

From the Gold Rush to the Urban Crush The Past, Present and Future of the South Platte River Basin

*Proceedings of the 17th Annual
South Platte Forum
October 25-26, 2006
Longmont, Colorado*

Jennifer Brown, Editor

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Colorado Water

Resources Research Institute

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Proceedings of the 17th Annual South Platte Forum
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The Past, Present and Future of the South Platte River Basin
October 25-26, 2006—Radisson Conference Center—Longmont, Colorado

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**Colorado Water Resources Research Institute, Reagan Waskom, Interim Director
Colorado State University, Fort Collins, CO 80523-2033**

17th Annual South Platte Forum
From the Gold Rush to the Urban Crush
The Past, Present and Future of the South Platte River Basin
October 25-26, 2006—Radisson Conference Center—Longmont, Colorado

Wednesday, Oct. 25

- 8:00 Registration and Continental Breakfast
- 9:00 **Welcome**
Reagan Waskom, Colorado Water Resources Research Institute
- 9:15 **Stake Your Claim**
The Evolution of Western Water Law
Mark Squillace, Natural Resources Law Center
Current Water Management Issues: Change and Conflict
Jim Hall, Colorado Division of Water Resources
What the Future Holds Under the Platte River Recovery Program
Deb Freeman, Trout, Raley, Montano, Witwer & Freeman, P.C.
- 10:25 Networking and Posters
- 10:45 **Field of Streams: If You Build It...?**
Why They Came: A Historical Perspective on Population Growth in Colorado
Elizabeth Garner, State Demography Office
Got Habitat and Sufficient Flow? They Will Come
Richard Meyerhoff, CDM
Streams and Roads: A Look at the Future
Jim Goodyear, Colorado Division of Wildlife
- 12:35 Friends of the South Platte Award — Presented to Robert Ward
- 12:45 **The South Platte River Renaissance**
Thomas J. "Dr. Colorado" Noel, University of Colorado
- 1:25 **A Well Runs Through It**
The Final Frontier
Dick Stenzel, Applegate Group
If You Build a Plan, the Well Will Run a.k.a. Been to the Desert on a Well with No Plan
Carol Ellinghouse, City of Boulder
When the Well Runs Dry: Economic Impacts and Farmers' Responses to Changing Augmentation Rules
James Pritchett, Colorado State University
How Green Was Our Valley: The Future of Groundwater Pumping in the South Platte Basin
Tom Cech, Central Colorado Water Conservancy District
- 2:55 Networking and Posters
- 3:15 **River in a Movie**
Tailings, Typhoid, and Triclosan - Oh My!
Sheila Murphy, U.S. Geological Survey
Written in Water
A film depicting the passion, conflict and vision surrounding Greeley's water supply
- 4:15 **Reception and Poster Session**
- 5:00 Day 1 Ends

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Thursday, Oct. 26

8:00 Registration and Continental Breakfast

9:00 **The Climate Channel**

Living in the Past - What Does Colorado's Historic Weather Data Show Us?

Nolan Doesken, Colorado Climate Center

What's Happening with the Weather Now?

Mike Nelson, KMGH Channel 7

What Can We Expect This Winter?

Klaus Wolter, NOAA, CIRES

10:20 Networking and Posters

10:45 **As Good as It Gets?**

Yesterday It Was Ammonia, Today It Is Estrogen - Only the Concentrations Have Changed

John Woodling, Consultant

Salinity Assessment in the Lower South Platte Basin

Alan Halley, Northern Colorado Water Conservancy District

Fish Consumption Advisories: Are Colorado's Fish Safe to Eat?

Nicole Vieira, Colo. Division of Wildlife

12:30 **H₂Oil Energy Production Water: A New Resource?**

Dave Stewart, Stewart Environmental Consultants, Inc.

1:10 **Mission: Possible**

Statewide Water Supply Initiative

Rick Brown, Colorado Water Conservation Board

How to Herd Cats from High Country to State Line

Bill Jerke, Weld County Commissioner

A History of Conflict and Compromises

David Freeman, Colorado State University

Conflict is Not a Four Letter Word

Mary Lou Smith, Aqua Engineering

Mark Your Calendar!!

The 18th Annual South Platte Forum

October 24-25, 2007

Location TBA

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

Stake Your Claim

Moderator: Reagan Waskom

Interim Director, Colorado Water Resources Research Institute, CSU Water Center, E102 Engineering, Fort Collins, CO 80523-1033, 970-491-6308, Reagan.Waskom@ColoState.EDU

Reagan Waskom currently serves as the interim director of the Colorado Water Resources Research Institute and Colorado State University Water Center. Dr. Waskom is a member of the Department of Soil and Crop Sciences faculty and serves as the Cooperative Extension water resource specialist at CSU. He has worked on various water related research and outreach programs in Colorado for 15 years.

The Evolution of Western Water Law

Mark Squillace

Director, Natural Resources Law Center, University of Colorado School of Law, 160 Fleming Law Bldg., 401 UCB, Boulder, CO 80309-0401, (303) 492-1287, mark.squillace@colorado.edu

This presentation will offer an overview of water resources law with a particular focus on the western United States. It will trace the early history of water law, show how it has evolved, and describe possible flaws in the current legal system.

Professor Mark Squillace is the director of the Natural Resources Law Center at the University of Colorado School of Law. Before coming to Colorado, Professor Squillace taught at the University of Toledo College of Law where he was the Charles Fornoff Professor of Law and Values. Prior to Toledo, Professor Squillace taught at the University of Wyoming College of Law where he served a three-year term as the Winston S. Howard Professor of Law. He is a former Fulbright scholar and the author or co-author of numerous articles and books on natural resources and environmental law. In 2000 Professor Squillace took a leave from law teaching to serve as Special Assistant to the Solicitor at the U.S. Department of the Interior. In that capacity he worked directly with the Secretary of the Interior Bruce Babbitt on a variety of legal and policy issues.

Current Water Management Issues: Change and Conflict

Jim Hall

Division Engineer, Division One, Colorado Division of Water Resources, 810 9th St., 2nd Floor, Greeley, CO 80634, (970) 392-1816, jim.hall@state.co.us

Jim Hall will give his perspective on the changes and conflict fostered by the drought of 2002, Supreme Court decisions and legislation associated with well administration, and continued municipal development in Division 1. He will focus on how these changes have already impacted the administration of water rights on the South Platte and may further impact administration in the future.

Jim Hall was born and raised in Colorado. After high school Jim attended Colorado State University where he earned a bachelor's degree in civil engineering. Jim then started work for the Division of Water Resources first as a hydrographer and then as an engineer associated with litigation and water supply plans for new developments. Jim then served as the water manager for a metropolitan city. In 1992 Jim took a job as assistant division engineer in Water Division One. Jim was appointed division engineer December 1, 2002. In this role he is the manager of approximately 40 staff responsible for water administration, dam safety, and hydrography in the South Platte, Republican and Laramie River Basin. Jim is a registered Professional Engineer in the State of Colorado.

The Future of Endangered Species Act Compliance for South Platte Water Users

Deborah L. Freeman

Trout, Raley, Montano, Witwer & Freeman, P.C., 1120 Lincoln St., Ste. 1600, Denver, CO 80203, (303) 861-1963, dfreeman@troutlaw.com

Conflicts between water use and the needs of endangered species in the Central and Lower Platte River basin have affected existing and planned irrigation, municipal and industrial water supply projects in the South Platte River in Colorado since the late 1970s. Endangered Species Act Section 7 consultations have entailed time intensive negotiations and mitigation requiring that water users replace their individual project depletions on a one-for-one basis in amount and in timing at the Colorado-Nebraska state line.

The proposed Platte River Recovery Implementation Program was developed by the States of Colorado, Nebraska and Wyoming and the U.S. Department of the Interior as a basin-wide approach to address the habitat needs of the species while allowing water use and development activities to continue in compliance with the ESA. The final environmental reviews were recently completed for the Program and it is scheduled to be presented for approval by the signatory states and Department of Interior shortly. Ms. Freeman will provide an overview of the Platte Program, its current status, and near-term implementation steps as Colorado gears up to meet its requirements under the Program. She will explore the anticipated future of ESA compliance for South Platte water users choosing to participate under this programmatic approach.

Deborah L. Freeman is with the law firm of Trout, Raley, Montano, Witwer & Freeman, P.C. in Denver, Colorado. Her practice concentrates in the area of natural resources and environmental law with particular emphasis on federal Endangered Species Act, Clean Water Act and NEPA compliance. Deb is a past chair of the Environmental Law Section of the Colorado Bar Association. She earned her undergraduate degree with honors from Stanford University and is a graduate of the University of Denver College of Law.

Ms. Freeman has represented the Platte River Project water users coalition in negotiations which culminated in the Cooperative Agreement toward development of a basin-wide Platte River Recovery Program for federally endangered species in Nebraska, signed by the Department of Interior and States of Colorado, Nebraska and Wyoming in July 1997. Ms. Freeman is a contributing author to "Acquiring, Using and Protecting Water in Colorado" (Bradford Publishing 2004). Other publications include "Against the Flow: Emerging Conflicts Between Endangered Species Protection and Water Use" published in the 1994 Proceedings of the Rocky Mountain Mineral Law Foundation, and "Reinitiation of Endangered Species Act ' 7 Consultation Over Existing Projects" which appeared in the ABA Endangered Species Act: Law, Policy and Perspectives Desk book published in 2002.

Wednesday, Oct. 25, 10:45 a.m.

Field of Streams: If You Build It...?

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 21 years with the State of Colorado; 18 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 2 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 seven years. Jay lives in the outskirts of Parker in what remains of rural Douglas County, is married and has two teenage daughters.

Why They Came:

A Historical Perspective on Population Growth in Colorado

Elizabeth Garner

State Demographer, State Demography Office, Colorado Department of Local Affairs, 1313 Sherman St., Room 521, Denver, CO 80203, (303) 866-4147, elizabeth.garner@state.co.us

From the gold rush and agriculture, to the federal government build up and defense spending, to advanced technology and tourism, the past 150 years of Colorado's economic development was largely determined by the availability of natural resources and labor. The state's desirable living conditions have enabled Colorado firms to attract workers with the necessary skills. The movement of these workers into the state resulted in one of the most highly educated labor forces in the nation. It has also meant that migration and therefore population growth was usually closely tied to job generation.

Demographic forces also shaped Colorado's economy. Immigrants from outside the U.S. in the late nineteenth and early twentieth century provided a workforce for the state's mines and farms. Members of the baby-boom generation moving into Colorado in the 1970s fueled the highest rate of residential construction in the state's history. Demographic changes were simultaneously a cause, an effect and a necessary condition for most of the major economic events. Among the most significant demographic changes is the change in age distribution of the population caused by baby-boom generation through the last 40 to 60 years.

This presentation will provide a historical overview of the main economic and demographic changes in Colorado as well as a brief forecast and highlight of the primary demographic forces yet to hit the state.

Elizabeth Garner is the state demographer with the Colorado Department of Local Affairs. She received her Bachelor of Arts in business at the University of San Diego and is a doctorate candidate in the Department of Agricultural and Resource Economics at Colorado State University. Elizabeth is a Colorado native and has also lived in worked in California and Costa Rica. Prior to becoming the state demographer she was with CSU Cooperative Extension as the coordinator of the County Information Service.

Got Habitat and Sufficient Flow? They Will Come

Richard Meyerhoff

Principal, CDM, 1331 17th St., Ste. 1200, Denver, CO 80202, (303) 298-1311, MeyerhoffRD@cdm.com

Studies conducted by the District in the 1990s to support a site-specific dissolved oxygen standard for Segment 15 revealed that, overall, habitat quality in the segment is low for indigenous fish species. Scarcity of cover, stream size, shifting sand substrate, and fluctuations in flow may limit aquatic species distribution and reproductive success. Possible loss of fish via entrainment with water diverted from the river for irrigation use was also identified as a concern. The site specific dissolved oxygen standard was adopted, with the agreement that the Metro Wastewater Reclamation District would work closely with the Colorado Division of Wildlife, Colorado Department of Public Health and Environment and EPA Region 8 to evaluate approaches to improve habitat and benefit aquatic species. Recently the District completed a comprehensive assessment to identify the best ways to improve aquatic life and habitat in Segment 15 of the South Platte River. This assessment not only looked at existing habitat conditions using newly collected channel and fish habitat preference data, but also evaluated habitat conditions taking into account future flow scenarios as the region continues to urbanize. This presentation will provide an overview of the findings from this assessment and discuss the regulatory agency-approved recommendations for where habitat improvements should be focused given future flow expectations.

Richard Meyerhoff is a Principal with CDM. He has bachelor's and master's degrees in biology from Baylor University and a doctorate in aquatic ecology from Oregon State University. Richard has more than 18 years of technical and regulatory experience in water-related issues, especially those involving the arid west. At the beginning of his career he worked as an Arizona Department of Environmental Quality regulator overseeing the state's water quality standards program, including early development of the state's bioassessment program. Since 1997 he has worked as a consultant assisting clients with Clean Water Act-related activities, including water quality studies, especially to support TMDL analyses; water quality standards development, including site-specific standards and use attainability analyses; and NPDES stormwater and wastewater permits. Since 2001 he has served as the Research Manager for the Arid West Water Quality Research Project.

Streams and Roads: A Look at the Future

Jim Goodyear

Statewide Inventoried Roadless Areas Manager, Office of the Deputy Director - Special Assignments, Fort Collins Service Center and Wildlife Research Center, Fort Collins, CO 80526, (970) 472-4306, Jim.goodyear@state.co.us

In the beginning there were a few extraordinary men with vision. . . .

It all began about 116 years ago with a fluke of legislation when Interior Secretary John W. Noble, at the end of the 1891 congressional session scribbled a poorly worded grammatically incorrect 60 word rider onto another bill and as legislation it lasted about 16 years. However, the following 5 dozen words contained one of the most far-reaching conservation decisions in the United States. It reads,

“Section 24. That the President of the United States may, from time to time, set apart and reserve, in any State or territory having public lands wholly or in part covered with timber or undergrowth, whether of commercial value or not, as public reservations, and the President shall by public proclamation declare the establishment of such reservations and the limits thereof.”

Within a month after passage of this act, President Harrison withdrew 13,000,000 acres and set up 15 reserves (Battlement Mesa Reserve in Colorado was the third such area set apart). President Cleveland doubled Harrison’s reserves and was nearly impeached for doing so. By 1907 when it came to an end, President Harrison, Cleveland and Roosevelt had jointly set aside 132,000,000 acres which today comprise the greater part of the national forests of the West.

Jim Goodyear has worked for the Division of Wildlife for 34 years. He was a district wildlife manager in Pueblo, Colorado Springs and Carbondale. In the mid-to late 1980s he was the Division's training administrator. Jim became the Northeast assistant regional manager in 1989. His most recent assignment began last November as manager of special assignments working directly for the Deputy Director. His focus since November has been on Colorado's Inventoried Roadless Areas.

Wednesday, Oct. 25, Noon

Friends of the South Platte Award Presentation

The third Annual Friends of the South Platte Award is presented to Robert Ward 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.

Robert C. Ward retired from his ‘jobs’ at CSU in December 2005, but he did not retire from his career in water resources. His ‘jobs’ were director of the Colorado Water Resources Research Institute and Professor of Civil Engineering at Colorado State University.

His career involves working with two dimensions of water resources: (1) bringing academic insight into current debates about water resources management; and (2) improving the ability of water quality monitoring systems to produce consistent, comparable, and scientifically sound information for management decision making purposes.

With respect to the first dimension, during 2002-2003 Robert served as president of the National Institutes for Water Resources – the organization that represents the 54 state-based water institutes created and operated under the Federal Water Resources Research Act. During 1995-96 he served as president of the Universities Council on Water Resources. As director of CWRRI for 14 years, Robert sought to develop a higher education-based water research program that worked hand-in-hand with the evolving information needs of Colorado water users and managers. He was recognized for his efforts by being awarded a Lifetime Membership in the Colorado Water Congress in January of this year.

With respect to the second dimension, Robert devoted most of his research efforts to defining and enhancing the interface between the science of monitoring and the information needs of management. He is the author of two books on the design of water quality monitoring systems and developed and taught both graduate level and short courses on the subject.

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Beyond campus, Robert participated in sabbatical leaves in Denmark and New Zealand. His work in New Zealand initiated a process that led to the creation of the New Zealand National River Water Quality Network, which has consistently monitored New Zealand's national water quality conditions since 1989. Since 1994, he has served on the Scientific Organizing Committee for four European-wide Monitoring Tailor-made conferences. During 1997-2005 he served as the academic representative on the National Water Quality Monitoring Council – a 35-member federally authorized group charged with improving the consistency and comparability of information produced by water quality monitoring. He remains professionally active through consulting and professional meeting participation.

During his 35-year career at CSU, Robert served in a number of administrative roles, in addition to that of CWRRRI Director: (1) Acting Department Head; (2) Associate Dean for Undergraduate Studies in the College of Engineering; and (3) Interim Vice Chancellor for Academic Affairs of the CSU System. Robert was a strong advocate for the establishment of a Water Resources Archive in CSU's Morgan Library. He advised both undergraduate and graduate students and taught engineering courses during his entire career, focusing on Operations Research and engineering design, in addition to water quality management and monitoring courses.

Robert and his wife, Brenda, are settling into a new home in Windsor, Colorado, while also gardening, traveling, skiing, hiking, biking, and reading. To satisfy his passion for water history, Robert is serving on the Poudre Heritage Alliance, a group of citizens developing a Poudre National Heritage Area; and is working with the CSU Water Archives to raise funds and increase recognition for the important role the Archives can play in preserving, protecting and promoting Colorado's long and rich water history.

Wednesday, Oct. 25, 12:45 p.m.

Keynote Speaker

The South Platte River Renaissance

Thomas J. "Dr. Colorado" Noel

University of Colorado-Denver, (303) 556-2044, tnoel@carbon.cudenver.edu

Thomas J. "Dr. Colorado" Noel, a professor of history and director of public history, preservation and Colorado studies at CU-Denver, is the author of numerous books, articles and columns. Tom is a graduate of CU-Denver and CU-Boulder, where his mother (a psychiatrist) and grandmother (a teacher) also completed graduate work.

Among Tom's works are "Colorado: A History" (Univ. Press of Colorado, 2005); "Riding High: Colorado Ranchers & 100 years of the National Western Stockshow" (Fulcrum, 2005); "Sacred Stones: Colorado's Red Rock Park & Amphitheatre" (City & County of Denver, 2004); "Buildings of Colorado" (Oxford Univ. Press, 1997); "Colorado: A Liquid History & Tavern Guide to the Highest State" (Fulcrum, 1999); "Historical Atlas of Colorado" (Oklahoma Univ. Press, 1993); and "Denver: Mining Camp to Metropolis" (Univ. Press of Colorado, 1990).

Tom teaches history courses at CU-Denver and conducts tours of Colorado and Denver for the Smithsonian Institute, Colorado History Museum, Denver Museum of Natural History, and Historic Denver. Tom appears as Dr. Colorado in the Rocky Mountain News / Denver Post and on television's "Colorado & Company".

Wednesday, Oct. 25, 1:25 p.m.

A Well Runs Through It

Moderator: Mary Halstead

Water Resources Engineer, Wildlife Conservation Section, Colorado Division of Wildlife, 6060 Broadway, Denver CO 80216, (303) 291-7273, mary.halstead@state.co.us

Mary Halstead is a water resources engineer with the Colorado Division of Wildlife specializing in groundwater resources and water rights projects. Mary has a bachelor's degree in geological engineering from the Colorado School of Mines and a master's degree in hydrology from the University of Arizona. She has more than 12 years experience working on Colorado water resources and water quality related projects. Mary spent four years slogging through swamps and golf courses as a Florida groundwater specialist. Mary grew up in Denver and enjoys skiing, hiking and just spending time around the state with her husband Larry and teenage daughter Sarah.

The Final Frontier

Dick Stenzel

Senior Water Resource Engineer, Applegate Group, Inc., 1499 W 120th Ave., Ste. 200, Denver, CO 80234, (303) 452-6611, dickstenzel@applegategroup.com

Development of Colorado's surface water supplies resulted in over-appropriated stream systems in many parts of the Colorado. The owners of junior water rights in the over-appropriated stream systems and individuals who did not have ready access to surface water supplies turned to groundwater development. In many areas of the state groundwater resources were limited or nonexistent prior to when irrigation ditches were constructed. The development of the groundwater system by water users was the last untapped Colorado water supply source. This development of the groundwater resources and the ultimate recognition that the groundwater development impacted the adjacent stream systems and senior water surface rights resulted in the 1965 Groundwater Management Act and ultimately the 1969 Adjudication and Administration Act.

Dick Stenzel retired from the State Engineers office in 2002 after 25 years of service. He was the Division One Engineer for the Colorado Division of Water Resources. He has a bachelor's degree in civil engineering and a master's degree in water resources engineering from the University of Nebraska. Currently he works part time as a senior water resource engineer with the Applegate Group. The balance of his time is spent in travel, photography and writing short articles regarding Colorado's water history. He also is photographing and producing a annual calendar for the Applegate Group called Colorado's Historical Water Projects.

How the Courts are Affirming the Colorado Water Rights System and Protecting Senior Rights

Carol Ellinghouse

Water Resources Coordinator, City of Boulder, PO Box 791, Boulder, CO 80306, EllinghouseC@bouldercolorado.gov

Recently the Colorado Supreme Court issued rulings that greatly affected the administration of out-of-priority diversions made under junior water rights. For decades well owners with junior rights in the South Platte basin operated under annual approvals of "temporary" substitute supply plans by the State Engineer's Office. Under these plans well owners reduced river flows by tens of thousands of acre-feet every year and did not provide enough augmentation water to offset the effect of their depletions on senior water users. As a result, downstream farmers with senior water rights have been deprived of some of their water for decades and have suffered the economic impacts of lost crop yield from thousands of acres during this time. In the early 1990's the SEO began allowing farmers with senior water rights to call for additional water from the river at times when upstream municipal reservoirs were filling. Therefore, many cities with water rights senior to the wells lost water even though junior well users were not required to fully replace water shortages they created.

The need for adequate augmentation plans for out-of-priority diversions under junior water rights could no longer be ignored. This issue is related to priority of water rights and the integrity of the Colorado water administration system. In other words, this is a property rights issue. It is not about well owners versus surface diverters or cities versus farmers.

In 2001 the Colorado Supreme Court issued the Empire Lodge decision. The Court found that the SEO had exceeded its authority when it approved substitute water supply plans. The Water Courts had exclusive authority to approve out-of-priority diversions under augmentation plans. This decision would have resulted in immediate shut-down of all diversions under SEO-approved plans. However, state legislators passed two bills in 2002 and 2003 that gave junior diverters until the end of 2005 to file applications in Water Court for augmentation plans while continuing to operate under annual approvals from the SEO.

Since 2003 about 500 South Platte irrigation wells that already had court-decreed augmentation plans continued operating. About 1800 wells have received decrees for augmentation plans from the Water Court since 2003 and are operating under these plans. About 1000 wells have Water Court cases pending and are operating under Substitute Water Supply Plans. About 450 wells under the Central Colorado Well Augmentation Subdistrict (WAS) were ordered shut down for failure to obtain a court-approved augmentation plan.

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WAS had been scheduled for a trial on its proposed augmentation plan in May 2006. However, WAS asked for a postponement of the trial and agreed to the Water Court's condition that WAS wells not be operated in 2006. WAS wells have caused 15,000 acre-feet of shortage to the South Platte River this year alone based on well use in past years. WAS could only obtain about 9000 acre-feet of water to address the augmentation required for off-setting past well use and had no water to cover new well use. Any new well use this year would have added to the shortage, both in this year and in future years, and would have increased the injury to senior water rights owners.

Carol Ellinghouse has been managing the City of Boulder's municipal raw water supply system and water rights portfolio for 16 years. As Boulder's water resources coordinator, she is responsible for the work group that operates and maintains the City's raw water supply system. This system includes 10 dams; 25 miles of pipeline through high mountain terrain; 9500 acres of land, including eight square miles of wilderness watershed area; and eight hydroelectric plants.

Ms. Ellinghouse has a bachelor's degree in civil engineering and a master's degree in civil engineering with an emphasis in water resources. Both degrees were received from the University of Colorado at Boulder. Before joining the City of Boulder, she worked for another Colorado municipality and for a water resources consulting firm.

When the Well Runs Dry: Economic Impacts and Farmers' Responses to Changing Augmentation Rules

Dr. James G. Pritchett

Assistant Professor, Agricultural and Resource Economics, Colorado State University, B327 Andrew G. Clark, Fort Collins, CO 80523-1172, (970) 491-5496, James.Pritchett@ColoState.edu

How have changing augmentation rules impacted farmers? This presentation summarizes a survey sent to South Platte farmers that focuses on how these managers responded to changing augmentation rules. Survey results are used to assess the regional economic consequences of recent legislation.

James Pritchett joined the Department of Agricultural and Resource Economics at Colorado State University in May 2001. Pritchett served as an assistant professor in Agricultural Economics at Purdue University from 1999 to 2001 and received a doctorate in Agriculture and Applied Economics from the University of Minnesota in 1999.

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 also examining the rural economic impacts of water transfers from agriculture to municipal and industrial use.

Originally from southeast Colorado, Dr. Pritchett attended Colorado State University and obtained a bachelor's degree in agricultural business and a master's degree in agricultural economics from the Department of Agricultural and Resource Economics.

How Green Was Our Valley: The Future of Groundwater Pumping in the South Platte Basin

Tom Cech

Executive Director, Central Colorado Water Conservancy District, 3209 W 28th St., Greeley, Colorado 80634, (970) 330-4540, tcech@juno.com

Groundwater irrigators have idled thousands of acres of productive farmground the past few years in north-east Colorado to protect senior water rights. The result has been loss of revenue for both on-farm and ag-related services, drastic reductions in land values, and the loss of farms that have been in families for generations. As this occurs senior water rights are selling at historically high prices, urban areas continue to grow at staggering rates, and many Front Range communities place no watering restrictions on their residents. What future awaits the agricultural sector of northeast Colorado?

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Tom Cech was born and raised on a farm near Clarkson, Nebraska. He received a Bachelor of Science in education from Kearney State College and taught high school mathematics in Wilber, Nebraska. He then moved to Salt Lake City and worked for the consulting firm of Architects/Planners Alliance. He returned to Nebraska and received a master's degree in community and regional planning from the University of Nebraska – Lincoln in 1982. He has been executive director of the Central Colorado Water Conservancy District since that time. Tom and his wife, Grace, have three daughters.

The Central Colorado Water Conservancy District has been very active in water education activities for teachers and students in Colorado. They organized the first Children's Water Festival in Colorado, developed curriculum for preschool through high school students, and are working with homeowners and agricultural producers on water and fertilizer management issues.

Tom authored *Principles of Water Resources: History, Development, Management, and Policy*, a college-level water resources textbook published by John Wiley & Sons. It is in its second edition. He has also taught undergraduate and graduate-level water resources and policy courses at the University of Northern Colorado in Greeley and at Colorado State University in Fort Collins.

Wednesday, Oct. 25, 3:15 p.m.

A River in a Movie

Moderator: Brian Werner

Public Information Officer, Northern Colorado Water Conservancy District, 220 Water Ave., Berthoud, CO 80513, (970) 622-2229, bwerner@ncwcd.org

Brian is the Public Information Officer for the Northern Colorado Water Conservancy District in Loveland. He oversees public affairs for the District including media relations, youth and public education, facility tours, and informational publications. His duties include writing and editing the District's magazine—WATERNEWS. He has coordinated more than 50 children's water festivals in Colorado and produced a video on the Colorado–Big Thompson Project. In addition, he gives numerous tours and presentations on the Colorado–Big Thompson, Windy Gap and other projects the District has built or is considering building.

With a master's degree in history, Brian has been able to continue his academic training by researching and giving presentations on the history of water development in Colorado and the American West. A Colorado native, Brian was born in Colorado Springs. He graduated from the University of Northern Colorado with a degree in history. He received a master's degree in history from Colorado State University in Fort Collins. He was chairman of the Poudre River Trust for five years and helped organize the first Riverfest and cleanup in 1994. He helped lead successful efforts to pass county-wide open space taxes in 1995 and 1999. He has also written a local sports column, hosted a local radio show and been a soccer and gymnastics dad.

He is on the board of directors of the Four States Irrigation Council, a commissioner for the Poudre Heritage Alliance, a member of the Public Affairs Committee of the Colorado River Water Users Association and member of the American Water Resources Association, National Water Resources Association, and Society for American Baseball Research. Outside interests include baseball cards, the Colorado Rockies, Colorado Avalanche, Denver Broncos, and his wife and stepson and three teenage daughters, not necessarily in that order!



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the 2007 South Platte Forum.**

Tailings, Typhoid, and Triclosan- Oh my! Water Quality Past, Present and Future

Sheila F. Murphy

*Hydrologist, U.S. Geological Survey, 3215 Marine St., Ste. E-127, Boulder, CO 80303, (303) 541-3023,
sfmurphy@usgs.gov*

“Is water quality today better or worse than it was in the past?” is a question often posed by water-supply planners, regulators, environmental organizations, and the public. It is not a question easily answered. Typically few water-quality data were collected before the 1950s and parameters measured in the past were often different from those that we are interested in today. However, alternative sources such as records of land use, mining, and waterborne disease; historical accounts; and water-quality regulations can be used to estimate past water quality. Water quality of many streams in the South Platte River Basin was impacted by placer and lode mining shortly after European-American settlement began in the 1850s. The first annual report of the Colorado Board of Health in 1877 asserted that pollution of drinking-water supplies by sewers, privies and cesspools was common in the state. Public health records indicate a high rate of typhoid in the beginning of the 20th century. State and local regulations regarding public water supplies led to improvements in drinking water quality. Sewage treatment was largely non-existent until federal grants led to the building of wastewater treatment plants (WWTPs) in the 1930s; between 1934 and 1939, the Colorado population served by WWTPs increased from six to 84 percent. These plants, however, were inadequate for bacteria removal, and the use of sewage-dominated rivers to irrigate crops led neighboring states to boycott produce from the South Platte Valley. WWTPs were upgraded to include secondary treatment and chlorination in the 1950s, but water-quality studies indicated that dissolved-oxygen values were low and few organisms could survive downstream. Discharge of sugar beet waste also added a high biological load to some South Platte tributaries. The 1972 Clean Water Act led to upgrades in WWTPs and subsequent improvements in water quality. In the 1980s and 1990s, public utilities focused on removing nutrients from WWTP effluent. Recent advances in technology have identified the presence of organic wastewater contaminants, such as hormones, surfactants, and prescription drugs, in streams in the South Platte River Basin. Reproductive anomalies in fish have been found in these same streams. Public concern about the impacts of these compounds on public and environmental health suggests that they will remain an important water quality issue in the future. Also, federal regulations and state and local programs are expanding from an end-of-pipe approach to address urban stormwater and nonpoint-source pollution.

Sheila Murphy is a hydrologist with the U.S. Geological Survey's Water Resources Discipline in Boulder, Colorado. She studies the impacts of natural factors and human activities on river water chemistry. She is also involved in water quality education. Before working with the USGS, she worked in water education for the City of Boulder and as an environmental consultant at gold, copper, and uranium mines in the Western U.S. She has a bachelor's degree in geology from the University of Michigan and a master's degree in geochemistry from Penn State University.

Written in Water

Presented by Jon Monson

*Water and Sewer Director, City of Greeley, 1000 10th St., Greeley, CO 80631, (970) 350-9820,
jon.monson@greeleygov.com*

This film depicts the passion, conflict and vision surrounding Greeley's water supply. It has been subtitled: *Passion for Water*; *Poetry* by Justice Hobbs; *Fighting Words* by W.D. Farr; and *Lyrical Imagery* by film maker Alexandre Phillip.

Thursday, Oct. 26, 9:00 a.m.

The Climate Channel

Moderator: Nolan Doesken

Living In the Past? What Does Historic Weather Data Show Us?

Nolan Doesken

State Climatologist and Senior Research Associate, Colorado State University, Fort Collins, CO 80523, (970) 491-8545, nolan@atmos.colostate.edu

Historic weather data collected since the late 1880s from several locations in the South Platte Basin and other parts of Colorado will be used to show current trends in Colorado temperature and precipitation data. Some weather records suggest significant warming has occurred, especially in recent years, but this does not hold true for all parts of the state. Monthly and seasonal patterns of basic climate elements from a century ago will be compared to our recent climate to show if any obvious changes have occurred. The status of long-term climate monitoring will be discussed and, finally, current climate monitoring projects designed specifically for tracking climate change will be described

Nolan Doesken has been monitoring Colorado's variable climate for nearly 30 years for the Colorado Climate Center at Colorado State University. He was recently appointed State Climatologist. He has been involved with many climate-related studies including assessments of drought and floods and is currently helping the National Weather Service implement a system of automated sensors for tracking snow accumulation across the country. Nolan is also the founder of the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) involving citizen volunteers of all ages in tracking local precipitation patterns.

What's Happening with the Weather Now

Mike Nelson

Chief Meteorologist, 7NEWS (KMGH-TV), 123 Speer Blvd., Denver, Colorado 80203, (303) 832-0181, mike_nelson@kmgh.com

Starting with a brief discussion of the climate of Colorado and its dependence on unique topography, the presentation will cover the current situation of drought including what drought is and how it interacts with our local climate. With the issue of drought defined there will be information on solar power and the technologies that can be introduced to better the environment and work more affectively with our already hot and dry climate.

Mike Nelson joined 7News in June 2004 as chief meteorologist. Mike and his family moved to Denver in 1991 from KMOV-TV in St. Louis, Missouri where he served as chief meteorologist from 1985 to 1991. While in St. Louis, Mike was a member of the American Meteorological Society's Board of Broadcast Meteorology and was one of six meteorologists that select candidates to receive the AMS Seal of Approval for Television Weathercasting. Prior to his position at KMGH, Nelson served as chief meteorologist for KUSA-TV from 1991-2004.

Mike received his degree in meteorology from the University of Wisconsin, Madison. In 1976 he began work at Weather Central, a private weather consulting firm specializing in forecasts for ski areas, agri-business, power utilities, the Wisconsin TV network and over 40 other radio and TV stations nationwide. Nelson was appointed executive vice president of Weather Central in 1979 and supervised a staff of 14 Meteorologists.

In 1979 Nelson partnered with fellow meteorologist, Terry Kelly, in devising a computer weather graphics system for television. This system, called LIVELINE, remains the most widely used television weather graphics system in the world, more than 500 TV stations use this system.

Mike has won 10 Emmy awards for Outstanding Weather Anchor. In 2001 Mike was recognized by the Colorado Broadcasters Association as their "Citizen of the Year" for his volunteer work in Colorado schools. Mike enjoys sharing his knowledge of the weather with young and old, visiting over 120 schools, clubs, and service organizations each year. His Tornado Dance is a much anticipated event!

Mike has also written a local best seller, "The Colorado Weather Book." His book covers our often-capricious Colorado climate in great detail and is available in all major bookstores.

What Can We Expect This Winter?

Klaus Wolter

NOAA-CIRES Climate Diagnostics Center, R/CDC1 325 Broadway, Boulder, CO 80303-3328, (303) 497-6340, Klaus.Wolter@noaa.gov

This talk will present some of the factors that come into play for my forecast this winter, and what this means for expected temperature and snowfall anomalies in different parts of Colorado. Among the 'usual suspects', this includes a discussion of the current and expected state of "El Niño", and the importance of long-term temperature trends. If time permits, I will also show how last year's forecast panned out.

After coming to the U.S. in 1982, Klaus studied at the University of Wisconsin in Madison where he received his Ph.D. in 1987. The title of his dissertation was "Modes of Surface Circulation and Climate Over the Tropical Atlantic, Eastern Pacific, and Indian Oceans." After a one-year stint at the National Meteorological Center in Washington, DC, Klaus transferred to the University of Colorado in the fall of 1988, where he has been affiliated with CIRES (Cooperative Institute for Research in the Environmental Sciences) since.

Mr. Wolter's main research interests lie in empirical climate research, in particular the application of statistical methods to climate problems, such as the impact of ENSO (El Niño/Southern Oscillation) on world-wide climate. He has developed and refined a Multivariate ENSO Index (MEI) based on tropical Pacific ship-based observations of sea level pressure, near-surface wind fields, sea and air surface temperatures, and total cloudiness. The MEI is more robust than conventional indices in monitoring the ENSO phenomenon. Monthly updates and discussions of the MEI can be found under <http://www.cdc.noaa.gov/people/klaus.wolter/MEI/>

In the last decade Klaus has been able to devote more attention to the analysis and understanding of western U.S. climate, being involved in the Western Water Assessment (WWA) project at CU. In the context of widespread drought conditions over Colorado and surrounding states, and prompted by repeated requests for better regional climate forecasts, he has developed statistical tools that allow him to make seasonal precipitation predictions. Originally, these forecasts leaned heavily on statistical associations with ENSO, but became based on a much wider variety of influences on our climate since late 2001. Monthly updated discussions and forecasts are posted under <http://www.cdc.noaa.gov/people/klaus.wolter/SWcasts/>

Thursday, Oct. 26, 10:45 a.m.

As Good as It Gets?

Moderator: Troy Bauder

State Extension Water Quality Specialist Colorado State University, Dept. of Soil and Crop Sciences, Fort Collins, CO 80523-1170, 970-491-4923, tbaud@lamar.colostate.edu

Troy Bauder is the state extension water quality specialist in the Department of Soil and Crop Sciences at CSU. Troy received his bachelor's degree in agronomy and his master's degree in soil science from Colorado State University. He is responsible for conducting statewide educational and applied research programs on water quality, especially related to protection of ground water quality from impairment to agricultural chemicals as authorized under the Agricultural Chemicals and Groundwater Protection Act (SB90-126). His research and outreach activities include nitrogen management using high nitrate irrigation water, aquifer vulnerability to contamination, and factors affecting adoption of BMPs by Colorado producers. Prior to attending CSU, Troy received hands-on training in water as a farm hand, landscaper, and well repair technician. He is actively engaged in the family farm near Sterling, Colorado.

Yesterday It Was Ammonia, Today It Is Estrogen— Only the Concentrations Have Changed

John Woodling

Retired Aquatic Biologist, (970) 254-9461, Woodling@colorado.edu

Ammonia was the pollutant that worried dischargers in the late 1970's. Claims were made that ammonia removal cost too much. Claims were made that toxicity data did not support such low discharge limits and that stream sampling data was inadequate to determine discharge limits. Dischargers resisted treating a pollutant to a level of parts per billion. A quarter century later ammonia impacts are no longer an issue. Ammonia-caused fish kills have been documented. The number of fish species present in some front-range streams is reduced due to chronic ammonia exposure. A quarter century later ammonia treatment is still an issue. Many claim treatment costs will impose an undue burden on citizens. Others like Denver Metro Sewage District are building facilities to remove ammonia at a cost of hundreds of millions of dollars. Less expensive forms of ammonia removal are available to small dischargers including artificial wetlands and adding detention ponds at lower end of treatment plants.

Now a new class of pollutants is emerging. Estrogenic compounds are becoming a new worry for dischargers. A study has been published demonstrating that fish reproduction is negatively impacted downstream of domestic waste water treatment plants where the effluent flow makes up a large part of stream flows. Few, if any, males are present. Intersex fish are present and ovarian development is altered. The initial analyses performed in 2002 were replicated in 2003 and 2004 with the same result. Laboratory studies in 2005 demonstrated that a seven-day exposure to 50% effluent and 50% upstream dilution water resulted in high vitellogenin levels in male fathead minnows. The same exposure level found the number of breeding tubercles decreased in male fathead minnows and the amount of sperm decreased in the testes of male fathead minnows. Fathead minnows are one of the few fish species routinely collected downstream of discharge points in effluent dominated streams on the eastern half of Colorado. The issue is real. However, instead of one chemical hundreds may be involved. Some are natural. Most are the result of our industrial age. Treatment levels are not parts per billion but parts per trillion or lower. Treatment costs are not even known. The answer probably upstream of the treatment plant. Europe has banned octylphenoals and nonylphenols. Both classes of chemicals are estrogenic. The same can be done in the U.S. Society needs to address this issue, especially if steps are taken to use treated sewage effluent as a drinking water supply.

John Woodling is a Colorado native (Pueblo). A long time ago, John received a master's degree from the University of Louisville in Louisville, Kentucky and a doctorate from the University of Colorado, Boulder. John worked as a researcher at the Water Quality Control Division (1973-77), a program manager at Camp, Dresser and McKee (1977-78), and at the Colorado Division of Wildlife in a variety of positions (1978-2003). Since 2003 John has lived in Grand Junction, Colorado while attempting to publish the results of many studies he was paid to complete at the DOW while hunting, drawing, representing Colorado Trout Unlimited in Water Quality hearings, irrigating alfalfa and fishing.

Investigating Salinity Issues on the Lower South Platte Basin

Alan A. Halley

Agricultural Water Resources Engineer, Northern Colorado Water Conservancy District, 220 Water Ave., Berthoud, CO 80513, (970) 622-2242, ahalley@ncwcd.org

Salinity is an ongoing concern among Colorado growers. Many have asked questions as to why their historically productive fields have become less productive without any significant changes in their farming practices being made. Furthermore, high salt levels resulting in decreased yields have forced some growers to abandon certain crops altogether from their operations. In order to address this issue, the Northern Colorado Water Conservancy District, in cooperation with the U.S. Bureau of Reclamation, has undertaken a seven-year study assessing salinity levels throughout the Lower South Platte Basin.

This study involves monitoring the surface waters of the Lower South Platte River and its tributaries, assessing salinity and water levels at several groundwater observation wells, and mapping soil salinity levels throughout the District boundaries. The monitoring began in the spring of 2001 and has continued to expand in its scope. Currently, there are twenty-six automated and twenty-eight manual stations recording salinity levels along the South Platte and its tributaries. Additionally, nine agricultural irrigation systems, a number of natural returned flows and forty-three groundwater observation wells are being monitored. The District has also gathered soil salinity data from several fields.

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While salinity is an ever-increasing problem facing Colorado growers, we hope information gathered from this study will help minimize negative effects of salinity in Northeastern Colorado. Upon completion of the study in 2007, the District hopes to have a comprehensive overview of salinity levels throughout the District boundaries, how they change spatially and temporally, possible sources and contributing factors, and suggestions for growers to more effectively manage their crops with increased awareness. More information can be found on the District's web site, www.ncwcd.org.

Alan A. Halley was born and raised on a family farm south of Brush, Colorado. Alan earned two Bachelor of Science degrees in agriculture / civil engineering and agricultural education. Alan joined Northern Colorado Water Conservancy District in 1997 as the agricultural water resources engineer. He primarily works promoting water conservation in the agricultural community throughout the Lower South Platte Basin. Alan has directed several projects for the District, including an irrigation demonstration farm, irrigation scheduling program, surge valve loan program, salinity assessment project, and a canal automation project. Alan has dedicated himself to keeping agriculture a productive and valuable part of Northeastern Colorado.

Fish Consumption Advisories: Are Colorado's Fish Safe to Eat?

Nicole Vieira

Water Quality Researcher, Colorado Division of Wildlife, 317 W. Prospect Rd., Fort Collins, CO 80526, (970) 472-4380, nicole.vieira@state.co.us

Dr. Nicole Vieira is a water quality researcher in the Aquatic Section of the Colorado Division of Wildlife. Research topics over recent years have ranged from the effects of endocrine disrupting chemicals on native plains fishes to the use of biocriteria to determine impacts of heavy metals on mountain stream communities. She and her colleagues at CDOW conduct monitoring studies at a number of Superfund sites, and conduct laboratory toxicity tests on fish and invertebrate species. Dr. Vieira represents CDOW on water quality issues before the Water Quality Control Commission and serves as a technical expert on advisory committees for various issues including fish consumption advisories. Nicole is an affiliate faculty in the Department of Fish, Wildlife and Conservation Biology at Colorado State University.

Thursday, Oct. 26, 12:30 p.m.

Keynote Speaker

H₂Oil Energy Production Water: – A New Resource?

Dave Stewart

President and CEO, Stewart Environmental Consultants, Inc., 3801 Automation Way, Ste. 200, Fort Collins, CO 80525, (970) 226-5500 ext 204, dave.stewart@stewartenv.com

Water 2025, a study that was commissioned by Interior Secretary Gale Norton, describes the water shortages in the western U.S., and highlights areas of projected water shortages in Colorado. In many of these areas of water shortages is a new water resource called production water. This water comes from the production of oil, deep natural gas and coal bed methane natural gas. More than two billion barrels of production water or 3.2 million acre feet of production water is brought to the surface each year. Most of this water is reinjected back into the subsurface. While this water is normally associated with high TDS, it is possible to treat this water for beneficial use. This presentation will provide an overview of this water resource and will provide a case history in the Wellington area.

Dr. David Stewart has more than 29 years of experience in the environmental infrastructure industry. He started his career with the US Public Health Service working on Indian Reservations and public health issues. He then joined CH2M Hill, one of the largest environmental engineering firms in the world. He is now the president and CEO of Stewart Environmental Consultants, Inc. He has expertise in air, water, wastewater, process design, hazardous waste and solid waste areas. He has several patents awarded or pending on his various industrial wastewater treatment systems. Dr. Stewart received one master's degree from the University of Arizona, and a bachelor's, second master's and doctorate from Colorado State University in environmental engineering. He is an adjunct faculty member at Colorado State University and teaches courses in industrial wastewater treatment as well as hazardous waste treatment and management.

Thursday, Oct. 26, 1:10 p.m.

Mission Possible

Moderator: Mary Lou Smith

Statewide Water Supply Initiative - The Search for Solutions: Conservation, Agricultural Transfers, and New Water Development

Rick Brown

Project Manager, Statewide Water Supply Initiative, Colorado Water Conservation Board, 1313 Sherman St., Ste. 721, Denver, CO 80203, (303) 866-3514, rick.brown@state.co.us

The Statewide Water Supply Initiative is a project being undertaken by the Colorado Water Conservation Board. SWSI is a basin by basin look at current and future (forecasted to the year 2030) water supply and water demands, and an evaluation of how Colorado's future water needs may be addressed. Last year Rick presented a summary of the findings and recommendations of the first phase of SWSI. This year Rick will focus on the choices Colorado has to address our 2030 water needs. How far can conservation and efficiency can get you? Are there ways to address the effects of permanent agricultural dry up? What role can new water development projects play within and between basins? Rick will discuss these topics and will outline a new 40 million dollar grant and loan program.

Rick Brown has been with the Colorado Water Conservation Board for seven years. He was hired to work on Platte River endangered species issues. Rick was asked to manage the Statewide Water Supply Initiative in February 2003. From May 2005 to June 2006 Rick served as acting deputy director for the CWCB. In June 2006 Rick assumed his current position as manager of the newly created Intrastate Water Management and Development Section. In this position Rick continues work on SWSI updates and refinements, administers the newly created Water Severance Tax Reserve Fund, and provides support to the Interbasin Compact process.

Prior to joining the Board, Rick worked for 10 years with the Colorado Department of Public Health and Environment. His work at the Department focused on investigation and remediation of contaminated hazardous waste sites under the federal Superfund program. Rick also has experience at the local government level having worked for Boulder County Health Department.

Rick is a native of Colorado and obtained his bachelor's degree from the University of Colorado.

How to Herd Cats from High Country to State Line

Bill Jerke

Weld County Commissioner, Weld County, P. O. Box 758, Greeley, CO 80632, (970) 336-7204, bjerke@co.weld.co.us

Bill Jerke irrigates on the South Platte River, owns three irrigation wells and stock in Western Mutual Ditch and Union Ditch, and is a director for the Weld County Farm Bureau. He is past chair of the Senate Bill 73 Water Committee and current chair of the House Bill 1177 Interbasin Compact Committee, South Platte Basin Roundtable. He is a past state representative and past member of the Agriculture and Natural Resources Committee, serving two years as Vice Chair and two years as Chair. During his eight-year legislative career, he carried numerous water-related bills, many of which became law.

Conflict and Compromise on Colorado's South Platte

David M. Freeman

Professor Emeritus, Department of Sociology, Colorado State University, Fort Collins, CO 80523, (970) 491-3881, david.freeman@colostate.edu

For purposes of discussion to follow, this presentation will briefly make note of major themes around which conflict in the South Platte Basin has been organized:

- Conflict and Ditch Building
- Conflict and Reservoir Building
- Conflict and Supplementation of Native Flows with Transmountain Water
- Conflict and Integration of Groundwater Use With Surface Water Priorities
- Conflict and the Platte River Habitat Recovery Program

David M. Freeman, Professor Emeritus at Colorado State University, has 38 years of experience in teaching, research, and policy analysis in the social aspects of technology, social conflict in the natural resources domain, and analysis of local organization for water management in the Western United States and South Asia. He has worked with the Peace Corps in South Asian program planning, with the USDA Forest Service in regional and forest planning, and with the World Bank and the U.S. Agency for International Development on matters of organizing farmers for improved irrigation water management. He is now working on a book length description and analysis of the Platte Basin Habitat Recovery Program undertaken by the U.S. Department of Interior in cooperation with Colorado, Nebraska, and Wyoming.

Conflict is Not a Four Letter Word

MaryLou M. Smith

Vice President, Aqua Engineering, Inc., 4803 Innovation Dr., Fort Collins, CO 80525, (970) 229-9668, msmith@aquaengr.com

MaryLou will share insights from two very different conferences, the March World Water Forum in Mexico City, and the August National Conference on Dialogue and Deliberation in San Francisco, to lend credibility to her premise that we should welcome conflict over water in the South Platte Basin and in Colorado. She will present a model for working on conflict involving complex issues.

For close to 30 years, MaryLou Smith has managed people and profits as a co-founder of Aqua Engineering, a Fort Collins irrigation engineering firm. Now, building on her master's degree in educational psychology and training from CDR Associates in Boulder, she is taking Aqua Engineering into the arena of water policy/water conflict facilitation and mediation. MaryLou served for 12 years on the City of Fort Collins Water Board and is currently facilitating the Public Education/Participation/Outreach Work Group of the HB 1177 Process's Interbasin Compact Committee.

See You Next Year!!

18th Annual South Platte Forum
October, 24-25, 2007, Location TBA

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

Poster Abstracts

Field and Laboratory Evidence of Reproductive Disruption in Fishes Exposed to Endocrine-Active Wastewater Effluent

Vajda, A.M., Lopez, E.M.

Department of Integrative Physiology, University of Colorado, Boulder, Colorado

Gray, J.L., Barber, L.B., Woodling, J.D.¹, Norris, D.O.¹

U.S. Geological Survey, Boulder, Colorado

The city of Boulder discharges its wastewater treatment plant (WWTP) effluent into Boulder Creek. This effluent contains detectable levels of biogenic steroidal estrogens (17 β -estradiol, estrone, and estriol), synthetic steroidal estrogens (17 α -ethinylestradiol), and synthetic non-steroidal estrogens (alkylphenol surfactants). We conducted field and laboratory investigations to determine the impact of this endocrine-active WWTP effluent on the reproductive potential of fishes in Boulder Creek. White suckers (*Catostomus commersoni*) were collected in Fall 2003 and Spring 2004 downstream from the WWTP outfall and from upstream reference sites. Downstream white suckers showed evidence of reproductive disruption at all examined loci consistent with exposure to exogenous endocrine-active chemicals. Gonadal intersex was identified in 20% of downstream white suckers but not in reference white suckers. The sex ratio was skewed in favor of females at downstream sites, with males half as abundant than at reference sites. Downstream male white suckers had decreased testicular sperm abundance and significantly elevated plasma vitellogenin; downstream females had smaller ovary to body mass ratios and an asynchronous pattern of ovarian follicular development. To determine whether this reproductive disruption was attributable to endocrine-active wastewater contaminants, we exposed adult male fathead minnows (*Pimephales promelas*) to either Boulder Creek water (Reference), 100% Effluent, or a 50/50 mixture of Reference and 100% Effluent (50% Effluent). Fish were maintained under stimulatory environmental conditions for 4, 7, 14, and 28 days on-site within a mobile flow-through exposure laboratory. Adult male fathead minnow primary and secondary sex characters were rapidly demasculinized upon exposure to 50%- and 100%-effluent. Within 14-days of exposure, males exposed to 50%- and 100%-effluent had significantly fewer and less prominent nuptial tubercles, significantly less prominent dorsal fat pads, and decreased abundance of sperm within the testes. Vitellogenin was maximally elevated in both 50%- and 100%-effluent treatments within 7 days, consistent with the hypothesis that the reproductive disruption observed is likely due to endocrine-active wastewater contaminants.

Greeley #2 Canal Modernization

MaryLou M. Smith

Vice President, Aqua Engineering, Inc. , 4803 Innovation Dr., Fort Collins, CO 80525, (970) 229-9668,

mismith@aquagr.com

The New Cache La Poudre Irrigating Company has implemented improvements to the 120 year old Greeley #2 canal which provide for improved deliveries to farmers. Improvements are all farmer-financed using concessionary loans available from the Colorado Water Conservation Board.

HAVE YOUR poster on display AT THE NEXT SOUTH PLATTE FORUM

If you have a poster you would like to present at the 2007 South Platte Forum, Oct. 24-25, 2007, email a one-page abstract to Jennifer Brown, jennifer@jbbrown.com, by Aug. 1, 2007.

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

Chatfield Reservoir Storage Reallocation Project – FR/EIS

Gary Drendel and Gene Weglinski

Tetra Tech, Lakewood, Colorado

Marty Timmerwilke²

U.S. Army Corps of Engineers, Omaha District, Omaha, Nebraska

The U.S. Army Corps of Engineers, Omaha District is considering reallocating a portion of the flood storage pool at Chatfield Reservoir to multipurpose use (including municipal and industrial water supply). A Feasibility Report/Environmental Impact Statement (FR/EIS) is being prepared to address the potential costs and impacts associated with the project. Tetra Tech (Lakewood, Colorado) is assisting the Corps in preparing the FR/EIS. The FR/EIS is focusing on a number of key issues including potential impacts to: Recreational facilities at Chatfield State Park; Natural Resources including Preble's Meadow Jumping Mouse, wetlands, migratory bird habitat, and fisheries; Water Quality; Cultural Resources; and downstream flooding (due to changes in reservoir discharges).

The Colorado Water Conservation Board is co-funding the project and is the lead cooperating agency for the state. Other cooperating agencies include the U.S. Fish and Wildlife Service, the Colorado Division of Wildlife, Colorado State Parks, and a number of water suppliers pursuing storage space in the reservoir.

The CWCB's Statewide Water Supply Initiative (SWSI) study has projected that by 2030 water demand in the South Platte River basin will be 409,700 acre-ft per year. About 319,100 acre-ft (78%) of this demand will be met by identified projects, leaving a "gap" of about 90,600 acre-ft (22%). The reallocation of storage at Chatfield would help fill a portion of the gap.

Three alternatives are being evaluated in the FR/EIS: 1) the No Action Alternative, 2) Reallocation of 20,600 acre-feet of storage, and 3) Reallocation of 7,700 acre-feet of storage. Under Alternative 2 the conservation pool would increase by up to 12' from 5432' to 5444'. Under Alternative 3 the conservation pool would increase by up to 5'. The No Action Alternative is evaluating several actions that would be pursued by water suppliers in the event that the reallocation at Chatfield is not approved. These include water storage in downstream gravel pits and groundwater pumping.

Some of the main actions completed to date include: modeling of water levels within the reservoir and associated outflows, performed by the Corps using HEC-5 (version 8.0); hydraulic modeling of the South Platte River by the Corps using HEC-RAS (version 3.1.2); water quality modeling of nutrient, bacteria, and metal levels in Chatfield; flood damages analysis; and surveys for rare plant species (Colorado Butterfly Plant and Ute ladie's-tresses orchid) and breeding birds. The FR/EIS is being drafted at this time, and it is expected for release to the public in early 2007. A Final FR/EIS document and Record of Decision are planned for later in 2007.

Results of Pumping Test Assessments of the Stream-Aquifer Connection along the Lower South Platte River

Calvin Miller and Deanna Durnford

Dept. of Civil and Environmental Engineering, Colorado State University

William E. Sanford

Dept. of Geosciences, Colorado State University

Two pumping tests were performed immediately adjacent to the lower South Platte River to evaluate the hydraulic connection between the river and the alluvial aquifer. The tests were designed to assess the streambed permeability and aquifer properties that govern groundwater-surface water interactions, and to calibrate analytical and numerical models for the computation of stream depletion caused by groundwater extraction wells operating within a few hundred feet of the river. The tests provided a measure of the river-aquifer system within the area of influence of the pumping well, with results representing averaged or effective properties along a river reach up to 2000 ft long. The results agree well with multiple point measurements (permeameter tests and grain-size analysis) of the streambed taken in the area by three independent studies. From the pumping tests and point measurements, streambed hydraulic conductivity estimates ranged from 20 to 600 ft/day, with a geometric mean equal to 70 ft/day.

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These analyses indicate the absence of a restrictive streambed layer, i.e., the streambed consists of the same high-permeability sands and gravel as the underlying aquifer. The absence of a restrictive streambed significantly reduces the range of uncertainty in stream depletion estimates, and it indicates that analytical stream depletion models (e.g., Glover, SDF, Hunt) can provide reasonable estimates in many cases for the South Platte. For pumping wells located very close to the river, however, vertical flow and other field conditions may need to be accounted for by using a reduced “effective hydraulic conductivity” in analytical models.

Barr Lake and Milton Reservoir Watershed Association – Stakeholder Group Facilitates Collaborative Effort to Improve Water Quality in Hyper-Eutrophic High Plains Reservoirs

Jill Piatt-Kemper, Information/Education Committee Chair

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

Alice Wood, Coordinator

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 are currently working together as a consensus-based group to author a watershed plan which will serve to guide the development of a pH TMDL and reservoir-specific nutrient standards. The BMW Association is also implementing an information/education program to inform the surrounding community and water users of both water quality issues and the group’s efforts to resolve those issues. The BMW Association watershed plan and information/education program are part of Phase 2 of a four-phased approach to identifying and implementing efficient water quality improvements. Phase 1, completed in 2002 – 2005, involved formation of the watershed group and development of a water quality database. Phase 2 (2006 – 2011) involves conducting reservoir assessments and modeling and development of the watershed plan. The BMW Association will begin Phases 3 and 4, development and implementation of a pH TMDL, respectively, in 2012. A Section 319 Nonpoint source grant, as well as annual dues from BMW Association members, currently funds the group’s efforts.

The BMW Association display summarizes the BMW Association focus area, water quality issues, and current activities.

Emerging Contaminants in Wastewater: A Pilot Project to Involve Community-Wide Stakeholders in Pollution Prevention

Kara Swanson

Associate, Institute for Environmental Solutions, 761 Newport St., Denver, CO 80220-5554, (303) 388-5211, SwansonK@pbworld.com

Trisha Culp

Associate, Institute for Environmental Solutions

Aaron Gutierrez

University of Denver Environmental Policy & Management Program

Carol E. Lyons

Executive Director, Institute for Environmental Solutions

Trace contaminants from pharmaceuticals and personal care products in wastewater are an emerging environmental concern. Many of these contaminants mimic hormones in living beings. Such contaminants are not removed by conventional treatment at wastewater treatment plants. Disruptions in the endocrine systems of fish and other aquatic species are being detected downstream of wastewater treatment plants.

Based upon research that has been completed thus far, several questions have emerged that we plan to study further:

How are emerging contaminants entering water supplies?

What is the biological and/or ecological significance of low-dose long-term exposure to these contaminants?

Can existing pilot programs implemented elsewhere be regionally tailored to fit Colorado's pollution prevention needs?

This poster presentation will illustrate the first phase of the Institute for Environmental Solutions' (IES') newest project ultimately aiming to bring together interested and affected parties from the public, private, and non-profit sectors of Colorado society to work toward the implementation of effective, science-based pollution prevention strategies.

IES is undertaking this innovative project to collect and build on the extensive research already conducted in various disciplines on many aspects of this issue. By doing this, IES hopes to be able to frame and present this issue in a way that can positively attract and engage a broad cross-section of Colorado to begin to work toward alleviating this emerging environmental concern.

IES recognizes that many government and private organizations are studying this nascent issue and working towards addressing the known problems. We propose this pilot project to find, test, and implement sound cost-effective solutions to this emerging environmental problem of trace contaminants in Colorado wastewater. 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.

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

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.