Annual South Platte Forum
October 22-23, 2008

Visit www.southplatteforum.org to get details and register.

About the South Platte Forum

The South Platte Forum was initiated in 1989 to provide an avenue for a timely, multi-disciplinary exchange of information and ideas important to resource management in the South Platte River Basin. Its stated mandates are:

- *to enhance the effective management of natural resources in the South Platte River Basin by promoting coordination between state, federal and local resource managers and private enterprise, and
- *to promote the interchange of ideas among disciplines to increase awareness and understanding of South Platte River Basin issues and public values.

The expressed opinions and information at the Forum and in this program are not necessarily endorsed by the South Platte Forum or any of its sponsoring agencies.

Friends of the South Platte

This award program was initiated in 2004 to recognize individuals and organizations who, through diligence and dedication, have made exceptional contributions in the South Platte River Basin.

Hall of Fame

Chuck GrandPre, “founder” of the South Platte Forum
Honorary Friend of the South Platte, 2002

Gene Schleiger
1st Annual Friend of the South Platte, 2004

Sakata Farms, Inc.
2nd Annual Friend of the South Platte, 2005

Robert Ward
3rd Annual Friend of the South Platte, 2006

Don Ament
4th Annual Friend of the South Platte, 2007

Nominations: To nominate an individual or organization for the Friends of the South Platte award, visit www.southplatteforum.org. Honorees are selected by the organizing committee.

Special thanks to John Fielder for his generous donation of the picture “South Platte Sunset” and his support of the Friends of the South Platte Award. “South Platte River Sunset” can be found with John’s other fine art prints at John Fielder’s Colorado, his art gallery in the Cherry Creek mall. You can also view his work, learn about workshops and order books at www.johnfielder.com.