COLORADO WATER

Newsletter of the Water Center at Colorado State University

APRIL 2001

CSU RECEIVES NSF GRANT to Fund Research Experiences for Undergraduates Program in Water Research ***-- For more information, see page 5***

Professor Jorge Ramirez explains CSU's recently funded NSF REU Program in Water Research to Nick Tessitore, a junior in Civil Engineering.

Colorado State University

Knowledge to Go Places

WATER ITEMS AND ISSUES . . .

COLORADO WATER

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EDITORIAL

PROACTIVE RESPONSE

Editorial by Robert C. Ward

Rapid population growth, increased water-based recreation, and efforts to restore Colorado's native species are causing stress on Colorado's limited water supplies. Municipalities, in an effort to respond constructively to the stress, are examining ways to control the increasing urban demand for water. 'Demand Management' is a term often used to describe city efforts to control the increase in water demand. With over 40% of municipal water use going for landscape maintenance purposes, outdoor water use becomes a key focus for future water conservation efforts.

A large 'industry' has developed to provide landscape services to Colorado citizens. The industry, as represented by the Green Industries of Colorado (GreenCO)[1], is responding to the increasing attention landscape water use is receiving by being proactive toward the issue. A GreenCO Water Task Force was established several years ago to examine ways the green industry can position itself to constructively respond to the growing need to manage landscape water use. Attached to the bottom of this editorial is a 2001 GreenCO Water Task Force Resolution that was approved, on February 15, 2001, by the GreenCO Board of Directors.

The Resolution realistically describes the water issues facing the landscape industry – issues that may appear threatening to its economic vitality. The resolution positions the green industry as a leader in addressing the evolving landscape water issues. Such leadership should help the industry adapt to the need for enhanced water conservation while protecting its economic vitality. For more information about GreenCO's Water Task Force plans and activities, please contact Lise Mahnke **(emamas@home.com)** or Beth Conover **(hdwater@ecentral.com).**

Whenever an industry seeks to take a leadership position in addressing evolving water needs in Colorado, there is a need to examine its use of water in an open and questioning manner. Such examinations often involve research, education and outreach components, implemented at various stages during the examination. Higher education, with its water research, education and outreach programs, can be a strong partner in helping an industry adapt to new water use limitations. CWRRI and Cooperative Extension have been working with the GreenCO Water Task Force as it develops options to position itself to constructively meet future water conservation challenges.

CWRRI has addressed urban landscape water use in the past, especially after the drought of the late 1970s. Below are listed a few of the publications that CWRRI has produced on the topic.

1. Achieving Urban Water Conservation: A Handbook, by Ernest J. Flack, Wade P. Weakley and Duane W. Hill, CWRRI Completion Report No. 80, Sept. 1977.
2. Achieving Urban Water Conservation: Testing Community Acceptance, by Robert W. Snodgrass and Duane W. Hill, CWRRI Completion Report No. 81, Sept. 1977.
3. Water Resources for Urban Lawns, by W.R. Kneebone, I.L. Pepper, R.E. Danielson, W.E. Hart, L.O. Pochop and J. Borelli (Regional Project - CWIC), Sept. 1979.
4. Water Requirements for Urban Lawns in Colorado, by Robert E. Danielson, William E. Hart, Charles M. Feldhake and Peter M. Haw, CWRRI Completion Report No. 97, Aug. 1980.
5. Urban Lawn Irrigation and Management Practices for Water Saving with Minimum Effect on Lawn Quality, by R.E. Danielson and C.M. Feldhake, CWRRI Completion Report No. 106, May, 1981.
6. The Effect of Conservation Programs on the Quality of Urban Lawns, by Andrew S. Winje and J. Ernest Flack, CWRRI Completion Report No. 142, Sept. 1986.
7. Consumptive Use and Return Flows in Urban Water Use, by Ramchand Oad and Michael DiSpigno, with contributions

[1] The Green Industries of Colorado includes the ALCC (Associated Landscape Contractors of Colorado), the ASLA (American Society of Landscape Architects), CALCP (Colorado Association of Lawn Care Professionals), CGGA (Colorado Greenhouse Growers Association), CAN (Colorado Nursery Association), GCC (Garden Centers of Colorado), ISA (International Society of Arboriculture), RMSG (Rocky Mountain Sod Growers Association) and WFC (Wholesale Florists of Colorado).

from David L. Nettles, State Engineer's Office, and Philip C. Saletta and Kevin D. Lusk, Colorado Springs Utilities Water Resources Department, CWRRI Report No. 189, Dec. 1996.

Abstracts of these reports can be found on the CWRRI Website under 'Publications' and 'Completion Report' series (http://CWRRI.ColoState.Edu).

This issue of *COLORADO WATER*, on pages 7-10, presents an update on current Agricultural Experiment Station research into water use by various turf grasses in western Colorado. The knowledge created by past, current, and future research will assist the GreenCO Water Task Force as it proceeds to implement its Resolution.

Many industries in Colorado are facing water situations not unlike that of the green industry. How an industry responds to the increasing competition for water will influence its ability to adapt successfully and remain economically competitive. Higher education's water research, education and outreach programs are willing and able to assist Colorado industries in proactively adapting to new water realities.

2001 GreenCO Water Task Force Resolution

Whereas:

Green Industries of Colorado (GreenCO) and its member organizations recognize the strategic importance of water to the green industry and assume the following:

Water shortages and water quality issues will adversely affect our industry.

Water shortages and water quality issues (caused by growth, regulations, lack of conservation, drought and other factors) will continue to have an adverse impact on built landscapes, their users and green industry service providers statewide. This trend is likely to accelerate rather than diminish in frequency and severity in the future.

Water use in landscapes is an easy target for regulations and restrictions.

Conspicuous use of water in built landscapes likely will cause all green industries to be targeted for water use regulations and restrictions by providers, regulators and policymakers.

Green industries are better off leading conservation efforts than following regulators.

There are substantial strategic, political and economic benefits to GreenCO in cooperating and partnering proactively with water providers, regulators, end users and other stakeholders to develop practical, horticulturally and technically sound solutions for effective water conservation and water quality standards.

All member groups should benefit and none should be unduly burdened by GreenCO water conservation and quality initiatives.

GreenCO will maintain a commitment to member organizations to actively seek input from each group, address the wide variety of ways members and their clients' interface with water in their businesses and landscapes, and support no initiatives that unduly burden one portion of the industry.

A unified GreenCO message will be important in communicating with all stakeholders.

There is a significant value in a unified communication strategy within GreenCO and in public and governmental arenas. This cohesiveness will markedly enhance GreenCO's efforts to educate and influence the members of GreenCO organizations, water providers, water regulators, legislators, and end users about effective means to improve water conservation and quality.

Therefore, be it resolved that GreenCO will:

1. Document the impacts of water-related issues on the green industry. GreenCO will accurately determine and prioritize

the economic and political impacts of water-related issues on green industries in Colorado. The various impacts of several scenarios (including a do-nothing strategy) should be carefully defined.

2. Pursue specific initiatives that demonstrate industry leadership in addressing water conservation and quality issues.
GreenCO will identify, develop and promote a few highly visible and effective water-related initiatives in cooperation with interested partners. These efforts would educate and engage the industry, water officials, policymakers and the public on targeted water issues, and would help strengthen the industry's leverage in helping form water-related public policy.

3. Measure our success with these initiatives.
GreenCO will evaluate and document the effectiveness of the initiatives (including the impacts on water resources, successful adaptation by GreenCO members, and quality of relationships with providers, regulators, policymakers and other stakeholders).

4. Dare to innovate.
GreenCO will "push the envelope" wherever possible on water conservation and quality measures to emerge as a valued and responsible leader in generating new ideas and promoting increased effectiveness. This leadership will bring a variety of public relations and competitiveness benefits to the green industry.

CSU RECEIVES NSF GRANT
to fund Research Experiences for Undergraduates Program in Water Research

A National Science Foundation grant awarded to Principal Investigator Jorge Ramirez, Department of Civil Engineering, through The CSU Water Center will offer a unique opportunity for 15 undergraduate students from four-year colleges and universities to conduct independent research in Water Science and Engineering during 8 weeks each summer. The goal of the 3-year program is to provide a comprehensive research experience that will motivate students toward a research career in water. Students will work in teams that include faculty, graduate students, and staff to conduct research and gain hands-on experience in laboratory and field research methods. Students will be under the guidance of faculty from the departments of Civil Engineering, Earth Resources, Soil and Crop Science, Chemical and Bioresource Engineering, Fishery and Wildlife Biology, and Rangeland Ecosystem Science.

General Program of Activities – Research Experiences for Undergraduates (REU) participants will gain comprehensive research experience through field and laboratory research, literature synthesis, laboratory analyses, modeling, statistical analyses, technical writing, teamwork, and oral communication. Interaction with faculty members and graduate students will facilitate and enhance the research experience.

Field Trips and Seminars – Students will participate in several field trips and bi-weekly workshops and seminars. Examples of previous seminars and workshops include a history of water development and water rights issues in the West and a four-part sequence of workshops on ethics in engineering science and research. Previous field trips have included a geomorphologic survey of the Cache-La Poudre River; a full-day, guided visit to Colorado Big Thompson Project hosted by the Northern Colorado Water Conservancy District; and a guided visit to the Engineering Research Center.

Financial Support for Students –Students will receive a $2,400 stipend per student for the 8-week period. Housing in CSU dormitories will be arranged by program coordinators. Otherwise, a housing allowance of $1,500 will be provided. A $300 travel allowance will be provided for the actual cost of travel from the student's residence to Colorado State University.

Eligibility — Must be an undergraduate student at a four-year college or university and a citizen or permanent resident of the United States or its possessions.

Look for more information about applying for this program in the October issue of COLORADO WATER. The application deadline for the 2002 summer program will be in March, 2002. The REU Website is: http://waterreu.colostate.edu/.

AWWARF ISSUES REQUESTS FOR PROPOSALS

The Awwa Research Foundation (AwwaRF), a non-profit organization dedicated to advancing the science of water, announces the selection of 48 new research projects approved for funding in 2001. AwwaRF sponsors practical, applied research for the drinking water community and, since 1986, has managed research projects worth over $180 million. The new research projects cover topics including UV disinfection, treatment chemistry, customer issues, distribution system water quality, and source water quality and monitoring. Requests for Proposals (RFPs) have been issued for 30 of the new projects and are available on the AwwaRF web site (www.awwarf.com). For additional information, contact AwwaRF at info@awwarf.com.

FOUR COLORADO PROPOSALS SUBMITTED TO USGS NATIONAL GRANTS COMPETITION

Four Colorado proposals have been submitted in response to the U.S. Geological Survey's Request for Proposals for its Water Resources Research National Competitive Grants Program for Fiscal Year 2001. The USGS, in cooperation with the National Institutes for Water Resources, issued the RFP to support research on non-point source water pollution, water quality sensors, and water use. A total of $1 million is available for research under this program, with at least $500,000 to be spent on topics addressing non-point source pollution. The proposals submitted are:

- **Aquatic Biotransformations of Common Metal Chelating Corrosion Inhibitors** – During the last decade, U.S. commercial airports used more than 35 million gallons of aircraft deicing fluid to ensure safe flying operations. This is a proposed study of the environmental effects caused by deicing fluids to determine the microbiological biotransformation potential of these compounds and confirm their mode of toxicity to environmental receptors present in terrestrial systems. Included in the study will be domestically marketed automotive antifreeze, brake fluids and metal-cutting fluids included in industrial cooling water systems. *Principal Investigator: Mark T. Hernandez, Department of Civil, Environmental and Architectural Engineering, University of Colorado*.

- **GIS Approach for the Assessment and Validation of Regional Ground Water Vulnerability to Pesticide Contamination** –This proposed research deals with protecting ground-water reservoirs from contamination by agricultural pesticides. It would apply a vulnerability model — already been proven to be effective at the county scale in Colorado — that incorporates soil characteristics, depth to ground-water table data, and pesticide properties to develop a vulnerability model that will serve as a pesticide contamination potential assessment tool that can be easily applied to any part of the United States. *Principal Investigators: John E. McCray, Department of Geology and Geological Engineering, Colorado School of Mines; and Reagan Waskom, Water Quality Specialist, CWRRI, Colorado State University*.

- **Production of DOC in Alpine Drinking Water Sources from Atmospheric Nutrient Enrichment and Algae Growth** – Researchers would investigate the effects of atmospheric nitrogen deposition on algal growth in an alpine lake and the subsequent effects on the quality of water supplied to the city of Boulder, Colorado by the Silver Lake Watershed. *Principal Investigator: Diane Marie McKnight, Institute of Arctic and Alpine Research, University of Colorado*.

- **Use of Low-Cost Data to Simulate Fractured-Aquifer Watersheds for Management of Water Quality and Quantity** – The Turkey Creek Watershed, a fractured-crystalline rock aquifer, is typical of those that support individual domestic wells and sewage disposal systems throughout the Rocky Mountains, the United States, and the world. This proposed research would integrate data from many sources and develop models to better understand the flow system, determine which low-cost data are instrumental in describing the system and in reducing uncertainty, and simulate the impacts of alternative development scenarios on groundwater levels, quality, and the effect on total maximum daily load in streams. *Principal Investigators: Eileen Poeter, John E. McCray, and Geoffrey Dickerson Thyne, Department of Geology and Geological Engineering, Colorado School of Mines.*

Research proposals will be peer reviewed and projects selected by a panel consisting of Water Institute directors, university scientists, and U.S. Geological Survey employees experienced in water resources research.

WATER-USE EFFICIENCY OF COOL-SEASON TURF GRASSES IN WESTERN COLORADO

by Dr. Calvin H. Pearson, Professor of Soil and Crop Sciences/Research Agronomist

Thirty-six cool-season turf grasses were planted at the Western Colorado Research Center at Fruita on September 27, 2000. Most of the turf plots established well during the fall. Plots that may not establish well in spring 2001 will be replanted. Water-use efficiencies of the turf grasses will be determined along with evaluations of disease incidence, biomass production, and stand uniformity and quality characteristics. This study will provide results that will be of value to homeowners, lawn care professionals, consultants, landscapers, outreach professionals, planners, seed company representatives, municipalities, park managers, golf course superintendents, sod producers, developers, policy makers, and others.

Fig. 1. Turfgrass plots at the Western Colorado Research Center at Fruita. Plots were planted September 27, 2000. Photo by Calvin Pearson, October 2000.

Introduction

Turfgrasses are of importance worldwide in enhancing and maintaining the function and beauty of natural and man-made landscapes. Turfgrasses enhance the landscape by contributing to aesthetic and practical appeal, and they also add significant economic value. Because of the diversity found in turfgrass species and varieties, they are used in many applications and under various conditions. Turfgrasses have three main functions:

1) They provide utility in applications such as dust and erosion control; glare reduction and for safety needs such as on air fields and along roads; reclamation and stabilization; and improvement of degraded natural areas and spots that have been adversely impacted by anthropogenic activities.

2) They are used for recreation on various types of sports fields, parks, and playgrounds. Turfgrasses for recreational uses can be for athletic activities, exercise and physical conditioning, therapeutic needs, and for improvement of general healthy living conditions.

3) They are widely used for beautifying all types of surroundings.

In any particular application, turfgrasses generally contribute to more than one function. Clearly, turfgrasses play a major role in our daily lives and in our pursuit of happiness (Watson et al., 1992).

As the population of western Colorado continues to grow, water continues to be a more valuable and limited resource. The increased demand for and increased uses of water has created controversy. This situation has promoted greater competition for water resources among the various users of water. Scrutiny of water applied to plants, such as crops and urban landscapes, is increasing the need for irrigation water-use efficiency. Water use efficiency of turf grasses is often low. The reason for low water-use efficiency of turf grasses in western Colorado may be the result of inadequate education and operation practices of the irrigator. Also, turf grasses need to be identified and planted that have increased water use efficiency. The objective of this research is to identify turf grass species/varieties that have good turf-quality characteristics that will improve water-use efficiencies and provide the consumer with quantitative information for selecting turf species and varieties to meet their needs.

Methods

Both cool-season and warm-season grasses are used as turf grasses. The warm-season grasses are best adapted to temperatures from 80 to 95 degreesF, which occur mainly in the southern states. The cool-season grasses are best adapted to temperatures from 65 to 75 degreesF, which occur in the cooler regions of the northern U.S. The cool-season grasses emerge from dormancy and grow rapidly in the spring. Growth of cool-season grasses slows during the heat of the summer. Cool-season grasses maintain their green color well into the fall, and some grasses may remain green during the winter. In comparison, the warm-season grasses emerge from winter dormancy much more slowly, and they do not achieve maximum growth until midsummer. Growth of warm-season grasses slows in the fall, and they became dormant when soil temperatures drop below 50 degrees F. As plants become dormant, warm-season grasses lose their chlorophyll. Dormant warm-season grasses display a brown color until growth is resumed and plants produce new green tissue (Christians, 1998). The warm-season grasses lack aesthetic appeal during the dormant season. The entries in this study were confined to cool-season grasses. The thirty-six turf grass entries being evaluated in this study are listed in Table 1.

Plot size is 5-feet wide by 20-feet long. The experiment design is a randomized, complete block with three replications. Available land space allowed for testing 36 turf grass entries (varieties). Differential irrigation -water application amounts will be applied using the line source sprinkler plot irrigation system developed by Hanks et al. (1976). Irrigation-water application amounts will be determined by placing plastic rain gauges throughout the plot area. Water use efficiencies will be determined for each of the 36 entries.

Plots were planted September 27, 2000 at a seeding rate ranging from 2 to 10 lbs per 1000 sq. ft. as specified by the seed supplier for a particular entry. Data collection will include date of winter appearance, weed growth, spring green-up, fall dormancy date, color, stand uniformity, disease incidence, relative estimate of biomass production, and water application rates. The expected duration of this experiment is three to five years.

Discussion

Most of the turf plots established well during the fall (Figs.1, 2). Plots were rated for growth and uniformity of establishment on November 2, 2000. The results of the establishment evaluation are shown in Table 1. Three entries (#28 'Reubens' Canada bluegrass, #30 - 'Barkoel' Koeleria, and #31 'MX-86' Sheep fescue) did not establish as well as other

grasses. Entries that do not establish well will be replanted during spring 2001. It is important to begin the study with a uniform, thick stand for all entries; otherwise, differences in plant performance may be caused by a variation in plant stand and not by the factor(s) imposed on the treatments.

Plots were also evaluated for fall appearance. Several turf entries, mostly tall fescues, perennial ryegrasses, and two creeping red fescues, had an overall yellow/bleached color to the plot, likely caused by winter sun bleaching (Table 1).

Fig. 2. Turfgrass plots established at the Western Colorado Research Center at Fruita. Plots were planted September 27, 2000. Photo by Calvin Pearson, October 2000.

References

Christians, Nick. 1998. Fundamental of Turfgrass Management. Ann Arbor Press. Chelsea, Michigan.

Hanks, R.J., J. Keller, V.P. Rasmussen, and G.D. Wilson. 1976. Line source sprinkler for continuous variable irrigation-crop production studies. Soil Sci. Soc. Am. J. 40:426-429.

Watson, James, R., Howard E. Kaefwer, and David P Martin. 1992. The turfgrass industry. pp. 29-88. In: Waddington, D.V., R.N. Carrow, and R.C. Shearman (co-eds.), Turfgrass. American Society of Agronomy Monograph no. 32. Madison, WI.

Acknowledgments

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Colorado State University Agricultural Experiment Station

Table 1. Growth and stand rating for each of the 36 turf grass entries at Fruita, Colorado 2000.

Turf Entry	Growth rating	Stand rating	Comments
1. Kentucky bluegrass 'Barblue'	1.8	3.0	
2. Kentucky bluegrass 'Bariris'	1.8	2.7	
3. Kentucky bluegrass 'Baronie'	2.0	2.2	
4. Kentucky bluegrass 'Bartitia'	1.8	2.3	
5. Kentucky bluegrass 'Freedom II'	2.0	3.0	
6. Kentucky bludegrass 'Newport'	1.8	3.0	
7. Tall fescue 'Barlexas'	2.8	3.0	sun-bleached leaf tips
8. Tall fescue 'Barrera'	3.0	3.0	sun-bleached leaf tips
9. Tall fescue 'Grande'	2.8	3.0	sun-bleached leaf tips
10. Tall fescue 'Survivor'	2.8	3.0	sun-bleached leaf tips
11. Perennial ryegrass 'Barclay'	3.0	3.0	sun-bleached leaf tips
12. Perennial ryegrass 'Barlennium'	3.0	3.0	sun-bleached leaf tips
13. Perennial ryegrass 'Champion'	3.0	3.0	sun-bleached leaf tips
14. Perennial ryegrass 'Pirouette'	3.0	3.0	sun-bleached leaf tips
15. Perennial ryegrass 'Premier II'	3.0	3.0	sun-bleached leaf tips
16. Creeping bentgrass 'SR1019'	3.0	3.0	
17. Creeping red fescue 'Barcrown slender'	2.2	2.7	sun-bleached leaf tips
18. Creeping red fescue 'Seabreeze'	2.0	2.8	
19. Creeping red fescue 'SR5200E'	2.5	2.5	sun-bleached leaf tips
20. Chewings fescue 'Bargreen'	2.0	2.7	
21. Chewings fescue 'Bridgeport'	2.0	2.7	
22. Chewings fescue 'SR5100'	2.0	3.0	
23. Colonial bentgrass 'SR7100'	2.7	2.7	
24. Creeping bentgrass 'Regent'	2.8	2.8	
25. Creeping bentgrass 'SR1119'	2.3	2.7	
26. Velvet bentgrass 'SR7200'	2.0	2.3	
27. Blue fescue 'SR3200'	2.0	2.5	
28. Canada bluegrass 'Reubens'	1.5	2.0	plant stand is questionable
29. Hard fescue 'SR3100'	1.8	2.5	
30. Koeleria 'Barkoel'	1.0	1.2	plant stand is questionable
31. Sheep fescue 'MX-86'	1.5	1.7	plant stand is questionable
32. Tufted hairgrass 'SR6000'	2.0	2.7	
33. Low Grow mix	2.5	2.7	
34. Nature's Choice mix	2.5	2.7	
35. Premium Lawn mix	2.2	3.0	
36. Sports Turf mix	2.5	3.0	
Ave.	2.3	2.7	

Colorado State University® Cooperative Extension

THE NATIONAL 4-H SPORTFISHING PROGRAM

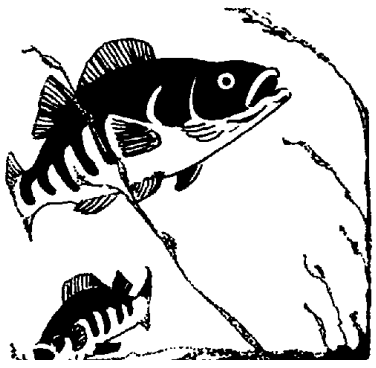
Doug Steele, Assistant Director, 4-H and youth development

Good anglers are concerned about the fish's primary need — water! Water covers about 70 percent of the earth's surface, but only about 3 percent of it is fresh water. Of this fresh water, almost 75 percent is in the form of ice. In fact, the frozen areas of the world have as much fresh water as all the world's rivers will carry for the next 1,000 years. It is very apparent that the ability to enjoy the sport of fishing in the future depends on our ability to be good stewards and managers of the limited water supply and fish habitat that is available today.

The National 4-H Sportfishing Program began in 1994 as a youth development program. It provides a comprehensive curriculum designed to develop life skills while providing information and motivation to youth and adult interested in sportfishing and aquatic resource stewardship. Colorado 4-H joined the program in 1999 by sending a team of 10 individuals to Spokane, Washington, to participate in the national workshop that was offered to train teams to implement state sportfishing programs. Team members received in depth information and materials on the five disciplines that comprise the national program: angling skills, aquatic ecology, coordinator, people and fish, and tackle crafting.

After spending the last year writing member manuals and a leaders guide for the project, Colorado 4-H will be offering a series of workshops during the fall of 2001 to introduce the program to volunteer adult leaders, who in turn, will develop local and county based sportfishing programs.

The 4-H philosophy is that the project is actually the tool or mechanism to promote positive youth development. In the sportfishing project, the idea of catching fish (although it is an important one for the youth) is really secondary to the overall concepts being taught. One vital 4-H Sportfishing Program discipline is that of aquatic ecology. Aquatic ecology is the study of aquatic organisms, the ways they interact, the places they live and the things they do. While the field of aquatic ecology is extensive, there are a handful of key concepts, terms and ideas that are most important to fishing. These concepts are taught and reinforced through activities that guide in the learning process.



Another important reason to include activities that build on aquatic ecology knowledge is to ensure the future of fishing, not only in Colorado, but also across the country. One of the examples mentions a fishing spot that was impacted by human activity. Are there any things your youth do in their every day lives that also impact the places they fish? Could your youth do anything to improve and protect the places they fish? Youth will come up with the answers to these questions through some of the activities in the project and understand that stewardship of our aquatic resources is critical to the future of fishing.

The conservation and wise use of water is also a major theme that appears throughout the curriculum. Did you know that in an average household, each person uses about 70 gallons of water per day? It takes three gallons to flush a toilet, about 15-30 gallons to take a bath and 10 gallons to wash a load of dishes.

Each year it becomes more evident that water is a precious resource that cannot be neglected or abused. Conservation of water is not just a concept needed for the future of fishing; it is needed for agriculture, industry and community development.

Water quality is another issue that can not be overlooked. If the water quality is good, more species of fish and larger populations of fish can be supported than if the water quality is poor. High-quality water will have a high concentration of oxygen. It will have a pH close to the neutral range — slightly acid to slightly basic. It will be relatively free from suspended solids, except for algae and plankton; and it will be moderate in temperature during the hottest part of the year. Some of the examples used to help youth understand the importance of pH balance include discussing how some apparently beautiful lakes are completely devoid of fish because the water quality is inadequate for nearly all aquatic life. Some productive lakes or ponds are devoid of fish life because water quality drops below tolerance levels at some time of the year. In many bodies of water or streams, the array and abundance of fishes is limited by water quality considerations.

The vision of the sportfishing program is to develop life skills in young people and adults while educating them to exercise leadership and support for responsible recreational fishing and stewardship of aquatic resources through an internationally recognized 4-H sportfishing program. It is believed that this can be accomplished by involving youth in a long-term, ongoing, community-based sportfishing and aquatic resources education program. While the 4-H sportfishing program cannot bring about positive changes towards conservation and stewardship overnight, it can begin the process to raise the awareness and appreciation of these issues.

For more information about this program, contact Doug Steele at Phone 491-6422 or E-mail dsteele@coop.ext.colostate.edu.

WATER SUPPLY

Snowfall during February slightly increased the percent of average snowpack across the state, producing a statewide March 1 value of 86 percent of normal. The Rio Grande basin currently has the highest snowpack in the state, at 103 percent of average. This is a reversal of the past few years when the Rio Grande basin, and the rest of the southwest corner of the state, had the lowest percents. Water use at this time of year is low, with reservoir filling being one of the primary river diversions.

The Surface Water Supply Index (SWSI) developed by the State Engineer's Office and the USDA Natural Resources Conservation Service is used as an indicator of mountain-based water supply conditions in the major river basins of the state. It is based on snowpack, reservoir storage, and precipitation for the winter period (Nov. through April). During the winter period, snowpack is the primary component in all basins except the South Platte Basin, where reservoir storage is given the most weight. The following SWSI values were computed for each of the seven major basins for March 1, 2001, and reflect conditions during the month of February.

Basin	3/1/01 SWSI Value	Change from the Previous Month	Change from the Previous Year
South Platte	-1.0	-0.1	-2.6
Arkansas	-1.6	-0.1	-0.4
Rio Grande	+1.3	+0.5	+4.0
Gunnison	-1.6	+0.2	+0.2
Colorado	-2.2	+0.1	+1.3
Yampa/White	-2.5	-0.5	+1.8
San Juan/Dolores	+1.7	+2.3	+4.2

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

ARE YOU FIREWISE?
A COMMUNITY FIRE PREVENTION PARTNERSHIP

by: Judy Serby and Katherine Timm, Colorado State Forest Service

The billowing smoke that was so visible on Colorado's western horizon last summer may be nothing more than a distant memory to some, but to others, it represents a painful lesson. Colorado residents who own property in or near the Bobcat Gulch or Hi Meadow fires vividly remember the helplessness they felt as they quickly grabbed whatever personal effects they could before evacuating their homes.

Recognizing the ever-increasing threat of wildfire, the Colorado State Forest Service and several partnering agencies and organizations developed a Red Zone assessment a few years ago to determine geographic areas of the state where the highest probability of wildfire occurrence existed. This was accomplished by gathering data on hazards, risks and social values.

Initially, the assessment identified Colorado's Front Range and a few other high-population areas as those with the greatest potential for catastrophic losses due to fire. Since then, the assessment was expanded to include all areas that have a wildland/urban interface problem. The wildland/urban interface is defined as property or land "where humans and their development meet or intermix with wildland fuels."

Recent estimates indicate that as many as 750,000 people reside in the Red Zone. Property in this area is often surrounded by dense, overgrown stands of trees where fuel is abundant. This factor—combined with increased development and 50 years of fire suppression—puts homeowners, residential structures and firefighters at great risk. When these fires occur, suppression activities cost taxpayers millions of dollars. Additional costs, which often go unmeasured, include habitat destruction, watershed damage, air quality problems, recreational impacts, damage to overall forest health, and impacts to aesthetics.

Along with these staggering statistics, the assessment yielded another important piece of information: The public identified education as a critical tool to reduce risks to life and property due to wildfire. As a result, Colorado's Are You FireWise? program evolved. The program enables people to take measures that make their properties and surrounding communities defensible. Through the use of fact sheets and a brief video, step-by-step guidance is provided on the following topics:

- creating access to property for fire equipment and personnel
- establishing an emergency water supply
- creating defensible space to slow the rate and intensity of an advancing fire and allow fire suppression operations to occur
- removing flammable native vegetation and replacing it with low-growing, fire-resistant plants
- using construction design and materials that reduce the chance of a structure catching fire or resisting further damage if it does
- installing residential fire sprinkler systems, smoke detectors and fire extinguishers
- planning an escape route
- creating a fire-prevention checklist and an emergency wildfire survival checklist

The FireWise kit is designed so that county personnel can localize pertinent sections to accommodate county ordinances.

Kristin Garrison, Forester, Colorado State Forest Service-Franktown District, provides FireWise training in Salida to CSFS staff and representatives from other agencies in the area.

Since the program's inception, the Colorado State Forest Service has offered introductory presentations and train-the-trainer sessions around the state. The goal is to have professional firefighters share the information with local constituents such as homeowners associations and landowners.

Beyond these key audiences, CSFS also will deliver the FireWise program to land-use planners, developers, commissioners, real estate agents, insurance agents and others who are interested in learning about how to protect property from catastrophic fire.

For more information about the FireWise program, contact

Judy Serby or Katherine Timm at 970/491-6303.

MEETING BRIEFS

COLLABORATION, COOPERATION AND COMMUNICATION: THE FUTURE IN WATER QUALITY MONITORING

by Canda Lorson

The title speaks for itself. **Collaboration, Cooperation and Communication** are the keys for the future in water quality monitoring. Different entities affiliated with water quality presented posters and research on topics ranging from data analysis to monitoring strategies and sharing information at the AWRA Conference held in Golden, Colorado, March 15-16, 2001. The conference was co-sponsored by the Colorado Water Quality Monitoring Council (CWQMC).

The National Water Quality Monitoring Council (NWQMC) was represented at the conference. Charles Spooner, of the Environmental Protection Agency, and Holly Huyck, CWQMC Coordinator, discussed the role of their councils — to provide collaboration and communication among the different water quality monitoring agencies. The CWQMC conducted a data swap on January 22, 2001, to learn what helps and hinders sharing data and information among agencies. Dr. Huyck presented results of the data swap, which included the observation that while there is some duplication of data collection, there are many opportunities to share data and information. Questions were asked about the reliability and quality of the data being shared. The agencies and organizations that work with water quality data noted the differences in databases in which they store data. When compatible methods are created and agreed upon, it will be possible to share data among agencies.

Charles Spooner highlighted one method for comparing data - The National Environmental Methods Index, which will be a web-based data system that permits rapid communication and comparison of methods. Spooner also expressed a renewed emphasis on the EPA's part to implement Section 106(c) of the Clean Water Act, suggesting this emphasis will allow the EPA to direct support toward enhanced monitoring efforts across the country. Spooner also mentioned other states that have active water quality councils, such as Virginia, Oklahoma, Texas and Maryland.

Dr. Emery Cleaves, the State Geologist of Maryland, discussed the history and development of the Maryland Water Quality Monitoring Council, including the ups and downs of initiating the council and the stability achieved by gaining support from state and local agencies. Colorado has modeled its own development of a water quality monitoring council after that of Maryland.

The evolution of water quality monitoring was evident in the presentations of new methods that are being developed and used for water quality monitoring of nutrients, pesticides and pharmaceutical compounds. Charles J. Patton, Mark W. Standstrom and Edward T. Furlong from the USGS National Water Quality Laboratory discussed the details involved with these new methods.

Public Awareness was the topic for Paul F. Hampel and Chris Rowe. Hampel, Coordinator, Roaring Fork Conservancy, showed how a volunteer group can be effective in sampling and testing water. Volunteers in the Roaring Fork Conservancy show their dedication to water quality protection through monthly collection and testing of samples as well as relaying the information to the Conservancy coordinator.

Chris Rowe, Executive Director, Colorado Watershed Network (CWN), helps watershed groups like the Roaring Fork Conservancy develop monitoring strategies, implement water quality monitoring and utilize water quality data. The CWN assists watershed groups as well other agencies collaborate with the goals of: (1) protecting watersheds; (2) increasing water quality understanding; and (3) developing long-range approaches to acquiring and managing water quality data at the watershed scale as well as sharing information with the public. CWN also directs River Watch group, under contract of the Division of Wildlife.

The United States Geological Survey was well represented at the conference. Topics ranged from 'Integrated Assessment of Water Quality and Stream Ecology in the Eagle River Watershed, Colorado', by Kirby H. Wynn, to 'The Importance of Streamflow Monitoring at Water Quality Sampling Locations', by David K. Mueller and Dennis R. Helsel. Wynn's study of the Eagle River was to determine the key land uses affecting water quality using algal and macroinvertebrate-community analysis. Mueller and Helser's presentation described the uses of long and short term streamflow monitoring and its importance.

The presentations and posters at this year's AWRW conference in Golden, Colorado were excellent. The opportunity to dialogue on these topics, during breaks and socials, provided great opportunities for everyone to discuss additional problems and even a few solutions concerning water quality monitoring. After the questions are answered and new agreements are made, Collaboration, Cooperation, and Communication is going to lead to rapid and easy sharing of data and information. This in turn will foster more efficient use of limited monitoring funds while expanding the information available on Colorado Water Quality.

COLORADO WATERSHED ASSEMBLY FORMS

by Chris Rowe, Executive Director of the Colorado Watershed Network

The Colorado Watershed Assembly held an organizational meeting in Silverthorne February 2, 2001.

In Colorado, there are more then forty local watershed initiatives involving citizen-based watershed groups. These initiatives vary in their missions and participants, but all share a common focus: a strong commitment to protect the health of the aquatic systems and the life that depends on them. Often these groups are collections of existing groups that are interested in working on common problems through a consensus approach. The strength of these diverse, often differing, organizations is in working together locally on common problems.

Representatives from Colorado watershed groups along with nonprofits, and governmental agencies have formed the Colorado Watershed Assembly. The CWA serves to formally link together the growing number of people and entities committed to collaborative, watershed-based approaches to conserving Colorado's lands, waters, and other natural resources.

To facilitate communication with and among those working on watershed issues, CWA organizes and presents an annual conference. This year's conference is in Frisco on September 7th and 8th. CWA hosts a watershed listserv for information sharing (rapids.rivernetwork.org/cgi- bin/mailman/listinfo/coloradowatersheds). It maintains a web site with up-to-date contact information for all Colorado watershed groups, nonprofits, and government (www.coloradowatershed.org/cwa.htm). It generates and communicates information about sources of financial and technical assistance for watershed activities, new and changing governmental programs, relevant legal and policy developments, activities in other states, and other meetings and workshops of interest. It fosters coordination of watershed-related governmental programs and activities in Colorado through its agency working group.

Membership in the Colorado Watershed Assembly is open to any group or individual supporting the Assembly's mission statement and statement of operating principles. That mission is: *The Colorado Watershed Assembly supports collaborative efforts to protect and improve the conservation values of the land, water, and other natural resources of Colorado watersheds*. The CWA is an "organization of organizations," besides representatives of the watershed community, andrepresentatives from all government agencies with watershed interests are encouraged to be involved. To learn more contact Chris Rowe at 303-291-7437.

CWRRI

CSM WATER NEWS

International Ground-Water Modeling Center

Colorado School of Mines
Golden, Colorado, 80401-1887, USA
Telephone: (303) 273-3103 / Fax: (303) 384-2037
Email: igwmc@mines.edu

igwmc

Short Course Schedule

Polishing Your Groundwater Modeling Skills	MAR 13-16	$1345	$1545 after 2/23
Applied Environmental Statistics	MAY 21-24	$1395	$1495 after 5/11
Zero to Kriging in 30 hours	JUN 7-10	$1245	$1445 after 5/24
MODFLOW: Introduction to Numerical Modeling	SEP 8-11	$895	$1095 w/o Modflow 2001*
Subsurface Multiphase Fluid Flow and Remediation Modeling	SEP 9-11	$895	$1095 w/o Modflow 2001
UCODE – Universal Inversion Code Automated Calibration of "Any" Code	SEP 10-11	$795	$995 w/o Modflow 2001
Practical Simulation/Optimization Modeling for Optimal Groundwater Management	SEP 10-11	$845	$1045 w/o Modflow 2001
Model Calibration Using PEST	SEP 14-16	$795	$995 w/o Modflow 2001
MT3DMS Workshop	SEP 15	$395	$495 w/o Modflow 2001
Advanced Modeling of Water Flow and Solute Transport in the Vadose Zone	SEP 15-16	$495	$595 w/o Modflow 2001

* MODFLOW 2001 Conference will be held on the Colorado School of Mines Campus in Golden, Colorado September 11-14, 2001.

FOR INFORMATION CALL (303) 273-3103 -- FOR REGISTRATION CALL (303) 273-3321
VISIT http://www.mines.edu/igwmc/ FOR MORE INFORMATION

CU WATER NEWS

THE NATURAL RESOURCES LAW CENTER PRESENTS TWO DECADES OF WATER LAW AND POLICY REFORM: A RETROSPECTIVE AND AGENDA FOR THE FUTURE

June 13-15, 2001, Boulder, Colorado

The Natural Resource Law Center's annual conference this year focuses on the agendas for reforming and improving water law and policy that emerged during the past two decades. The purpose of the Conference is to assess what has (and has not) been accomplished by pursuing these reforms, to explore lessons and implications, and to prognosticate on the future of water law and policy. Sessions will feature "keynote" presentations that provide an overview of the following issues as well as commentary from a variety of perspectives: (1) using water more efficiently, (2) securing water for federal purposes, (3) acquiring water for tribal uses, (4) allocating water for environmental purposes, (5) facilitating changes in water use through markets and other innovations, (6) clarifying state water rights, (7) integrating science and technology into water management, and (8) improving the governance of water resources. Introductory and concluding sessions will provide an overview of the issues and a discussion of implications for future policy making. In addition to a number of distinguished experts in water law and policy, former Secretary of Interior Bruce Babbitt and current Secretary Gale Norton have been invited to speak at the conference.

The agenda and registration form are available at the Center's website at
http://www.colorado.edu/Law/NRLC/Conference/2001conference.html
Natural Resources Law Center, University of Colorado School of Law, 401 UCB
Boulder, CO 80309-0401
Phone: (303) 492-1272 Fax: (303) 492-1297

CU WATER NEWS

THE NATURAL RESOURCES LAW CENTER PRESENTS

HOT TOPICS in Natural Resources

April 26, 2001

"Messages From Frank's Landing"
Speaker: Charles Wilkinson, University of Colorado School of Law
Readings from Wilkinson's book and discussion of tribal sovereignty
To be held at Holland & Hart, 555 17th Street, 32nd Floor, Denver
details available at: www.colorado.edu/Law/NRLC/hottopics.htm#April26

May 14, 2001

"Mining and Sustainable Development: A Global Perspective"
Cecilia Dalupan, 2001 NRLC El Paso Energy Corporation Law Fellow
To be held at Holland & Hart, 555 17th Street, 32nd Floor, Denver
details available at: www.colorado.edu/Law/NRLC/hottopics.htm#May14

Western Water Resources Research

The Natural Resources Law Center (NRLC) is continuing its long-standing tradition of water resources research. One such project is the center's "water and growth in Colorado" report, an outgrowth of the Center's June 2000 conference on water and growth in the West, that is prompted by the explosive growth in Colorado's population and economy. This growth raises several difficult issues involving water resources development, allocation and management. The report will provide an overview of those issues, focusing not only on the particulars of specific situations, but also on the strategies that have been, or could be, used to address these challenges. A somewhat related set of issues is associated with the Center's ongoing work under the Western Water Assessment, a NOAA-sponsored effort evaluating the legal and institutional issues raised by the potential impacts of climate change and variability on the water resources of the South Platte and the Upper Colorado River Basin.

Land Management at the Urban/Wildland Interface

Another new NRLC initiative is the Western Lands Program, which examines the interaction of communities, resources, and public policy in the rapidly growing and problematic urban/rural transition. Some of the policy issues emerging from these investigations include the need to better reconcile local collaborative processes with national mandates (e.g., roadless-area policies and national monument designations), the challenges associated with fostering enhanced interagency coordination, and the necessity of promoting interjurisdictional cooperation to reflect ecological and political boundaries as well as community interests. Some of the substantive resource issues include endangered species, mineral development, water quality and quantity, and wild fires and forestry.

The University of Colorado at Denver
College of Engineering and Applied Science
offers
ADVANCED URBAN STORMWATER MODELING

Course Overview— NCES 8235
This two-day course will provide a comprehensive review and practice with the stormwater modeling methodology and procedures using the Colorado Urban Hydrograph Procedures in combination with the Urban Drainage Stormwater Model, a kinematic flood routing model. The course will focus on hands-on uses of the latest versions of the personal computer models CUHP98 and UDSWM2000, the latter originated from the Runoff Block of the EPA Stormwater Management Model. Workshops will be conducted using local urban watersheds as examples covering many urban drainage features, such as streets, sewers, road-side ditches, diversions and detention basins and the application of these models in drainage design and analysis.

Who Should Attend
This course is intended for civil and drainage engineers, hydrologists, water resources specialists and stormwater management professionals working for city and county engineering departments, consulting firms, and other agencies that have interests in stormwater management and design.

Course Description
The course will concentrate on:

- Watershed Drainage Characteristics
- Unitgraph Method
- Drainage Network Modeling
- Watershed Diversions
- Detention Basin Modeling
- Comparisons between CUHP98 and UDSWM2000

Upon completion of the course, participants will have working knowledge of the models and their application to complex urban systems.

Instructors
James C.Y. Guo, Ph. D., P. E.. He has published more than thirty technical articles in the area of Stormwater Modeling and Analysis and has developed several stormwater prediction methods and modeling.

Ben Urbonas, P. E., He has led an effort for consistent and updated applications of the CUHP98 and UDSWM2000 computer models and stormwater design methods developed for urban areas.

Course Details
Dates: May 24 and 25, 2001; Thursday and Friday
Times: 8:00 a.m. - 5:00 p.m.
Location: Auraria Campus, downtown Denver
CEUs: 1.6 Continuing Education Units
Cost: $645
Registration www.cudenver.edu/engineer/cont.

For more information contact:
Colleen Anderson, Marketing/Program Coordinator
Continuing Engineering Education Program
Campus Box 115, P.O. Box 173364
Denver, Colorado 80217-3364
Voice: 303-556-4907 303-556-6688 E-Mail csanders@carbon.cudenver.edu

NEW FACULTY PROFILES

by Marian Flanagan

Dr. Raj Khosla
Department of Soil and Crop Sciences
Colorado State University

The Department of Soil & Crop Sciences' newest assistant professor is Dr. Raj Khosla. Dr. Khosla graduated from the University of Allahabad in India, with a Bachelor's Degree in Agricultural Sciences, and earned his M.S. in Soil Physics and his Ph.D. in Soil Fertility from Virginia Tech.

Dr. Khosla is responsible for the Precision Farming and Irrigated Cropping Systems Research, Extension and Teaching Program at CSU. By applying new technologies, such as global positioning systems and geographic information systems, to farming — called precision agriculture — Dr. Khosla and a team of scientists are finding ways to make agriculture more profitable and more environmentally sensible at the same time. He is working on the development and evaluation of precise crop-input management techniques, which involve managing the spatial variability of soils. This can increase a farmer's bottom line by identifying field regions with inherent properties that limit grain yield. Khosla explains, "By using variable rate applicators, farmers can bring the net dollar return of the whole field to the same level,…reducing inefficient blanket application rates of nitrogen over less productive areas…[and]decreasing nitrogen levels that can potentially leach into the ground water."

Dr. Khosla's research includes evaluating remote sensing techniques to quantify crop stress conditions in irrigated corn, obtaining tissue samples and chlorophyll meter measurements called "ground truthing", and then running spatial correlations with satellite images to make site-specific N-recommendations. His interests in economic analysis of precision farming and remote sensing techniques to evaluate when and where such practices will become profitable, offer tremendous value to farmers and the environment, and indirectly and ultimately affect the water quality.

Dr. Khosla and his wife Reena, have a six-month old son, Milan. Dr. Khosla has traveled in Asia, Europe, North & Central America, and plans his next visit to Latin America. He likes traveling, reading, and soft instrumental music.

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 supplements to existing awards. The new projects are highlighted in bold type.

COLORADO STATE UNIVERSITY
FORT COLLINS, CO 80523

Title	PI	Dept	Sponsor
Water Quality Control Division Riparian Classification	Kittel, Gwen M	FWB	CDPHE
Comprehensive Statewide Wetland Characterization & Classification	Culver, Denise R	FWB	CDNR
Spatial Integration of Regional Carbon Balance in Amazonia	Denning, A Scott	Atmospheric Sci.	NASA
Introduction Chapter of the PMJM Recovery Plan	**Schorr, Robert**	**FWB**	**USFWS**
Identifying Ecosystem Controls on Biodiversity: a US & UK Project (Collaborative Research)	Wall, Diana H	NREL	NSF
Use of ARM Data to Develop & Test Improved Cloud Parameterization	Randall, David A	Atmospheric Sci.	DOE
Developing a Landscape Approach to Evaluation of Wetland Condition in the Southern Rocky Mountains	**Steingraeber, David A**	**Biology**	**CDNR**
Shipboard Radar Observations of Precipitating Convection in EPIC 2001	**Rutledge, Steven A**	**Atmospheric Sci.**	**NSF**
Development of a Statistical Tropical Cyclone Rainfall Algorithm	Vonderhaar, Thomas H	CIRA	Florida Internat'l University
Monitoring the Effects of the Bobcat Fire	Stednick, John D	Earth Resources	USDA-USFS-RMRS
TRMM Precipitation Radar & Microphysics: Interpretation & Precipitation Estimation	Venkatachalam, Chandrasekaran	Elec. & Computer Engr.	NASA
Towards a Multisensor Approach to Improve on Current Tropical Rainfall Measurement…	Stephens, Graeme L	Atmospheric Sci.	NASA
Use of Tropical Rain Measuring Mission Data to Test an Improved Parameterization of Stratiform Precipitation	Randall, David A	Atmospheric Sci.	NASA
Interaction of the Cloudy Arctic Boundary Layer with Variable Surface Conditions	Randall, David A	Atmospheric Sci.	NASA
Hierarchical Physical Classification of Western Streams	**Bledsoe, Brian**	**Civil Engr.**	**EPA**
Demonstration Erosion Control Monitoring Program 2000-2002	Watson, Chester C	Civil Engr.	COE

FEDERAL SPONSORS: BLM-Bureau of Land Management, COE-Corps of Engineers, DOA-Department of the Army, DOD-Department of Defense, DOE-Department of Energy, DON-Department of the Navy, DOT-Department 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, , USBR-US Bureau of Reclamation, USDA/ARS-Department of Agriculture, Agricultural Research Service, USDA/NRS-Department 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 Department of Natural Resources, CDPHE-Colorado Department 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., CIRA-Cooperative Inst. for Research in the Atmosphere, DARE-Dept. of Agric. & Resource Economics, FWB-Fishery & Wildlife Biology, HLA-Horticulture & Landscape Architecture, NREL-Natural Resource Ecology Lab, NRRT-Nat. Resources Recreation & Tourism, RES-Rangeland Ecosystem Science. 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, 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	Dept	Sponsor
Wetland, Aquatic & Riparian Protocols	Wohl, Ellen E	Earth Resources	Univ.of Wy.
Activities & Participation in DMSP Satellite Data Processing & Analysis	Vonderhaar, Thomas H	CIRA	NOAA
Developing a Mesoscale Observing Network over the North Atlantic Continent and Adjacent Ocean Areas	Vonderhaar, Thomas H	CIRA	NOAA
Using Genetically Engineered Plants to Elucidate Factors Controlling Heavy Metal Tolerance…	Pilon-Smits, Elizabeth	Biology	EPA
Human-Induced Land Cover Change, Biophysical Responses, & Implications for Land Resource Management	**Pielke, Roger A**	**Atmospheric Sci.**	**USGS**
Develop a Comprehensive Restoration Plan for Agua Fria Creek, El Malpais, New Mexico	Smith, Freeman M	Earth Resources	NPS
Development & Evaluation of Fishery Management Options for the Control of Salmonid Whirling Disease	**Bergersen, Eric P**	**Coop Fish & Wildlife Research**	**USGS**
Coordinated Analysis of Fully Polarimetric CSU-CHILL Radar Signatures with Surface…	Bringi, Viswanathan N	Elec. & Computer Engr.	NSF
Developing Sustainable Dryland Cropping Systems in SW Colorado	Berrada, Abdelfettah	SW Colo. Res. Ctr.	Utah State Univ.
Analysis of Pre- & Post-Restoration Hydrology of a Pine Savanna Wetland at Moores Creek National Battlefield, NC	**Cooper, David J**	**Earth Resources**	**NPS**
Watershed Research in the United States National Parks	Binkley, Daniel E	Forest Sciences	USGS
Riparian Vegetation Studies on the Green & Yampa Rivers	Cooper, David J	Earth Resources	USBR
Rio Grande Channel Maintenance Mode	Abt, Steven R	Civil Engineering	USBR
Research & Education Activities to Enhance Water Management & Conservation in Southwest Colorado	Berrada, Abdelfettah	SW Colo. Res. Ctr.	USBR
Development of an Airborne Cloud Water Sampler	**Collett, Jeffrey L. Jr**	**Atmospheric Sci.**	**NSF**
Biological Resources Division Global Change Data Management & Program Support	Simmons, Carol L	NREL	USGS
Training & Education for Agricultural Chemicals & Groundwater	Waskom, Reagan M	Soil & Crop Sci.	CDA
Electrically Induced Redox Barriers for the In-Situ Treament of Contaminated Groundwater	**Sale, Thomas C**	**CBE**	**DOD**
Inventory & Monitoring Natural Resource Status & Trends in the National Park Systems	Hannah, Judith L	Earth Resources	NPS
Kokanee in Blue Mesa Reservoir: Causes for their Decline & Strategies for Recovery	Johnson, Brett M	FWB	NPS
Arkansas River Water Quality	**Clements, William H**	**FWB**	**CDWL**
Towards a Multisensor Approach to Improve on Current Tropical Rainfall Measurement Mission . . .	Stephens, Graeme L	Atmospheric Sci.	NASA
Characterization Channel Disturbance Regimes in Hydroclimatically Extreme Regions	Wohl, Ellen E	Earth Resources	DOD-ARMY
Development & Test of Fuel Loadings Disturbance & Fire Spread Models Based on Satellite Imagery & Field Surveys	**Reich, Robin M**	**Forest Sciences**	**USDA-USFS-RMRS**
Predicting the Effects of Ecosystem Fragmentation	**Noon, Barry R**	**FWB**	**No. Arizona Univ.**
Riparian CD ROM Project	**Culver, Denise R**	**FWB**	**Nature Conservancy**
TRMM Precipitation Radar & Microphysics: Interpretation & Precipitation Estimation	Venkatachalam, Chandrasekaran	Elec. & Computer Engr.	NASA
Use of Tropical Rain Measuring Mission Data to Test an Improved Parameterization of Stratiform Precipitation	Randall, David A	Atmospheric Sci.	NASA
Analysis of Data from Tropical Rainfall Measuring Mission to validate Tropical Rainfall Measuring Mission…	Rutledge, Steven A	Atmospheric Sci.	NASA

UNIVERSITY OF COLORADO
BOULDER, COLORADO 80309

Title	PI	Dept	Sponsor
Sediment Flux to the Coastal Zone: Predictions for the Navy	**Syvitski, James**	**IAAR**	**DON**
Origins of Coastal Uplift in San Diego and Orange Counties: Huge Blind Thrusts or a Sesmic Rift Shoulder	**Mueller, Karl**	**Geological Sci.**	**USGS**
A Regional, Integrated Monitoring System for the Hydrology of the Pan-Arctic Land Mass	Serreze, Mark	CIRES	NASA
Global Land Ice Measurements from Space	Scharfen, Gregory	CIRES	NASA
Snow and Ice Distributed Active Archive Center	Barry, Roger	CIRES	NASA
Evaluation and Verification for Application to Land-Use Change: Atmospheric Correction, Soils and Sparse Vegetation Mapping	Goetz, Alexander	CIRES	NASA
A Study of Sea Level Change in the NE U.S. Using GPS and Tide Gauge Data with Applications to Global Sea Level Change	**Nerem, Robert S.**	**ACAR**	**NSF**
Alternatives in Waste Cover Systems and in Engineering Education	**Zornberg, Jorge**	**CEAE**	**NSF**
Feedback Coupling Between Flow and Reactions in Heterogeneous Porous and Fractured Media	Rajaram, Harihar	CEAE	NSF
…A Study of the Spatial and Temporal Transitions of Climate and Ecosystems in the Circumpolar Arctic	Lynch, Amanda	CIRES	NSF
Modularity in the Development and Evolution of the Dentition of Teleost Fishes	**Smyth, Joseph**	**Geological Sci.**	**NSF**
The Niwot Ridge Long-Term Ecological Research Program - Controls on the Structure, Function and Interactions of Alpine and Subalpine Ecosystems of the Colorado Front Range	Seastedt, Timothy	IAAR	NSF
Paleoglaciology of Alaska - Climate Parameters During the Last Glacial Maximum from GIS Determination of Equilbrium Line Altitudes	Manley, William	IAAR	NSF
Investigation of Soil Aquifer Treatment for Sustainable Reuse: Characterization of Effluent Organic Matter	Amy, Gary	CEAE	Arizona State Univ.
Water Resources Issues Within the Integrated Assessment of the Human Dimensions of the Global Change	Strzepek, Kenneth	CEAE	Carnegie Mellon Univ.
Demonstration of Emerging Technologies for Arsenic Removal	**Amy, Gary**	**CEAE**	**HDR Engr., Inc.**
Merging Infrared Sea Surface Temperature with Satellite Altimetry to Map Ocean Currents in Two Coastal Domains	Emery, William	ACAR	Jet Propulsion Lab
Analysis of Airborne Data for Validation of Cloudsat Ice Cloud Measurements	Evans, K. Franklin	PAOS	Jet Propulsion Lab
Using Multi-Sensor Data to Model Factors Limiting Carbon Balance in Global Arid and Semiarid Lands	**Asner, Gregory**	**Geological Sci.**	**Colo. State Univ.**
Conservation Genetics of Poolfish (Empetrichthyes)	Martin, Andres	EPOB	Nev. Div. Of Wildlife

Water, not unlike religion and ideology, has the power to move millions of people. Since the very birth of human civilization, people have moved to settle close to water. People move when there is too little of it; people move when there is too much of it. People move on it. People write and sing and dance and dream about it. People fight over it. And everybody, everywhere and every day, needs it. We need water for drinking, for cooking, for washing, for food, for industry, for energy, for transport, for rituals, for fun, for life. And it is not only we humans who need it; all life is dependent upon water for its very survival.

Mikhail Gorbachev
Civilization, Oct.-Nov. 2000
(Library of Congress newsletter)

PUBLICATIONS

CWRRI PUBLICATIONS

South Platte Mapping and Analysis Program (SPMAP) - Decision Support Tools for the Lower South Platte, by Luis A. Garcia, Dave Patterson, and Robert W. Lange, Integrated Decision Support Group; in cooperation with: Jon Altenhofen, Northern Colorado Water Conservancy District, James R. Hall, State Engineer's Office, Colorado Division of Water Resources, Forrest Leaf, Central Colorado Water Conservancy District, and Jack Odor, Groundwater Appropriators of the South Platte. Completion Report No. 193. Free. To obtain a copy call 970/491-6308 or email CWRRI@colostate.edu.

U.S. GEOLOGICAL SURVEY PUBLICATIONS

Contact the U.S. Geological Survey, Box 25046, MS415, Denver Federal Center, Lakewood, CO 80225. Phone 1-888-ASK-USGS or 303/202-4700 (unless another source is provided). Website: **http://webserver.cr.usgs.gov**.

Pesticides in Surface Waters of the Upper Colorado River Basin, Colorado, 1996-98, by Nancy J. Bauch and Norman E. Spahr. 2000. Water-Resources Investigations Report 00-4005.

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WATER NEWS DIGEST

by Marian Flanagan

ENDANGERED SPECIES

Rio Grande Silvery Minnow still in peril

Water officials from Colorado, New Mexico and Texas gathered at Adams State College for the annual meeting of the Rio Grande Compact Commission on March 22, and were told that the status of the 3-inch silvery minnow is "unimproved from 1999," according to a report from compact engineers. Officials last year released millions of acre-feet of water from several New Mexico reservoirs to keep the river "wet" enough to support the tiny fish. Tom Tunney, New Mexico's compact representative, said "Even if all human uses cease entirely, it would not be sufficient enough to keep the river wet all the way to Elephant Butte Reservoir. State and federal money must be secured, and steps must be taken to prevent the minnow's extinction."

Denver Post, 3/23/01

Natural Resources chief Greg Walcher and Attorney General Ken Salazar have written to Interior Secretary Gale Norton urging her to delay the issuance of recovery goals for four endangered fish – the razorback sucker, Colorado pikeminnow, humpback chub and bonytail chub. "We cannot accept goals that may conflict with Colorado water law and vital reservoir operations," the two wrote in their letter. Fish and Wildlife officials had hoped to publish their draft recovery goals in the Federal Register, but the agency gave Colorado until April 11 to submit additional comments.

Denver Post, 3/24/01

FLOODPLAIN MANAGEMENT

Cities unite to pursue comprehensive flood strategy

Cities with a stake in the Fountain Creek watershed and an emerging watershed plan are Pueblo, Fountain, Colorado Springs, Green Mountain Falls, Manitou Springs, Monument, Palmer Lake and Woodland Park. The Pikes Peak Area Council of Governments is developing the plan with financial support from the Pueblo Area Council of Governments. The plan will identify critical issues in the watershed, possible technical and policy solutions, and changes in the main part of Fountain Creek over the past 30 years. Aerial photos of Fountain Creek taken by the U.S. Department of Agriculture in 1955 and after the 1999 flood show drastic movement of the creek in some places - for example at Pinon, where by 1999 the creek had moved quite a distance to the east and had severely damaged the Pinon Bridge. A federally funded reconnaissance study of Fountain Creek currently is being done by the Army Corps of Engineers to determine if there is benefit to the design and construction of flood or environmental restoration projects. The study includes identifying a local sponsor to split the cost of a feasibility study, estimated at $2 million to $4 million. More information about the Fountain Creek Watershed Plan can be obtained at the Web site: www.fountain-crk.org

Pueblo Chieftain, 3/23/01

INSTREAM FLOWS

Park Service files for water rights in Black Canyon

The Black Canyon of the Gunnison National Park recently filed a claim in Colorado Water Court for a federal reserved water right for the park. In 1933, the Black Canyon of the Gunnison River became a national monument entitling it to a federal reserved water right. At that time there was no decision quantifying the amount of water for the right, but required the federal government to return to court with a claim to quantify the right, according to Sheridan Steele, Park Superintendent. A 1978 court ruling reaffirmed that water right. The proposed claim focuses on river flow to meet park needs, considering water flows that mirror the park's pre-dam days and mimic historical flows..." said Steele. It calls for a 300 cubic-feet-per-second (cfs) year-round base flow with the recognition of a higher flow during wet years. NPS "got serious" about proceeding with the claim 10 years ago. It completed research necessary to study river flows and what it means to the canyon. The Bureau of Reclamation, Bureau of Land Management and Western Power Administration were involved to gain a consensus on the water rights.

Rod Kuharich, newly appointed executive director of the Colorado Water Conservation Board, met with the Colorado River Water Conservation District in January, where he discussed the NPS quantification claim. According to CRWCD board member Marlene Zanetell, Kuharich feels the appropriation date for the rights (1933 when the canyon became a monument) is a problem, and that the Park Service should be held to a 2001 appropriation date with a re-regulating structure that provides water for the monument without interfering with power production.

Gunnison Country Times , 2/8/01

Deadline nears for Black Canyon water opposition

The Upper Gunnison Water Conservancy District (UGRWCD) held a special meeting March 15, as the March 30 deadline to file applications opposing the National Park Service's (PS) water quantification claim for the Black Canyon neared. "The preliminary engineering findings reveal the Black Canyon quantification claim would have a significant impact on junior water rights," UGRWCD manager Kathleen Curry said. The PS claim is for a year-round base flow of 300 cubic feet per second (cfs), an approximate 85-day shoulder flow period around 600-700 cfs, and a 20-30 day peak flow cycle. Curry explained to those at the well-attended meeting the PS's purpose is to protect the purpose of the monument by clearing the canyon of vegetation and making sure sediment does not accumulate. UGRWCD conducted a preliminary engineering study to assess the PS's claim, looking at the past four years. Curry said that in a normal year such as 1999, 75 percent of normal inflows are not adequate to meet the needs of the proposed claim. Pending runoff, there would be 85 days of call to meet the Black Canyon claim beginning in mid to late June with a possible call on junior rights. The study looked at 1997, a wet year that was 136 percent of normal. "Even in a wet year, we'd have 18 days of call," Curry said. With an engineering recommendation to look at more years, the knowledge that other entities are interested in the Black Canyon claim, the considerations of how to meet flows, and the possibility of a lengthy legal proceeding that lies ahead, Curry and the board instructed legal council to draft a statement of opposition. "The Aspinall Unit and UGRWCD hold a 1957 right. The 1957 priority date and not the 1933 makes a big difference obviously to people here," Curry said. She said the district supports the PS's concept originated at a 1998 meeting of a 1957 coequal date, which honors the subordination agreement, that 60,000 acre-feet of depletion will not be called on by the Aspinall Unit. All users junior to 1933 would be protected under the concept.

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Gunnison Country Times, 3/ 22/01

Allard seeks to repeal bypass flow requirement

Colorado Senator Wayne Allard is asking Sec. of Agriculture Ann Veneman to repeal a federal requirement that local governments release enough water from mountain reservoirs to keep minimum flows in rivers. The battle over bypasses started in 1990, when the Forest Service attempted to use federal land-use authority to order cities with storage facilities on forest lands to relinquish part of their water supply. Bypass means allowing a certain amount of water to bypass storage facilities. Numerous facilities store water in the national forests. The Forest Service requires Northern Colorado cities to release bypass flows at certain times to maintain a minimum flow in the Poudre River. In exchange, the cities receive a renewal of their special-use permits on high-mountain reservoirs. This has resulted in legal battles in Colorado involving the Arapaho-Roosevelt National Forest and Front Range water users.

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Fort Collins Coloradoan, 3/28/01

Voluntary river flow plan endorsed

Speakers at the Arkansas River Basin Water Forum gave a voluntary program to regulate flows in the Arkansas River west of Pueblo high marks. Water users such as Pueblo's Board of Water Works, the Colorado Springs Utilities, the U.S. Bureau of Reclamation and the City of Aurora participate in the program. The program relies on reservoirs near Leadville and Lake Pueblo to allow water managers to run water at some times and hold it at others to meet the different needs of municipal water users, anglers and rafters. Pueblo, like other water owners, was afraid the program would interfere with the city's ability to move water when and where it wanted, but the reason the program works now is because it is voluntary and because participants have worked together long enough to trust each other. Participants sign yearly agreements to abide by the program. The program has a lot of flexibility for water users, allowing a water user to release water from a mountain reservoir one day and make it up later when conditions are more favorable. It has eliminated flow management lawsuits, water users are pleased and the program is likely to be copied along other rivers.

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The Pueblo Chieftain, 3/24/01

OUT-OF-BASIN TRANSFERS/MITIGATION

Communities want compensation when farmers sell water

Stymied in their efforts to prevent transfers of their water, some rural communities are asking cities and companies for compensation for economic harm when they buy farming water rights. Still, questions remain over how communities should be compensated, whether mitigation should be required and whether it would interfere with property rights. Some counties have argued for a state law requiring mitigation, effectively arguing that Colorado should address the conflict between water as private property and water as a rural community's foundation. Most recently, Otero County commissioners asked the state legislature to come up with a law requiring mitigation. They argue that farmers can make millions by selling their water rights, but it can lead to unpleasant effects for their communities. The land left behind has less tax value, shrinking revenue for county governments, school districts and public services. In a 1999 report, CU Professor Charles W. Howe wrote about water sales in the Lower Arkansas Valley from 1984 to 1991 that included one in Crowley County to Colorado Springs and Aurora. Howe said the sale resulted in "large-scale negative impacts," including a drop in the county's tax base when increased social services were badly needed. In the Platte River Valley, Howe found the negative effects were more nearly offset by increased economic activity in the nearby cities that bought the water. Some opponents of the sale of Rocky Ford Ditch water to Aurora have argued water courts should also consider how a transfer might affect water quality, such as when a transfer would dry up a stream so much that pollutants would be concentrated in remaining water. The state's water law has never addressed the community impact of water changes, according to Steve Kastner, the state's assistant water chief for the Arkansas Valley.

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The Aurora Sentinel, 3/01/01

Jackson campaigns against out-of-basin water transfers

The Arkansas Valley can't withstand any more transfers of farming water to other parts of the state, former state lawmaker Bob Jackson said at the March 23 Arkansas River Basin Water Forum. To stop the transfers, Jackson wants voters to approve a change to the state constitution that would bar out-of-basin water transfers, forbid the sale, lease or other transfer of water out of the state, and make water judges stop the transfer of water within a basin if it hurts water quality. The measure would clash with the current legal status of water rights as private property rights, which can be bought and sold at will as long as other water users aren't hurt. But Jackson said the public good is more important. Jackson, who served almost 20 years on the Colorado Water Conservation Board, said it costs too much money for basins to fight a water transfer. Jackson's measure would have a 50-year life, allowing the state's residents to decide whether or not to continue it after that. Jackson said the amendment would have to be referred to voters by the legislature or by citizen initiative.

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Pueblo Chieftain, 3/24/01

Water-sale mitigation sought

The Southeastern Colorado Water Conservancy District is lobbying state lawmakers to add legal language requiring mitigation of many agricultural-to-urban water transfers to two pending growth-control bills, or the district may ask a legislator to introduce the measure as a stand-alone bill. The measure would require local governments or their utilities that buy water from farms in another county to make up for the economic effects of transferring the water away. Water-buying cities and rural counties where the water is being sold would have to negotiate an agreement that would include any of the following requirements by the buyer: a) Make payments in lieu of the property taxes lost by drying up the farm land. b) Provide water rights or water storage or transportation facilities to the county losing the water. c) Enact some kind of revenue sharing program. Counties from which the water is being sold and water buyers would have 180 days to craft an agreement, after which the water buyer could ask for mediation to ensure that unwilling county commissioners can't just veto the purchase. The language may be added to either House Bill 1225 or Senate Bill 148, which are the respective House and Senate versions of a growth-control bill. The amendment is just one of 40 being proposed. The issue of mitigating the economic damage of agricultural water sales has gathered more attention due to the pending purchase by Aurora of farming water rights in the Rocky Ford Ditch in Otero County. Aurora already is negotiating with county officials to make up for some of the depressed land values and loss of economic activity that the sale will bring. There is some opposition to the idea, especially from cities that would have to pay for the mitigation if they buy farming water. The conservancy district's board of directors favored the measure, although county representatives don't really want the growth bill to pass.

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Pueblo Chieftain, 3/22/01

Saving water could save farmland as well

Two Arkansas Valley ag scientists say newer water-saving methods may help save the area's farm economy. Superintendent Frank Schweissing and vegetable crops scientist Mike Bartolo of the Arkansas Valley Research Center at Rocky Ford said thrifty methods such as drip irrigation may be an answer for the valley - providing there is any water for farmers to use. "Drip irrigation with wells is more efficient than furrow irrigation, but if you go to drip irrigation, it's an expensive start-up," Schweissing said. Bartolo said all vegetables will do well with drip irrigation, though he, too, said the cost of putting it in is high - from $600 to $1,000 an acre. "You'd want to put it in initially on a high-value crop," Schweissing said. "In Kansas, they've used it on field crops like corn [and] it's a lot more efficient use of fertilizer, which can be delivered by drip," he said. Bartolo said drip irrigation prevents water loss in transit and evaporation, and can result in better water quality because excess water is eliminated, and isn't running through the soil, picking up salts and carrying them to the river. He said the reaction of area farmers to drip irrigation is mixed. "Some see a lot of benefits - it's labor saving, too, because a lot of it is automated. Others say, 'I'm not making it now; why should I invest in something new?' ''

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Pueblo Chieftain, 3/7/01

RECREATION

Horsetooth extends boater welcome — water levels should last into August

Horsetooth Reservoir, the reservoir that was drained last summer for repairs to its four dams, is open for business. Filled to about one-third of its usual capacity, it's still a bit emaciated, but after seven boat-less months, officials are welcoming boaters back. The water level has been steadily rising all winter and now stands at an elevation of 5,360 feet - the highest point it can reach during dam repairs. This winter, the county and bureau lengthened the boat ramp and dock at the swim beach and built a new ramp about 1/3 of a mile north to accommodate boating while the reservoir is lowered. The bureau provided $200,000 for the project, with the county matching that amount in labor from the Parks Department and volunteers. Two additional docks might be added if there's enough demand. The new ramp will be operable until the water level drops below 5,330 feet, said Brian Werner, spokesman for the Northern Colorado Water Conservancy District. The district owns and manages the reservoir's water. The reservoir's water level is expected to fall to 5,306 feet by the end of September, and reach "dead storage" - 5,291 feet - by the end of the year, Werner said. "At dead storage - about 2 percent of capacity - crews will repair the outflow gates at Horsetooth Dam, he said."

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Fort Collins Coloradoan, 3/22/01

Wolf Creek seeking water to make snow

Wolf Creek Ski Area, in a quest for snowmaking capabilities, has applied for a conditional water right and rights of exchange for water in Mineral, Hinsdale and Rio Grande counties. The ski area wants 1.534 acre feet of water per year to supply a 500,000 gallon "snow-making water tank" for the ski area as well as for commercial, domestic and fire protection. According to Wolf Creek's application to water court, the water would come from "unnamed tributaries" of Pass Creek, a tributary of the South Fork of the Rio Grande. In exchange for the water rights, Wolf Creek Ski Corp. will assure a return flow from the snowmaking operation, which would mean that less than one-tenth of an acre-foot of water would be consumed by the project.

The Pueblo Chieftain, 2/9/01

"TAKINGS"

Colorado Supreme Court rules on Breckenridge Sanitation District "Takings" case

In February, the Colorado Supreme Court handed down its decision in a case brought by property owners/developers in the Breckenridge Sanitation District, a special district providing wastewater services. The district assesses a plant investment fee (PIF) on all building projects within the district. The owners/developers of a new residential townhouse project challenged the PIF assessment, arguing that it amounted to an unconstitutional taking of property. The Supreme Court held that such an assessment, which provides for development to help pay its own way and protects the environment from pollution it generates, is not an unconstitutional taking of property, and is not subject to a takings analysis under Nollan v. California Coastal Commission, 483 U.S. 825 (1987) and Dolan v. City of Tigard, 512 U.S. 374 (1994). The decision noted that "…the impact of human activity on water quality and quantity in this geographical area drives the District's service obligations and its revenue requirements." The trial court also noted that "…the PIF addresses wastewater collection and treatment, not land use." Finally, the court noted that the PIF is roughly proportional to the impact of the project on the district's facilities. Justice Greg Hobbs delivered the Opinion of the Court.

See the Colorado Supreme Court Website at: http://www.courts.state.co.us/supct/supct.htm

WATER BANKING

Water banks: is the time ripe?

According to John Rose, water representative for Otero County, it's time a water bank was created in the Arkansas Valley. A bill is being debated in the state Legislature to do that in the form of a five-year pilot program. Rose said California's water bank was started in 1991 while the state was suffering its fourth straight year of drought. The bank was established to buy water from willing sellers, usually farmers who put their land in fallow, and sell it to thirsty cities. The state-established bank bought more than 800,000 acre-feet of water in just 45 days, paying sellers $125 per acre-foot. But a spell of unusually heavy rainfall in March reduced the need for the water. A few remaining sellers were paid about $30 per acre-foot for the 400,000 acre-feet of water purchased for agricultural, municipal and industrial users. More than half of that water was carried over in storage until 1992, with most of it being held as insurance against another drought. The short-lived water bank was considered very effective at reallocating a temporarily scarce resource. It created substantial gains for the state's agricultural and overall economy and had minimal negative economic effects. In 1996, Arizona started the Arizona Water Banking Authority because the state wasn't using its full share of Colorado River water. Rose said the bank has helped the state use 14 million acre-feet of water that otherwise would have drained away to southern California. Pressure for a water bank in Colorado, and the Arkansas Valley in particular, has mounted in the face of Aurora's purchase of farming water rights in the Rocky Ford Ditch in Otero County. Backers say a water bank would allow farmers to make money from their water rights without selling them outright. Farmers could sell a year's water, especially in dry years when cities would be more likely to buy it. Gov. Bill Owens' commission on open space last fall suggested a water bank or other trading mechanism so that water rights wouldn't leave their basin of origin. The bank could lease the water back to farmers and other users and use the proceeds for administration and to repay debt. The profits would then be returned to the Arkansas Valley

Pueblo Chieftain, 3/23/01

WATER/ENERGY

Cities to lease water to plant

Boulder and Longmont are two of three northern Front Range cities arranging to lease water to a California-based power company that plans to build a gas- and steam-powered electricity plant north of Denver. Boulder would begin sending Calpine Corp. three-quarters of a million gallons of water a day — 219 million gallons a year — in the South Platte River in 2004, the year the plant is expected to start generating electricity for Xcel Energy. Greeley and Longmont also are expected to take part in the deal, which would send a total of 955 million gallons a year to the plant, planned near the Weld County town of Hudson. Calpine Corp., based in San Jose, Calif., produces electricity at natural gas and geothermal power plants it owns in 27 states and in Canada. It would use its leased water for cooling and steam generation. Last month, the Boulder City Council authorized a pair of 20-year lease agreements with Calpine allowing the company to use city-owned water that is mainly unused Windy Gap drought-protection reserves. The company will pay $252,000 for the first year's water, and after that, the price will increase annually to match inflation, said city water resources

manager Carol Ellinghouse. The Calpine plant was included in Xcel's recent plan outlining how it would generate the electricity to meet Colorado's needs over the next six years. The Calpine plant would provide nearly a third of the new energy Xcel intends to offer by 2004 to meet increased demand. In the March 9, 2001 edition of the *Aurora Sentinel,* however, Calpine announced it had signed a deal with Aurora. Details of the plan were not immediately available.

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*Boulder Daily Camera***,** 3/5/01

WATER LITIGATION

Colorado, Kansas wait on Supreme Court ruling

Colorado Attorney General Ken Salazar announced that he and Kansas Attorney General Carla Stovall have put Arkansas River Compact settlement negotiations on hold until the U.S. Supreme Court has ruled on the damage phase of the case. The foremost issue is how much Colorado should pay Kansas in damages now, five years after the Supreme Court found Colorado permitted excessive well pumping that depleted Kansas' entitlement at the state line in violation of the 1949 compact. The states have been in extensive negotiations to resolve remaining issues advancing their understand of one another's positions. Kansas filed the compact lawsuit in 1985. Colorado has spent an estimated $11 million on legal defense and scientific expenses. Colorado has argued it should owe no more than $9 million, rather than Kansas' latest demand of $64 million. On March 20, members of the U.S. Supreme Court questioned whether Kansas is entitled to about $19 in interest payments from Colorado taxpayers as part of the damages. Some justices challenged Kansas' claim to "prejudgment interest" on damages it suffered in the early '60s and '70s from irrigation wells along the river. There was concern voiced about amounts that other states might claim if Kansas is allowed large interest payments for the missing water. And Justice David Souter said he was troubled that Kansas learned of the diversions in 1969 but waited 16 years before suing Colorado.

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Pueblo Chieftain Denver Bureau, 3/7/01; *Denver Post*, 3/20/01

WATER QUALITY

Bush vows to reduce arsenic in H2O

President Bush is defending his decision to withdraw new arsenic regulations issued by President Clinton in the final days of his administration. President Bush said he will pursue some reduction in the amount of arsenic allowed in drinking water, but not before more scientific studies on where the level should be set. The current standards, set in 1942, allow a maximum of 50 parts per billion arsenic in drinking water. Clinton's Environmental Protection Agency directed the standards be lowered to 10 parts per billion. The decision, although announced three days before Clinton left office, had been in the works for several years, prompted in part by a lawsuit by environmentalists. The new Clinton standards were to have taken effect March 23. Health and environmental groups have been campaigning since 1996 to reduce the standards. The EPA acted as part of a court settlement after the National Academy of Sciences found in 1999 that arsenic in drinking water can cause bladder, lung and skin cancer, and might cause liver and kidney cancer. For more information on the Net: EPA: http://www.epa.gov, House Energy: http://www.house.gov/commerce, NET: http://environet.policy.net, NRDC: http://www.nrdc.org.

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Associated Press, 3/29/01

Officials warn of septic pollution

Population is booming in many mountain communities, and health officials warn that septic contamination might be reaching groundwater and surface water in mountain communities as more people move to those areas. Homes in the hills above Boulder already have contaminated groundwater as does part of Jefferson County, which stopped development in parts of Indian Hills two decades ago because of septic contamination. Jefferson County also is in the middle of a water study to determine both the longevity of the area's water supply and the level of contamination. In Boulder County, there are 17,000 septic systems, and last year the county issued permits for 200 new ones. Jefferson County doesn't know exactly how many systems it has now, but estimates at least 25,000. Still, health officials say they have little discretion to stop new septic systems. If a homeowner meets the requirements, health departments must issue a septic permit. The frustration health officials face is that homebuilders believe they can get septic systems into places with extreme terrain. "They feel like anything can be engineered," said Bruce Wilson, director of environmental health for the Tri-County Health Department, which covers Adams, Arapahoe and Douglas counties. "The side of the mountain may be a great view, but you can't do anything with your sewage." New septic systems installed in the harsh mountain environment can have short life spans — two years in some cases, Wilson said. But the real threat may be from decades-old systems. Now, health departments in several counties have made it a top priority to find ways of staving off widespread pollution. They also are trying to find ways to change the regulations to require homeowners to keep track of septic-system maintenance. Along with regulatory changes, Jefferson County is looking at innovations such as having private contractors use telemetry to monitor systems through telephone lines. Boulder and Douglas counties are trying to encourage group septic systems for subdivisions. Some counties also are pushing for homeowners to use advanced septic systems that are designed to provide much better sewage treatment than older models.

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Associated Press - Daily Reporter-Herald, 2/ 12/01

Safe roads affect water quality

Consultant Art Hirsch, who has conducted studies for the Colorado Department of Transportation, discussed the potential water-quality impacts from highway operations March 28 as part of the Boulder Creek Watershed Forum. He said negative effects of sediment on water quality could be relieved if the CDOT constructed sediment ponds to filter out dirt before the water drained into streams, built sediment traps near drains, established buffer areas next to roadways and applied only the amount of traction sand needed. The state of Colorado uses about 350,000 tons of the sand mixture a year. It has reduced use since 1993 because of air quality standards — the sand particles become airborne after being pummeled by cars once the road is dry. In its place, magnesium chloride can be used. The state uses about 6 million gallons of liquid de-icers, the most common of which is magnesium chloride, said Dan Hopkins of the CDOT. The city of Boulder is far ahead of other municipalities in completely eliminating the use of traction sand. In 1999, Boulder used 272,553 gallons of magnesium chloride and 272 tons of a mixture of sodium chloride, potassium chloride and magnesium chloride, said Stephanie Grainger, the city's transportation maintenance coordinator. Managers are also looking at an organic alternative, which is too costly now to apply everywhere. And even though a study by University of Colorado professor William Lewis found that proper application of magnesium chloride was unlikely to contribute to environmental damage, some people worry about the compound's effects. But even if traction sand and magnesium chloride could be eliminated from roadway maintenance, streams must deal with other problems caused by highways. Heavy metals, such as copper, lead and zinc, can come off vehicles, and oils can leak. These materials wash off roads and eventually end up in creeks or streams. Water sources are also affected by road construction and design. Hirsch said.

Boulder Daily Camera 3/29/01

WETLANDS

EPA shoots down Erie's wetlands argument

The Environmental Protection Agency (EPA) has ruled that a federal law protecting wetlands applies to a disputed marsh in the Prince One reservoir area, contrary to Erie's arguments that the area is exempt. A recent U.S. Supreme Court ruling, which the town was using as evidence, is not relevant to the Prince One Reservoir situation, and has shut down expansion of Prince One — critical to Erie's water-storage needs — for more than one year. EPA accused the town of violating the 1972 Clean Water Act by destroying at least 12 acres of federally protected wetlands when a town contractor dumped dirt on the area without a permit while expanding for future water storage. EPA ordered Erie to return the reservoir to its natural state, but Erie officials refused. They said they didn't do anything wrong because dirt was dumped on a one-acre area that was going to be — and was permitted by the Army Corps of Engineers to be — excavated in the $1.4 million expansion project. Erie also argued that a Supreme Court decision in January in an Illinois case limited the scope of the Clean Water Act. Town officials said that ruling should be applied to Prince One as well. In the Illinois case, justices ruled that seasonal wetlands are not protected by the Clean Water Act. They said the act is intended to cover major rivers or drainage systems flowing from state to state. Erie lawyers said Prince One should not be protected by the EPA because it is seasonal, filling with water only in the spring, and is fed by an irrigation ditch — not a river. A U.S. Department of Justice attorney disputed that, saying the reservoir is fed by the South Boulder Canyon Ditch, which connects to Coal Creek, which connects to Boulder Creek, which connects to the South Platte River, which flows state to state. David Getches, a University of Colorado law professor and water-law specialist, said the Clean Water Act does apply to Prince One. He said the wetlands in the Illinois case did not connect to a major river and that makes those wetlands different from Prince One. "That case did not include water that was hydrologically connected — a physical connection — to rivers," Getches said. "The Corps (of Engineers) has every right to extend its jurisdiction to any hydrological water connection."

Boulder Daily Camera, 3/16/01

MISCELLANEOUS

Highline Canal to be studied

The 71-mile Denver Highline Canal, which was constructed in the 1800's primarily for irrigation and which winds through Littleton as a favorite walk for many people, is a storm drainage ditch that will soon come under the scrutiny of engineers, politicians, city managers and other key government players. It is owned and maintained by the Denver Water Department, and runoff from streams, gulches, and storm sewers flow into the canal or cross it. During heavy rainstorms, runoff may cause drainage problems or flood properties downstream. There are even times when it has not rained downstream, yet areas will flood because of runoff from the canal. Much of the drainage patterns along the canal have been altered because of land development. Several areas in Littleton are affected by its drainage, including Dad Clark Gulch, Lee Gulch, Little's Creek, Slaughterhouse Gulch and Big Dry Creek. The UD&FCD wants to update their 1973-drainage study. The Littleton City Council has unanimously approved a resolution to enter into an intergovernmental agreement with UD&FCD, which is requesting funding from Littleton and several cities and agencies.

Littleton Independent, 2/22/01

California's Westland Water District, farmers, review proposal

In February, California's Westland Water District briefed San Joaquin Valley farmers on a proposal to quit farming 150,000 to 250,000 acres in exchange for a $500 million federal buyout. Westland, the nation's largest irrigation district, covers 600,000 acres and some 600 farms in Fresno

and Kern counties in California. The preliminary proposal contains the following elements: (1) up to 200,000 acres would be retired from production, where a high, salt-laden groundwater table impairs crop growth; (2) the federal government would underwrite the cost of retiring the land for an estimated average sale price of $2,500 per acre (Westland would retain title to it, possibly as a conservation easement); (3) in exchange, the government would be relieved of its obligation to provide drainage for Westland, which has been the source of considerable litigation; (4) Westland and the US Bureau of Reclamation would execute a 'settlement contract,' pursuant to which Westland's entitlement to Central Valley Project water would be reduced from 1.5 million acre-feet to 805,000 acre-feet; and (5) the district would give up its recent attempt to divert water from the San Joaquin River. Only willing sellers would be involved in the retirement program, according to Westland officials. The proposal is reportedly being criticized by environmentalists as a bad deal for taxpayers.

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Western States Water, 2/16/01 (from *San Francisco Chronicle*, 2/11/01)

Dillon offers water aid to Georgetown Loop

The Town of Dillon is apparently one of many groups stepping up to try to help the Georgetown Loop historic railroad track with its current water problems. The Georgetown Loop, a historic railroad that takes tourists from Silver Plume to Georgetown on a narrated tour of the area's history, doesn't have any adjudicated water rights, although the railroad does have an application working its way through water court. The Front Range municipality of Golden wants to maintain its kayak course, raising concerns it could leave upstream users — including the Georgetown Loop's steam locomotives — without water. The Loop is headquartered in Silver Plume in Clear Creek County, east of the Eisenhower Tunnel. Golden's new water right would guarantee a water flow through the city's popular course, which has attracted several national events in the three years it has been open. The course has recently been ranked among the top 10 in the nation, according to Golden water attorney Glenn Porzak, who said the course needs the water to maintain its national standing. The railroad isn't alone. The towns of Georgetown, Silver Plume and Empire and Clear Creek County were notified last summer that the flows they had used for more than 100 years for washing dishes and taking showers soon will be used by Golden. "We were told to stop using it," said Gregory Heine, mayor of Silver Plume, a town of 175 people. "It caught us by surprise. We've bought some water for the next couple years, but we're stuck for a long-term solution. We weren't going to use the water for growth, but to sustain what we had." Golden claimed the water in the early 1860s and has seniority. The towns, the county and the railroad have more recent flow claims — later in the 1860s and after Golden's. While Golden wasn't using the water, there was no problem. Now, Golden wants the water kept in the creek to expand its popular kayak park. So the railroad and the towns will have to find other water.

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Associated Press -- Loveland Daily Reporter Herald, 3/6/01

Mountain glaciers vanishing

The ice cap atop Mount Kilimanjaro is retreating at such a pace that it will disappear in less than 15 years, according to new studies. A variety of scientists say the vanishing of the seemingly perpetual snows of Kilimanjaro, echoed by similar trends on ice-capped peaks from Peru to Tibet, is one of the clearest signs that a global warming in the last 50 years appears to have exceeded typical climate shifts and is at least partly caused by gases released by human activities. Measurements taken over the last year on Kilimanjaro show the mountain has lost 82 percent of the ice cap it had when it was first carefully surveyed in 1912. Even given the fact that glaciers have grown and retreated in pulses for tens of thousands of years, the pace of change measured now goes beyond anything in recent centuries. The retreat of mountain glaciers has been seen from Montana to Mount Everest to the Swiss Alps. In the Alps, scientists have estimated that by 2025 glaciers will have lost 90 percent of the ice that was there a century ago. Separate studies of air temperature in the tropics, made using high-flying balloons, have shown a steady rise of about 15 feet a year in the altitude at which air routinely stays below the freezing point – probably the biggest influence in glacial shrinkage. Lonnie G. Thompson, senior research scientists at the Byrd Polar Research Center of Ohio State University, presented the data at the annual meeting of the American Association for the Advancement of Science in San Francisco. The accelerating loss of mountain glaciers is also described in a scientific report on the impact of global warming, which is being released in Geneva by the Intergovernmental Panel on Climate Change, a network of scientists advising world governments under the auspices of the United Nations. The melting is likely to threaten water supplies in places like Peru and Nepal, the report says, and could also lead to devastating flash floods. Kilimanjaro may provide the most vivid image of the glaciers' change, but the rate of retreat is far faster along the spine of the Andes. For 25 years Lonnie Thompson has been tracking a Peruvian glacier, Qori Kalis. From 1998 to 2000, the glacier pulled back 508 feet per year. Thompson said, "That's 33 times faster than the rate in the first measurement period," referring to a study from 1963 to 1978.

Roger Pielke, Colorado's state climatologist and Professor of Atmospheric Science at Colorado State University, doesn't agree that global and regional changes can be primarily attributed to humans releasing greenhouse gases. Climate-change computer models lack a key factor – changes in ground cover – Pielke said at the American Association for the Advancement of Science meeting held in San Francisco. Pielke is concerned that estimates don't include ground cover changes such as converting short-grass prairie to fields that are irrigated. He believes that for all the heat trapped by human-caused greenhouse gases, fields that have been irrigated or reforested produce equal counter-effects. Pielke said if carbon dioxide, a greenhouse gas, doubles, as some scenarios state, vegetation growth would be affected. Since plants absorb carbon dioxide — which affects growth, the amount of area they cover and the amount of water vapor they put in the air – they would have a more immediate impact on regional climate than the doubled carbon dioxide. As a result, predicting temperatures for 100 years in the future isn't possible, Pielke said. "Vulnerabilities should be examined instead of potential temperatures… to decide what's mitigatable and what we're going to be forced to adapt to," he said, particularly with an eye toward what climate has done in the past.

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The New York Times, 2/19/01

CALLS FOR PAPERS

12TH ANNUAL SOUTH PLATTE FORUM
Oct. 24-25, 2001
Raintree Plaza, Longmont, Colorado

Call for Posters

Overview: The South Platte Forum in an annual conference designed to promote and encourage interdisciplinary dialogue on South Platte Basin issues. It is a forum for anyone to share ideas, problems, analysis and solutions on all aspects of water in the basin.

Poster Session: Selected posters will be displayed throughout the one and one-half day forum with a staffed session during the social hour from 4-7 p.m.., Wednesday, Oct. 24.

Abstract Submittal: Please submit a one-page (minimum 12 pt. font) abstract to the organizing committee by the deadline of Aug. 1, 2001. Abstracts should include: title, author name, affiliation, full mailing address, e-mail, phone, and fax. Submit to:

Jennifer Brown
South Platte Forum
513 N Harding
Johnstown, CO 80534
E-mail: southplatte@qwest.net Phone: (970) 213-1618

Authors whose posters are selected for presentation will be notified by Sept. 1, 2001. All accepted abstracts will be published in the conference proceedings.

The South Platte Forum is sponsored by:

Colorado Division of Wildlife
Colorado State University Cooperative Extension
Colorado Water Resources Research Institute
Denver Water
Northern Colorado Water Conservancy District
U.S. Fish and Wildlife
U.S. Geological Society

Organizing Committee:

Chair - Don Kennedy, Denver Water
Troy Bauder, Colorado State University Cooperative Extension
Rob Henneke, U.S. Environmental Protection Agency
Gene Schleiger, Northern Colorado Water Conservancy District
Jay Skinner, Colorado Division of Wildlife
Cathy Tate, U.S. Geological Survey
Robert Ward, Colorado Water Resources Research Institute
Jennifer Brown, Coordinator

AWRA ANNUAL WATER CONFERENCE
Albuquerque, New Mexico
November 12-15, 2001

AWRA members and guests will meet to discuss many aspects of water – cultural, ecological, legal, economic, artistic, social, hydrological, climatological and geological. Submit your abstract online at http://www.awra.org or mail to Michael Campana, Annual Conference Chair, American Water Resources Association, PO Box 1626, Middleburg, VA 20018-1626. Phone 540/687-8390. DEADLINE: May 7, 2001. Speakers do not receive complimentary registration.

CONFERENCE ON
TAILINGS AND MINE WASTE '02
January 27-30, 2002
Colorado State University, Fort Collins, Colorado

This event provides a forum for members of the mining community, engineers and scientists serving the mining industry, regulatory groups, and other interest groups concerned with environmental issues related to tailings and mine waste management. The conference has proven to be an exciting place for attendees to present ideas, learn of new developments, make contacts in their professional fields and discuss problems of mutual interest. Issues of mining, milling, environmental geotechnics, mining engineering, tailings management, geohydrology, geochemistry and other related topics will be covered in focused sessions. Authors are requested to submit a short one-page abstract by June 15, 2001.

To submit an abstract or for information contact:
Linda Hinshaw
Department of Civil Engineering
Colorado State University
Fort Collins, CO 80523-1372
Phone: 970/491-6081 FAX: 970/491-3584 E-mail: lhinshaw@engr.colostate.edu
Website: http://www.tailings.org

MEETINGS

WHO'S IN CHARGE?
The 26th Annual Colorado Water Workshop
Western State College, Gunnison, Colorado
July 25-27, 2001

How are changes in the federal and state governments affecting water use in Colorado? How are the legislature and the courts shaping the future? Are economic trends and public attitudes driving water management decisions? Is "multi-objective water management" working for water users?

Join the Colorado Water Workshop for a mix of policy debates and case studies. Speakers will include new federal appointees, state legislators, water users, and legal experts. Sessions will examine the relative influences of the federal and state governments, water users' efforts to implement multi-objective management, and federal activities in the Gunnison basin and other areas.

Registration materials will be mailed in May. Scholarships are available for students. For more information contact: Lucy High, Director, 970/641-8766, Email water@western.edu, Website http://www.waterinfo.org/workshop.html.

CHALLENGES OF MANAGING LIMITED WATER RESOURCES IN COLORADO LAKES AND RESERVOIRS

October 3, 2001

The Colorado Lake and Reservoir Management Association 5th Annual Conference will be held on October 3, 2001. The theme for the conference is "Challenges of Managing Limited Water Resources in Colorado Lakes and Reservoirs." The registration cost is $75 for the one-day conference. Please contact Sharon Campbell at 970-226-9331, email: sharon_g_campbell@usgs.gov for further information, or look for further information in the June issue of *COLORADO WATER*.

COLORADO STREAMGAGING SYMPOSIUM

Sponsored by the
Colorado Water Resources Research Institute
State Engineer's Office
U.S. Geological Survey
Colorado Water Conservation Board

May 3, 2001
Village at Breckenridge, Breckenridge, Colorado

Information on stream flow conditions in Colorado is critical to the interests of many Colorado citizens and businesses. The Colorado Streamgaging Symposium will provide an opportunity for sharing of information about:

The major streamgaging programs in the State
The importance and various uses of the streamflow data;
The historic and current coverage of streamflow gages in Colorado and perceived deficiencies in the current coverage; and,
Opportunities that may be available to the water community to diversify and perhaps increase overall investments made to support the collection, dissemination, and archiving of streamflow information.

Beginning with the first streamflow gage operated by the U.S. Geological Survey (USGS) in 1881, the number of streamflow gages in Colorado has grown to well over 600 today. Statewide streamgaging programs now are administered by both the State Engineer's Office (SEO) and the USGS, with support from more than 60 cooperating organizations. Those programs are closely coordinated between the SEO and USGS to help ensure the data are comparable and easily accessible to everyone, including the provision of real-time data on the World Wide Web. Other organizations, including the U.S. Bureau of Reclamation and Forest Service, Northern Colorado Water Conservancy District, and the Urban Drainage and Flood control District, also collect streamflow information to support their project needs and make those data available to water users and managers.

The following topics will be included on the symposium agenda:

- Past and Present – History of steamflow data collection in Colorado;
- The evolving uses and importance of streamflow information;
- Current access to streamflow information;
- User perspectives on information uses, needs, and priorities; and,
- Opportunities for improvement in gage network coverage and dissemination of streamflow information.

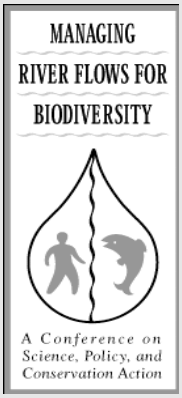
To register for the Symposium, please fill out the registration form and return to:
Colorado Streamgaging Symposium, USGS Colorado District Office
P.O. Box 25046, MS 415, Denver Federal Center
Lakewood, CO 80225-0046
Attn: Eric Hensel

Space is limited so send in your registration form early. Registered attendees will receive another mailing with directions and further details. Additional information can be found on the CWRRI homepage: **www.CWRRI.Colostate.edu** under 'Upcoming Events'.

2001 AWRA/UCOWR SUMMER SPECIALTY CONFERENCE
DECISION SUPPORT SYSTEMS
FOR WATER RESOURCES MANAGEMENT
SNOWBIRD, UTAH
JUNE 27-30, 2001

For registration information, access the AWRA website at: **http://www.awra.org**

This conference will provide a forum for addressing the latest advancements in data collection, information processing, decision support systems, and remote data collection for water resources management, and for discussing the educational and institutional infrastructure needed to make the use of these tools more effective in the water sector. Remote data collection has become rapid and inexpensive. Water resources managers now have access to high quality data that is available more rapidly and in greater quantities than ever before. The challenge now is to process and understand the data as rapidly as it is generated. Decision support systems, often employing technology such as Geographic Information Systems (GIS) and the World Wide Web (WWW), offer decision-makers the opportunities to utilize information to evaluate a variety of potential system operations by providing them with data in form that facilitate immediate and accurate decisions. During the conference, the National Science Foundation is sponsoring four sessions addressing the relevance of university-based science to society. The Corp of Engineers is sponsoring three sessions addressing curricula development for water resources planning and management graduate studies, primarily for continuing education purposes.



MANAGING RIVER FLOWS FOR BIODIVERSITY
July 30 - August 2, 2001
Colorado State University, Fort Collins, Colorado

The **Managing River Flows for Biodiversity Conference** is designed for water managers, staff from non-governmental organizations that work to influence water management decisions, and the attorneys, scientists, and other consultants that advise these groups. Attendees will have an opportunity to examine the real and perceived conflicts between meeting ecosystem needs and human demands for water; discuss the state of science with respect to flow requirements for biodiversity conservation; hear case studies where practitioners are working to meet human demands for water while also providing for ecological needs; and attend a field trip to nearby Rocky Mountain rivers.

To register for the conference, please download the printable registration form (105kb pdf file) located at **http://cwrri.colostate.edu**. Click on Upcoming Events.

COLORADO WATER CONGRESS - SUMMER CONVENTION
Sheraton Steamboat Resort
Steamboat Springs, Colorado
August 23 - 24, 2001

Program and Registration Information to be posted later on the Colorado Water Congress website at: http://www.cowatercongress.org

FALL WORKSHOP SCHEDULE

The Colorado Water Congress conducts a series of six to ten workshops each fall to increase and update water knowledge both for the actively involved water community and for general public knowledge. These workshops are all held in the Colorado Water Congress Conference Room, 1580 Logan Street, Suite 400, Denver, Colorado. A Water Law Seminar will be held on September 10-11, 2001, and fall workshops will be announced on the Colorado Water Congress website as they are scheduled. CLE credits are awarded for each workshop.

CALENDAR

Apr. 30-May 2	AWRA ANNUAL SPRING SPECIALTY CONFERENCE, WATER QUALITY, MONITORING, & MODELING, San Antonio, TX. Contact: Michael J. Kowalski, AWRA Director of Operations, AWRA, 4 W. Federal St., PO Box 1626, Middleburg, VA 20118-1626, Phone 540/687-8390, FAX 540/687-8395, e-mail: mike@awra.org.
3-May	COLORADO STREAMGAGING SYMPOSIUM, Breckenridge, CO. Contact: Eric Hensel at USGS District Office, PO Box 25046, MS 415, Denver Federal Center, Lakewood, CO 80225-0046; FAX 303/236-4912, or see the Website at **http://cwrri@colostate.edu** (go to Upcoming Events).
May 17-18	THE ENDANGERED SPECIES ACT & HABITAT CONSERVATION PLANNING, Denver, CO. Register online at **http://www.cle.com** or call 800/873-7130.
June 27-30	TRANSBASIN WATER TRANSFERS, Denver, CO.USCID, Phone 303/628-5430, FAX 303/628-5431, Email stephens@uscid.org, Website **http://www.uscid.org/-uscid**.
June 27-30	JOINT AWRA/UCOWR SUMMER SPECIALTY CONFERENCE, DECISION SUPPORT SYSTEMS FOR WATER RESOURCES MANAGEMENT. Snowbird, UT. Contact: Direct inquiries as follows: Technical Program Chairperson Donald F. Hayes, Civil and Environmental Engr., Univ. of Utah, 122 So. Central Campus Dr., Ste 104, Salt Lake City, UT 84112, Phone 801/581-7110, FAX 801/585-5477, e-mail: hayes@civil.utah.edu. Conference General Co-Chairperson Mac McKee, Utah Water Research Lab, Utah State Univ., UMC8200, Logan, UT 84322-8200, Phone 435/797-3188, FAX 435/797-3663, e-mail: mmckee@cc.usu.edu, Website **http://www.awra.org**.
Aug. 19-24	LINKING STORMWATER BMP DESIGNS AND PERFORMANCE TO RECEIVING WATER IMPACTS MITIGATION, Snowmass, CO. Contact: Ben Urbonas at 303/455-6277; 303/455-7880, Email burbonas@udfcd.org.
Aug. 19-Sept 13	17th International Seminar on FOREST AND NATURAL RESOURCES ADMINISTRATION AND MANAGEMENT, Fort Collins, CO. Contact Ann Keith, Coordinator, Phone 970/482-8098, FAX 970/490-2449, E-mail IFS@cnr.colostate.edu, Website **http://www.fs.fed.us/global/isfam**.
Sept. 5-6	WETLANDS & REMEDIATION, Second International Conference, Burlington, VT. Contact: The Conference Group, 1989 W. 5th Ave., Suite 5, Columbus, OH 43212-1912, Phone 800/783-6338 or 614/424-5461, FAX 614/488-5747, E-mail conferencegroup@compuserve.com.
Sept. 9-12	DAM SAFETY 2001, Assoc. of State Dam Safety Officials Annual Conference, Snowbird, UT. Contact: ASDSO, 450 Old Vine Street 2nd Floor, Lexington, KY, 40507. Phone 859/257-5140, FAX 859/323-1958, E-mail info@damsafety.org, Website **http://www.damsafety.org** (go to conferences and training).
Oct. 10-12	SYMPOSIUM ON THE SETTLEMENT OF INDIAN RESERVED WATER RIGHTS CLAIMS, St. George, UT. Contact: Western States Water Council, Website **http://www.westgov.org/wswc/** .
Oct. 17-19	THE NATIONAL URBAN WATERSHED CONFERENCE, Costa Mesa, CA. Contact: National Water Research Institute, PO Box 20865, Fountain Valley, CA 92728-0865. Phone 714/378-3278, FAX 714/378-3375, Email NWRI-2@worldnet.att.net.

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Fort Collins, CO 80523