COLORADO WATER

Newsletter of the Water Center at Colorado State University

December 2002

Drought Conference Attracts Participants With Diverse Water Interests

Clockwise from bottom left: Kent Holsinger, Department of Natural Resources, gives keynote address at luncheon.

Hal Simpson, State Engineer, speaks to capacity audience.

Paul Weiss enjoys the Poster Session during a break with Sara Rathburn and two of her students from the Department of Earth Resources.

Co Sponsored by:
Colorado Water Resources Research Institute
Colorado State University Agriculture Experiment Station
Colorado State University Cooperative Extension
Colorado State Forest Service

Colorado State University

Knowledge to Go Places

WATER ITEMS AND ISSUES . . .

COLORADO WATER
Vol. 18, No. 6 December 2002
Editor: Shirley Miller
Writers: Marian Flanagan and Michael Blackledge

Published by the

Colorado Water Resources Research Institute
Colorado State University, Fort Collins, CO 80523
Phone 970/491-6308 FAX: 970/491-1636
E-mail: CWRRI@ColoState.EDU

INTERNET SITES

Colorado Water Resources Research Institute: http://cwrri.colostate.edu
CSU Water Center: http://watercenter.colostate.edu
South Platte Forum: http://southplatteforum.colostate.edu
Colorado Water Knowledge: http://waterknowledge.colostate.edu
Hydrology Days: http://hydrologydays.colostate.edu/
Student Water Symposium: http://watersym.colostate.edu/
Water REU: http://watereu.colostate.edu/

EDITORIAL

REFLECTIONS ON 2002

by Robert C. Ward, Director

2002 has been a challenging year for anyone involved in water in Colorado. The drought deepened quickly last spring and in a manner not seen before in Colorado – lowest runoff on record in many rivers and streams. The combination of two dry years followed by the extremely low flows of 2002, in many ways, redefined the job descriptions for many water managers in Colorado, or at least sharply refocused job priorities.

As 2002 draws to a close, it is a time to reflect upon the 'water' events of the past year and recognize the extra efforts of a number of faculty and Colorado water managers involved in drought-related research and water education.

At CSU, faculty realized that the drought demanded a proactive response and created a new DroughtLab (Drought Analysis and Management Laboratory), in collaboration with faculty from other universities, to facilitate and encourage drought-related research and education efforts. Under the auspices of DroughtLab, a number of 'seed grant' projects were initiated immediately, several large drought-related proposals were submitted to national water research competitions, and a very successful drought conference was held at CSU on December 4, 2002. DroughtLab was the brain-child of Professors Jose Salas in Civil Engineering and Roger Pielke, Sr. in Atmospheric Science. Over the summer and fall they devoted considerable time to drought-related information and education activities.

> The water management community in Colorado has stepped up to the water education 'plate' and is working hard to ensure that the public understands the critical water supply issues facing Colorado during the current drought.

The Colorado Drought Conference, summarized on page 13 of this issue of Colorado Water, provided a forum for discussing how Colorado can survive the uncertainty of future water supplies during this time of drought. The conference's success can be attributed to the close collaboration between water organizations and higher education. In particular, the assistance of the Colorado Water Conservation Board, the Colorado Water Congress, the Division of Water Resources (State Engineer's Office), and the Colorado District of the USGS in the initial planning, publicizing, and execution of the conference is greatly appreciated.

Cooperative Extension, with its network of extension agents in 57 of Colorado's 63 counties, synthesized an extensive amount of drought-related information and made it readily available on its webpage: http://www.ext.colostate.edu/

Reagan Waskom, State Water Resources Extension Specialist, provided leadership in bridging across a number of water-related topics to ensure ready access to a broad range of drought-related information in many formats and locations around Colorado. Reagan also serves as a member of the Board of Trustees of the Colorado Water Education Foundation.

The Agricultural Experiment Station, under the direction of Lee Sommers, in collaboration with NOAA, seeded a grant to survey drought impacts on agriculture this fall. The project, under the direction of Eric Schuck, Assistant Professor of Agricultural and Resource Economics at CSU, is quantifying agricultural impacts of drought so that policy makers and water managers can begin to understand the options available to mitigate the large negative impacts on agriculture.

The Colorado State Forest Service is carefully examining the impact of past forest management practices on the health of Colorado's forests in hopes of reducing fire danger, especially in areas of heavy human habitation. As forest fires burned this summer, faculty were active in preparing water-quality monitoring efforts to document the impacts of the fires on Colorado's water resources. Lee MacDonald, in the Watershed Sciences Program at CSU, has been very active in monitoring water quality impacts after forest fires.

The Colorado Climate Center, under the direction of Roger Pielke, Sr., assembled excellent summaries of Colorado's weather and precipitation history in light of the renewed interest in understanding the historical context of the current drought. Roger and Nolan Doesken, Research Associate with the Center, presented numerous talks about Colorado's climate and weather – talks that help many Colorado citizens understand the semi-arid nature of Colorado – an understanding that is critical as Colorado develops responses to the current drought.

While the drought commanded considerable time of faculty, existing water research and education duties were not neglected. The annual CSU water resources seminar, held each fall semester with the help of nine Colorado water managers, conducted an examination of water management issues in the Arkansas Valley - a valley experiencing many, if not most, of the pressures facing all Colorado water managers.

The following seminar speakers brought current thinking on Arkansas Valley water issues to the students and faculty at CSU and for this I am extremely grateful.

Alan Hamel, Executive Director, Board of Water Works, Pueblo

Steve Witte, Division II Engineer, Water Resources Division, Pueblo

Jim Pearce, Senior Water Resources Specialist, Colorado River Water Conservation District, Glenwood Springs

Hal Simpson, Colorado State Engineer, Water Resources Division, Denver

Dennis Montgomery, Hill and Robbins, Denver

Dick Stenzel, Division I Engineer, Water Resources Division, Greeley

Dick MacRavey, Executive Director, Colorado Water Congress, Denver

Dan Merriman, Chief, Stream and Lake Protection, Colorado Water Conservation Board, Denver

David Robbins, Hill and Robbins, Denver

On page 12 of this issue of Colorado Water, the initiation of the new Colorado Water Education Foundation is described. Creation of the new Foundation involved the efforts and energies of many people, but the special efforts of Tom Cech, long-time chair of the Water Education Committee of the Colorado Water Congress, and Dick MacRavey, Executive Director of the Colorado Water Congress, must be highlighted.

In checking the websites of a number of water suppliers in Colorado, I note that many, if not all of them, greatly expanded their public information efforts in the area of drought issues and water conservation strategies. Water suppliers modified their websites to make information on drought more accessible and expanded the availability of water information via other media. The collective effort of Colorado water organizations appears massive, and in many cases combines in-house information with that provided by higher education. The water management community in Colorado has stepped up to the water education 'plate' and is working hard to ensure that the public understands the critical water supply issues facing Colorado during the current drought.

The above contributions to water research and education in Colorado during 2002 are most appreciated, but it must be recognized that many other faculty and water managers were actively involved and their efforts, likewise, are also appreciated and valued. I wish there were space to list them all.

AWWARF SOLICITS PROPOSALS

The American Water Works Association Research Foundation is soliciting proposals to promote basic and fundamental research based on original concepts and/or novel techniques that will prepare the water community to meet the future needs and expectations of its consumers. The project period cannot exceed three years. Budgets shall not exceed $150,000 in sponsor funds. Researchers are encouraged, but not required, to include a twenty-five percent match to the sponsor's funds as in-kind services. In-kind services can include labor, materials, or other services, either by the researcher, utility, or other participating parties. The deadline for pre-proposals is February 3, 2003. They must be submitted electronically. Full proposals must be postmarked by April 28, 2002.

Contact:	Traci L. Case, Project Manager
Address:	6666 Quincy Ave.
	Denver, CO 80235
Program URL:	http://www.awwarf.com/research/guides/unsolicited.pdf
E-mail:	tcase@awwarf.com
Tel:	303-347-6120
Fax:	303-730-0851

COLORADO STATE UNIVERSITY RECEIVES $1.4 MILLION NSF GRANT TO ENHANCE ITS NATIONAL WEATHER RADAR FACILITY

Colorado State University will move into the forefront of world weather radar research with a $1.4 million major research instrumentation grant from the National Science Foundation. The grant is enhancing Colorado State's CHILL National Radar Facility by funding the development of an antenna that will greatly improve the accuracy of radar mapping of precipitation type and amount.

The CHILL Radar facility was awarded the NSF grant for the development of a new type of high-performance radar antenna, known as a dual-offset Gregorian antenna. Colorado State will be the first university in the world to own and operate this highly advanced weather radar antenna technology. The new antenna will replace the current parabolic reflector antenna at the CHILL Radar research facility located near Greeley, Colo.

"There is no other 9-meter, dual-offset antenna available for a meteorological radar anywhere in the world," said V.N. Bringi, professor of electrical engineering and principal investigator of the project. "This will make CHILL the premier facility for advanced weather radar research."

Colorado State's CHILL facility, funded by the National Science Foundation and the state of Colorado, supports the academic and atmospheric research community by providing data and evaluating new techniques and technologies for remote sensing of the atmosphere. The facility is a collaboration of the university's Department of Electrical and Computer Engineering and its Department of Atmospheric Science.

"The impact of the new high-performance antenna will place Colorado State's CHILL Radar facility at the forefront of meteorology for at least the next decade," said Steven Rutledge, scientific director of the facility and head of the atmospheric science department. "It will enable us to pinpoint more precise rainfall and precipitation measurements and allow scientists to conduct new levels of weather-related research."

With the new system, intense rainfall that produces flash floods can be better estimated and mapping rain and hail storms will become more accurate. The advanced technology also can distinguish among the various types of precipitation particles in both summer and winter storms allowing scientists to locate, track and research even the most minute precipitation elements.

The CHILL facility is operated as a national weather radar research center under a cooperative agreement with the National Science Foundation. It is a national and international educational and basic research facility, meaning that other universities and scientific organizations can use the facility to conduct research and collaborate on projects. The new antenna will improve research capabilities not only at Colorado State but for scientists throughout the United States and beyond.

According to electrical engineering professor and co-principal investigator V. Chandrasekar, the new radar technology will also be used by undergraduate and graduate students at Colorado State as part of their academic programs. "This device will expose students to new technology and allow them to gain hands-on experience using the latest in radar remote-sensing research," he said.

The National Weather Service currently has a system of more than 150 Doppler radars that was established in the early 1990s, but is looking to upgrade all of the Dopplers with new technology developed by Colorado State. Basic research performed at Colorado State will provide much needed information required by the NWS to make the transition.

The radar is being developed and built in collaboration with Colorado State by world-leading antenna designer Vertex RSI of Kilgore, Texas. The project will take two years to complete and is the largest antenna of its type ever constructed by the company. Once assembled and tested, it will be shipped from the company's manufacturing facility in Texas to Colorado and set up at Colorado State's CHILL National Radar Facility. More information about the CHILL facility can be found on the Web at http://chill.colostate.edu.

Brad Bohlander, CSU University Relations – 10/3/02

RESEARCH

EUTROPHICATION OF DRINKING WATER RESERVOIRS ON THE COLORADO FRONT RANGE

by

Jim C. Loftis, Professor of Civil Engineering and Extension Water Quality Specialist

Eutrophication, or the aging of lakes and reservoirs due to nutrient inputs, has been observed in many, if not most, Colorado Front Range reservoirs. Notable examples include Standley Lake, Lake Loveland, and Horsetooth Reservoir. While eutrophication is a natural process, the rapid pace with which it is occurring in Front Range reservoirs is a cause for concern and is the subject of a nearly completed one-year study funded by the Colorado Water Resources Research Institute and Front Range Water Providers including the cities of Fort Collins, Greeley, Longmont, Denver, Aurora, and the Northern Colorado Water Conservancy District. Jim Loftis, Extension Agricultural Engineer, is managing the project with assistance from faculty members Brett Johnson of Fishery and Wildlife Biology and Laurel Saito, University of Nevado Reno, and graduate students Brian Gelder and Marci Koski.

For many reservoirs in this region, a shift in use is occurring rapidly, away from irrigation water storage and toward municipal water supply, with generally more stringent requirements for water quality. In several reservoirs water quality has already been impacted to the extent that treatability for municipal water supply is affected, and in some cases recreation and aesthetics have been impacted as well. In addition to taste and odor concerns associated with excess algae production, elevated levels of total organic carbon (TOC) are an increasing concern because of the harmful and stringently regulated disinfection by-products that result from chlorinating waters high in TOC. Management intervention may be necessary across the region for protecting these beneficial uses over the long term. Certainly, public awareness must be raised on a statewide level.

To date, Front Range Reservoirs have been studied individually, and management has been addressed on a case-by-case basis. This approach makes sense in that each system is unique in its chemical, physical, and biological characteristics, and the uses of the reservoir are often primarily local. The disadvantages of this approach are, however, that there are very likely common lessons that could be learned regarding causes, effects, and potential solutions to the eutrophication problem. A regional approach, rather than an individual approach, is necessary to explore these commonalities. The overall goal of the Water Institute research project is to determine whether the drinking water supply reservoirs in the region have enough similarities to warrant a regional approach to monitoring, modeling and management, and to help set priorities for future cooperation among the participating water providers.

For many reservoirs in this region, a shift in use is occurring rapidly, away from irrigation water storage and toward municipal water supply, with generally more stringent requirements for water quality. In several reservoirs water quality has already been impacted to the extent that treatability for municipal water supply is affected, and in some cases recreation and aesthetics have been impacted as well.

The research has two components; the first is to develop, implement, and evaluate the results of a survey of Front Range water suppliers. The second is to review and evaluate existing reservoir water quality models. The survey was developed from an initial meeting with Front Range water suppliers. The survey was implemented by meeting with each participant and then having them supply detailed information on study reservoir characteristics and water quality issues of importance to them. The results were complied in an Access database for analysis.

The survey identified a fairly wide range of reservoir physical characteristics, including size, depth, residence time and age. All but one of the study reservoirs was primarily off-line storage, meaning that more than half of the inflow was from out-of-basin sources. The top five issues identified via the survey were, in decreasing order of importance:

1. nonpoint pollution
2. nutrient loading
3. watershed protection
4. eutrophication/trophic status
5. algae blooms.

Virtually every water supplier on the Colorado Front Range that depends on reservoir storage is concerned about these issues. The State of Colorado will be attempting to set nutrient criteria for lakes and reservoirs in the near future. The levels of nutrients that are important for many of the Front Range drinking water reservoirs are low, and difficult to measure (especially phosphorus). Different sampling and analytical methods or different laboratories can yield very different results. Yet

there is no consensus on what monitoring approaches and laboratory methods should be used to measure standards compliance, much less on what numerical limits would be appropriate.

Reservoir water quality models were evaluated by matching the assumptions and governing equations of each model to study reservoir characteristics. For a few cases, the models were actually run and results evaluated. Models for testing were selected based on the ability to have a working model within the time constraints (2-3 months) and the ability to model dissolved oxygen and total phosphorous, which are the causes of water quality concerns for the operators and managers. The selected models by Chapra and Canale, and Vollenweider were then applied to three reservoirs (Aurora Reservoir, Horsetooth Reservoir, and Standley Lake) that had readily available monitoring data to evaluate the ability to adequately model the constituents of concern and the model's ease of use. In addition the CE-QUAL-W2 model was applied to Aurora Reservoir only. Based on the model characteristics and results, Chapra and Canale's model incorporating sediment feedback appears most favorable for implementation for most of the reservoirs looking at low cost, low time requirement solutions.

The overall conclusion of the study is that future collaboration on monitoring is absolutely essential for effective management of Front Range drinking water supply reservoirs, especially in a regulatory setting. Collaboration on modeling may prove helpful as well, though the varying characteristics of the reservoirs may make application of a single model rather difficult. For management, information exchange on the effectiveness of management alternatives is the logical first step. Entrenched local policies, on recreational use of reservoirs in particular, may make a common approach to management difficult in the near term. The Colorado Lake and Reservoir Management Association, CLRMA, continues to be an effective forum for information exchange and is the likely forum for future collaboration on monitoring, management, and modeling.

NUTRIENTS AND TROPHIC STATUS IN OFF-CHANNEL STORAGE RESERVOIRS OF THE SOUTH PLATTE RIVER, COLORADO

by E.B. Hall and J.D. Stednick
Department of Earth Resources, Colorado State University

Off-channel storage reservoirs along the South Platte River downstream of Denver, Colorado are often filled with river water that may contain high concentrations of nitrogen and phosphorous (USGS 1998). Anecdotal evidence suggests that these reservoirs on the eastern Colorado plains are experiencing eutrophication. Algae blooms and fish kills have been reported. Eutrophication in these reservoirs may impair the recreational and aquatic life beneficial uses.

From Denver to Balzac, Colorado, total phosphorous (TP) concentrations in the main stem of the South Platte River generally exceed the U.S. Environmental Protection Agency (USEPA) recommendation of less than 67.5 µg/L for rivers (Table 1) (USEPA 2001, Hernandez 2002). One study of the South Platte River in 1995 found TP concentrations greater than 2,000 µg/L immediately downstream of Denver, with concentrations decreasing to approximately 500 µg/L near Balzac (Litke 1996). Off-channel storage reservoirs in the South Platte River region downstream of Denver are often filled with this high-nutrient level water (USGS 1998). There is little information on nutrients and algae in the plains region of the South Platte Basin (USGS 1995).

The prior appropriation water rights system and the physical nature of the South Platte River result in specific times in which water managers are

Table 1: EPA causative and response numeric values for Ecoregion V (EPA 2001)

Parameter	Rivers and Streams	Lakes and Reservoirs
TP	67.5 µg/L	33 µg/L
TN	880 µg/L	560 µg/L
Chlorophyll-a	3.04 µg/L	2.3 µg/L
Turbidity or Transparency	8NTU	1.3 meters

able to divert water for storage in these reservoirs. Often water managers are not graced with the option of filling the reservoirs with higher quality water. Instead, managers must fill when they are in priority.

This project examined the in-reservoir nitrogen and phosphorous concentrations in relation to the reservoir biological response, as measured by chlorophyll-a. The determination of the nutrient - chlorophyll-a relationships will aid in evaluating off-channel reservoir trophic status, predicting eutrophication potential, and identifying reservoir management options. Different Trophic Status Indices (TSI) were evaluated in this study. The measured high nutrient concentrations, lack of previous reservoir studies, and pending state nutrient criteria recommendations prompted this study.

Study Sites

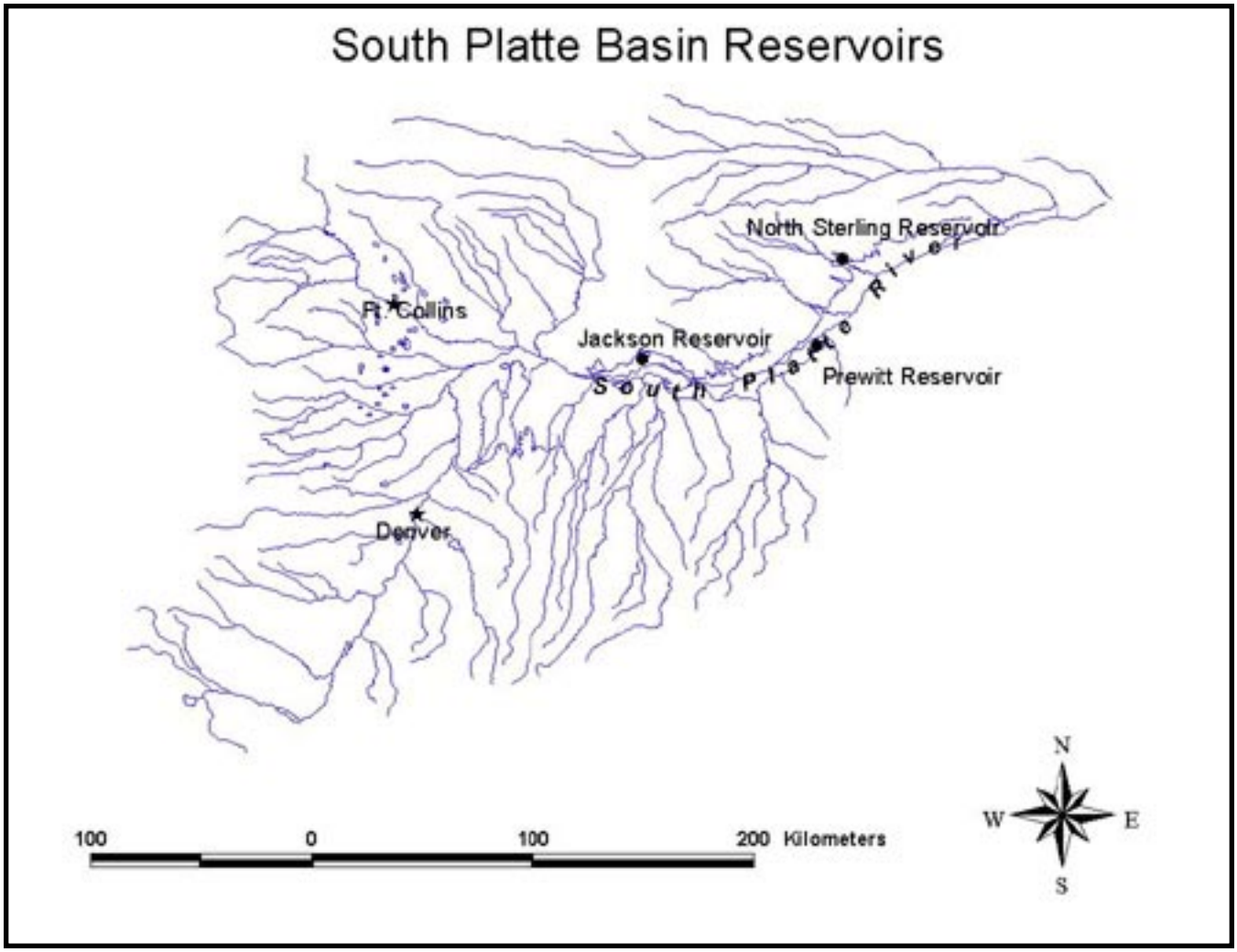
The study focused on three off-channel storage reservoirs located in north central Colorado in the South Platte River basin: Jackson Reservoir, Prewitt Reservoir and North Sterling Reservoir (Figure 1). The primary purpose of the off-channel storage reservoirs is to provide irrigation water, which typically leads to a significant annual change in reservoir volume. Jackson and Sterling Reservoirs are operated as State Parks and Prewitt Reservoir is a state wildlife area. All three provide recreational opportunities leading to increased public pressure for constant water levels and excellent water quality (Maurier 2001).

Methods

Nutrient concentrations, chlorophyll concentrations and physical parameters were measured at each reservoir on 10 sample days over the 2001 growing season (April – October). Nutrient concentration changes and primary production were compared within and between the reservoirs. TSI models for prediction of primary production were evaluated using these nutrient and chlorophyll data.

Physical parameters, including Secchi depth, were collected at three sampling locations at North Sterling and Jackson Reservoirs (Hall 2002). All samples of Prewitt Reservoir were taken from the boat dock. Physical data were collected using the Yellow Springs Instruments ® 6920 or ® 600-XLM probe. Date, time,

Figure 1. Location of three study reservoirs in the South Platte River Basin.



temperature (°C), specific conductance (µS/cm), and dissolved oxygen (mg/L) were collected at each sampling site and at depth.

Water quality samples were taken for nutrient and chlorophyll analysis at each reservoir. Samples were collected at approximately 0.5 meter depth from the boat in 1 liter HDPE bottles. Laboratory analysis for ammonia, nitrate, organic nitrogen, total phosphorous (TP) and orthophosphate (PO_4^{3-}) was completed at the Colorado State University Soil, Water and Plant Testing Laboratory using Standard Methods (APHA 1995). Field and laboratory duplicates were completed on 10% of the samples as part of the quality assurance and quality control protocol (Hall 2002).

A Microsoft Excel workbook was developed to evaluate trophic relations for this study and designed for future use by reservoir managers. The workbook consists of two spreadsheets, the first of which contains 24 common nutrient-chlorophyll models from a literature review. The second spreadsheet uses three common TSI to determine the trophic state based upon input values.

The first spreadsheet allows user input of measured values (TP, chlorophyll-a, Secchi disk depth and total nitrogen - TN), which are used in the equations and TSI (Hall 2002). In order to compare the effectiveness of common nutrient - chlorophyll-a models, the spreadsheet was developed to compute five measures (correlation coefficients, confidence intervals, and average and percentage error) of precision between the computed and observed chlorophyll-a values (Canfield et al. 1983, Brown et al. 2000).

The second spreadsheet compared reservoir classification determined by different TSI to evaluate TSI applicability to Eastern Colorado reservoirs in the South Platte Basin. The worksheet allows the input of data and computes the resulting index and classification (oligotrophic, mesotrophic or eutrophic) based upon each parameter. The final results can then be compared.

Results

The water volumes of all three reservoirs decreased significantly as waters were used for irrigation. In general, reservoirs showed little evidence of a thermocline (temperature change with water depth), the well-mixed waters were also chemically similar with depth. In both Sterling and Jackson Reservoirs dissolved oxygen generally decreased as water depth increased.

Nutrient results were interpreted in relation to recently developed EPA nutrient criteria and guidance for the South Platte River Basin (EPA 2001) (Table 1). These criteria are intended to aid the State of Colorado in developing nutrient standards.

A decrease in TN from April through early August was observed at all three reservoirs (Figure 2). The concentrations remained low in North Sterling, but increased at Jackson and Prewitt between August and October. The range of TN concentrations was 8,300 – 1,700 µg/L at Jackson, 6,900 – 1,600 µg/L at Prewitt and 9,400 – 2,300 µg/L at Sterling.

Nitrate concentrations in North Sterling and Jackson Reservoirs showed a seasonal decline (Figure 2). Between April 10 and October 8, nitrate concentrations in North Sterling Reservoir decreased from over 5,000 µg/L to less than the detection limit of 100 µg/L. Similarly, concentrations at Jackson Reservoir decreased from 2,700 µg/L to at or below the detection limit through late July, August and September with a slight increase on the last sampling date. Nitrate was below detection limits in Prewitt Reservoir on four of the sampling days, and a seasonal decline was not observed. Ammonium ranged from below detection to 1,100 µg/L with no seasonal pattern.

Jackson TP concentrations taken from the boat ranged from 142 to 350 µg/L. Prewitt TP concentrations ranged from 173 to 355 µg/L. North Sterling TP concentrations ranged from 53 to 410 µg/L, and did not show a seasonal trend. In general, TP concentrations decreased slightly in June and July, but increased again by the end of the study period.

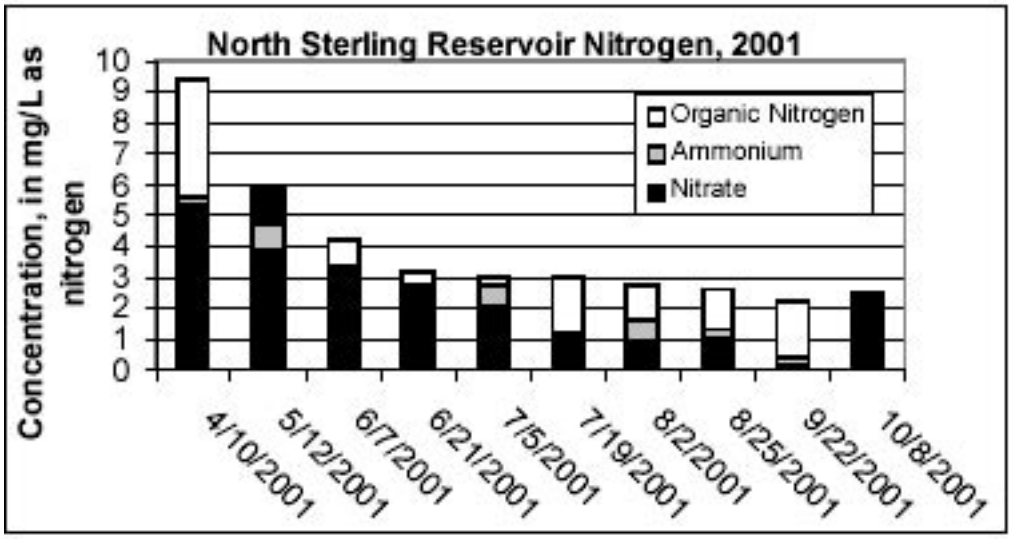
Jackson Reservoir orthophsopahate (PO_4^{3-}) concentrations ranged from 5 to 137 µg/L, excluding one sample with concentrations below the detection limit. Prewitt PO_4^{3-} concentrations ranged from 2 - 146 µg/L, excluding one sample below the detection limit. North Sterling PO_4^{3-} concentrations were below the detection limit of 1 µg/L in June, but ranged from 3 to 75 µg/L for the remainder of the sampling period. Over time, PO_4^{3-} concentrations showed no trend.

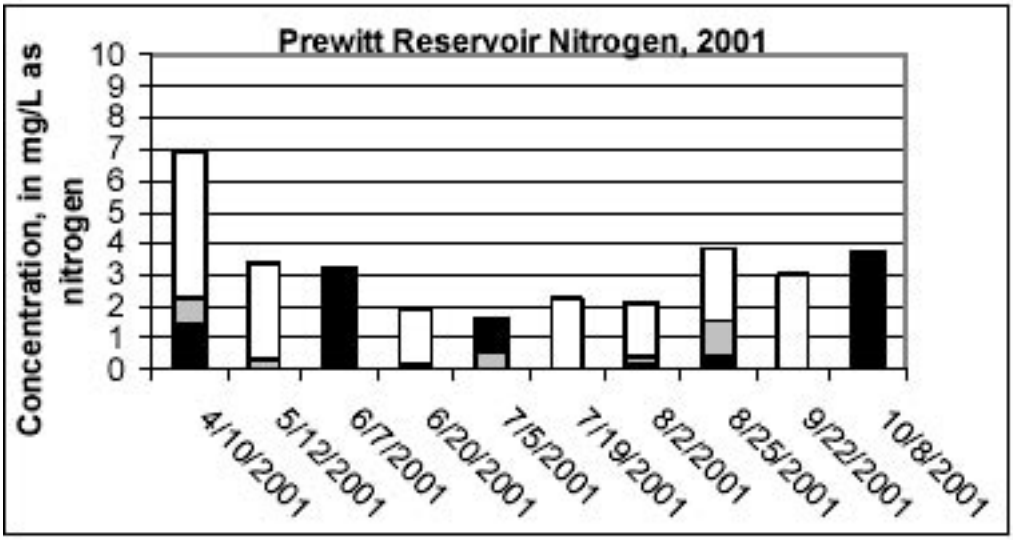
Chlorophyll-a concentrations increased over the summer, with chlorophyll-a concentrations for Prewitt being higher than those found in Jackson or North Sterling. The median concentration of chlorophyll-a at Prewitt Reservoir was 142 µg/L. The median concentrations at Sterling and Jackson were 46 µg/L and 45 µg/L, respectively.

Median total nitrogen (TN) concentrations in Jackson (2,550 µg/L), Prewitt (3,100 µg/L) and North Sterling (3,550 µg/L) reservoirs exceed the EPA standard recommendation of 560 µg/L. Median total phosphorous (TP) concentrations in Jackson (208 µg/L), Prewitt (267 µg/L) and North Sterling (183 µg/L) exceeded the EPA recommendation of 33 µg/L. Median chlorophyll-a concentrations exceeded the recommended value of 2.33 µg/L by a factor of at least 20.

Linear and multiple regressions were used to determine the relationships between nutrient concentrations and chlorophyll-a (Table 2). TP and chlorophyll-a were positively correlated (p=0.10) at North Sterling (r^2=0.53; p=0.04) and Jackson Reservoirs (r^2=0.59; p=0.03), but not at Prewitt Reservoir (r^2=0.27; p=0.19). Multivariate regression using TN and TP strengthened the correlation with chlorophyll-a at all of the reservoirs. Multivariate regression using inorganic-N and TP resulted in the strongest correlation at North Sterling Reservoir.

Figure 2: Nitrogen concentrations at Jackson, Prewitt and North Sterling Reservoirs between April and October, 2001.





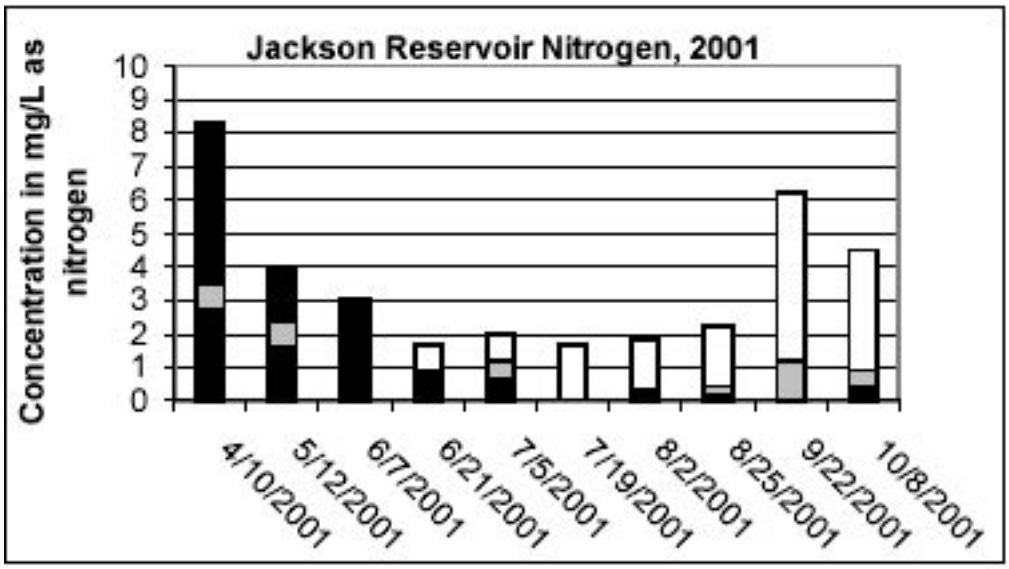


Table 2: Nutrient and chlorophyll-a correlation coefficient r and (p-value) at North Sterling, Prewitt and Jackson Reservoirs from June to October 2001.

Reservoir	Log TP	log TN	Log PO_4^{3-}	log Inorg-N	log TP and log TN	log TP and log Inorg-N
North Sterling Reservoir	0.73 (0.04)	-0.58 (0.13)	0.64 (0.09)	-0.88 (0.04)	0.83 (0.05)	0.91 (0.01)
Prewitt Reservoir	0.52 (0.19)	0.34 (0.41)	0.47 (0.24)	0.12 (0.78)	0.78 (0.10)	0.53 (0.43)
Jackson Reservoir	0.77 (0.02)	0.65 (0.08)	0.76 (0.03)	0.13 (0.76)	0.82 (0.06)	0.78 (0.09)

An analysis of the applicability of common Trophic Status Index (TSI) models suggested that all reservoirs are eutrophic - hypereutrophic based upon chlorophyll-a, TP and Secchi depth measurements. Models using chlorophyll-a generally resulted in a lower trophic designation than those based upon TP. Model precision analysis (correlation coefficients, 95 percent confidence intervals, and average and percentage error) was used to evaluate 24 common models that predict chlorophyll-a from nutrient concentrations. Using precision analysis, models based upon TP were the best at Prewitt Reservoir, while models using TN and TP were best at Jackson and Sterling Reservoirs (Hall 2002). This study suggested that one model does not fit all reservoirs. Based on precision analysis and model selection methods, nitrogen and phosphorous concentrations should be used when assessing off-channel storage reservoir trophic status.

Summary

Nutrient concentrations in the South Platte off-channel storage reservoirs were higher than the EPA recommended nutrient criteria. Nitrate concentrations decreased over time suggesting nitrogen-limited waters, but median values were still above the criteria. Nutrient concentrations and dynamics indicate that both nitrogen and phosphorous concentrations should be used in reservoir assessment and that no one model fits all three reservoirs.

Literature Cited

APHA, editor. 1995. Standard Methods for the Examination of Water and Wastewater, 19th edition. American Public Health Association, Washington, D.C.

Brown, C. D., M. V. Hoyer, R. W. Bachmann, and D. E. Canfield. 2000. Nutrient-chlorophyll relationships: an evaluation of empirical nutrient-chlorophyll models using Florida and North-temperate lake data. Canadian Journal of Fisheries and Aquatic Science 57:1574-1583.

Canfield, D. E., K. A. Langeland, M. J. Maceina, W. T. Haller, and J. V. Shireman. 1983. Trophic state classification of lakes with aquatic macrophytes. Canadian Journal of Fisheries and Aquatic Science 40:1713-1718.

Hall, E. 2002. Nutrients on off channel storage reservoirs of the South Platte River, Colorado. M.S. Thesis Department of Earth Resources. Colorado State University, Fort Collins.

Hernandez, K. 2002. Personal communication. EPA recommended nutrient criteria for Ecoregion V. January 24, 2002.

Litke, D. W. 1996. Sources and loads of nutrients in the South Platte River, Colorado and Nebraska, 1994-1995. Water resources investigations report 96-4029, U.S. Geological Survey.

Maurier, J. 2001. Reservoir Lease Negotiations: The Recreation Perspective. in J. Brown, editor. Wassup in the South Platte Basin: Proceedings of the 12th Annual South Platte Forum, Longmont, Colorado.

USEPA. 2001. Ambient water quality criteria recommendations: information supporting the development of state and tribal nutrient criteria. EPA 822-B-01-010, U.S. EPA Office of Water, Washington, DC.

USGS. 1995a. Inventory of biological investigations related to water quality in the South Platte River basin, Colorado, Nebraska, and Wyoming, 1891- 1994. Open File Report 95-379, U.S. Geological Survey, Denver, Colorado.

USGS. 1998. Water quality in the South Platte River basin, Colorado, Nebraska, Wyoming, 1992 - 95. Circular 1167, USGS, Denver, CO.

EDUCATION

COLORADO FOUNDATION FOR WATER EDUCATION BECOMES A REALITY

by Reagan Waskom, Water Resources Specialist

The acute need for public education on water was recently acknowledged by the Colorado Legislature with the inauguration of the Colorado Foundation for Water Education (CFWE). In the 2002 Session, the State Legislature authorized a $250,000 appropriation to establish the foundation. As an independent non-profit organization, its purpose, according to the legislation, "is to promote a better understanding of water issues through educational opportunities and resources." This will include helping Colorado citizens to better understand water as a limited resource and make informed decisions.

Following several years of dedicated work by Tom Cech, Dick MacRavey, Lew Entz, Chris Treese, and Brian Werner, to name just a few, water managers and educators from around the state gathered in late August in Pueblo to name the foundation's first Board of Trustees. The foundation's 22-member board includes representatives from agriculture, environmental groups, water conservation, industry, education, recreation and the legislature.

In September, the 22-member board had its first meeting to begin the work of operating the foundation. The CFWE officers, are: Rep. Diane Hoppe (R-Sterling), president; Colorado State Supreme Court Justice Greg Hobbs, vice president; Becky Brooks, Stealey II, 2nd vice president; Wendy Hanophy, Division of Wildlife, secretary; Lynn Herkenhoff, Southwestern Water Conservation District, assistant secretary; Summit County Commissioner Tom Long, treasurer; Matt Cook, Coors Brewing, assistant treasurer. Two at-large seats were also filled by Taylor Hawes, Northwest Colorado Council of Governments, and Lori Ozzello, Northern Colorado Water Conservancy District.

Other Board of Trustee members include and represent: Kent Holsinger, Department of Natural Resources; Harold Miskel, Colorado Water Conservation Board; David Nickum, Environment; Tom Pointon, Agriculture; John Porter, Colorado Water Congress; Chris Rowe, Water Quality; Rick Sackbauer, Recreation; Gerry Saunders, Higher Education; Ann Seymour, Water Conservation; and Reagan Waskom, Adult Education.

The board selected Karla Brown, from a number of excellent candidates, as the executive director. Brown holds an MS in rangeland ecosystem science from Colorado State University, and earned a BA in political science at Cornell University. Karla formerly worked in Montrose, Colorado, as a water resources specialist for Colorado State Cooperative Extension. Her background includes development of water-related research and educational programs, grant writing, public outreach and group facilitation. Previously, she also worked as an environmental consultant for projects in the United States, Africa, Brazil, Kazakhstan and Indonesia.

In addition to the start-up grant, the legislature agreed to provide $150,000 annually thereafter for operating expenses, administered through the Colorado Water Conservation Board. The foundation must raise any additional money for its education projects and publications. The foundation will not take an advocacy position, nor participate or intervene in any political campaign on behalf of any candidate for public office. Instead, it will work to help resolve water resource problems through educational programs.

In 2003, the foundation will target adult audiences such as journalists, the general public, and public decision makers, as well as K-12 educational opportunities. Some of the educational products currently under development by the foundation include easy-to-read briefings on topics such as water law and hydrology. Maps outlining the state's water resources and history will soon be available. Educational tours highlighting regional water issues will also be developed for 2003.

Karla can be contacted at
karlab@co-water-edu.org,
toll free at 1-877-H2O-4434,
or on the web at www.co-water-edu.org.

COLORADO DROUGHT CONFERENCE DISCUSSES OPTIONS FOR SURVIVING THE UNCERTAINTY

Over 250 scientists, public officials, water managers, and media representatives gathered on the campus of Colorado State University on December 4th to share lessons learned in managing the driest year on record (2002) and examine options for addressing the uncertainty of water availability in 2003.

The Colorado Drought Conference was organized under the auspices of the new CSU DroughtLab, a joint initiative of the CSU Water Center and the Colorado Climate Center to proactively engage higher education expertise in addressing the knowledge needs associated with the not only the current drought, but future drought preparation.

The conference was cosponsored by the Colorado Water Conservation Board, the Colorado Water Congress, the Division of Water Resources (State Engineer's Office), and the Colorado District of the U.S. Geological Survey.

The conference examined data from 2002, beginning with the available water supply and the context of the current drought within the historic record. While a three-year drought is not unusual for the semi-arid Colorado climate, the extremely low flow of 2002 is a rare event. Projections for moisture in 2003 vary, adding to the uncertainty facing water managers.

While the low flows of 2002 created stresses on Colorado's water management system, the system appeared, in general, to work well. Water managers were able to make the adjustments needed to minimize the impacts. However, several sectors of Colorado's economy, it was noted, such as agriculture and recreation and tourism, experienced major losses.

Options discussed for better preparing for future droughts included increasing funding for water infrastructure and management, managing forests in a more 'healthy' manner (which will result in additional flows), and cloud seeding to enhance stream flows.

A proceedings of the conference will be published by the Colorado Water Resources Research Institute. It is hoped the proceedings can capture not only the information and data presented, but also the uncertainty expressed by many water managers as to the situation they face in 2003. When droughts end, the problems during the drought tend to be forgotten quickly. Hopefully, the proceedings will serve to remind us of the uncertainty drought brings and the need to be mindful of drought preparation at all times, not just during times of drought.

The Colorado Climate Center at Colorado State University is documenting the severity of the drought in terms of precipitation deficit and temperature anomalies. So far, we have found that the one year from September 1, 2001 to August 30, 2002 was exceptionally dry and warm, but the several-year period ending August 30, 2002 was not an unusual drought period. The threat of longer-term drought, based on the historical precipitation record, raises concern about even more serious drought impacts in the future. This work was reported in part at the December 4, 2002 Drought Conference.

Roger Pielke, Sr.

The College of Engineering and the Department of Civil Engineering provided seed resources to characterize the severity of droughts in the Poudre River. The project, under the direction of Jose D. Salas, Professor of Civil Engineering and co-Director of DroughtLab and in collaboration with Water Resources Specialists of the City of Fort Collins and the Northern Colorado Water Conservancy District, is quantifying the drought severity and drought risk using streamflow records of the Poudre River. Partial results of this project, which were summarized in a poster presentation during the Colorado Drought Conference on Dec. 4th, suggest that the return period of the 2000-02 three-year drought in the Poudre is of the order of 500-1000 years depending on the definition of drought event considered, i.e. quite a severe drought.

Pictures on page 14, clockwise from upper left: Jose Salas, Professor of Civil Engineering and Co-Director, Colorado DroughtLab; Roger Pielke, Sr., Professor of Atmospheric Science and Co-Director, Colorado DroughtLab; Representative Diane Hoppe with Dick MacRavey, Executive Director, Colorado Water Congress and Larry Simpson, Water Resources Management, Loveland; Tom Sanders, Professor of Civil Engineering and Rocky Wiley, Denver Water; and Chips Barry, Denver Water with Klaus Wolter, NOAA/CDC, Boulder; and Mark Waage, Denver Water.Chips Barry, Denver Water with Klaus Wolter, NOAA/CDC, Boulder; and Mark Waage, Denver Water.

…Despite regular snowfalls since September, reservoirs, on average, are still more than half empty after three years of below average snowpacks. Streams and rivers lost nearly one-third of their flow this year as Colorado sweated out a hot, dry summer when massive wildfires chased rain clouds from the sky, experts said. Meteorologists were split on whether the state will get plenty of snow this winter. Klaus Wolter, a Colorado-based atmospheric scientist with the National Oceanic and Atmospheric Administration, predicted a dry midwinter...Others said historical trends pointed to a wetter-than-usual year ahead, based on weather patterns and tree rings that have recorded droughts for centuries. Denver Post, 12/5/02.

The Colorado Drought Conference attracted a great deal of interest from the media, with coverage located at the following websites:

Channel 9 News: http://stream.liquidcompass.net/9news/newmedia/, 9News web site story: http://www.9news.com/storyfull-search.asp?id=9103 and Channel 7 News: http://www.thedenverchannel.com/news/1820973/detail.html

Loveland Reporter Herald: http://www.lovelandfyi.com/region.htm

Coloradoan: http://www.coloradoan.com/news/stories/20021205/news/511560.html

Rocky Mountain News: http://www.insidedenver.com/drmn/local/article/0,1299,DRMN_15_1588532,00.html

Denver Post: http://www.denverpost.com/Stories/0,1413,36%257E23447%257E1030610,00.html

Longmont Times Call: http://www.longmontfyi.com/regionstate.htm#story2

Clockwise from upper left: Larry Simpson, Water Resources Management, Loveland with John Porter, Retired Manager, Dolores Water Conservancy District and Dan Merriman, Colorado Water Conservation Board; Peter Binney, City of Aurora Utilities with Cat Shrier, CSU Graduate Student and Representative Bob McCluskey; Evan Vlachos, Professor of Sociology, CSU with David Thaemert, SEH of Fort Collins and John Eckhardt, CH2M Hill, Englewood; Representative Diane Hoppe and Kevin Darst, reporter with Longmont Times Call; Tony Frank, CSU Vice President for Research and Information Technology; and Charles W. Howe, Professor of Economics at the University of Colorado with Ray Anderson, retired USDA/ARS agricultural economics specialist and faculty affiliate at CSU.

13TH SOUTH PLATTE FORUM ASKS, WHO'S RUNNING THIS ECOSYSTEM?

Protecting the future of the South Platte River Basin -- integrating habitat protection with agricultural production, understanding Colorado climate changes, keeping watch on water quality in Colorado, and redefining beneficial use – these were the issues presented and examined in moderated sessions at the 13th Annual South Platte Forum October 23-24, 2002.

Keynote speakers Steve Sims, Robert E. Roberts, and Daniel F. Luecke provided an overview of major issues facing South Platte water users – wildlife habitat, endangered species, compact compliance, the Three State Agreement, groundwater use rules, exchanges and augmentation -- issues that overlap and make this the most complicated river basin in the state.

Water Court Judge Jonathan W. Hays, Keynote Luncheon speaker, reflected on the changes that have taken place over time in the issues presented to the water court including underground water rights and emerging restrictions on well and aquifer pumping. He summarized significant cases that have come before his court, including the South Park Conjunctive Use Project, the City of Golden kayak course, and the City of Denver B-City effluent exchange application.

Highlighting this year's forum was the special recognition of Chuck GrandPre (see middle picture on page 17). Chuck was founding chair of the South Platte Forum Planning Committee. His persistence and commitment moved the forum from a rocky start to a smoothly operating dialogue on environmental, ecosystem and water issues in the South Platte River Basin.

Gene Schleiger of the Northern Colorado Water Conservancy District presented the award to Chuck, and observed:

> In the beginning, there was a man named Chuck GrandPre, a Division of Wildlife employee who saw a division between the 'water community' and the 'environmental community.' Chuck envisioned a form where these two groups, along with others, could sit down face-to-face, hear issues, and have meaningful dialogue about these issues that affect all South Platte Basin citizens…
>
> Today it has evolved to a forum where even the most controversial topics can be explored …Attendees have come to expect nothing less than the trust that has been built over the past twelve years.
>
> The South Platte Forum has not only survived, but thrived. There is continued interest with increasing attendance…[Chuck GrandePre's] outstanding vision, leadership, and persistence allowed the forum to become the success it is today.

Right: Dan Luecke, Environmental Scientist and Water Resources Specialist

A summary of Dan Luecke's presentation, A South Platte Basin Wildlife Habitat Overview, is presented on page 18.

Participating agencies are: Colorado Division of Wildlife, Colorado Water Resources Research Institute, Colorado State University Cooperative Extension, Denver Water, Northern Colorado Water Conservancy District, U.S. Bureau of Reclamation, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and the U.S. Geological Survey.

Clockwise from upper left: Roger Pielke, Sr., Atmospheric Science Department, CSU; Herrick Roth with Gene Schleiger, Northern Colorado Water Conservancy District and Chuck GrandePre, U.S. Fish & Wildlife Service (retired); Gene Schleiger and Chuck GrandPre; Bill Horak, US Geological Survey, Denver with Vera Monteanu, Visiting Scientist from Moldova; Robert Sakata, Chair, Water Quality Control Commission with Robert E. Roberts, Administrator, Region VIII Environmental Protection Agency, Denver.

KEYNOTE ADDRESS -- 13th Annual South Platte Forum
A SOUTH PLATTE BASIN WILDLIFE HABITAT OVERVIEW

by Dan Luecke, Environmental Scientist and Water Resources Specialist

Introduction

In a 1982 book entitled Progress and Privilege: America in the Age of Environmentalism, author William Tucker defined progress as simply, "The process whereby each generation tries to make life better for itself and for the next generation." He went on to observe that:

"Standing in the path [of progress] were environmentalists, "a social group that opposes every form of economic growth and progress as a general policy." Environmentalism was aristocratic, privileged, and conservative in the worst sense: "At heart, environmentalism favors the affluent over the poor, the haves over the have-nots." Like aristocrats through the ages, "having made it to the top, [environmentalists] become far more concerned with preventing others from climbing the ladder behind them, than in making up a few more rungs themselves."

I will try not to disappoint Mr. Tucker with my observations, as an environmentalist, on South Platte issues in Colorado.

To set the stage, I'd like to quote from an essay by Wallace Stegner from his book Where the Bluebirds Sings to the Lemonade Springs: Living and Writing in the West.

"Aridity, more than anything else, gives the western landscape its character. It is aridity that gives the air its special dry clarity; aridity that puts brilliance in the light and polishes and enlarges the stars; aridity that leads the grasses to evolve as bunches rather than as turf; aridity that exposes the pigmentation of the raw earth and limits, almost eliminates, the color of chlorophyll; aridity that erodes the earth in cliffs and badlands rather than in softened and vegetated slopes, that has shaped the characteristically swift and mobile animals of the dry grasslands and the characteristically nocturnal life of the deserts. The West, Walter Webb said, is "a semi-desert with a desert heart." If I prefer to think of it as two long chains of mountain ranges with deserts or semi-deserts in their rain shadow, that is not to deny his assertion that the primary unity of the West is a shortage of water.

The consequences of aridity multiply by a kind of domino effect. In the attempt to compensate for nature's lacks we have remade whole sections of the western landscape. The modern West is as surely Lake Mead and Lake Powell and the Fort Peck reservoir, the irrigated greenery of the Salt River Valley and the smog blanket over Phoenix, as it is, the high Wind River Range of the Wasatch or the Grand Canyon. We have acted upon the western landscape with the force of a geological agent. But aridity stills calls the tune, directs our tinkering, prevents the healing of our mistakes; and vast unwatered reaches still emphasize the contrast between the desert and the sown."

The consequences of this aridity are also manifested in the relative scarcity of aquatic and riparian areas in the West -- a scarcity that magnifies their significance to a wide range of native species. On average these areas constitute only five percent of habitat in the arid and semiarid West, but perform (in conjunction with a naturally varying hydrology) a diverse set of ecosystem functions for at least 65 percent of native species. This fact, when combined with the tradition of treating water as cheap commodity in the service of a narrowly defined set of economic development objectives, has lead to very significant ecological losses whose importance far exceeds the area of physical habitat that has been inundated, desiccated, or otherwise transformed. Every western river corridor is now highly developed. Of the 25 largest dams in the United States, over 90 percent are in the West.

Some First Impressions of the South Platte

Theodore Talbot (Fremont's second expedition, 1824): "Here the buffalo come to drink and stand during the heat of the day, adding their own excrement to the already putrescent waters. This compound, warmed for weeks by the blazing sun, makes a drink palatable to one suffering from extreme thirst."

Colonel McClure (1867): "The river rolls its turbid waters through the Platte Valley and makes no sign of life along its border. It is shallow, wide, and muddy and broken by innumerable islands, treacherous and apparently useless. It doesn't even shirt its own banks with shrubs or timber."

James Michener (Centennial, 1974): "And finally there is the river, a sad, bewildered nothing of a river. It carries no great amount of water, and when it has some, it is uncertain where it wants to take it. No ship can navigate it, nor even canoe it with reasonable assurance. It is the butt of more jokes than any other river on earth, and the greatest joke is to call it a river at all. It's a sand bottom, a wandering afterthought, a useless irrigation, a frustration, and when you've said all that, it suddenly rises up, aprils out to a mile wide, engulfs your crops and lays waste to your farm."

Joe Verrengia (Rocky Mountain News, August 1994): "Pretend, for a moment, that you are Fremont in 1844. Stand on the eastern grasslands and gaze west. Fifty miles away, the

snowcapped peaks of the Continental Divide poke through the clouds. That 50-mile vista contains six distinct ecological zones: shortgrass prairie, canyon and tablelands, alpine tundra, river banks and lake shores, foothills and forests. The elevation increases so sharply that plans and animals in each zone fundamentally change to cope with the colder climate and shorter growing season.

It's the ecological equivalent of standing in Florida and seeing all the way to Greenland – a distance of 2,500 miles."

John C. Fremont (South Platte canyon, 1840s): "We came upon the pines, and the quaking aspen was mixed with the cottonwood. There was excellent grass and many beautiful flowers…We surprised a grizzly bear sauntering along the river; which, raising himself upon his hind legs, took a deliberate survey of us…scrambled into the river and swam to the opposite side."

A Perspective on Restoration Potential of the South Platte

Todd Harris (South Platte Restoration):

* The biotic community is not unlike other high plains streams;

* The river (below Denver) is effluent dominated;

* Habitat is restrictive for most fish species;

* Nutrients are high;

* Flows (and water quality) are function of Metro discharge;

* Groundwater coming into the stream is higher in nutrients than surface waters;

* Oxygen depletion exceeds re-aeration in man-made slack water regions;

* Groundwater gains account for almost all late summer flow

* The riparian corridor is diminishing;

* The river, though highly regulated, is still subject to extreme flows that are confined to a narrow channel and destroy habitat; and

* Irrigation structures obstruct upstream migration of fish and divert larval fish.

Water Project EISs from the 1970s

* Upper South Platte Unit of the Pick-Sloan Missouri Basin Program (BuRec, 1974)
* Narrows Dam EIS (BuRec, 1976)
* Foothills Project (BLM, 1978)

Concluding Comment

The South Platte basin is Colorado's most urbanized watershed, one of its most intensively irrigated, and the recipient of the largest share of water diverted from west of the Continental Divide in the Colorado basin. Some of its tributaries (most notably, Clear Creek) also show the scares and poor water quality associated with abandoned mining operations that have their origins in the gold rush of the mid-nineteenth century. Despite the level of development, the upper basin contains stream reaches of very high quality, remarkable fisheries, and valuable recreation areas. The lower basin serves an important role in supplying a portion of the water that sustains the Big Bend reach in Nebraska, critical habitat to endangered bird species.

The challenge for all those with a stake in the basin is the development of institutional structures and management plans that will make it possible for the full range of the river's values to be supported in the face of growing demands from all interests. This presentation will suggest some ways this can be accomplished.

Mark Pifher, Colorado attorney, has replaced David Holm as division director of Colorado's Water Quality Control Division. Holm retired as division director this summer after 14 years. Pifher gained national prominence in water circles for his successful challenge of an EPA toxicity test designed to gauge the effect of pollutions on aquatic life. In Colorado, he represented Aurora and Colorado Springs in an unsuccessful effort to divert water from the Holy Cross Wilderness Area and represented National Hog Farms in the company's challenge of the state health department's denial of an air pollution permit.

_____

Rocky Mountain News, 10/26/92

NEW FACULTY PROFILE

Gregory E. Smoak
History Department
Colorado State University

by Marian Flanagan

Gregory E. Smoak joined Colorado State University's Department of History as Assistant Professor in August 2002. Smoak earned his Bachelors degree in history from Florida Atlantic University, Boca Raton, Florida and his Masters degree in history from Northern Arizona University, Flagstaff, Arizona in 1984 and 1985, respectively. He received his Ph.D in history from the University of Utah, Slat Lake City in 1999. Smoak spent the academic year 2000-2001 as a visiting professor of history at the University of Minnesota and a year working at the American West Center just prior to joining CSU's faculty.

Most of Dr. Smoak's work has been with Native American Indians, particularly, the Shoshone-Bannock Tribes of Fort Hall Idaho, who contracted with the American West Center at the University of Utah where Smoak worked for 9 years while attending graduate school. The American West Center, an independent research center affiliated with the College of Social and Behavioral Science, has worked with tribes throughout the American west for over 35 years to prepare for litigation in defense of treaty, land, and water rights. The center's projects have also included curriculum development for Indian tribes for primary and secondary schools. The main focus of Smoak's work at the center was preparing historical documentation for legal proceedings.

Smoak went to University of Wyoming at age 23 to work with Peter Iverson but when Iverson left Wyoming, so did Dr. Smoak. He then went to the University of Utah to work with Richard White, a noted historian of American Indians and Environmental history. In 1992, Smoak had a fellowship with the Smithsonian Institute and worked in Washington DC in the national archives. While preparing for a job in academia at University of Utah, Smoak became involved in the American West Center. By 1994, Smoak began working full-time at the Center doing research and applied work including projects for the Shoshone Bannock Tribes of Fort Hall. His first research paper for the Shoshones was a history of their irrigation project. Smoak has worked with political scientist Dan McCool, the current director of the American West Center, whose specialization is water policy in the West, specifically, with Indian tribes. Smoak did considerable work with McCool in terms of policy, rather than history. Smoak pointed out that McCool's work on federal reserved water rights settlement agreements has recently been published by the University of Arizona Press. In the mid-nineties, Smoak also worked with E. Richard Hart, an expert witness for American Indian Tribes, whom he recently brought to the CSU campus as a guest lecturer.

In terms of academic research Dr. Smoak does not deal with water directly; however, as he said, "When you deal with the American West, water and water rights always enter the issue. " And in addition, "There will continue to be disputes in the future over Shoshone Bannock fishing rights," he said. And when historic evidence supports that the Native American Indians rights are entitled by treaty, Smoak's outside projects will continue to support the rights of these people by documenting both legal entitlement and their continued use.

Smoak teaches about the American West and public history. He is an avid kayaker and has done many of the great rivers of the west.

CWRRI
CU
water
news

THE NATURE AND IMPACTS OF MARKET TRANSFERS OF WATER IN THE SOUTH PLATTE AND ARKANSAS BASINS[1]

Professor Charles W. Howe
Christopher Goemans

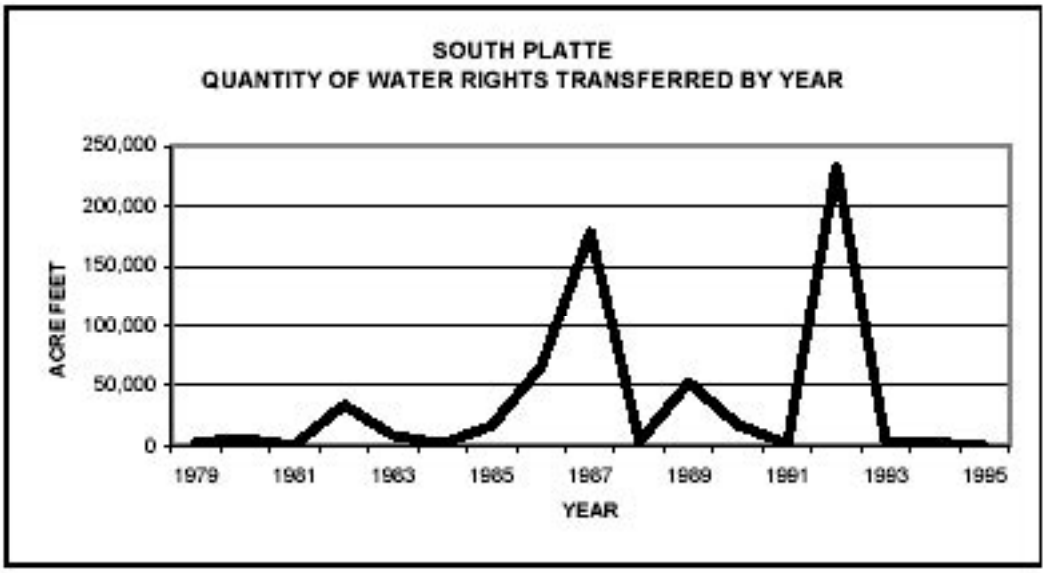
In the western U.S., the development of new water supplies has become costly in economic and environmental terms. Thus it is important that water be transferable from older, lower-valued uses to newer, higher-valued uses. This is especially true since roughly 85% of the consumptive use of water still takes place in irrigated agriculture, much in the production of low-valued crops (U.S. Geological Survey, 1993). Water markets are important in increasing this flexibility.

The goal of this study has been to increase understanding of the influence that economic and social-demographic conditions have on the functioning of water markets, both on the kinds of transactions and the impacts of transfers on the basin of origin. The characteristics of water transfers in the South Platte Basin of Colorado were compared with the characteristics of transfers occurring in the Arkansas River Basin of Colorado. Most transfers were from agriculture to M&I uses. Transfers in the South Platte have been to uses in the same basin and tend to be small with a pattern of continuous transactions over time. In the Arkansas, recent transfers have typically been out-of-basin, large and discontinuous. Direct plus indirect impacts of reduced agriculture on personal incomes, employment and tax revenues were estimated for samples of transfers in each Basin. Losses were estimated to be more severe per acre-foot and per capita in the Arkansas Basin. In the South Platte the gains and losses were in the same basin, while the Arkansas absorbed uncompensated losses with the benefits going to the purchasing area.

All water rights transfers in the period of 1979 through 1995 and transfers of Northern Colorado Water Conservancy District (NCWCD) shares (allotments) were analyzed for the South Platte Basin. Similarly, 1979-1995 transfers in the Colorado Arkansas Basin were investigated. Transfers were classified by size (acre-feet) and nature of buyer and seller (e.g. agriculture-to-agriculture, ag-to-urban, non-ag to non-ag).

The diagrams below characterize the transfers of traditional water rights in the South Platte Basin (Division 1) over the 1979-1995 period. Figure 1 shows acre-feet of water rights transferred by year.

Figure 1.



[1] Charles Howe is Professor Emeritus of Economics and Professional Staff, Institute of Behavioral Science and Christopher Goemans is a Ph.D candidate in Economics, University of Colorado-Boulder, Campus Box 468, Boulder, CO 80309 Charles.Howe@Colorado.edu. The study was sponsored by The General Service Foundation, Aspen, CO, grant no. DS-11-99.

The very uneven temporal pattern has been caused by severe droughts, spurts of economic growth and speculative bubbles. Figures 2 and 3 show the frequency distribution of Division 1 water rights transfers by size and the nature of the transfers by purpose.

Figure 2.

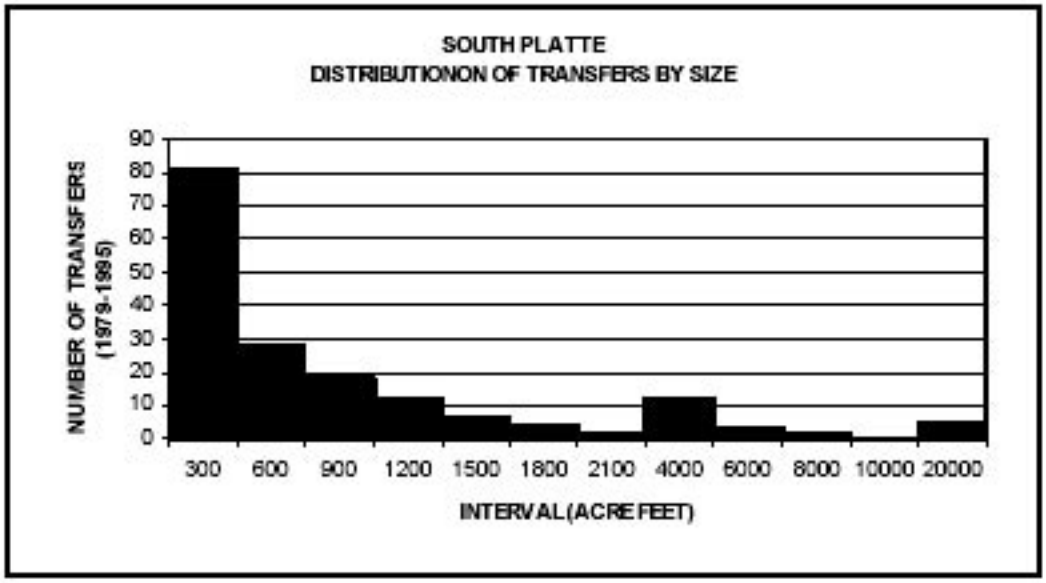
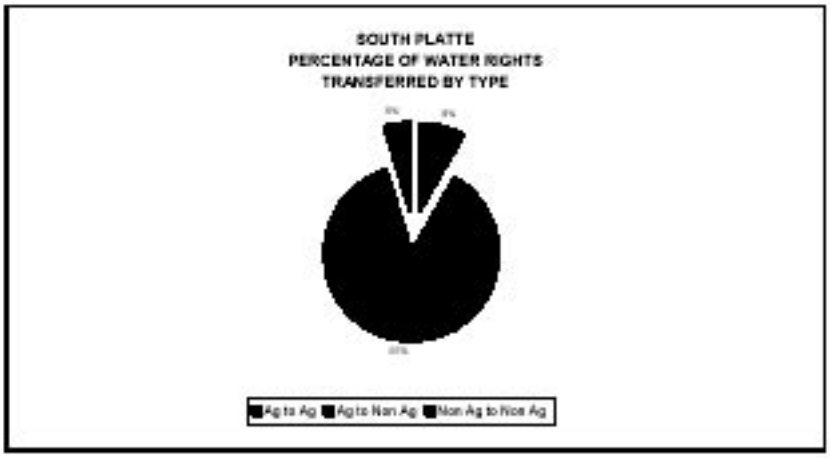


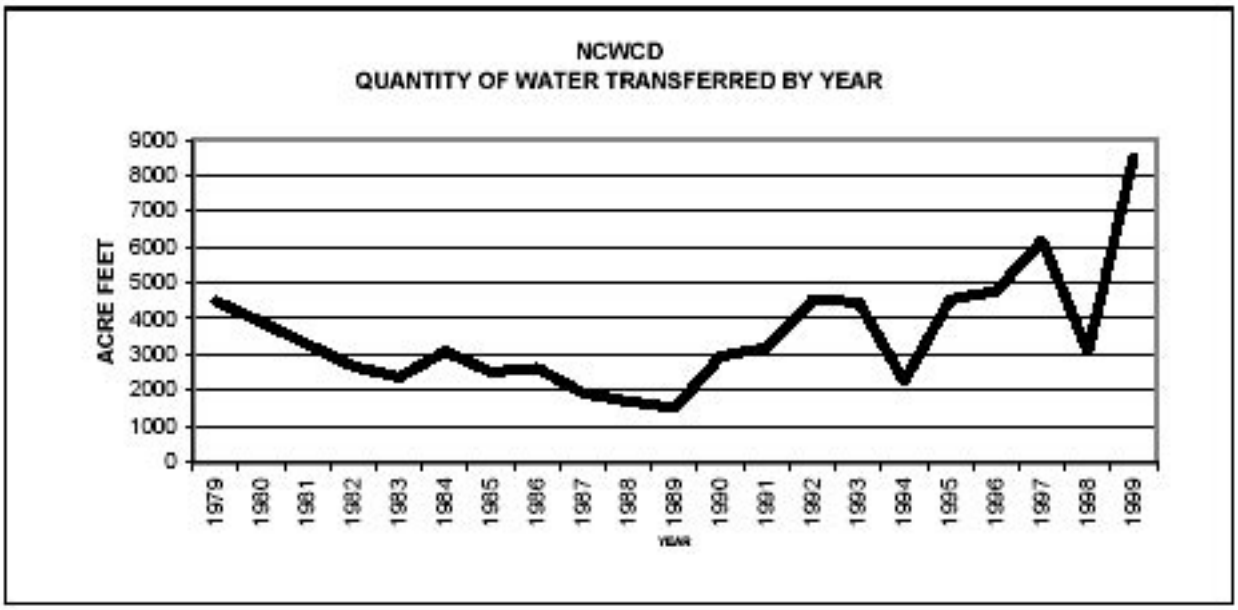
Figure 3.



The median transfer size of 367 acre-feet (Fig. 2, mean = 3425 a.f.) is small in comparison with the large transfers that have attracted the public's attention, e.g. the Thornton transfers in the South Platte and the Colorado Canal transfers in the Arkansas Valley. This suggests a smooth working water market in which transactions costs are low and in which buyers can expect to find water for sale when needed.

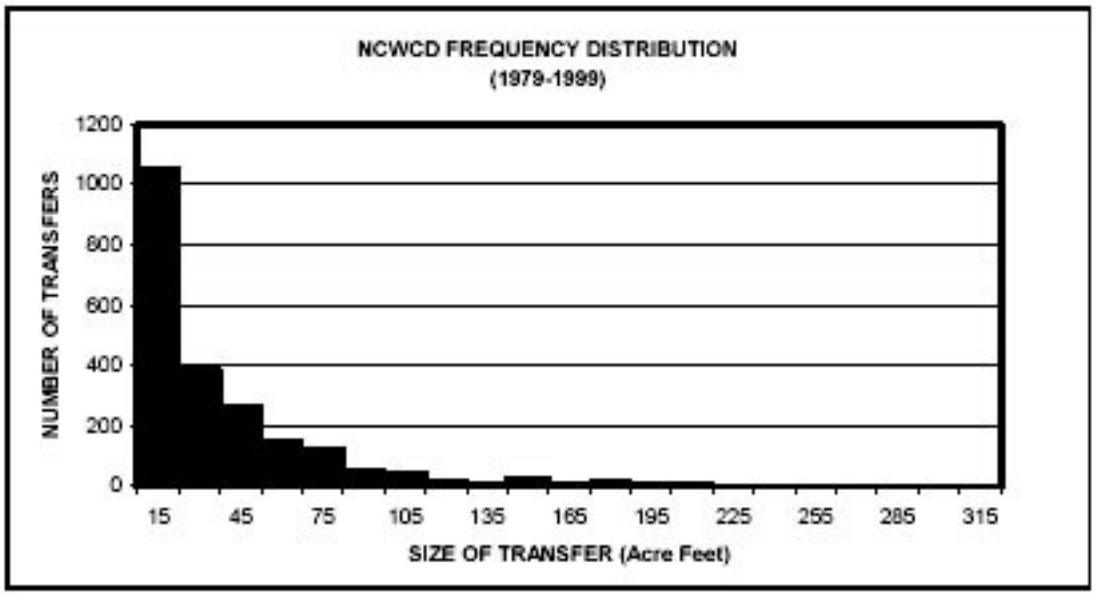
The NCWCD brings an average of 270,000 acre-feet of water into the Platte Basin from the headwaters of the Colorado River on the western slope of the Rocky Mountains (see Tyler,1992). This extra-basin supply constitutes about 30% of the total supply in the South Platte. The market for this water (in the form of shares in NCWCD) is greatly facilitated by the facts that the shares are homogeneous (each gets 1/310,000th of the available water each year, deliverable almost anyplace in the District) and that imported water is totally owned (initial use and all return flows) by the District so that transfers are not subject to the water court review process (Radosevich et al.,1976, Chapter 6). A very active water market has developed within the District (Howe et al, 1986, Michelsen, 1994). Figure 4 shows the volume of NCWCD water transferred by year.

Figure 4.



Figures 5 and 6 show the distribution of NCWCD transfers by size and the nature of the transfers by purpose over the 1979-99 period in the Northern District.

Figure 5.



The median size of transfer of 17 acre-feet is much smaller than that of state water rights transfers in Division 1, suggesting an efficient and continuous market with low transaction costs that allows buyers and sellers to undertake small transactions as the need arises, rather than occasional large transfers of traditional water rights. The types of transfers are also quite varied: 64% ag to non-ag; 26% ag to ag and 9% non-ag to non-ag. transfers.

Figure 6.

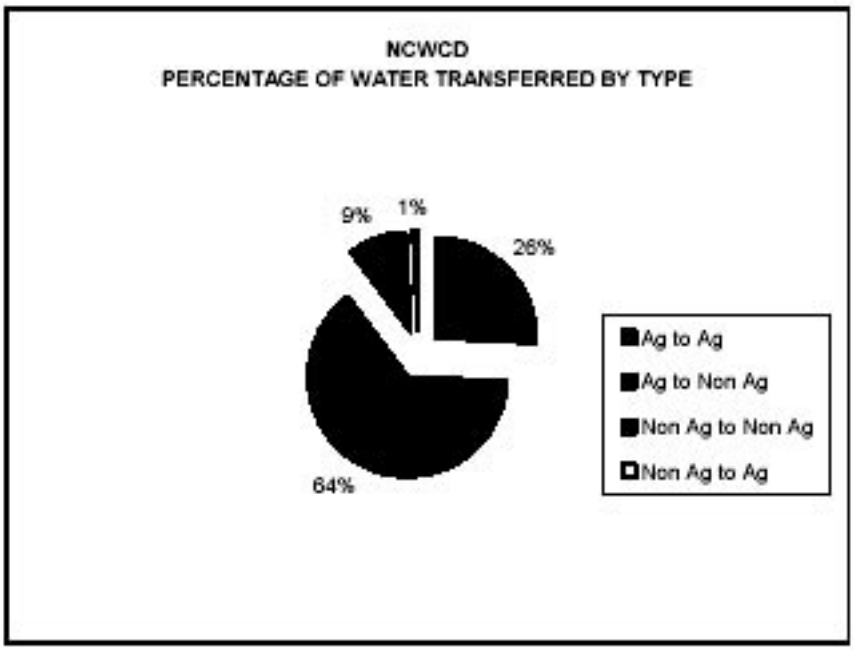
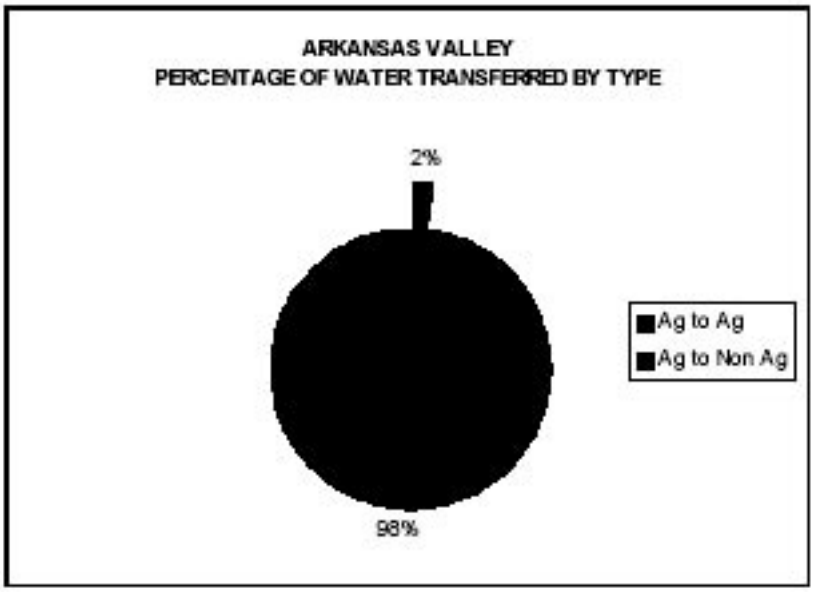


Figure 7 indicates that nearly all water rights transfers in the Arkansas from 1979 to 1995 were from agricultural to M&I uses. Transfers were again quantified according to quantity of water transferred by year (Fig. 8) and the distribution of transfers by size (Fig.9).

Figure 7.



The economic and social impacts of a transfer of agricultural water on the area of origin depend on (1) the size of the transfer, (2) the vitality of the regional economy in terms of diversified activities, changing land-use patterns and alternative investment opportunities and (3) whether or not the transfer is to the same or a different economic region. When agricultural water is sold in Colorado, the land is usually required by the water court to be dried up in perpetuity. When agricultural production falls, activities linked to agriculture are negatively affected: suppliers of agricultural inputs lose business; processors of agricultural outputs lose supply sources; financial institutions lose the demand for loans, etc. While the selling farmer is presumably better off than he/she would otherwise be, the surrounding community suffers losses of income and social displacements as people move and change jobs while the community loses tax revenues that support community services.

Figure 8.

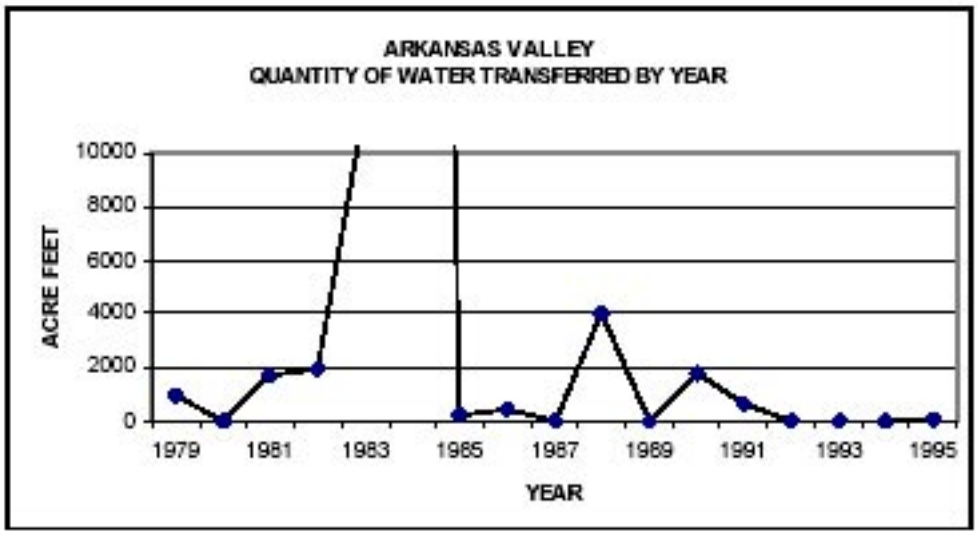
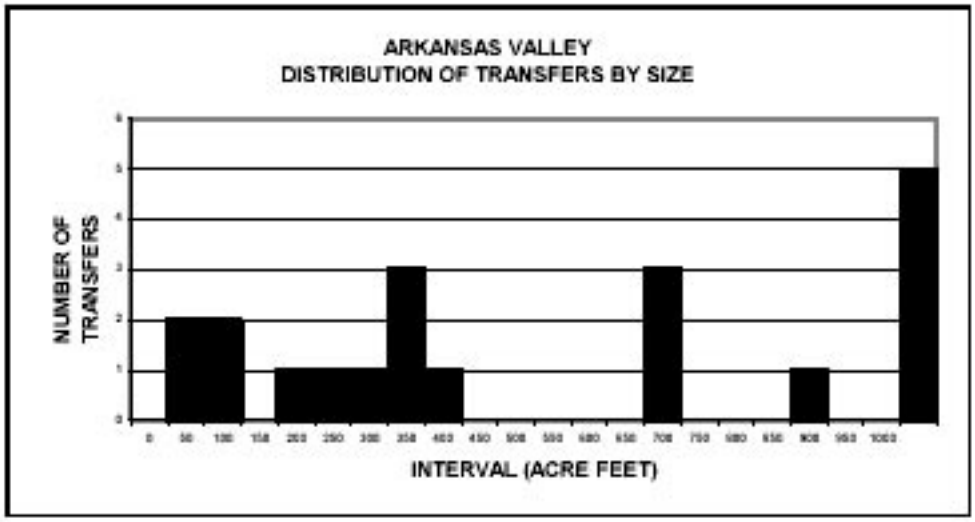


Figure 9



The economic and social impacts of a transfer of agricultural water on the area of origin depend on (1) the size of the transfer, (2) the vitality of the regional economy in terms of diversified activities, changing land-use patterns and alternative investment opportunities and (3) whether or not the transfer is to the same or a different economic region. When agricultural water is sold in Colorado, the land is usually required by the water court to be dried up in perpetuity. When agricultural production falls, activities linked to agriculture are negatively affected: suppliers of agricultural inputs lose business; processors of agricultural outputs lose supply sources; financial institutions lose the demand for loans, etc. While the selling farmer is presumably better off than he/she would otherwise be, the surrounding community suffers losses of income and social displacements as people move and change jobs while the community loses tax revenues that support community services. However, if the economic region is economically diversified and buoyant, alternative employment opportunities are close at hand and the selling farmer can find local investment opportunities for his/her money. The "secondary impacts" in such a setting are likely to be small and short lived. When the new use of the water is in the same economic region, the region will be better off overall from the water sale. The South Platte Basin is such a region.

In the Arkansas Valley, the economy has historically been less vigorous while 90% of water transferred in the 1979-1995 period was to out-of- basin buyers. The benefits of new water supplies occurred, therefore, outside of the region while limited opportunity existed for the proceeds from the sale of the water to be invested in the local economy. In such cases, the negative regional impacts associated with a transfer of water rights can be quite severe.

Table 1 provides estimates of the annual negative direct plus indirect impacts on the regional economies of the South Platte and Arkansas Basins of selected samples of large ag-to-urban transfers that occurred in the two Basins during the study period. These impacts were estimated through the use of an IMPLAN input-output model of the 5 major basin counties.

Table 1

Direct and Indirect Negative Impacts of Selected Water Transfers on Basins-of-Origin:
South Platte and Arkansas Basins, Colorado

	Direct Impacts		Direct + Indirect	
	South Platte	Arkansas	South Platte	Arkansas
Output/af	65.08	88.99	104.06	117.02
Tax impact/af			8.83	12.24
Pers Inc/af	8.52	17.89	21.6	28.48
Employ/TH afaf,1.29,2.02,1.78,2.57	1.29	2.02	1.78	2.57
Output/cap	1.61	14.11	2.56	18.51
Tax/cap			0.22	1.72
Pers Inc/cap	0.21	2.63	0.53	4.27
Employ/100,000 pop	3.92	35.26	5.63	43.49

Negative direct plus indirect effects of agricultural water sales in the South Platte Basin are small relative to the benefits implied by the purchase price of the water paid by towns and industries. Initial year direct plus indirect employment losses per thousand acre-feet of water sold amount to approximately 1.8 jobs. Direct and indirect personal income losses (wage and salary income and income from other sources such as investments) amount to $22 per acre-foot sold. Public sector tax losses are estimated to be about $9 per acre-foot. Regional income losses per capita are small.

For the Arkansas, employment losses per thousand acre-feet are significantly higher, and personal income loss per acre-foot is significantly larger than in the South Platte. Public sector tax losses are greater and all per-capita impacts larger than in the South Platte.

The “present value” of the personal income and tax losses over a transition period is the appropriate measure of the region’s costs stemming from displaced labor and capital. In a prosperous region like the South Platte, water sales are often driven by the sale of land for non-agricultural purposes. Displaced labor, capital and land are likely to be gradually re-employed in other productive activities within a relatively short period. The losses in the Arkansas are likely to persist over a longer period. Weber’s earlier study (1989) found that most farmers in the Arkansas who sold their water had to use the money to pay off long-standing debts.

These results suggest grounds for assistance to basins-of-origin when conditions in the basin conform to those found in the Arkansas. The set of criteria to be considered by the water courts in approving, modifying or disapproving water transfers should be expanded to include consideration of the secondary economic and environmental costs imposed on the basin-of-origin (as is the practice in several western states). One or both of two actions might be employed: (1) a transfer fee per acre-foot could be imposed on the buyer and transferred to a unit of general government in the area of origin to support social services during the period of transition; and (2) a spreading over time of the transfer could be specified, allowing more time for adjustments to take place (as is done currently with re-vegetation requirements).

Literature Cited

Howe, Charles W., Dennis R. Schurmeier and W. Douglas Shaw, Jr., 1986, “Innovative Approaches to Water Allocation: the Potential for Water Markets”, Water Resources Research, Vol. 22, No. 4 (439-445).

Michelsen, Ari M., 1994, “Administrative, Institutional and Structural Characteristics of an Active Water Market”, Water Resources Bulletin, 971.

Radosevich, G.E., K.C. Nobe, D. Allardice and C. Kirkwood, 1976, Evolution and Administration of olorado Water Law: 1876-1976, Fort Collins, Colorado: Water Resources Publications.

Tyler, Daniel, 1992, The Last Water Hole in the West: The Colorado-Big Thompson Project and the Northern Colorado Water Conservancy District, University Press of Colorado, Niwot, Colorado 80544

U.S. Geological Survey, 1993, Estimated Use of Water in the United States in 1990, Circular 1081, Books and Open-File Reports Sales, USGS, Federal Center, Box 25286, Denver, Co. 80225

Weber, Kenneth R., 1989, "What Becomes of Farmers Who Sell Their Irrigation Water?: the Case of Water Sales in Crowley County, Colorado", unpublished paper, Environment and Behavior Program, Institute of Behavioral Science, University of Colorado-Boulder, Nov 16

CU Professor Receives Presidential Early Career Award

Jorge G. Zornberg, Assistant Professor in the Civil, Environmental, and Architectural Engineering Department at the University of Colorado at Boulder, has been named a recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE). The award is the highest honor bestowed by the U.S. Government on outstanding scientists and engineers who are in the early stages of establishing independent research careers. This year's awardees were nominated by nine participating federal agencies and were recognized at a White House ceremony. Zornberg was nominated for the award by the National Science Foundation. His research work has focused on the use of evapotranspirative cover systems for hazardous waste sites in arid and semiarid climates. The studies involve analyzing unsaturated flow processes in soil cover systems for waste containment, combining physical (centrifuge) and numerical (finite-element) modeling for analyzing geotechnical systems, and using geosynthetic (polymeric) materials as reinforcement inclusions in embankments and retaining walls. Zornberg joined the Colorado faculty in 1998. His earlier accolades include the Young Member Award from the International Geosynthetics Society and ASCE's Collingwood Prize. He received a doctorate from the University of California at Berkeley in 1994.

CSM water news

MODFLOW and More 2003: Understanding through Modeling
Sept. 17-19, 2003
Ice-Breaker Evening of Sept. 16

The MODFLOW conference series has become a tradition for the presentation of cutting-edge practical application of ground water models in all aspects of hydrologic work. MODFLOW, the USGS modular three-dimensional finite-difference, ground-water flow model, has become an international standard for ground-water modeling. MODFLOW serves as a centerpiece for the recurring conference, but we anchor on MODFLOW only because of its widespread use and its status as a community model. The conference organizing committee needs and encourages participation by users of all types of models in all kinds of applications, including those for which MODFLOW is not suitable, so that the modeling capability of our profession will evolve. MODFLOW is a basis from which other models can be considered. The advantages and disadvantages of alternative codes can be reflected from MODFLOW with which nearly all modelers are familiar.

The conference will include keynote speakers on a wide range of topics, contributed oral presentations and poster sessions (both oral and poster papers will be published in a proceedings volume), exhibitors, short courses, and software demonstrations. The purpose of this conference is to bring together model users and developers to exchange ideas on the latest innovations in model applications, discuss the capabilities and limitations of currently available codes, and explore the needs and directions for future developments.

Those interested in presenting a paper or poster should submit an approximately 200-word abstract via http://www.mines.edu/research/igwmc/events/modflow2003/abstract_form.shtml no later than April 20, 2003. Abstracts must include sufficient detail to permit a thorough review by the Technical Committee. If the abstract is accepted for an oral or poster presentation, the author will be notified by May 20, 2003; he/she is then required to submit a short paper for publication in the proceedings by July 20, 2003. IGWMC will sponsor travel and registration for the student submitting the abstract judged to be the best.

RESEARCH AWARDS

A summary of research awards and projects is given below for those who would like to contact investigators. Direct inquiries to investigators c/o indicated department and university. The list includes new projects and suppments to existing awards. The new projects are highlighted in bold type.

COLORADO STATE UNIVERSITY, FORT COLLINS, COLORADO
Awards for September 16, 2002 to December 1, 2002

Title	PI	Department	Sponsor
Implementation of the National AFO Strategy in Colorado	Davis, Jessica	Soil & Crop Sci.	CDPHE
Shrub Establishment Study	Redente, Edward	Rangeland Ecosystem Science	DNR
Wetland Monitoring & Evaluation Project	Culver, Denise	FWLB	CDOW
Survey & Assessment of Critical Wetlands in Southern Alamosa & Costilla Counties in the San Luis Valley	Rocchio, Joseph	FWLB	CDNR
Survey & Assessment of Critical Wetlands for La Plata County, Colorado	Culver, Denise	FWLB	CDNR
Examination of the Linkages between the Northwest Mexican Monsoon & Great Plains Precipitation	Cotton,William	CIRA	NOAA
Activities & Participation in DMSP Satellite Data Processing & Analysis	Vonderhaar, Thomas	CIRA	NOAA
U.S. Weather Research Program Joint Grants Program Severe Weather Research	Vonderhaar, Thomas	CIRA	NOAA
Monitoring & Modeling Isotopic Exchange between the Atmosphere & the Terrestrial Biosphere	Denning, A Scott	CIRA	NOAA
Role of Stratocumulus Clouds in Modifying Pollution Plumes Transported to North American Continent	Kreidenweis-Dandy, Sonia	CIRA	NOAA
Satellite Data & Analysis Equipment & Support for Research Activities	Vonderhaar, Thomas	CIRA	NOAA
Stochastic Modeling & Simulation of the Great Lakes Net Basin Supplies Salas, Jose	CIRA	NOAA	
CIRA Activities & Participation in NGDC Data Repository, Processing & Management	Matsumoto, Clifford	CIRA	NOAA

FEDERAL SPONSORS: BLM-Bureau of Land Management, COE-Corps of Engineers, DOA-Dept. of the Army, DOD-Dept. of Defense, DOE-Dept. of Energy, DON-Dept. of the Navy, DOT-Dept. of Transportation, EPA-Environmental Protection Agency, HHS-PHS-Public Health Service, NASA-National Aeronautics & Space Administration, NBS-National Biological Survey, NOAA-National Oceanic & Atmospheric Admin., NPS-National Park Service, NRCS-Natural Resources Conservation Service, NSF-National Science Foundation, , USAID-US Agency for International Development, USBR-US Bureau of Reclamation, USDA/ARS-Dept. of Agriculture, Agricultural Research Service, USDA/NRS-Dept. of Agriculture, Natural Resources Service, USFS-US Forest Service, USDA-USFS-RMRS-Rocky Mountain Research Station, USFWS-US Fish & Wildlife Service.

STATE/LOCAL SPONSORS: CDA-Colorado Department of Agriculture, CDNR-Colorado Dept. of Natural Resources, CDPHE-Colorado Dept. of Public Health and the Environment, CDWL-Colorado Division of Wildlife, NCWCD-Northern Colorado Water Conservancy District. OTHER SPONSORS: AWWA-American Water Works Assn., CID-Consortium for International Development.

UNIVERSITY DEPARTMENTS, INSTITUTES AND CENTERS: Colorado State: BSPM-Bioagricultural Sciences & Pest Management, CBE-Chemical & Bioresource Engr., CFWLU-Cooperative Fish & Wildlife Unit, CSMTE-Center For Science, Mathematics & Technical Education, CIRA-Cooperative Inst. for Research in the Atmosphere, DARE-Dept. of Agric. & Resource Economics, ECE-Electrical & Computer Engineering, ERHS-Environment & Rad. Health Sciences, FWB-Fishery & Wildlife Biology, HLA-Horticulture & Landscape Architecture, NREL-Natural Resource Ecology Lab, NRRT-Nat. Resources Recreation & Tourism, RES-Rangeland Ecosystem Science, SCS-Soil & Crop Sciences. University of Colorado: ACAR-Aero-Colorado Center for Astrodynamic Research, AOS-Atmospheric & Oceanic Sciences, CADSWES-Center for Advanced Decision Support for Water and Environmental Systems, CEAE-Civil, Environmental, and Architectural Engineering, CIRES-Cooperative Institute for Research in Environmental Sciences, CRCMAST-Cooperative Research Center for Membrane Applied Science & Technology, EPOB-Environmental, Population & Organismic Biology, IAAR-Institute for Arctic & Alpine Research, IBS-Institute of Behavioral Science, ITP-Interdisciplinary Telecommunication Program, LASP-Lab. For Atmos. And Space Physics, PAOS-Program in Atmospheric and Oceanic Sciences.

Title	PI	Department	Sponsor
Stochastic Modeling & Simulation of the Great Lakes Net Basin Supplies	Salas, Jose	CIRA	NOAA
CIRA Activities & Participation in NGDC Data Repository, Processing & Management	Matsumoto, Clifford	CIRA	NOAA
Establishment of Baseline Water Quality Conditions in the National Park	Hannah, Judith	Earth Res.	NPS
Visitor Experience & Media Effectiveness	Loomis, Ross	Psychology	NPS
Synthesis, Digitization, & Analysis of Clean Water Act Impairments & Use Designations for National Park System Water	Loftis, Jim	Civil Engr.	NPS
Establishing the Status & Trends of Impaired, Threatened, & Outstanding National/State Resource Waters...	Loftis, Jim	Civil Engr.	NPS
TRMM Precipitation Radar & Microphysics: Interpretation & Precipitation Estimation	Venkatachalam, C.	Elec. & Comp. Engr.	NASA
Validation & Enhancement of AMSR-E Cloud & Precipitation Products	Stephens, Graeme	Atmos. Science	NASA
Use of Tropical Rain Measuring Mission Data to Test an Improved Parameterization of Stratiform Precipitation	Randall, David	Atmos.Science	NASA
Tropical Rainfall Measuring Mission Sounding Studies	Johnson, Richard	Atmos. Science	NASA
Quantifying Space-Time Variability in Agricultural Landscapes	Salas,Jose D	Civil Engr.	USDA-ARS
Colorado CRP Research Project: Carbon, Water & Land-Use in Conservation Reserve Lands of the Shortgrass Prairie	Paustian, Keith	Soil & Crop Sci.	USDA-ARS
Impacts on Irrigated Agriculture of Federal Decisions Affecting Water Use in the South Platt River Basin	Frasier, Marshall	Agric & Resource Econ.	USDA-ERS
Fundamental Studies in Tropical Cyclone Structure & Intensity Change	Montgomery, Michael	Atmos. Science	DOD
Ecological Effects of Reservoir Operations on Blue Mesa Reservoir	Johnson, Brett	FWLB	USBR
Develop Information and Database for Threatened & Endangered Species	Stevens, Joseph	FWLB	NPS
Fish Losses Associated With Irrigation Diversions On the Wind River Indian Reservation, Wyoming	Bergersen,Eric	Coop Fish & WL	USGS
Management Practice Study II - County Land Use Impacts on Irrigation Districts	Wilkins-Wells,John	Sociology	USBR
Effects of Prescribed Burning on Stream Water Chemistry at Different Spatial & Temporal Sites, Sequoia & Kings…	Stednick, John	Earth Res.	NPS
Develop a Water Resources Management Plan for Capital Reef National Park	Smith, Freeman	Earth Resources	NPS
Testing Passage Rates of Rio Grande Silvery Minnow in Rock Channel & Vertical Slot Fishways	Bestgen, Kevin	FWLB	USBR
Colorado River Cutthroat Trout Translocation Research	Fausch,Kurt	FWLB	DOI
Coupling of Carbon & Water Cycles in a Cold, Dry Ecosystem: Integrative Physical, Chemical & Biological Processes	Welker, Jeffrey	NREL	NSF
Statistical Research for Weather Prediction & Climate Change	Lee, Chun Man	Statistics	UCAR-NCAR
nvestigation of the Organic Composition of Fogs & Clouds	Collett, Jeffrey	Atmos. Science	NSF
Forward & Inverse Modeling of Carbon Dioxide & 13 Carbon Dioxide in the National Center for Atmospheric Research . . .	Denning, A Scott	Atmos. Science	NSF
Winter Precipitation, Sublimation, & Snow-Depth in the Pan-Arctic: Critical Processes & a Half Century of Change	Pielke, Roger	Atmos. Science	NSF
Regional Ecosystem-atmosphere CO2 Exchange via Atmospheric Budgets	Denning, A Scott	Atmos. Science	DOE
ARM Carbon Modeling & Land Surface-Atmosphere Model Applications	Hanan, Niall	NREL	Univ. of Tenn./Battelle

Title	PI	Department	Sponsor
Carbon & Water Management in Conservation Reserve Program Lands of the Shortgrass Prairie	Hanan, Niall	NREL	Univ. of Neb.
Occurrence & Fate of Emerging Organic Chemicals in Onsite Wastewater Systems & Implications on Water Quality…	Ward, Robert	CWRRI	USGS
Determining Present & Future Impacts of Coal Bed Methane Development in Powder River Basin, Wyoming & Montana	Kalkhan, Mohammed	NREL	USGS
Investigation of Microbe Transport in Filter Sand & Karst Media	Ward, Robert	CWRRI	USGS
Preservation, Protection, & Management of Water Aquatic Resources of Units of the National Park System	Sanders, Thomas	Civil Engr.	NPS
Environmental Horticulture Park	Klett, James	Hort.& LS Arch.	City of Fort Collins
Comparison of Reclamation Treatments at the Buffalo Creek Wildfire Site	Barbarick,Kenneth	Soil & Crop Sci.	EPA
Fate and Transport of Metals and Sediment in Surface Water	Julien, Pierre	Civil Engr.	EPA
Remediation of Mine Drainage in a Microbially Active Permeable Barrier Reactor	Reardon, Kenneth	Chem. Engr.	EPA
Evaluating Recovery of Streat Ecosystems from Mining Pollution: Integrating Population, Community & Ecosystem	Clements, William	FWLB	EPA
Microbial Reduction of Uranium in Mine Leachate by Fermentative & Iron-reducing Bacteria	Shackelford, Charles	Civil Engr.	EPA
Evaluation of Hydrologic Models for Alternative Covers		Civil Engr.	EPA
Monitoring & Modeling the Effects of the Fires in the Colorado Front Range on Runoff & Erosion	Macdonald, Lee	Earth Resources	USFS
Water Yields in the United States under Climate Change	Ramirez, Jorge	Civil Engr.	USFS-RMRS
Development of Design Criteria for Siting and Spacing of Grade Control Structures Phase I	Watson, Chester	Civil Engr.	USFS-RMRS
Monitoring the Effects of the Bobcat Fire	Stednick, John	Earth Resources	USFS-RMRS
Measurement & Predictions of Cumulative Effects on the Eldorado National Forest	Macdonald, Lee	Earth Res.	USFS

UNIVERSITY OF COLORADO, BOULDER, COLORADO
Awards for October 2002

Title	PI	Department	Sponsor
Genetic Studies of Greenback Cutthroat Trout	Mitton, Jeffry	EPOB	USFS
Development of Operational Hydrologic Forecasting Capabilities	Clark, M.P.	CIRES	NOAA
Understanding and Enhancing Linkages Between Decision Making and Carbon Cycle Research	Pielke, Roger	CIRES	NOAA
Carbon Cycle Atmospheric Gas Collection	Losleben, Mark	IAAR	NOAA
Modeling the Effect of Climatic and Human Impacts on Margin Sedimentation	Syvitski, James	IAAR	DOD
Influences of Flow Transients and Porous Medium Heterogeneity on Celloid Associated Contaminant Transport in the Vadose Zone	Ryan, Joseph	CEAE	DOE
Advanced Decision Support for Water & Environmental Systems	Zagona, Edith	CEAE	USBR
HDB Water Accounting	Zagona, Edith	CEAE	USBR
Extend River Basin Modeling Tools and Hydrologic Database	Zagona, Edith	CEAE	USBR
Center for Drinking Water Optimization	Summers, R. Scott	CEAE	EPA

Title	PI	Department	Sponsor
A Cedar Modeling Study of Global Change in the Mesosphere and Lower Thermosphere	Akmaev, Rashid	CIRES	NSF
Niwot Ridge Long-Term Ecological Research Program: Controls on the Structure Functions and Interactions of Alpine and Subalpine Ecosystems of the Colorado Front Range	Bourgeron, Patrick	IAAR	NSF
Water Resources Issues Within the Integrated Assessment of the Human Dimensions of the Global Change	Strzepek, Kenneth	CEAE	Carnegie-Mellon Univ.
Exploratory Study of Deepwater Currents in the Gulf of Mexico	Leben, Robert	ACAR	Science Applic. Internat'l.

CU-Denver Continuing Engineering Education Program: Spring 2003
Professional Development Courses:
… Fundamentals of Engineering (FE) Examination Refresher Course
… Professional Engineers' Examination Refresher Course for Civil Engineering
… Professional Engineers' Examination Refresher Course for Mechanical Engineering
… Professional Engineers' Examination Refresher Course for Electrical Engineering
… Managing Technology Projects: Preparing for Certification as a Project Management Professional (PMP')
… Managing Projects with Microsoft Project': The Fundamentals of Project 2000
… Explicit Consideration of Safety in Highway Design
… C++ Programming for Non-C Programmers
… C# Programming
… The Fundamentals of XML
… Oracle Administration
… Oracle Database
… Blended (Online/Classroom) IT Certification Program: Core Computer Networking Track
… Blended (Online/Classroom) IT Certification Program: Wireless Networking Certification Track
… Blended (Online/Classroom) IT Certification Program: Computer Networking/CISCO CCNA Certification Track
Credit:
… Java Programming Leading Toward Sun Certification

Please contact Continuing Engineering Education at 303-556-4907 to request a catalog or visit the web site at www.cudenver.edu/engineer/cont to browse course specifics.

WATER NEWS DIGEST

by Marian Flanagan

ARKANSAS VALLEY

Fort Lyon Canal buyers sue to kill water district
The company attempting to buy most of the Fort Lyon Canal has filed a lawsuit in district court here Tuesday to void the creation of the Lower Arkansas Water Conservancy District. High Plains A&M attorney Robert Bruce of Denver filed the suit, arguing that the ballot question that created the district was unconstitutional because it contained more than one subject. Voters in Bent, Crowley, Otero, Pueblo and Prowers counties approved Initiative 4A by a 62-38 percent margin last Tuesday. The measure passed in all five counties, although Bent County's 54 percent win was the lowest margin, due to opposition by some who already had sold their land and water to High Plains. The district was marketed to voters as a way to save farming water by raising money with a property tax to buy water from farmers who might otherwise sell their water rights out of the Arkansas Valley. Also, the tax revenues raised would allow the district to sell bonds, the proceeds from which also would be used to buy water. High Plains wants the district prevented from collecting taxes and wants the entire election victory thrown out. The Nevada-registered company also wants to be paid for its attorney fees and other costs for filing the suit. The new conservancy district doesn't have a board of directors yet, or a lawyer. The lawsuit was filed against the new district, the Arkansas Valley Preservation Trust, which started the new district, and the commissioners of all five counties included in the district.

———

The Pueblo Chieftain, 11/13/02

Lawyer: High Plains suit does not hold water
Mark Grueskin, an expert on Colorado ballot issue law, says he doesn't see how last week's election to form the new lower Arkansas Water Conservancy District can be overturned. Grueskin said a lawyer who knows the law should be able to successfully defeat the lawsuit. The single-subject rule applies only to statewide ballot issues and to those local jurisdictions, such as Colorado Springs, that specifically adopt the rule for themselves. "The Colorado Supreme Court decided, prior to adoption of the single-subject rule in the Constitution, that local ballot titles may have more than one subject as long as they communicate the issue adequately to the voters," Grueskin said. There's not anything in state law that applies the single-subject rule to local elections," he said.

_____
Pueblo Chieftain Denver Bureau/November 15, 2002

THE COLORADO RIVER

Interior Department to Withhold California's Extra Water
The Interior Department says that beginning January 1 it will bar California from using surplus Colorado River water. The announcement came a day after Imperial County rejected a deal to relinquidh part of its share of river water, the linchpin to a broader agreement to curb the state's historic overuse of the Colorado. For years, California has used 800,000 acre-feet more than the 4.4 million acre-feet it is entitled to under an agreement with seven Western sates because the other states didn't use all their allotments. Three years of rapid growth across the West, however, prompted the Interior Department to enforce "the law of the river," said Bennett Raley, the department's assistant secretary. California's Imperial Irrigation District's board of directors voted 3-2 to reject a deal to transfer nearly 500,000 acre-feet of water a year – enough for 1 million households – to districts across Southern California. The biggest portion, up to 200,000 acre-feet, would have gone to fast-growing San Diego County.

_____
Fort Collins Coloradoan,/December 11, 2002

USBR Seeks Approval for Shorter, More Frequent Floods
A new flood planned for the Grand Canyon will be shorter and better timed that an effort in 1996, and if the Bureau of Reclamation wins approval for its plan, it could start the flood as early as January. The idea is to mimic water surges that occurred on the river before the Glen Canyon Dam was built. Until the dam began operation northeast of the Grand Canyon in 1956, natural floods maintained sandbars, backwaters, and eddies with influxes of silt from the Colorado River's tributaries. Scientists, conservationists and government officials have been trying to find a way to restore the ecosystem. In the first flood of March, 1996, water gushed through the dam, moving silt onto the canyon floor and creating new beaches and sandbars. However, the formations lasted only a few months. The new flood would be shorter than the seven-day flood done in 1996, and it would be timed to coincide with natural collections of sediments from tributaries, says a USBR spokesman.

_____
Fort Collins Coloradoan/October 4, 2002

KANSAS VS. COLORADO

Colorado's Water Bill Set at $28.9 million
Kansas, which had sought $52.8 million in damages for Arkansas River water that Colorado had diverted over several decades, will get $28.9 million. A spokesman for Attorney General Ken Salazar said the $28.9 million may not be the final figure, but it will be close. The amount could vary by as much as $500,000 as the special master appointed by the Supreme Court continues to examine how much Kansas can claim. The diversions stopped long ago, but in 1995 the Supreme Court ruled that Colorado must pay for taking the water. The only question was how much. Last year, the high court agreed that Kansas should not be allowed to collect interest on damages it was seeking from before 1985, the year it filed its legal complaint. The special master notified the states that he will accept Colorado's calculation of damages. A spokesman for the Kansas attorney general's office said the special master's decision is not necessarily final, hinting that "…the U.S. Supreme Court will still have the final say in this case."

_____
Denver Post/December 4, 2002

RECREATIONAL WATER RIGHTS

Court Hears Challenge in Golden Case
Attempts by Colorado cities to turn rivers into world-class recreation venues are being challenged by the state, which is seeking to limit recreational water rights, the Colorado Supreme Court was told in October. At issue is a 2001 decision by state water judge Jonathan W. Hays, which gave the city of Golden recreational water rights so the city could maintain peak flows on its internationally renowned Clear Creek whitewater kayaking course.Hays gave the city 1,000 cubic feet per second of flow in May, June and July. The state of Colorado is challenging the decision. Golden's water attorney said that after the water leaves Golden, it is used by a variety of industrial, municipal and agricultural interests. The State of Colorado maintains that Hays gave the city far more than it needs. The court usually takes about five months after hearing arguments before issuing a decision.

_____
Denver Post/October 3, 2002

WATER SUPPLY/DEVELOPMENT

Douglas Water Worries
Residents of fast-growing Douglas County will see their water bills skyrocket during the next 10 to 20 years as water levels in the Arapahoe Basin aquifer continue to drop and pumping costs increase, a water engineering consult says. John Halepaska told south metro water and government officials that levels in the basin, used by Parker and Highlands Ranch, have started to dip and the wells are already less productive. "In 20 years, even with more wells, we'll be getting only one-third of the production of today," he said. In Parker, wells produced 6,780 gallons per minute in 2001, but the volume dropped to 2,695 gallons per minute in 2002 despite limits on lawn watering and steep prices for excessive use, said Frank Jaeger, manager of the Parker Water and Sanitation District.

_____
Denver Post/December 7, 2002

58 Counties Seek Water Solution
A coalition of 58 counties has banded together to push for a fair solution to Colorado's water problems. Members of Action 22, representing 22 counties in southeastern Colorado, Club 20, representing 22 counties in western Colorado, and Progressive 15, on behalf of 15 counties in the northeast part of the state, said all water users have to share in resolving the problems, and solutions should not come at the expense of others. Counties not represented in the coalition included some of the state's biggest water users, including Denver, Gilpin, Jefferson, Broomfield, Clear Creek and Boulder. The coalition said the state should provide assistance for local water supply planning, that existing local water supplies should be fully explored prior to consideration of new water transfers, and the state should pursue additional storage. The groups also said the right of water owners to market their water rights must be protected.

_____
Fort Collins Coloradoan-Associated Press/October 25, 2002

Coalition Puts Spotlight on Water Issues
Drought and an expected flood of water-related legislation have pumped up organizing efforts of the Colorado Water Partnership. The coalition wants to deelop long-term plans and build support for projects to ensure there is enough water for a growing population. Projections call for Colorado's population to grow by another 1.7 million by 2020 to 6 million people. The Colorado Legislative Council estimates 300,000 acre-feet of water will be required to serve the growing demand along the northern Front Range. Arapahoe County Commissioner Marie Mackenzie, chair of the partnership, told her Jefferson County counterparts, who agreed to join, that up to 80 water-related bills will be introduced in the upcoming legislative session. In particular, she said, projects are needed to capture the half-million acre-feet that flows out of the state in the Colorado River. "There is no storage," she said, though many communities are relying on dwindling aquifers. Chris Paulson, a water attorney representing the Colorado Water Partnership, said water rights can be purchased from farmers, but that dries up the agricultural land. The partnership plans to study proposed water bills and to ensure that studies are done on alternatives to the "Big Straw," a project that would pump water to the Front Range from the Colorado-Utah line.

_____
Denver Post/October 17, 2002

Denver Water Aims to Keep Chatfield Flows
For the first time, Denver Water plans to draw from Chatfield Reservoir to boost its drinking water supplies. The 1,450-acre Chatfield, designed as a flood-control project, is slowly filling to its maximum volume. That's because the U.S. Forest Service requires Denver Water to release water from its Strontia Springs Reservoir, located upstream, into the South Platte River to maintain trout habitat in Waterton Canyon, which runs between Strontia and Chatfield. But once Chatfield fills to 27,000 acre-feet, the Army Corps of Engineers requires that water be released further down the South Platte to maintain room in the reservoir to contain potential floodwaters. In normal years, Denver Water would broker an exchange with other users downstream. The other users would use the water released from Chatfield, and Denver Water would hold back an equivalent amount of the users' water upstream. But this year, there isn't enough water upstream. So, when Chatfield fills and its gates open in mid-December, Denver Water wouldn't get anything in return for the water it would be required to release to the South Platte. Although Lake Dillon is still 60 percent full, exposed parts of the lake bottom have been the most visible symbol of the state's water shortage. With no end to the drought in sight, Denver Water wants to save as much water in its reservoirs as possible. So, the utility has to find a way to keep Waterton Canyon wet without letting Chatfield fill. Managers want to lower Chatfield's level by pumping about 1,200 feet into a conduit that runs to nearby Marston Reservoir, where it can be treated. But before Denver Water can start lowering Chatfield's level, it needs the approval of the Corps of Engineers, which build the earthen dam as a flood-control measure in 1965, and the U.S. Fish and Wildlife Service, which is concerned about flows for endangered birds 600 miles downstream in Nebraska. The change from flood control to municipal supply would force a coalition of Denver, south metro and agricultural water users to come up with at least $50 million to pay back the federal government for the initial construction.

_____
Denver Post/October 20, 2002

Cloud Seeding Debated
In August, the Denver Water Board voted unanimously to partner with 25 metro-area water facilities and ski resorts to begin a $700,000 seeding program expected to run from November 1 through March 2003. The practice remains contentious despite no scientific finding that it robs the snow supply from downwind regions. It has been used for years by ski areas such as Vail to increase snowfall. Still, even the most enthusiastic scientists warn cloud seeding won't cure drought. Others, such as atmospheric scientists William Cotton of Colorado

State University who has studied the practice for about 40 years, says "There's no way to assess the benefit of cloud seeding in terms of runoff. Lewis Grant, retired CSU professor of Atmospheric Science and now a farmer in Wellington, believes cloud seeding is a good tool to increase snowfall, but also said it won't fix the drought. In the early 1990s, the states of Wyoming and Utah jointly funded a cloud-seeding study bedcause Wyoming was concerned Utah was robbing moisture from Wyoming, Grand said. The analysis gave no indication that was happening. Brian Werner, Northern Colorado Water Conservancy Distric spokesman, expects some of the Denver cloud-seeding programs near the Frasier area to benefit the district, which is the top supplier of water in Fort Collins. The district has no plans to begin a seeding rogram of its own, he said.

_____
Fort Collins Coloradoan/October 3, 2002

Poudre Storage Plans Include New or Expanded Reservoirs
Representatives from the Northern Colorado Water Conservancy District met with officials from Fort Collins and other communities and water districts as possibilities were presented for a new reservoir serving Northern Colorado. The most likely options are an expansion of Seaman Reservoir on the North Fork of the Poudre River of the construction of a new reservoir just east of the mouth of the Poudre Canyon. Another option is to build a new dam on the main stem of the Poudre River, the Grey Mountain project. Project planning is entering its second phase, and the NCWCD hopes to have a project it can propose by December 2003. The second phase, which will entail evaluation and planning, should cost about $1.4 million. The cost will be split by the participating entities. A new reservoir would hold 100,000 to 200,000 acre-feet of water and have a price tag in the neighborhood of $200 million. At capacity, Horsetooth Reservoir holds 156,000 acre-feet.

_____
Fort Collins Coloradoan/September 20, 2002

WATER QUALITY

National Water Quality Inventory
On October 15, EPA published its National Water Quality Inventory for the year 2000. Roughly one-half of assessed waters are not fit for uses suck as fishing and swimming. Pursuant to the Clean Water Act, section 305(b), states, tribes, territories, and jurisdictions are to assess their water quality biennially, and report their findings. The 2000 report includes information collected on about one-third of the nation's waters, including approximately 700,000 miles of rivers, 17.34 million acres of lakes, and about 31, 000 square miles of estuaries. Only 6 percent of the nation's shoreline miles were assessed. The report indicates that 53 percent of assessed river segments had food water quality , 8 percent were marginal, and roughly 39 percent remained polluted. Approximately 47 percent of lakes were reported as having good water quality, 8 percent were marginal, and 45 percent of estuary waters were reported as having good quality, less than 4 percent were , marginal, and 51 percent were labeled as polluted. Of assessed ocean shoreline miles, 14 percent were impaired, primarily due to bacteria, oxygen depletion, and turbidity caused primarily by urban and non-point source runoff.

The major pollutant contributions to impaired lakes and rivers are nutrients, metals and sedimentation, caused primarily by agricultural activities, hydrologic modifications, and urban runoff. Estuaries were polluted mostly by metals, pesticides, oxygen-depleting substances, municipal point sources, urban runoff, and industrial discharges. The leading cause of impairment of the nation's estuaries and lakes in the year 2000 was mercury. The high levels of mercury have led many states to warn vulnerable segments of the population against consuming some types of fish. Air-born mercury, which comes mainly from power-generating facilities, incinerators, mining and various natural processes, was cited in 2,242 of the 2,838 fishing advisories collectively reported by the states in 2000.

The report indicates that wetland loss has continued to slow over the last 40 years, with an estimated loss of 58,500 acres per year. The leading reasons for wetland loss are filling and draining, as well as conversion for agricultural and other purposes. With respect to ground water the report states, "Overall, the states found that ground water quality is good and can support many different uses. However, measurable negative impacts have been detected in some areas and are commonly traced back to sources such as leaking underground storage tanks, septic systems, and landfills."

In an effort to streamline the reporting process and improve the consistency and comprehensiveness of water quality reporting, EPA is providing states with guidance for satisfying the requirements of Clean Water Act sections 305(b) and 303(d) through a "2002 Integrated Water Quality Monitoring and Assessment Report."

_____
See www.epa.gov/owow/tmdl/202/wqma.html for the guidance, and www.epa.gov/305b/2000report for the text of the 2000 report.

MISCELLANEOUS

Thirsty Trees Damaging Pipes
Metro Denver plumbers and others who work on sewer lines say roots have created a 25 to 50 percent spike in business. With watering restrictions and without rain this summer, trees are looking for moisture. A field training manager says "The idea would be to stay ahead of the game. The best offense against meandering roots is a good defense.

_____
Denver Post/October 25, 2002

CALLS FOR PAPERS

Tenth International Symposium On Individual and Small Community Sewage Systems--The Tenth International Symposium on Individual and Small Community Sewage Systems will be held from March 21 through 24, 2004, in Sacramento, California. The symposium is sponsored by the American Society of Agricultural Engineers (ASAE). Deadline for submitting the paper proposals is February 15, 2003. For more information go to http://www.asae.org/meetings/sew04/index.html, or contact Jim Converse, Chair of the 10th National Symposium on Individual and Small Community Sewage Systems at jcconver@facstaff.wisc.edu or at 608-262-1106.

AGU Hydrology Days 2003--On behalf of the Organizing Committee of Hydrology Days, I would like to invite you to participate in the Year 2003 edition of the AGU Hydrology Days, which will be held at Colorado State University during March 31 - April 2, 2003. For detailed information about the Year 2003 edition of Hydrology Days please point your web browser to our web page at the URL address: http://HydrologyDays.ColoState.edu/. The web page also provides information about on-line registration and on-line submission of abstracts and papers. Please share this invitation with your friends and colleagues and encourage them to participate. Hydrology Days is a unique celebration of multi-disciplinary hydrologic science and its closely related disciplines. The Hydrology Days vision is to provide an annual forum for outstanding scientists, professionals and students involved in basic and applied research on all aspects of water to share ideas, problems, analyses and solutions. The focus includes the water cycle and its interactions with land surface, atmospheric, ecosystem, economic and political processes, and all aspects of water resources engineering, management and policy. I am looking forward to your participation. Best regards,

Jorge A. Ramirez, Chair, Organizing Committee

Eighth International Drainage Symposium--The Eighth International Drainage Symposium will be held from April 14 through 17, 2004, in Sacramento, California. Sponsored by the American Society of Agricultural Engineers, the symposium is a continuation of ASAE's commitment to provide important information on drainage and water management in a changing environment. Phone (800) 371-2723, e-mail mcknight@asae.org or visit www.asae.org

Tenth Annual Conference on Tailings and Mine Waste--The conference will be held from October 12-15, 2003 in Vail, Colorado. It will provide a forum for presenting the state-of-the-art advances with respect to tailings and mine waste. Abstracts are solicited on the general themes of the conference and related topics. For information contact Linda L. Hinshaw, Dept. of Civil Engineering, Colorado State University, Fort Collins, CO 80523-1372. Phone 970/491-6081, FAX 970/491-3584/7727, E-mail lhinshaw@engr.colostate.edu.

WATER SUPPLY

Basin	11/1/02 SWSI Value	Change From Previous Month	Change From Previous Year
South Platte	-2.2	+0.4	-2.6
Arkansas	-2.5	-1.5	-2.0
Rio Grande	-2.9	+0.3	-1.0
Gunnison	-2.8	+0.1	-0.6
Colorado	-3.5	-0.1	-2.2
Yampa/White	-3.2	-0.2	-1.5
San Juan/Dolores	-1.2	+1.0	+1.4

SCALE								
-4	-3	-2	-1	0	+1	+2	+3	+4
	Severe Drought		Moderate Drought	Near Normal Supply	Above Normal Supply		Abundant Supply	

The state enters the 2003 water year with dry conditions statewide, evidenced by all basins having negative SWSI values. The widespread above-average precipitation that began in September continued into October over some areas, resulting in select streams experiencing a minor increase in flow. Those basins with increased SWSI values over last month reflect the benefit of those precipitation and stream flow effects. Even though there were some small benefits, all stream flows remain significantly below average. Statewide reservoir storage is also well below

The state enters the 2003 water year with dry conditions statewide, evidenced by all basins having negative SWSI values. The widespread above-average precipitation that began in September continued into October over some areas, resulting in select streams experiencing a minor increase in flow. Those basins with increased SWSI values over last month reflect the benefit of those precipitation and stream flow effects. Even though there were some small benefits, all stream flows remain significantly below average. Statewide reservoir storage is also well below normal amounts.

MEETINGS

RECLAMATION CO-SPONSORS WORKSHOP FOR NORTHERN COLORADO WATER INTERESTS

An outreach workshop for northern Colorado agricultural water interests, Stretching Agricultural Water Supplies, will be held February 19, 2003, at the Best Western Regency Hotel (701 8th Street) in Greeley, Colorado. The workshop is sponsored by the Bureau of Reclamation in collaboration with the Northern Colorado Water Conservancy District and the U.S. Department of Agriculture.

Workshop objectives include:

A description of beneficial, new technology and tools for irrigation
A discussion of current challenges to farmers, ditch and reservoir managers, and others
Identification of opportunities to cooperate and share resources to develop, demonstrate and deploy affordable technologies for water users and managers.

The workshop will feature four panel sessions. The first panel will identify and discuss current issues from local, state and federal perspectives. Next, presentations describing recent developments and ongoing efforts to improve water handling and management capabilities will be given. The third session will explore the availability of financial assistance and low interest loans for delivery systems and on-farm upgrades. The final session will focus on future actions to be taken. Additional information and demonstrations will be available throughout the day.

All members of northern Colorado's agricultural interests are invited to participate. For additional information, contact:

Siegie Potthoff (D-9000)
Bureau of Reclamation
Science and Technology Program
Denver Federal Center
Denver CO 80225

Phone: (303) 445 2136
Fax: (303) 445 6323
e-mail: spotthoff@do.usbr.gov

Information about the conference will also be posted at http://www.usbr.gov/research/ .

A contemporary water management agency, Reclamation is the largest wholesale water supplier in the United States, with operations and facilities in the 17 Western States. Today, these facilities include 348 reservoirs with the capacity to store 245 million acre-feet of water. Reclamation projects supply one out of five western farmers with irrigation water for approximately 10 million farmland acres. Reclamation facilities also provide water to about 31 million people for municipal and industrial uses. In addition, Reclamation is the nation's second largest producer of hydroelectric power, generating more than 42 billion kilowatt hours of energy each year from 58 hydroelectric power plants. Its facilities also provide substantial flood control, recreation, and fish and wildlife benefits.

International Workshop on Integrated Water Resource Management
April 7 - 11, 2003 -- Denver, Colorado

This workshop will review and analyze recent developments in integrated water resource management (IWRM) and tools. The speakers will be experts from the Bureau of Reclamation and specialists from other water resource management entities who will provide a comprehensive overview of IWRM theory and techniques with discussion on policies and practical management issues - - from river basin level to individual water resource projects. Discussion will focus on assessing and dealing with competing demands imposed on a limited water resource and, at the project level, means to better promote their efficient operation, maintenance, and management for multiple purposes including irrigated agriculture, flood control, hydropower, water supply and environmental purposes. Specific sessions in the Workshop will be devoted to a wide array of topics including IWRM theory, data collection, water quality, water conservation, drought management, adaptive management, decision support systems, and conflict management.

For information contact - Ms. Leanna Principe, E-mail: lprincipe@do.usbr.gov, International Affairs, D-1520, U.S. Bureau of Reclamation, P.O. Box 25007, Denver, Colorado, 80225, U.S.A. telephone: (303) 445-2127, Fax: (303) 445-6322.

2003 COLORADO AGRICULTURAL OUTLOOK FORUM

Renaissance Denver Hotel
Thursday, February 20, 2003

"Weathering Tough Times Together"

Wednesday, February 19

5:30 – 7:30 P.M. Reception—Renaissance Denver Hotel—3801 Quebec Street, Denver
Sponsored by: McClure & Egglestron, P. C.

Thursday, February 20

7:30 – 8:15 A.M. Registration with coffee & rolls; exhibits begin

8:15 – 8:30 Multi-Image Presentation: Ms. Jeri Mattics Omernik, Rocky Mountain Marketing & Communications, Montrose

8:30 – 8:50 Welcome: Don Ament, Colorado Commissioner of Agriculture; introduced by morning moderator Dr. Bob Hamblen, Boulder County director, CSU Cooperative Extension

8:55 – 9:25 Keynote: "Weathering Tough Times Together"
Dr. Albert Yates, president, Colorado State University (invited)

9:30 – 10:20 State Overviews on Water

- Mr. Nolan Doesken, research associate, Colorado State University Climate Center
- Mr. Ken Salazar, attorney general

10:20 –10:50 Coffee Break

10:50 -12:00 noon Regional Perspectives on Working Together Toward Solutions

- Mr. Chips Barry, general manager, Denver Water (invited)
- Mr. Eric Wilkinson, general manager, Northern Colorado Water Conservancy District
- Mr. Reeves Brown, president, Club 20

12:00 -1:30 Luncheon: Leopold Conservation Award (CCA, CCALT, Sand County Foundation)

1:45 – 4:15 Two Rounds of 5 Breakout Sessions each

All workshops are located on the Mezzanine Level, two floors up from the general session

AG OUTLOOK FORUM CONCLUDES; PARTICIPANTS ARE WELCOME TO ATTEND THE FOLLOWING:

4:15 – 5:30 Silent Auction and Reception (with cash bar) sponsored by the Colorado FFA Foundation

5:30 – 8:30 Colorado Agriculture Hall of Fame Banquet

Separate tickets required via the Colorado FFA Foundation

2003 COLORADO AGRICULTURAL OUTLOOK FORUM – February 20, 2003
Breakout Sessions: A (1:45-2:55 pm); B (3:05-4.15 pm) 11/13/02

1. IRRIGATION STRATEGIES

Session A: Limited Water Management and Irrigation Scheduling
- Frank Stonaker, director, Specialty Crop Center, CSU, moderator
- Joel Schneekloth, CSU Cooperative Extension irrigation specialist, Akron
- Dennis Alexander, assistant state conservationist for programs, USDA—NRCS

Session B: Irrigation Precision Technologies
- Hal Smedley, Colorado Corn Administrative Committee, moderator
- Jack Jenkins, Industrial Programs, U.S. Department of Energy
- Rick Grice, director, Governor's Office of Energy Management and Conservation
- Dale Heermann, research leader, USDA—Agricultural Research Service, Ft. Collins
- James Lenz, president, Colorado Corn Growers Association
- Jake LaRue, project manager, Irrigation Division, Valmont Industries, Inc., Valley, NE

2. DRY CROPLAND AND RANGELAND STRATEGIES

Session A: Rangeland/Livestock Strategies
- Roy Roath, state range specialist, CSU Cooperative Extension, moderator
- Randy Blach, executive vice-president, CattleFax
- Jeff Burwell, state resource conservationist, USDA—Natural Resource Conservation Service

Session B: Dryland Sustainable Agroecosystem Management
- Frank Stonaker, director, Specialty Crop Center, CSU, moderator
- G. A. Peterson and D. G. Westfall, Dept of Soil and Crop Sciences, CSU
- Jeff Burwell, state resource conservationist, USDA—Natural Resource Conservation Service

3. WATER SHARING STRATEGIES

Session A: The South Platte Basin
- Tim Davis, private lands coordinator, Colorado Division of Wildlife, moderator
- Forrest Leaf, water resources engineer, Central Colorado Water Conservancy District
- J. R. Schnelzer, town administrator, Milliken
- Bret Hall, chief operating officer, Hall-Irwin Construction Company

Session B: The Arkansas River Basin
- Eric Schuck, Dept. of Agricultural and Resource Economics, CSU, moderator
- Steve Witte, division engineer, Water Division 2, Colorado Division of Water Resources, Pueblo
- Leroy Mauch, Prowers County commissioner, Lower Arkansas Valley Water Conservancy District

4. AGRICULTURE AND WILDLIFE STRATEGIES

Session A: Nature-based Tourism
- Tammy VerCauteren, Prairie Partners-landowner outreach/GIS specialist, Rocky Mtn Bird Observatory, moderator
- Remelle Farrar, executive director, Texas Prairie Rivers Region, Inc., Canadian, TX
- Jim Bill Anderson, rancher, Canadian, TX

Session B: Habitat Conservation
- Ken Morgan, state coordinator, Private Lands Habitat Program, Colorado Division of Wildlife, moderator
- Bill Noonan, Colorado coordinator, Partners for Fish and Wildlife, U.S. Fish & Wildlife Service
- Bob Sanders, projects coordinator, Ducks Unlimited, Monte Vista

5. MANAGING RISK, STRESS, AND CONFLICT

Session A: Financial and Risk Managemeent
- Russ Groshans, vice president, Centennial Bank of the West, Eaton, moderator
- Eric Schuck, Dept of Agricultural and Resource Economics, CSU
- Dennis Kaan, regional Extension specialist, Agriculture and Business Management, Akron

Session B: Mediation and Stress Managemeent
- Jeanne Davies, rancher, Deer Trail, and past president, Colorado State Grange, moderator
- Gary Graalman, coordinator, Colorado Agricultural Mediation Program (CAMP)
- Robert Fetsch, Dept of Human Development and Family Studies, CSU

Registration Form: The cost of the Forum is $90 per person for early bird registration before Feb.5, 2003. Registration thereafter is $100pp. This fee includes the pre-Forum reception and the Forum. Cash, check or money order is accepted. Make your check payable to CAOF and mail to the Colorado Dept. of Agriculture, 700 Kipling Ave. Ste 4000, Lakewood, CO 80215-8000. Credit cards are not accepted. Cancellation Policy: Cancellations will be accepted if received in writing no later than February 5, 2003, for a full refund. No refunds will be given after February 5. Hotel reservations: $89/single or double. Deadline February 12. Call the Renaissance Denver Hotel at 303-399-7500 and refer to 'Colorado Agriculture' with the Colorado Department of Agriculture. All registrants are responsible for their own hotel reservation(s). NOTE: The management team of the Colorado Agricultural Outlook Forum reserves the right to make necessary changes in the program. Every effort will be made to keep presentations and speakers represented. However, unforeseen circumstances may result in substitution of a presentation topic/or speaker. For more information contact CAOF at the Colorado Dept. of Agriculture by calling (303) 239-4112 or email david.carlson@ag.state.co.us.

2003 Colorado Agricultural Outlook Forum Registration: (Please print)

Last Name:_____First Name:_____

Professional Title:_____

Indicate: (□ Mr. □ Mrs. □ Ms) __Producer __ Agri-Bus __ Govmt. __ Student __ Instructor

Name of your business, organization, company, agency, farm or ranch:

_____

Mailing Address: _____

City_____State_____Zip Code_____

Phone: ( ) _____ Fax: ( ) _____Email: _____

Number of people attending: _____ Amount Enclosed: $_____

Lower South Platte Water Symposium
Thursday, February 13, 2003
Northeastern Junior College - Sterling, CO
Registration begins at 8:00 a.m.

Colorado State University Cooperative Extension

How It Works

CURRENT TOPICS

Water Law and Issues that Impact the River
Hal Simpson, State Engineer

How the System Works: Where the Water Comes From and Where it Goes -- Luis Garcia, Colorado State University

Climatology of the South Platte Basin
Nolan Doesken, Colorado State University

Water Year 2002 in Review
Jim Hall, Office of the State Engineer

Legal/Practical Issues with Managed Groundwater Recharge
Steve Sims, Assistant Attorney General
Jon Altenhofen

History of Water Development in the South Platte
Justice Gregory Hobbs

What's in the Legislature Regarding Water?
Don Ament

This symposium will enlighten you about the "Big Picture" of the Lower South Platte River. Update your knowledge on current water use and management practices and obtain insight on the issues at hand concerning the future and protection of this most valuable resource. Who should attend? Ag producers, elected officials, city council/managers, electric association boards, SCD boards, ground water management boards, people associated with water use issues and citizens.

For More Information Contact: Joel Schneekloth, 970-345-0508; or Jan Nixon, 970-522-3200 ext. 0

Name _____

Address _____

City/State/Zip _____

Home Phone _____

Business Phone _____

Registration Fee: Lunch, Breaks & Handouts

Before February 3rd – $10/person

Late Registration Fee - $20/person

Payable to: Golden Plains Area Extension Fund
181 Birch Avenue
Akron, CO 80720

Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating
Cooperative Extension programs are available to all without discrimination

CALENDAR

Jan. 13-15	USDA NATIONAL WATER QUALITY COORDINATORS CONFERENCE, Building the Network, Strengthening Partnerships, Tucson, AZ. Website for the conference is http://www.engr.colostate.edu/ce/csrees/index.shtml.
Jan. 23-24	COLORADO WATER CONGRESS 45th Annual Convention, Northglenn, CO. Contact: Dick MacRavey, Executive Director, at Phone 303/837-0812, FAX 303/837-1607, E-mail macravey@cowatercongress.org. Web site: http://www.cowatercongress.org.
Feb. 13	LOWER SOUTH PLATTE SYMPOSIUM -- THE SOUTH PLATTE: LEARNING HOW IT WORKS AND HOW TO MAKE IT WORK. Contact: Joel Schneekloth, Phone 970/345-0508, E-mail jschneek@coop.ext.colostate.edu.
Mar. 27-28	WATERING YOUR FUTURE -- 2003 ARKANSAS RIVER BASIN WATER FORUM, University of Southern Colorado, Pueblo, CO. For information, call (719) 336-9421 or e-mail rappel@co.usda.gov.
Apr. 7 - 11	INTERNATIONAL WORKSHOP ON INTEGRATED WATER RESOURCE MANAGEMENT, Denver, CO. Contact Ms. Leanna Principe, E-mail: lprincipe@do.usbr.gov,
April 23-25	NATIONAL MITIGATION BANKING CONFERENCE, San Diego, CA. Contact: Carlene Bahler, E-mail Cbahler@erols.com or call 703/837-9763, website http://www.mitigationbankingconference.com.
June 29-July 2	American Water Resources Association 2003 International Congress, WATERSHED MANAGEMENT FOR WATER SUPPLY SYSTEMS, New York. Contact: AWRA, 4 W. Federal St., Middleburg, VA 20118-1626,
July 23-25	28TH COLORADO WATER WORKSHOP, Western State College, Gunnison, CO. Contact: George Sibley, Western State College,
Oct. 12-15	10TH ANNUAL CONFERENCE ON TAILINGS AND MINE WASTE, Vail, CO. Contact: Linda Hinshaw, Coordinator, Dept. of Civil Engr., CSU, Phone 970/491-6081, FAX 970/491-3584, E-mail lhinshaw@engr.colostate.edu.

COLORADO WATER CONGRESS MEETING SCHEDULE

The 2003 45th Annual Convention will be January 23-24, 2003 in Northglenn, CO
The 2003 Summer Convention will be August 21-22, 2003 in Steamboat Springs, CO
The 2004 46th Annual Convention will be January 29-30, 2004 in Northglenn, CO

CONTACT: Dick MacRavey, Executive Director, at Phone 303/837-0812, FAX 303/837-1607,
E-mail macravey@cowatercongress.org. Web site: www.cowatercongress.org

Colorado State University
Colorado Water Resources Research Institute
Colorado State University
Fort Collins, CO 80523