



COLORADO WATER

Newsletter of the Water Center at Colorado State University

DECEMBER 2001

UPCOMING MEETINGS

**Colorado Water Congress
2002 Convention
January 23-25, 2002
Northglenn, CO
See page 41**

**Tailings and
Mine Waste '02
January 27-30, 2002
Fort Collins, CO
See page 44**

**Ogallala Aquifer
Symposium
February 21, 2002
Sterling, CO
See page 40**

**AGU Hydrology Days
April 1-4, 2002
See page 43**



State Representative Diane Hoppe talks water issues with Hal Simpson, Colorado State Engineer; and Jon Altenhofen, Northern Colorado Water Conservancy District during a break at the South Platte Forum. The forum was held October 24-25, 2001, in Longmont, Colorado. See page 16 for a summary of the meeting.

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

**Colorado
State
University**

Knowledge to Go Places

💧 WATER ITEMS AND ISSUES ...

WATER DIALOGUES ON CAMPUS — <i>Editorial by Robert C. Ward, Director</i>	3
CSU WATER CENTER	
CSU's Civil Engineering Department Receives Award	4
Water Center Fellowship Awarded.....	6
USGS/NIWR Issue Call for Proposals	6
CSU AGRICULTURAL EXPERIMENT STATION	
Aquatic Macroinvertebrate Communities Associated With Changing Urban Environments	7
CSU COOPERATIVE EXTENSION	
Reduction of Nitrogen Losses by Use of Surge Irrigation.....	14
MEETING BRIEFS	
12 th South Platte Forum a Big Success.....	16
Wildlife and the South Platte Forum: A New Partnership.....	17
Untying the Gordian Knot: How to Recover Endangered Species In Nebraska and at the Same Time Allow Water Users to Receive Their Water.....	17
WATER SUPPLY.....	24
Student Water Symposium Showcases Student Coursework and Research.....	25
CWRRI -- Happenings at CU	28
CWRRI -- Happenings at UNC	29
New Faculty Profile	29
REU -- Research Experiences for Undergraduates.....	30
Research Awards	31
Water News Digest.....	34
Meetings.....	40
Call for Papers	42
Calendar	44



COLORADO WATER

Vol. 18, No. 6

December 2001

Editor: Shirley Miller

Writers: Marian Flanagan and Michael Blackledge

COLORADO WATER is a publication of the Colorado Water Resources Research Institute. The scope of the newsletter is devoted to enhancing communication between Colorado water users and managers and faculty at the universities in the state. This newsletter is financed in part by the U.S. Department of the Interior, Geological Survey, through the Colorado Water Resources Research Institute. The contents of this publication do not necessarily reflect the views and policies of the U.S. Department of the Interior, nor does mention of trade names or commercial products constitute their endorsement by the United States Government.

Published by the

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

INTERNET SITES

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

EDITORIAL**WATER DIALOGUES ON CAMPUS**

by Robert C. Ward, Director

The 2001 Fall edition of CSU's Water Resources Seminar (GS 592), currently drawing to a close, was comprised of a semester-long examination of the prior appropriation doctrine in Colorado. The seminar began with an overview of water doctrines practiced around the world as well as an overview of early Colorado history that led to adoption of the prior appropriation doctrine. The seminar ended with an examination of how well the doctrine is meeting the new and changing water needs and values of a rapidly increasing Colorado citizenry. In between, the mechanics of the doctrine, as practiced in Colorado, were examined, along with the changes that have occurred over the years to adapt to new economic and ecosystem needs.

The water dialogues, held each Tuesday afternoon this past semester, were guided by excellent speakers. I would like to publicly thank each of them.

Jim Schmehl, Schmehl, Yowell & Mackler, P.C., Fort Collins
Brian Werner, Northern Colorado Water Conservancy District, Loveland
Bill Fischer, Fischer, Brown and Gunn, Fort Collins
Dick Stenzel, Division 1, Water Resources Division, Greeley
Doug Kenney, Natural Resources Law Center, University of Colorado, Boulder
Dan Merriman, Colorado Water Conservation Board, Denver
Marshall Frasier, Agricultural and Resource Economics Dept., CSU, Fort Collins
Chris Paulson, Friedlob, Sanderson, Paulson and Tourtillott, Denver
Justice Greg Hobbs, Colorado Supreme Court, Denver

The organizers of the seminar greatly appreciate the time and effort of these Colorado water experts in sharing their knowledge and insights with future Colorado water managers. At strategic times during the semester, the students led discussions that reacted to the information presented by the speakers. It was obvious from the student led discussions that their understanding of the prior appropriation doctrine increased dramatically over the semester.

The seminar captured considerable interest among CSU faculty and students as well as water professionals in the area. The seminar organizers are currently seeking evaluations from the students regarding water topics they would like to see addressed in the Fall 2002 Water Resources Seminar. Given the interest generated off-campus, the organizers would also like to receive suggestions from professionals off campus as well -- particularly those who would join us if certain water topics and speakers were included next fall. The goal of the seminar organizers is to foster excellent dialogue on water topics of interest to all water managers in Colorado. In this way, CSU students are gaining insight into topics critical to their careers in water resources in Colorado.

If you have suggestions for the GS 592 Water Resources Seminar next fall, please contact one of the following seminar organizers:

David Freeman, College of Liberal Arts [dfreeman@lamar.colostate.edu]
Dan Smith, College of Agricultural Sciences [dhsmith@lamar.colostate.edu]
Freeman Smith, Colorado of Natural Resources [freeman@cnr.colostate.edu]
Robert Ward, College of Engineering [robert.ward@colostate.edu]

The education of future Colorado water managers is greatly enhanced by conversations that not only address topics deemed critical by current water managers, but also those that *involve* current water managers. Look for announcements of the Fall 2002 Water Resources Seminar in future issues of *Colorado Water* and join us next fall. We had an excellent dialogue this fall and hope to have an even better one next fall.

A decorative horizontal line with a wavy, water-like pattern in shades of blue and cyan, located at the bottom of the page.



CSU'S CIVIL ENGINEERING DEPARTMENT RECEIVES AWARD FOR EXEMPLARY CONTRIBUTIONS TO WATER RESOURCES MANAGEMENT



From left: Robert Ward, Sandy Woods, and John S. Grounds, III following presentation of the Csallany award to CSU's Civil Engineering Department

On November 14, 2001, Colorado State University's Civil Engineering Department received the Sandor C. Csallany Institutional Award for Exemplary Contributions to Water Resources Management. Dr. Sandra (Sandy) Woods, Chair of the Civil Engineering Department, and Dr. Robert Ward, Director of the CSU Water Center, accepted the award at the Annual Awards Luncheon of the American Water Resources Association. The luncheon was held in conjunction with AWRA's Annual Water Resources Conference in Albuquerque, New Mexico. In announcing the award, Dr. John S. Grounds, III, President of the American Water Resources Association, said, "The CSU Civil Engineering Department has demonstrated its leadership in water resources management by achieving an unmatched level of eminence in water education, research and service."

The Sandor C. Csallany Institutional Award for Exemplary Contributions to Water Resources Management was established in 1991 and is awarded to a water resources institution that has achieved a status

of eminence in some aspect of managing the nation's waters. CSU's Civil Engineering Department was recognized for its sustained contributions to improved water management that began with Professor Elwood Mead's creation of an irrigation-engineering program in the 1880s at what was then called Colorado Agricultural College. During the summer months, Prof. Mead collaborated with the Colorado State Engineer, E.S. Nettleton, to improve understanding of evaporation and water measurement. While Professor Mead established a CSU tradition for leadership in the field of water engineering, Professor Louis Carpenter, in the 1890s and 1900s, expanded the leadership both nationally and internationally. In the 1910s a new hydraulics laboratory was established on campus. In the 1920s, Ralph Parshall, who moved from the Civil Engineering faculty to a position in Fort Collins with the U.S. Department of Agriculture, developed the Parshall flume, a device employed today to measure water flow around the world.

The Civil Engineering Department's leadership in water resources greatly expanded after World War II with the addition of a number of outstanding water engineers. In the ensuing years, Civil Engineering faculty had a profound impact on the management of water quantity and quality in Colorado, the American West, and around the world. To illustrate the worldwide contributions, beginning in the mid-1950s, CSU engineers helped develop graduate-level water programs at the University of Peshawar in Pakistan, and this influence is felt more than 40 years later in Pakistan's dry areas. Similar projects were conducted in Afghanistan. In 1959, CSU helped establish the Southeast Asia Treaty Organization graduate school in Thailand, known as the Asian Institute of Technology. In the early 1960s Colorado State researchers were active in creating the Peace Corps, and over the years faculty have maintained an active role in training volunteers. CSU engineers have assisted with irrigation management projects in Egypt's Nile Valley for over two decades.

In 1967, the Civil Engineering Department established the International School for Water Resources (ISWR) to meet the need for non-degree training in areas such as prevention of water-related diseases, the management of reservoir water quality, urban water problems and water resources planning. More than 350 professionals from 57 nations have received training certificates.

During the past 30 years, the Civil Engineering Department has had over 200 graduate students enrolled annually, the vast majority studying for careers in water resources. CSU Civil Engineering graduates now work throughout Colorado, the U.S. and the world. CSU Civil Engineering alumni in Indonesia, Egypt, and Brazil have contributed to the formation of Colorado State University Alumni chapters in their home countries.

Today, the Civil Engineering Department supports an active and extensive water research program, and is home to 36 faculty and 357 undergraduate, 78 masters, and 78 PhD students. The civil engineering and agricultural and bioresource engineering faculties merged during 2000 to better coordinate academic programs and research focusing on water resources and the environment. The Department also now offers a B.S. in environmental engineering.

The development of computer tools and software has become a central research activity of CSU civil engineers. MODSIM, a stream network-simulation model, is widely used by water districts to evaluate supplies; AQUARIUS, a general model for spatial and temporal allocation of water among competing users in a river basin, is popular with engineers and water managers; and SPMAP, developed for the South Platte, is used to determine water augmentation needs associated with ground water pumping in the lower South Platte River. To help protect against flash floods such as the devastating Big Thompson Canyon flood of 1976, a Colorado State researcher is creating a state-of-the-art simulation of surface runoff generated from high-intensity rainstorms that develop quickly over small areas. The department also continues to house a unique, large-scale hydraulic laboratory that attracts projects of national interest.

The accomplishments and contributions of CSU's Civil Engineering Department faculty-- in water education, research and service at the state, national and international level -- combine to offer students a unique educational opportunity to prepare for their 21st century careers.

CSU, Mines Share Pollution Grant

A consortium of Colorado State University and Colorado School of Mines faculty has been selected as one of five U.S. centers that will do major research and outreach on hazardous substances. The CSU-Mines consortium will focus on finding ways to remediate mine wastes and conduct outreach activities, such as transferring research to industry, assisting communities with environmental problems and evaluating pollution's impact on the environment.

The award from the Environmental Protection Agency consists of a \$3.8 million, five-year grant to set up the center, with CSU and Mines each contributing about \$200,000 annually. The intention is for the centers to be self-sufficient at the end of the grant period.

Charles Shackelford, a CSU civil engineering professor, is the center's director. Sandra Woods of Colorado State and Don Macalady of the School of Mines are assistant directors of the center, which covers a six-state region including Colorado, Utah, Wyoming, Montana and North and South Dakota.

The consortium's research projects include contaminants that migrate through the ground, sediments such as old tailings that are leached by rainwater into the environment, efficient and cost-effective ways to clean up pollution, and biological indicators of pollution.

Center director Shackelford said the School of Mines has done a lot of work in chemistry and geochemistry, environmental science, and engineering. And CSU has a worldwide reputation in work related to aquatic sediment transfer.

EPA Administrator Christie Whitman announced the consortium's selection on November 19th in Washington, D.C., as part of a package of more than \$22 million in grants.

Partial Source: <http://www.denverpost.com>



WATER CENTER FELLOWSHIP AWARDED TO TRACY PHELPS

Tracy Phelps, graduate student in the Department of Earth Resources specializing in surface-water hydrology, is the recipient of the CSU Water Center's 3-F Graduate Fellowship for the 2001-2002 school year.

Tracy attended Brevard College, a United Methodist liberal arts college located in Brevard, North Carolina, where she graduated with highest honors and was the first recipient of a mathematics degree from the college. Tracy's career goal, she says, is to use her mathematical skills to improve the environment. "The process of water fascinates me, in all aspects," says Tracy.

Tracy is working with her adviser, Professor Ellen Wohl, on the North Fork of the Cache la Poudre River investigating three-dimensional velocity characteristics using an acoustic Doppler velocimeter (ADV) in a six-meter riffle section of the river. She has collected about two-thirds of the data for her thesis, and will collect the rest in the spring. Tracy hopes to find correlations between velocity characteristics and site-specific variables, and to investigate temporal characteristics as well.

Before entering CSU, Tracy participated in a Research Experience for Undergraduates (REU) program at the University of Delaware College of Marine Studies. Her REU project characterized tidal and non-tidal flow in Delaware's inland bays.



Tracy's awards and accomplishments include the Presidential Award for Achievement and Leadership and the 1998 Academic Athletic Award for highest GPA of all athletes at Brevard College. She was president of Brevard College Student Ambassadors from fall 1997 through Spring 2000 and secretary of the Brevard College circle of Omicron Delta Kappa, the National Leadership Honor Society.

While in Colorado, Tracy has enjoyed the many outdoor activities the area has to offer. She says she enjoys mountain biking and the many exciting places to see.

WATER RESOURCES RESEARCH NATIONAL COMPETITIVE GRANTS PROGRAM FY 2002 REQUEST FOR PROPOSALS RELEASED

The U.S. Geological Survey in cooperation with the National Institutes for Water Resources requests proposals for matching grants to support research on non-point source water pollution, water quality sensors, and water use. A total of \$1 million is being made available for research under this program. Any investigator at an institution of higher learning in the United States is eligible to apply for a grant through a Water Research Institute or Center established under the provisions of the Water Resources Research Act of 1984, as amended. Proposals involving substantial collaboration between the USGS and university scientists are encouraged, especially on proposals addressing non-point source pollution. Proposals may be for projects of one to three years in duration and may request up to \$250,000 in federal funds. Successful applicants must match each dollar of the federal grant with one dollar from non-federal sources.

**Click on the National Competitive Grants Program – 104(G) at
<http://www.niwr.org/NIWR> for the announcement, including deadlines.**





AQUATIC MACROINVERTEBRATE COMMUNITIES ASSOCIATED WITH CHANGING URBAN ENVIRONMENTS

by R. E. Zuellig and B. C. Kondratieff

Anthropogenic influences on the landscape have occurred worldwide and nowhere is this more evident than in the urban environment. Studies have shown that streams receiving stormwater runoff and other urban pollutants are faced with multiple stressors and as a result can experience noticeable changes in surface and ground water quality, biological condition, and channel morphology. Reviews by Burton et al. (2000) and Pitt (2001) have concluded that strong relationships exist between urban run-off and the degradation of biological condition. Aquatic macroinvertebrates are often used as indicators of environmental degradation because they are closely associated with their habitat, reflecting the general condition of their watershed (Barbour et al. 1999).

Recent needs to improve stormwater drainage within the urban growth areas of Fort Collins and Boulder have driven the evaluation of stream habitat that supports macroinvertebrate communities. Streams of this region have been historically altered to meet the needs of multiple uses beginning with the development of extensive irrigation canal networks in the 1860's that were well established by 1900 (Eschner et al. 1983). Little historical information exists about the ecology of these streams before the establishment of irrigated agriculture (Fausch and Bestgen 1997). This region, typical of Front Range landscapes, is currently being subjected to extreme urban growth, which has led to multiple biological impacts such as the decrease of species diversity. Additionally, these streams have been drastically altered to meet the needs of stormwater conveyance and irrigated agriculture. Returning the streams of this region to their natural state is no longer an option due to the current demand for water and land use (Strange et al. 1999).

One aspect of this study was to determine habitat-based relationships of macroinvertebrate communities to aid the design and enhancement of aquatic habitats during future stormwater development. Habitat relationships determined during this study will provide a basis for design criteria that stormwater engineers can use during future regional projects.

Study Area -- The study area is located in north central Colorado in the South Platte River Basin (Figure 1). Ten stormwater basins of Boulder Creek in Boulder and the Cache la Poudre River in Fort Collins were investigated between 1999 and 2000. Dennehy et al. (1994) provides an excellent overview of the characteristics of the South Platte River Basin. Fossil Creek, Smith Creek, Mail Creek, McClelland's Creek, Foothills Creek, Spring Creek, and Clearview Creek in Fort Collins and Goose Creek, Four-Mile Canyon Creek, and Bear Creek in Boulder were chosen for study based on access and permanency of flow. Goose Creek was divided into an upper and lower section as the upper portion is entirely captured by the Whiterock Boulder Irrigation Canal.

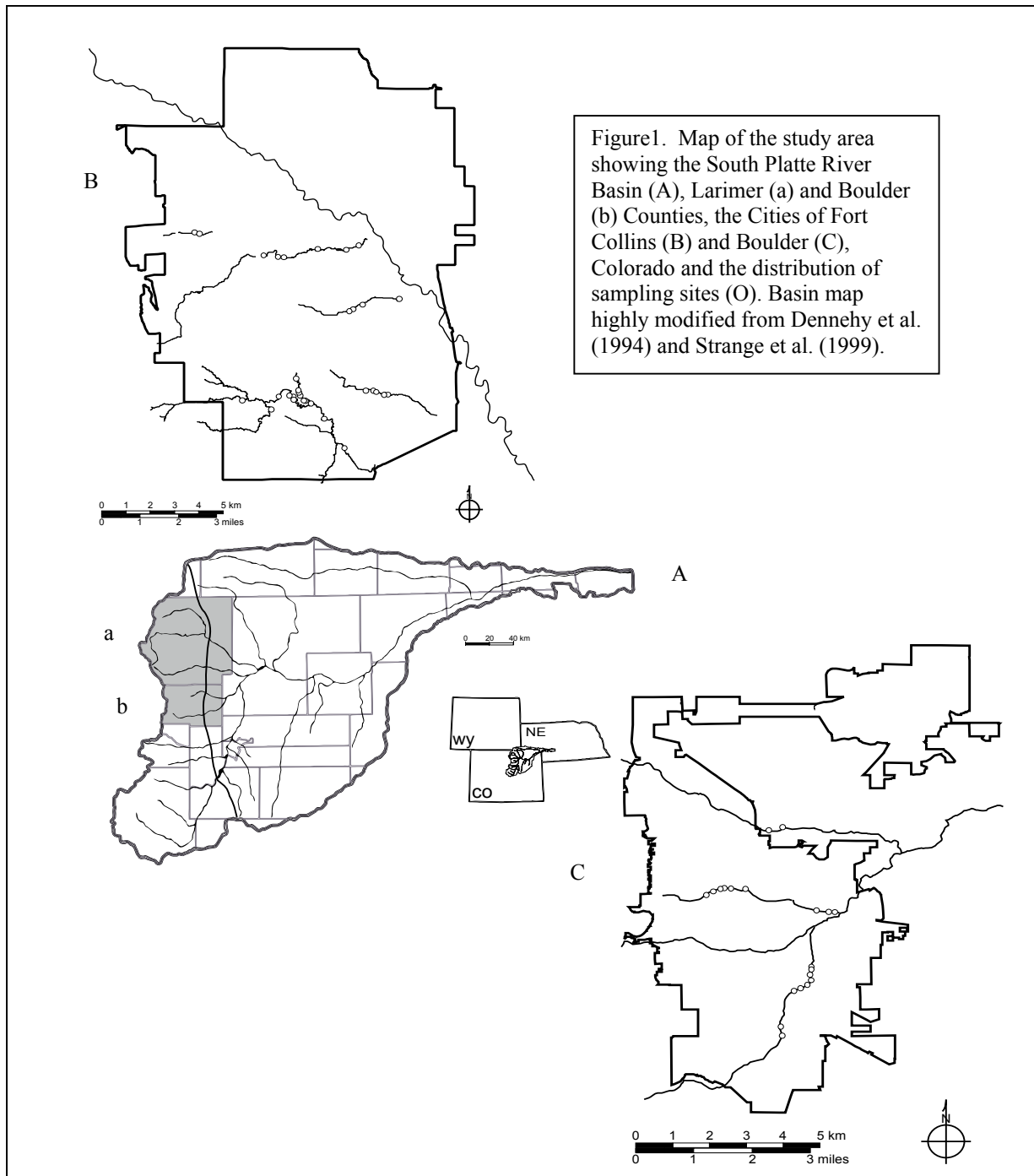
Methods

Study streams were mapped using a hand-held global positioning unit and were segmented into reaches on site. A modified Habitat Quality Index (HQI) from Barbour et al. (1999) was used to characterize stream reaches into similar groups. Prior to HQI assessment, streams were surveyed to establish the range of habitat expected. Habitat quality index scores were totaled for all reaches identified and each assigned to groups 1-5. Group one represented the "best" available habitat and group 5 represented the "worst". A total of 88 stream reaches were evaluated using HQI. Stream reaches were segmented into 50 m sites, and 54 were randomly selected for macroinvertebrate sampling and habitat evaluation.

Each fifty-meter site was divided into the habitat units, run, riffle, pool and glide following guidelines described by Bain and Stevenson (1999). Characteristics associated with these habitat units were measured to reflect the 10 parameters used in the HQI. Additionally, maximum site depth, substrate composition, rootwad area, undercut bank area, percent raw bank, riparian width using Bain and Stevenson (1999) and dissolved oxygen, pH, temperature, and turbidity using Stednick and Gilbert (1996) were also measured.



Macroinvertebrates were collected at each site during the first week of July 1999 and 2000. See Zuellig (2001) for a detailed description of the macroinvertebrate sampling protocol used. Sample processing followed the protocol established by Barbour et al. (1999) with minor modification.



Data Analysis -- Multi-metric and multivariate methods were used to evaluate macroinvertebrate communities and associated habitat. Metrics included taxa richness, mayfly (Ephemeroptera) and caddisfly (Trichoptera) taxa richness (ET), percent ET taxa, midge plus non-insect taxa combined, and percent contribution of the dominant taxon (Karr and Chu 1999, Hoffman 1995). ET was used instead of mayfly (Ephemeroptera), stonefly (Plecoptera), and caddisfly (Trichoptera) (EPT)

because stoneflies have been apparently extirpated from the streams under investigation. Individuals from these three insect orders (EPT) are considered sensitive to pollution and habitat disturbance. Taxa were assigned overall status based on relative percent of all individuals collected as abundant > 10%, common 5-10%, or uncommon < 5%. Box plots representing the median, interquartile range, and extreme values were explored for variability HQI groups. The multivariate technique Canonical Correspondence Analysis (CCA) was used to identify environmental gradients associated with macroinvertebrates and to distinguish any grouping patterns associated among sites (ter Braak 1986, 1994, 1995, Palmer 1993, Jongerman et al. 1995). Pearson correlation was used on the environmental data to identify relationships among habitat variables, HQI scores, biological metrics, and CCA linear combination axes scores.

Results

A total of 11,292 individuals were collected representing 85 macroinvertebrate taxa, of which 61 taxa made up less than a relative 1% of total individuals collected (Table 1). Eight macroinvertebrate taxa made up a combined 77% of the total number of macroinvertebrates collected. Remaining macroinvertebrate taxa were considered uncommon (Table 1). Macroinvertebrates were found on a variety of substrates ranging from cobble riffles to mats of trailing filamentous algae attached to bottom substrate. The midges were the most diverse, representing 32 taxa, of which 25 made up less than 1% of the total collected.

Habitat Quality Index (HQI) scores did not consistently predict site and macroinvertebrate community characteristics, although separation occurred between best and worst available habitat (Figure 2). However, Conical Correspondence Analysis identified % pool, % glide, % riffle, stream width, and rootwad area as predictors of macroinvertebrate communities. Specifically, CCA indicated that % glide habitat was associated with midges, worms, and snails, which are considered taxa tolerant to disturbance. More sensitive groups, such as mayflies and caddisflies were associated with higher percent pool, and more diverse habitats.

Discussion

Many environmental variables were significantly correlated with HQI scores suggesting that HQI was adequate for assessing habitat; however, patterns established by CCA suggest that HQI scores alone may not be a useful predictor of the benthic communities of these Front Range urban streams. Low HQI scores did not always indicate macroinvertebrate assemblages consisting of groups usually associated with poor water quality and degraded habitat nor did high HQI scores consistently indicate a community thought to be associated with higher quality habitat. Several environmental variables were significantly correlated with macroinvertebrate metrics and CCA axes suggesting that quantitative measurements may be better predictors of the urban benthic community than subjective measures of habitat quality (HQI) although this too was not always consistent.

Sites associated with high occurrences of midges, worms, snails, amphipods, bivalves, and crayfish were most closely associated with sites along narrow streams with a high percent of glide habitat with fewer pools, and those associated with mayflies and caddisflies were associated with sites that were wider, with high percent riffle and high percent pool habitat. Some sites along Upper Goose Creek, Foothills Creek, and parts of Bear Creek have relatively complex habitat but were dominated by macroinvertebrate groups that are often associated with poor water quality and habitat condition, which suggests that site-specific habitat characteristics are not the only controlling factors affecting these urban benthic communities.

Also, the CCA grouping patterns of sites found within the Fossil Creek, Bear Creek, and Goose Creek Basins further supports the idea that basin wide influences may be important in influencing urban macroinvertebrate communities. Many workers have investigated the influence of land use on biotic condition and have found that regional landscape factors are stronger predictors than site-specific conditions (Roth et al. 1996, Allan et al. 1997). Also, Richards and Host (1994) found that macroinvertebrate community differences were correlated with housing density and that substrate heterogeneity was the strongest factor influencing macroinvertebrate communities. Stoneflies are apparently extirpated from the streams under study and are considered good water quality indicators (Baumann 1979).



Table 1. List of macroinvertebrate taxa collected during July of 1999 and July 2000 at 54 sites from 11 streams within the cities of Fort Collins and Boulder, Colorado, their frequency of occurrence among all sites "FOC", and relative abundance "RA" of 11,292 individuals collected during the study, and status "ST" (A = abundant > 10%, C = common 5-10%, and u = uncommon < 5%). * = taxon makes up less than 1% of taxa collected.

Group	Taxon	FOC	RA	ST	
Mayflies	<i>Acentrella insignificans</i>	24	1	U	
	<i>Baetis tricaudatus</i>	46	14	A	
	<i>Baetis flavistriga</i>	13	7	C	
	<i>Fallceon quilleri</i>	22	1	U	
	<i>Pseudocloeon dardanum</i>	1	*	U	
	<i>Heptagenia diabasia</i>	10	*	U	
	<i>Nixie sp.</i>	1	*	U	
Caddisflies	<i>Tricorythodes minutus</i>	22	3	U	
	<i>Ceratopsyche bronta</i>	9	1	U	
	<i>Cheumatopsyche pettiti</i>	27	8	C	
	<i>Hydropsyche occidentalis</i>	3	*	U	
	Hydroptilidae	29	1	U	
	<i>Hydroptila sp.</i>	24	1	U	
	<i>Agraylea multipunctata</i>	11	*	U	
Dragon and Damselflies	<i>Oecetis sp.</i>	1	*	U	
	<i>Argia sp.</i>	3	*	U	
	<i>Archilestes grandis</i>	1	*	U	
	Coenagrionidae	1	*	U	
	<i>Ophiogomphus severus</i>	1	*	U	
True Bugs	<i>Belastoma fluminea</i>	1	*	U	
	<i>Rhagovelia distincta</i>	3	*	U	
	<i>Sigara sp.</i>	4	*	U	
	<i>Gerris sp.</i>	1	*	U	
Beetles	<i>Aquarius remigis</i>	1	*	U	
	<i>Agabus sp.</i>	7	*	U	
	Elmidae	9	1	U	
	<i>Dubiraphia sp.</i>	8	*	U	
	<i>Heterolimnius corpulenta</i>	1	*	U	
	<i>Optioservus sp.</i>	2	*	U	
	<i>Zaitzevia parvula</i>	2	*	U	
	<i>Peltodytes sp.</i>	1	*	U	
	True Flies	<i>Tipula sp.</i>	18	*	U
		Stratiomyidae	2	*	U
<i>Ephydra sp.</i>		3	*	U	
<i>Clinocera sp.</i>		5	*	U	
<i>Limnophora sp.</i>		2	*	U	
<i>Simulium sp.</i>		44	12	A	
Ceratopogonidae		1	*	U	
Pentaneurini		38	1	U	
<i>Thienemannimyia grp.</i>		38	1	U	
Tanypodini		1	*	U	
<i>Tanypus sp.</i>		1	*	U	
Diamiesini		2	*	U	
<i>Pseudodiamesa sp.</i>		2	*	U	
Prodiamiesinae		3	*	U	
<i>Odontomesa sp.</i>		1	*	U	
<i>Prodiamesa sp.</i>		2	*	U	
Corynoneurini		10	*	U	
<i>Corynoneura sp.</i>	2	*	U		
<i>Thienemanniella sp.</i>	10	*	U		
Orthocladiini	50	10	A		

	<i>Brillia</i> sp.	6	*	U
	<i>Cricotopus</i> sp.	44	9	C
	<i>Eukiefferiella</i> sp.	17	1	U
	<i>Limnophyes</i> sp.	1	*	U
	<i>Orthocladius</i> sp.	1	*	U
	<i>Parakiefferiella</i> sp.	1	*	U
	<i>Parametriocnemus</i> sp.	2	*	U
	<i>Tvetenia</i> sp.	1	*	U
	Chironomini	45	8	C
	<i>Chironomus</i> sp.	2	1	U
	<i>Cryptochironomus</i> sp.	15	1	U
	<i>Dicrotendipes</i> sp.	23	3	U
	<i>Endochironomus</i> sp.	2	*	U
	<i>Glyptotendipes</i> sp.	1	1	U
	<i>Microtendipes</i> sp.	1	*	U
	<i>Parachironomus</i> sp.	1	*	U
	<i>Paratendipes</i> sp.	3	*	U
	<i>Phaenopsectra</i> sp.	8	*	U
	<i>Polypendilum</i> sp.	9	*	U
	<i>Stictochironomus</i> sp.	7	2	U
	Tanytarsini	20	1	U
	<i>Pseudochironomus</i> sp.	1	*	U
	<i>Micropsectra</i> sp.	6	*	U
	<i>Nimbocera</i> sp.	1	*	U
	<i>Paratanytarsus</i> sp.	6	*	U
	<i>Rheotanytarsus</i> sp.	4	*	U
	<i>Tanytarsus</i> sp.	1	*	U
Crayfish	<i>Orconectes</i> sp.	23	1	U
Scuds	<i>Gammarus lacustris</i>	22	3	U
	<i>Hyalella azteca</i>	5	1	U
Water Mites		8	*	U
Sow Bugs	<i>Caecidota</i> sp.	27	*	U
Aquatic Worms	Lumbricidae	27	2	U
	Lumbriculidae	13	2	U
	Naididae	25	4	U
	Tubificidae	43	11	A
Flat Worms	<i>Dugesia</i> sp.	33	2	U
Nematodes		15	*	U
Leeches	Hirudinidae	17	*	U
Snails	Physidae	32	3	U
	Lymnaeidae	2	*	U
Mollusks	<i>Sphaerium</i> sp.	7	1	U
	<i>Pisidium</i> sp.	7	*	U

In the urban environment investigated here, the majority of the common macroinvertebrate taxa found, including species of mayflies and caddisflies, are considered tolerant to human disturbance and therefore can exploit a wide range of habitat conditions. This may explain why some measured environmental variables that are known to affect benthic communities such as substrate, stream depth, bank stability, and riparian area were not important factors in predicting these urban benthic communities.

Of the habitat variables investigated, glide habitat, which is often created during stormwater projects by straightening, deepening, and widening the stream channel to increase the efficiency of flow during high water events, was associated with tolerant organisms; therefore, using percent glide habitat might be a way of identifying a habitat gradient of urban influence on stream communities. Glide habitat often has non-turbulent flow with low to moderate even velocity and lacks features associated with pools and has an indefinable thalweg (Bain and Stevenson 1999). The construction of this type of habitat should be avoided during stormwater development. Pool and riffle development should be encouraged in stormwater design

without the use of vertical drop structures, which flatten the slope and potentially block the upstream movement of aquatic organisms.

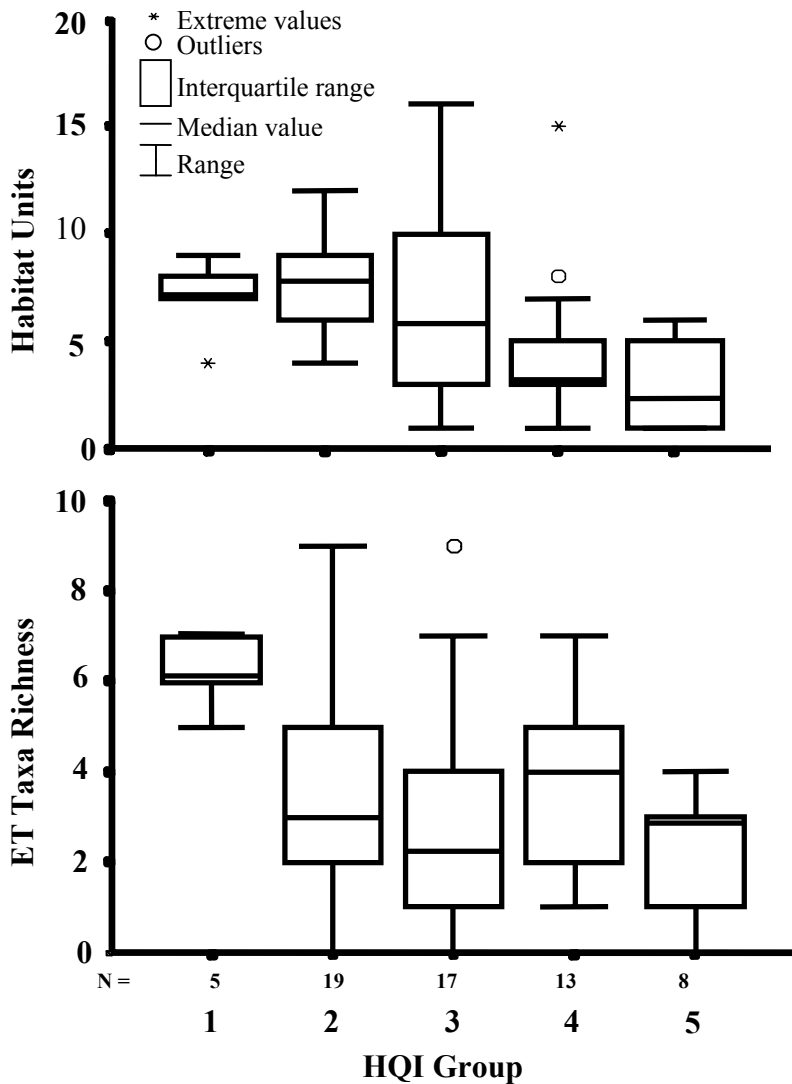


Figure 2. Box plots representing the interquartile range, median, range, outliers, and extreme values of ET taxa richness and the number of habitat units plotted against Habitat Quality Index (HQI) groups. The number of habitat units is the cumulative number of different habitat types identified at a site and ET taxa richness is the cumulative number of mayfly (E) and caddisfly (T) taxa collected at a site. N = the number of sites represented by the plot.

Results indicate that macroinvertebrates are responding to channel morphology in these urban streams, which can be influenced by stormwater departments through the proper design of stable channels in urban environments. Stormwater engineers should work with aquatic biologists throughout the design and construction process so that habitat features important to aquatic organisms can be incorporated into urban streams. This is especially important along the Front Range, where most cities have been established near the transition zone between mountains and plains, which theoretically should harbor highest species richness. Consistent biological monitoring and maintenance of such projects will be essential in determining the success of any mitigation that takes place in the urban environment and should be incorporated throughout the stormwater management process.



Literature Cited

- Allan, J.D., D.L. Erickson and J. Fay. 1997. The influence of catchment land use on stream integrity across multiple spatial scales. *Freshwater Biology* 37:149-161.
- Bain, M. B. and N. J. Stevenson, editors. 1999. *Aquatic habitat assessment: common methods*. American Fisheries Society, Bethesda, Maryland. 216 pp.
- Barbour, M.T., J., Gerritsen, B. D. Snyder, and J. B. Stribling. 1999. *Rapid bioassessment protocols for use in streams and rivers: Periphyton, benthic invertebrates, and fish*. Second edition. EPA-841-B99-002, U.S. Environmental Protection Agency, Washington, D.C.
- Baumann, R.W. 1979. Nearctic stonefly genera as indicators of ecological parameters (Plecoptera: Insecta). *Great Basin Naturalist* 39:241-244.
- Boulton, A. 2000. The subsurface macrofauna. In: *Streams and Groundwaters*. Eds. Jones, J.B. and P.J. Mulholland. Academic Press, San Diego, California. Pp 337-356.
- Dennehy, K.F., D.W. Litke, C.M. Tate, and J.S. Heiny. 1994. South Platte River Basin-Colorado, Wyoming, and Nebraska. *Water Resources Bulletin* 29:647-683.
- Eschner, T. R., R. F. Hadley, and K. D. Crowley. 1983. Hydrologic and morphologic changes of the Platte River Basin in Colorado, Wyoming, and Nebraska: a historical perspective. U.S. Geological Survey Prof. Paper 1277-A. 39 pp.
- Fausch, K.D. and K.R. Bestgen. 1996. Ecology of Fishes indigenous to the central and southwestern Great Plains. Pp. 131-166 In F.L. Knopf and F.B. Samson, eds. *Ecology and Conservation of the Great Plains Vertebrates*. Springer Verlag, New York.
- Hoffman, S. 1995. *Water quality work plan for Spring Creek and Fossil Creek, Fort Collins, Colorado, final report to the City of Fort Collins stormwater utility*.
- Jones, R.C. and C.C. Clark. 1987. Impact of watershed urbanization on stream insect communities. *Water Resources Bulletin* 23:1047-1055.
- Jongerman, R.H.G., C.J.F. ter Braak and O.F.R. van Tongeren. 1995. *Data analysis in community and landscape ecology*. Cambridge University Press, Cambridge, 299 pp.
- Karr, J.R. and E.W. Chu. 1999. *Restoring life in running waters: better biological monitoring*. Island Press. Washington D.C. 205 pp.
- Palmer, M.W. 1993. Putting things in even better order: the advantages of canonical correspondence analysis. *Ecology* 74:2215-2230.
- Pitt, R. 2001. Receiving water impacts associated with urban runoff. In: *Handbook of Ecotoxicology 2nd edition*. Eds. D.J. Hoffman, B.A. Rattner, G.A. Burton, Jr. and J. Cairns, Jr. Lewis Publishers. CRC Press, Boca Raton. In press.
- Richards, C. and G. Host. 1994. Examining land use influences on stream habitats and macroinvertebrates: a GIS approach. *Water Resources Bulletin* 30:729-738.
- Roth, N.E., J.D. Allan, and D.L. Erickson. 1996. Landscape influences on stream biotic integrity assessed at multiple spatial scales. *Landscape Ecology* 11:141-156.
- Stednick, J. and D. Gilbert. 1996. *Water quality inventory protocol: riverine environments*. National Park Service. Department of the Interior. Fort Collins, Denver, and Washington. Technical Report NPS/NRWRD/NRTR-98/177.
- Strange, E.M., K.D. Fausch, A.P. Covich. 1999. *Sustaining ecosystem services in human-dominated watersheds: biohydrology and ecosystem processes in the South Platte River Basin*.
- ter Braak, C.J.F. 1986. Canonical correspondence analysis: a new eigenvector technique for multivariate direct gradient analysis. *Ecology* 67:1167-1179.
- ter Braak, C.J.F. 1994. Canonical community ordination. Part 1: basic theory and linear methods. *Ecoscience* 1:127-140.
- ter Braak, C.J.F., and F.M. Verdonschot. 1995. Canonical correspondence analysis and related multivariate methods in aquatic ecology. *Aquatic Sciences* 57:255-289.
- Zuellig, R.E. 2001. *Macroinvertebrate and fish communities along the front range of Colorado and their relationship to habitat in the urban environment*. M.S. Thesis. Colorado State University.

Acknowledgements

The Agricultural Experiment Station provided financial support for this project. The departments of Water Quality Services of the Cities of Fort Collins and Boulder provided additional financial support. Many people from both cities provided guidance throughout this project. For their assistance we thank Kevin McBride, Robert Zakely, Donna Scott, Betty Solek, and Nancy Steinberger. Many other people provided assistance in the field collecting information, often spending long hours under sometimes unpleasant conditions. For their assistance, humor, and camaraderie I thank Heather Berman, Tami Laninga, John Laurer, Joe Nicholson, and Tad Stout. Also, Richard Durfee and Dr. Kevin Bestgen (Larval Fish Lab, Colorado State University) gave unselfishly of their time verifying identifications of macroinvertebrates and fish.

MILAN REWERTS RECEIVES PRESTIGIOUS AWARD

Milan Rewerts, director of Colorado State University Cooperative Extension, received the Ruby Award Nov. 15 in recognition of his distinguished service to the organization. Epsilon Sigma Phi, the national Cooperative Extension professional fraternity, gives the Ruby Award annually to a director of one of the nation's land-grant university Cooperative Extension programs. The award is the most prestigious award given by the organization. As director of Colorado State Cooperative Extension, Rewerts has consistently demonstrated innovative leadership and support for teamwork within the university.



REDUCTION OF NITROGEN LOSSES BY USE OF SURGE IRRIGATION

*by Daniel F. Champion
Cooperative Extension, Mesa County*

Surge irrigation has long been known to conserve applied irrigation water by advancing the water through the field more rapidly than if the water had been allowed to run continuously. The process employs a controller and valve that switches the water back and forth between two halves of a field for times that increase upon each switch. These are called "advance times," and the amount of time needed to get the water through the length of the field varies according to the size of the field and the amount of water available for application. At the conclusion of the advance of the water to the end of the field, the controller switches the water application to shorter "soak" cycles. These are analogous to applying the water to the field in "layers."

The advantages of this process are many: the water is applied more efficiently; deep percolation losses of water are minimized; and runoff losses of water are minimized. Thus, it follows that sediment and nutrient losses may be minimized as well under surge irrigation.

A grant was obtained from the U.S. Bureau of Reclamation to study the benefits of surge versus conventional irrigation with respect to losses of nitrogen. The grant supplied enough funds to purchase two automated water samplers and flow meters and other peripheral equipment. Under a previous grant from the U.S. Bureau of Reclamation, surge valves and controllers were placed with selected producers in the Grand and Gunnison Valleys. The terms of the placements were that Colorado State University Cooperative Extension personnel would be allowed to monitor irrigation efficiencies from both the surge-irrigated portion of the field and the conventionally irrigated portion. The results of the study were published annually, and are available elsewhere. The conclusions obtained were that the surge irrigation increased water use efficiency by about 25 percent over the conventional irrigation, and that producers accepted and immensely liked surge irrigation.

We sought to re-establish several contacts with these producers so that we could study the losses of nitrogen fertilizer from both surge and conventionally irrigated fields. However, due to the popularity and effectiveness of the surge irrigation, producers were reluctant to place a portion of their fields back into conventional irrigation. Finally, four irrigations were compared for nitrogen in runoff and deep percolation from surge versus conventional irrigation for one time only for each site. Two sites were in Montrose County, and two were in Mesa County, in West-Central Colorado. The sites in both Mesa and Montrose Counties were planted to corn and small grain.

The automatic samplers were placed at the tail end of the fields to be measured. One of the samplers was set to sample one side of the surge irrigation and the other was set to sample the runoff from the conventional side of the field. The samplers obtained one composite sample of 18 liters.

The total water applied to the field was either measured by small furrow v-notch trapezoidal flumes placed in four furrows or by U.S. Bureau of Reclamation flow meters. Water off the field was measured by the small v-notch flumes. The data from the four furrows was extrapolated to the entire field.

Table 1 presents the data for small-grain runoff concentrations in Montrose County. The data is from the fourth irrigation of the season. By previous agreement, the producers' names remain unknown in this report. It is obvious that the runoff, nitrate nitrogen and phosphorus as well as total runoff, are less from the surge irrigated field portion than from the conventionally irrigated field. Phosphorus is generally insoluble in alkaline water solutions, and travels mainly attached to sediment. When the sediment is diluted by a greater body of water, more of the phosphorus may come into solution.



Table 1. Sediment, nitrate nitrogen and phosphorus in runoff, small grain, Montrose County

<u>Irrigation Method</u>	<u>NO₃-N</u>	<u>Ortho-P</u>	<u>Sediment</u>	<u>Runoff</u>
-----mg/L-----				AF/A
Surge	0.05	0.02	1.22	0.18
Conventional	0.08	0.02	1.68	0.28

Field Size: 46 acres, 5 acres conventional

Table 2 shows similar data for a sweet-corn field in Montrose County. Sweet-corn producers often apply amounts of fertilizer and irrigation water greater than those applied to feed corn. Similar results can be observed for the sweet-corn field as the small-grain field, but the concentrations of nitrate nitrogen in the runoff are somewhat greater as are the amounts of runoff. However, the surge-irrigated portion of the field had significantly less runoff and nitrate nitrogen in the runoff than did the conventionally irrigated field portion. The results are from the third irrigation of the season, and the second after an application of nitrogen fertilizer as ammonium nitrate.

Table 2. Sediment, nitrate nitrogen and phosphorus in runoff, sweet corn, Montrose County

<u>Irrigation Method</u>	<u>NO₃-N</u>	<u>Ortho-P</u>	<u>Sediment</u>	<u>Runoff</u>
-----mg/L-----				AF/A
Surge	0.11	0.02	1.87	0.26
Conventional	0.13	0.02	1.78	0.38

Field Size: 30 acres, 5.5 acres conventional

Table 3 presents data from a small-grain field in Mesa County. This was the first irrigation after an application of nitrogen and phosphorus fertilizers, and the fertilizer pellets were still visible on the soil surface. This is a common practice – plant the grain in the fall with a minimum application of fertilizer, and then apply the bulk of the fertilizer upon green-up in the spring. Irrigation water is then applied and it moves the fertilizer into the root zone.

The data suggest that surge irrigation was responsible for lessening the amount of runoff, sediment and nutrients from a recently fertilized field. The concentrations of nutrients were significantly higher than those from fields that were not recently fertilized.

Table 3. Sediment, nitrate nitrogen and phosphorus in runoff, small grain, Mesa County

<u>Irrigation Method</u>	<u>NO₃-N</u>	<u>Ortho-P</u>	<u>Sediment</u>	<u>Runoff</u>
-----mg/L-----				AF/A
Surge	0.16	0.13	0.32	0.33
Conventional	0.23	0.08	0.40	0.48

Field size: 8 acres, 2 acres conventional

Table 4 shows data that was obtained from a cornfield in Mesa County. Similar results to those observed in Montrose County were realized.

Table 4. Sediment, nitrate nitrogen and phosphorus in runoff, corn, Mesa County

<u>Irrigation Method</u>	<u>NO₃-N</u>	<u>Ortho-P</u>	<u>Sediment</u>	<u>Runoff</u>
-----mg/L-----				AF/A
Surge	0.09	0.03	0.37	0.22
Conventional	0.13	0.02	1.41	0.40

Field size: 17 acres, 2.2 acres conventional

Surge irrigation was instrumental in significantly reducing nutrients in irrigated field runoff, both in quantity and concentration in the runoff. In addition, sediment losses were lessened by use of surge irrigation. Also, surge irrigation decreased nitrogen movement through the soil profile.

MEETING BRIEFS



12TH SOUTH PLATTE FORUM A BIG SUCCESS

Over 160 people convened at the Raintree Plaza in Longmont, Colorado, October 24 and 25, 2001, for an update on water conservation, water quality, water banking, well augmentation, and recreation issues in the South Platte Basin. Twenty-three speakers enlightened and entertained the audience, providing insight and understanding of the increasingly complex water management tasks facing both water managers and citizens in the South Platte valley.

The 'Who wants to be a Water Manager?' game show, in a humorous manner, illustrated the extent and depth of information needed to allocate water among competing uses. Bob Steger, Denver Water, and Jay Skinner, Colorado Division of Wildlife, were excellent in the skit.

Ralph Morgenweck, Regional Director, U.S. Fish and Wildlife Service and Russell George, Director, Colorado Division of Wildlife provided updates on the federal and state perspectives, respectively, regarding the interface between water and wildlife issues. Their talks have been transcribed and follow this brief summary of the Forum.



Above: Rob Sakata, Chair, Colorado Water Quality Control Commission, and Eric von Stroheim, Graduate Student, Department of Sociology at CSU.



Above: Emile Hall, Graduate Student, CSU Earth Resources Department; and Cathy Tate, USGS South Platte NAWQA Chief (and member of South Platte Forum Organizing Committee).



Above: Rob Hennecke, Region VIII, EPA (and member of the South Platte Organizing Committee); and Christine Habermann, University of Darmstadt, visiting CSU researcher from Germany.





WILDLIFE AND THE SOUTH PLATTE FORUM: A NEW PARTNERSHIP

Keynote Address presented at the South Platte Forum October 25, 2001

*by Russell George, Director
Colorado Division of Wildlife*

Thank you, Gene (Gene Schleiger), for that nice introduction. Commissioner of Agriculture Don Ament, raise your hand and let us welcome you. I've known Don a long time, and in recent years I've learned that when you are in a meeting with Donald Ament, you are entitled to have a little fun at his expense. I don't know what it is about him, but we all do it and we all enjoy it immensely. And I see Ralph Morgenweck sitting beside him. Ralph, you should feel pretty good about the fact that I'm going to pick on Don, because I think the USFWS regional director gets picked on about as much he does. Nice to see you here, Ralph.

I mentioned Don because so often in the eight years he served in the legislature, before I got there and then when we served together for a number of years, we both ended up on the Capital Development Committee. That caused us to have to ride around the state together for long periods of time. We had to sit in the same automobile for hours and listen to each other talk. Well, it didn't matter where we were, you can imagine that we would be talking about water.

Don Ament now lives about as far away from the headwaters of the South Platte as I live from the headwaters of the Colorado. I was born, raised, and still live along the Colorado River. Don has spent his entire life trying to steal the water that I'm trying to keep him from having. So, particularly as we would get over to this part of the state, he'd start bragging about the success that the Northern Colorado Water Conservancy District has had in increasing the supply of water to the Eastern slope. Notice when I jump from Ament to Northern, I drop the word "stealing." The only reason I did that was because you have to learn over the years to be careful whom you make into enemies.

As an old western Colorado irrigator and water lawyer, you can imagine what I must have thought when I sat down at the table, and on my left is Denver Water and on my right is Northern Colorado Water Conservancy District. Being gentlemen, as we all are, the topic of conversation during lunch was, "Isn't it interesting how everything changes as time goes on and people that you once thought were not your friends now end up breaking bread with you?" I think that is the message your conference wants for you; all of you are here from many places and from the many interests you represent, and this may be your largest conference so far. Oftentimes the fact that people come is the first sign of success, because generally people do not come to a conference unless they intend to communicate, to inform and educate, or to work. So you're already motivated



Russell George describes efforts to protect endangered species by the Colorado Division of Wildlife.

when you come, and that's why the prospect of this conference being such a success is very likely.

First, on behalf of the Division of Wildlife, I want to tell you how much we enjoy being a partner in this particular forum. We have been a partner from the beginning, and I want to think that ongoing participation is important. We think what you're doing with the forum is right and we're grateful, glad, and thankful to be a player in it. That is reflective of what I want to say about the whole South Platte River Basin. Now bear in mind how difficult this is for an old Colorado water boy to talk about the South Platte River.

I am probably the most ignorant person in the room about South Platte River water issues, but I have learned that the Division of Wildlife has a number of people who know a great deal about them: water rights, species issues and all of the other corollary parts. I have been on a high-speed learning curve on the South Platte, so please forgive me if I seem to not

understand about a very unique system that we have here. You'll just have to understand that you have probably had more time and opportunity to be thoroughly familiar with what's happening here than I have had. If you want to talk about the Colorado River, maybe we can turn that around a bit, because Hal Simpson is here and he's our expert on every drop of water in the state.

Let me tell you about just a few of the things that we are doing. My colleague, Shane Briggs is here. Shane helped me walk through the many things we do and gave me some notes I want to share with you. Forgive me that the list is fairly long, but it's an interesting list of the things we're doing. We are partnering with any number of you in trying to understand, manage, and improve the benefit of the water flows and uses of water in the South Platte River.

The first project that I had a chance to examine, shortly after becoming director, is the Tamarack State Wildlife Area and the Tamarack Project. The interesting effort there is to pump out of the water level of the South Platte River during non-call periods - pump the water up onto our property to create wetlands and then use the return flow and the timing of the return flow as a way to help our compact demands. It's a form of water storage that I was not familiar with. On the Western Slope you can't do that. First, if you can find any water in a well the quantity is such that you can't do much with it, and then if you do dump it on the ground you end up ruining the soil. So, it was a new concept to me to see the ability to use groundwater in this way and be able to imagine how that can be a form of storage and return flows and have some legal benefits as well as all the wildlife benefits we have. We're in the early phases of that, and if it works, we have more wells to drill, more quantities of water to apply, and more opportunity to meet that compact.

There are some very complicated legal questions involving the measurement, the timing and return flows. I'm not sure we have that all sorted out. There are a lot of very competent people working on that and we do hope to be a player in that effort for a long time. We've done a lot of wetland improvement work on that property and we may even be able to put a fish hatchery in there as well, and use the water that way. So, we have used Tamarack for water rights issues and for wetlands issues.

We have also been involved in going up to the headwaters of the South Platte. We have supported the alternate forest plan proposal for the South Platte canyon, an alternative to the Wild

and Scenic designation. Trout Unlimited and other people with interest in Denver water have worked with us on that. Also, while I talk about the headwaters of the South Platte, we have a problem with the dam at Tarryall Reservoir. I don't know if you're all familiar with how Tarryall plays into the flows of the headwaters, but we have observed an engineering problem with the dam at Tarryall. We had to draw it down this year. We're going to have to repair that dam. There is some question of whether, instead of repairing it, we ought to build it larger, increasing the size of that lake, all of which would be very interesting and have an impact on the flows up at the headwaters.

Jumping back to the east, we are now doing some recreation work at Pruitt. We also have some recreation issues on Jumbo Reservoir, not so much water flow issues, but we were trying to improve the fishery and trying to change the effect of the wake of the water on the reservoir. About anything we did was

creating a conflict for other uses. And whenever we see conflict, the attitude at the Division of Wildlife is, "All right; back up. Whose interests are at stake? How do we balance those interests?" We must understand the interests and issues of the owners of the reservoir, the irrigation company and all of the users, not just our fishermen but also recreation equipment users.

It is not easy to accommodate all those interests, and we had gone in the direction that we can make everybody happy, so we'll advance the wildlife issues. And we will - we'll advance those issues, but we'll do it in such a way that the whole community appreciates it and that none of them has a negative effect upon those other uses. I am pleased if we are headed that way, and maybe that's a template for how we can solve other problems involving lakes where we have all those competing uses.

The Colorado Division of Wildlife is a major landowner and wildlife manager, with 15 state wildlife areas on the main stem of the river from Greeley to Nebraska. That means we have significant wildlife types, differences of wildlife habitat, and probably one of the most biologically diverse ecosystems in the entire state. I'm probably not telling you folks anything you don't already know, but it does complicate how we meet our mission. We have hunting and wildlife observation opportunities, wild

...whenever we see conflict, the attitude at the Division of Wildlife is, "All right; back up. Whose interests are at stake? How do we balance those interests?"



turkey, bobwhite, quail, various waterfowl species, and of course we have fairly good hunting for both mule deer and whitetail deer, and some elk.

I have a long list of other things we've done at the Elliott State Wildlife Area – we have a great success story on that: the wetland initiative that we're involved in with a number of partners including the Nature Conservancy and Ducks Unlimited. We have put millions of dollars into thousands of acres to improve wetlands all up and down the South Platte River Basin with very wonderful success stories that you should all be interested in, and many of you are very proud to have been a part of that.

In conclusion I want to say to all, whomever you are, that you want us to succeed as the Division of Wildlife, the State wildlife manager, and you want Ralph Morgenweck of the United States Fish and Wildlife Service to succeed. By that, I mean that in looking at all the species that we have in the South Platte River Basin – all types of wildlife -- what you want to say to us is, "Will you please be successful in protection and recovery of every one of those species that you can." Wherever we fail, it imposes on wildlife, endangered species, and threatened species choices over the water law regime, and it is a different set of laws. So, if your interests in the river are somehow attached to the prior appropriation system or our constitution -- whether it's a property right concern or a quantity or a quality question for you -- the body of law that you're working with will be changed, will be trumped, anytime we have a wildlife species concern. I am not putting a value judgment on that – I am not saying it is good or bad – that is just the way it is.

As the state wildlife manager, I have to tell you that as long as I have this job we will not allow a single species of living creature go extinct. It is not going to happen. We will take great care as we learn what is out there, it's health and population, and what it will take to assure that health and survival. I want to stay out of your way. The old water lawyer in me is very much committed to the constitutional system – the Prior Appropriation Doctrine. I want to keep us out of your way so that you can exercise your constitutionally protected

property rights – the ownership and use of water. But you will have to help me on this – don't fight me, help me. That's when partnership is at it's best.

That is really the final message. At our table earlier I was talking about how aggravated I used to be as a water lawyer. Every time I turned around, some government entity was suing another government entity. Now, unless I was being paid by one of them, I thought this was a bad deal. As I got older and my tax bill increased, as my kids got older and all expenses increased, and then as I got into the legislature, I found that I had to do something about protecting the public's money. It has become virtually unacceptable to me as a public servant to see one governmental entity suing another for any purpose. It's bad government; it's bad policy. And I don't find a thing wrong with the courts. I understand the value and place for our courts and respect enormously our legal system, particularly the strength of our constitutional system. That's not my issue. My issue is the investment of resources.

We don't have time to be wasting our resources fighting. That's just nonsense, and I don't know what it means to figure out how to always solve the problem without resorting to litigation. But my advice to my own people, the advice that I will give anywhere, anytime is: you figure out a solution. I have spent most of my adult life trying to find solutions to problems. Try to honor competing uses and goals, figure out a balance of give and take. It can be done and it should be done. I'm getting old enough now, and my kids are old enough now, that I can give fatherly advice to all of you today. We will certainly do our part along these lines with the Division of Wildlife, and I suspect you are all susceptible to this discussion or you would not be a part of the forum and you would not be here today. Thank you all very much; I have enjoyed being here.

FISHERIES ECOLOGY – CSU Spring 2002 Course – FW540

Course Description: This course will present conceptual foundations from basic ecology that apply to the management of environmental problems in lotic and lentic systems from population, community and ecosystem perspectives. Applications to contemporary issues related to ecohydrology, river restoration, food web and water quality management, management of river/reservoir ecosystems, sustainable fishery management practices and conservation of aquatic biodiversity will be discussed.

See the website at <http://www.cnr.colostate.edu/FWB/fw540/index.html>



UNTYING THE GORDIAN KNOT: HOW TO RECOVER ENDANGERED SPECIES IN NEBRASKA AND AT THE SAME TIME ALLOW WATER USERS TO RECEIVE THEIR WATER

*by Ralph Morgenweck, Regional Director
U.S. Fish and Wildlife Service
Denver, Colorado*

I have been involved with Platte River issues for some time. I have been regional director now for about nine years. About the time I took the job, one of the things I heard about was the Management Joint Study on the Platte River, where for a number of years studies had been conducted looking at issues related to endangered species, other wildlife, water use, etc. When I came into my job, it seemed like the energy in those studies was pretty well gone. So we wondered, where are we going to go from there? We had some Federal Energy Regulatory Commission relicensings coming up, and how were we going to get through the endangered species issues on the river?

That prompted about a six-month effort involving the Bureau of Reclamation where we consulted with the three states – Nebraska, Wyoming and Colorado – about whether we could sit down and negotiate some kind of program that would deal with the endangered species issues on the river much like what we had done on the Upper Colorado River. It took six months for all the parties to agree to sit down and negotiate. We then took another three years to negotiate what is now known as the Cooperative Agreement. That set the stage for the negotiations to develop the actual recovery program itself, which would be contained in a biological opinion as a reasonable and prudent alternative that would cover water depletions on the Platte River.

It has been three or four years now that we have been negotiating on the program. One of the things that you have to learn in these issues is patience; that is what it takes to get through these issues. While we were negotiating the Cooperative Agreement, we thought the most difficult thing would be dealing with the water issues, so we worked and worked and worked collectively with the states, the water users, the environmental groups, etc., and we came up with a reasonable approach. We thought the land part would be the easy part, but we found that was just as difficult as the water.



Ralph Morgenweck presents a federal perspective on the three-state agreement and endangered species issues

Today I want to explain what we as the Fish and Wildlife Service see as the important components to a reasonable and prudent alternative. Let me first spend a couple of minutes on the Endangered Species Act. When an action is taken where the Federal Government authorizes or carries out permits and there is an endangered species involved, there is a responsibility on the part of action agencies like the Federal Energy Regulatory Commission or Bureau of Reclamation, Forest Service, etc. to consult with the Fish and Wildlife Service to identify what the impacts on endangered species are. If those impacts are severe enough that they would jeopardize the continued existence of the species, we work together to come up with what is called “reasonable and prudent alternatives;” that is, some modification in the proposed project that would eliminate the jeopardy to the species. What we are trying to accomplish in the Platte River Program is to develop this reasonable and prudent alternative that



would then create a situation where existing water uses, and in fact some new uses, would all pass muster under the Endangered Species Act. That is, the jeopardy condition would be alleviated. That is our task.

I am going to borrow some of the lessons that we have learned from 13 or 14 years of work on the Upper Colorado River, because that program has been in existence now since 1988. It has gone through a lot of the problems and issues that we are now working on in the Platte River. There are some lessons we can borrow that hopefully will shed some light on where we might go in the future. One issue is, if we are able to agree on a reasonable and prudent alternative, how then do we measure whether that reasonable and prudent alternative is being carried out successfully by all the parties involved in this program? This is what we call a milestone concept or a milestone approach. What that really says is that the principals involved in the Platte River on the governance committee for the program have agreed to a certain number of things that we are going to accomplish. So far, we have agreed on about 10 things; including the modification to Pathfinder Reservoir, putting in place the Tamarack Program, continuing to use the Nebraska Environmental Account to manage the water – things of that sort.

The certainty that water users have under the Endangered Species Act continues so long as those milestones are met -- the biological opinion stays in place, water users can use their water, and things will continue as they were. Now, what happens if one of those milestones can't be met? This is one of the issues that has been problematic in our discussions on the Platte River. What works very well in the Colorado River, for example, is that we agree that in the first 13-year phase of the program we will acquire interests in approximately 10,000 acres of land to provide terrestrial habitat for the species in question, which are the least tern, piping plover, and whooping crane. What happens if, after 12 years and nine months, we only have 8,500 acres? Does the biological opinion's reasonable and prudent alternative go away? Do people lose their compliance with the Endangered Species Act? The answer is no, and here's why. What we have found in the Colorado River is that as we evaluate our progress on milestones and we see that we are having problems somewhere (which is not any news to those who have Colorado River), we gather together and evaluate why we are having a problem. Is it that we can't find enough willing sellers in terms of this example on the Platte River? Is it that we cannot act fast enough as an

organization as land becomes available, land that we want, but someone else is in there before we can get it? What is the problem?

Historically, on the Colorado River, we sit down and devise a new plan that becomes the new milestone and maintains the protections of the Endangered Species Act both for the species and the people who have been depending on that reasonable and prudent alternative. That is how we deal with it. So, this concern about milestones comes in and goes out, comes in and goes out, in terms of the discussions on the Platte River. Those of us who have been through the wars on the Colorado River see this as a very workable thing, but for those who haven't been through this it is a very frightening thing. If you are depending on this program for your Endangered Species Act compliance you want to make sure that it will stay there, because you will be investing resources to implement this reasonable and prudent alternative as well. The milestone issue is very important on the Platte.

What are some of the components of our reasonable and prudent alternative that we need to come to agreement on in the proposed program for the Platte? There are five things overall, but I will only talk about three. The five things are:

Have appropriate milestones.

Have the depletion plans by the three states.

Have whatever depletion plans are required for the federal agencies that may have new, substantial depletions coming in the future.

Have a habitat protection plan to protect and manage the 10,000 acres in the first 13-year program.

What are we going to do related to the pallid sturgeon, which is another listed species found much farther down in the Platte system, down where it and the Missouri River come together?

The last includes the issues of flow, vegetation and sediment, all interacting together in terms of the habitat on the river.

I will take these last three items one at a time and talk a little about each of them.

The Habitat Protection Plan

The Habitat Protection Plan, or the terrestrial habitat portion of this program, is about 90 percent put together. We have kept the goal that we agreed to in the cooperative agreement of 10,000 acres in habitat complexes. That is an important concept: What are habitat complexes? These are complexes of sand-island habitats in the river, roosting habitat for the whooping cranes that requires a certain depth of water in a certain field of vision – probably about 1,100 feet according to our best biology – and wet meadows associated with the river channel where cranes can get their protein food as they are preparing for their migration and egg-laying. Those complexes of habitats, we think, should be about 2,500 acres in size.

We are interested in these habitat complexes because we believe that they are the best way of assembling habitats for the species that we are concerned with. But one thing that we know from the experience of Audubon and the Platte River Trust is that you cannot acquire these things overnight. These complexes are just not out there to be had. There are a lot of landowners, some interested perhaps in selling, others not. There will have to be restoration of habitat or manipulation of habitat to make some of those areas suitable; and quite frankly, the Platte River has become a more and more popular area for recreational use. Homes are being built, whether they are first or second homes doesn't make any difference, and also a lot of people are interested in hunting there, so the price of land is going up. Our priorities, then, are to start with these complexes. If we can't get complexes, we want to get components of complexes. If we can't get that, then we want to get important habitats that are useful to the species, habitats that sometime in the future could be formed into a habitat complex.

We are also looking at other habitats not included in these complexes that may well provide biological benefits to the species. We are calling these non-complex habitats, and they might be such things as sand pits where terns and plovers do nest because there is an ongoing and active sand operation. It also could be wetlands; not the wet meadows associated immediately next to the river, but larger wetland complexes greater than 50 acres outside the river channel itself. We know that whooping cranes will use those larger wetlands, 50 acres and above; they prefer them 100 acres above but at 50 acres we know they will use them. We are looking at some of these non-complex habitats as well.

There are some participants in the program who are concerned about reaching the 10,000-acre number even

if some of it is not necessarily good habitat. My message is: I think it is more important to get the right and good habitat and do our best to make 10,000 acres; but if we fall a little short, we can look at our milestones and find a way of dealing with that situation. We don't think there are a lot of these non-complex habitats are out there. We think perhaps if you will look at a 3-1/2-mile zone on either side of the river in the critical habitat part of the Platte that there may be a couple of hundred acres of those wetlands. Right now, we know that Nebraska Public Power District is managing three sand pits for birds. We know of three other sand pits that have birds nesting on them and that totals 32 acres, so I don't think these non-complex habitats will necessarily add up to a whole lot by the time we are done. My main point is that we believe that biologically complex habitats are the most important types of habitat that we could get for the species. I don't want our partners in this to feel that they are being pressured to just get any old habitat out there just to get the 10,000 acres. That is not the way we should proceed.

The Pallid Sturgeon

The second of the three that I want to mention is the pallid sturgeon. The pallid sturgeon creates a lot of uncertainty because we don't know very much about the fish itself. We are concerned with why we would go through all this difficulty of putting together a program that serves as a reasonable and prudent alternative for water depletions and then not deal with the pallid sturgeon and not include it in the program. Then you would have another endangered species issue hanging out there. How do we do that if we don't know a lot about the specifics of this animal? When we first started the Colorado River Program, we didn't know much about razorback suckers, humpback chubs, the Colorado pike minnow, and the bonytail. The early years of that program were devoted very heavily toward research on the species so we understood better how many there were, what their habitat type was, what did it take for spawning, where did they spawn, did they spawn – answering a lot of biological questions.

Once we had some answers, we were able to devise management actions so we could address the habitat problems, whatever they happened to be. The pallid sturgeon falls into the same category, in my mind, in that we need some milestones that get us to where we can ultimately decide what we really need to do for the pallid sturgeon in this program. Of concern to our partners is that this sounds really open-ended. Let's say I am a water user. I don't really know whether or not this pallid sturgeon thing will cost the program \$10, \$10,000,



100,000, \$10 million, or \$100 million. It feels open-ended to me. We are trying, as a group, to devise milestones that are reasonable and doable, recognizing that we can't answer that question right now. One of the things that needs to be in the reasonable and prudent alternative is having adequate depletion plans, which the states are working on and the appropriate federal agencies as well; then combine that with active investigations about the pallid sturgeon and what it needs in the area where we find it down at the lower end of the Platte River. Once we understand that better, we can devise program actions later on to take care of those issues. Do we know how big that elephant is? We don't. It may be an elephant; it may be a mouse. I don't know.

So, there is some level of uncertainty; but if we do the things that are laid out in the reasonable and prudent alternative, regulatory certainty for the regulated public will last certainly through that first phase of the program. At the end of the first 13 years we will evaluate, decide what needs to be done for a second phase, and that will continue the regulatory certainty for those water users.

Flow, Vegetation and Sediment

The last issue is one that has been of great concern, a great deal of work, and a lot of consternation: it concerns flow, vegetation, and sediment. Our conclusion as the Fish and Wildlife Service is that it is probable that river and habitat trends reflect the view that losses of habitat are continuing due to the interactions of existing flows which obviously are less than they were historically because of the dams on the North Platte; that during periods of low flow vegetation establishes itself in the river and we don't have high flows to scour that away (and there is debate about whether or not that really happens), as well as change in sediment regime. A lot of the sediments that came from the North Platte obviously are being trapped behind dams, and the South Platte is now the major contributor of sediment, and the sediment is coarser than what came out of the North Platte.

As we looked at a GIS analysis of the habitat in this Big Bend reach of the Platte River, we noticed that if you look at the upper end and compare what the river looks like there with the lower end, the upper end is much more wooded; the channels are narrower; and there are not large or broad-site distances for whooping cranes, for example, to roost in. We believe that condition is a result of all the things that have happened in the river, and we are concerned that the condition is moving downstream. We believe the program needs to take

actions that will maintain the good habitats that are in the lower part of that stretch, and hopefully, with appropriate actions over time, this will restore some of those habitats in the upper part. To what extent we don't really know, but we believe this is an active process that is occurring.

This doesn't mean that everyone else agrees that is what is happening. The states hired Parsons Engineering to look at all of this, and they have some different hypotheses about why things are the way they are. I don't believe we will have agreement on that as we move into the first phase of the program. What will we do about that? We believe there has to be a commitment to define elements in the program that are contained in the reasonable and prudent alternative that we will investigate in terms of changing things on the river – for example, removing vegetation from islands, lowering those islands to increase the site distances for the cranes, and widening the channel. At the same time we will look at some of the hypotheses that Parsons has put forward about how the river processes work – sediment movement, vegetation reestablishment – how this fits together based on a period of time when it may be wet versus a period of time when it may be dry. We believe there has to be a combination of investigations not only by river processes but also by what we call actions that we take to try and create more habitat for the species – widening the river, lowering the islands, etc.

We believe also that a very important part of this is our integrated monitoring and research program. We need to gather data about what works, what doesn't work, and what happens when we try some of these actions. As we look at river processes, how do we then take that new information and make some sense out of it, because this is an adaptive program. Adaptive management to me, but not necessarily to everyone else, means we try things, we monitor them, we test them, we see if we get the desired results, and if we don't we try other things. We continue that way, trying to increase the habitat for these species and reduce the jeopardy condition. We believe that the kinds of physical actions in the river that need to be investigated are the things that I just mentioned: taking the vegetation off the islands, lowering some of the islands, hopefully being able to find sources of sediment life when we lower the islands to see how the sediment reacts and what happens in the river. Obviously, you have to be mindful that you have neighbors when you do these kinds of things, so you have to select the right places to do that.

I will go back to one thing about disagreement. A lot of people can argue very vigorously about what they

believe is happening in the river, and there is not agreement. What we must do when we have these disagreements is find a way of moving forward so that we can agree on steps in a certain direction: that we test, we monitor, we do research, and then we take our next step based upon what we have learned there. That has served us well in the Upper Colorado River and I think it will serve us well in the Platte River as well. That element is a very important part of the overall program.

I just want to summarize that the three items that we believe are most critical in our biological opinion contained in that reasonable prudent alternative are the habitat protection plan; what to do about the pallid sturgeon; and the whole issue of flow, vegetation, and sediment. Obviously, we must have the milestones and depletion plans in there as well, but those are things that are being taken care of on an independent track. We think that this can produce an effective solution for Platte River water users.



WATER SUPPLY

Dry conditions exist across most of Colorado, as reflected in the low SWSI values. October river flows and precipitation were below normal in all major river basins. Most demands for irrigation water end during October, which allows river flows to begin to be directed to reservoir storage and recharge. Water rights for many reservoirs are junior in priority to direct flow irrigation users, and so must typically wait for direct flow irrigation use to stop before they can take water. Recharge projects along the lower South Platte River are used to create delayed groundwater and return flows that augment the river during the summer. Recharge in the San Luis Valley is accomplished in order to replenish the shallow unconfined aquifer from which large numbers of irrigation wells divert.

We have been at it for a long time, and we must remain patient. We have to look at borrowing the experiences from other places around the country, including the Upper Colorado, because it is so close. Situations may be different. I have been involved in the Colorado River, the Platte River, and the Missouri River, and I can say that this kind of approach is workable with patience, but there are also unique characteristics about each one and you have to be prepared for those unique situations.

I also think that if we are unsuccessful in putting together this program, it is a very unhappy future for all of us. It would mean that the Fish and Wildlife Service would be consulting on all kinds of individual actions. Trying to assemble some kind of impact offset that way is very, very difficult to do, it is expensive to do, and in the end I am not sure that we can get where we need to be, which is a large-scale program that pools resources and brings results that are better and cheaper for everyone. We will continue to be engaged as the Fish and Wildlife Service, and will continue to work with all of our partners to make this happen.

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 streamflow, reservoir storage, and precipitation for the summer period (May through October). During the summer period, streamflow 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 November 1, 2001, and reflect the conditions during the month of October.

Basin	9/1/01 SWSI Value	Change from the Previous Month	Change from the Previous Year
South Platte	0.4	-1.1	-1.0
Arkansas	-0.5	-0.4	0.9
Rio Grande	-1.9	-1.4	-0.9
Gunnison	-2.2	+0.3	-0.5
Colorado	-1.3	-0.4	-1.0
Yampa/White	-1.7	+0.6	-0.7
San Juan/Dolores	-2.6	-1.5	-2.0

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





STUDENT WATER SYMPOSIUM SHOWCASES STUDENT COURSEWORK AND RESEARCH

by Annie Epperson, Symposium Coordinator

The Fifth Annual Student Water Symposium was held on the 7th, 8th and 9th of November, 2001, in the Lory Student Center at Colorado State University. The theme this year was "Planning for the Inevitable," an opportunity to examine the relationship between anthropogenic influences on environmental factors and the nature of change and extreme events. Both invited speakers and student presenters addressed the theme.

Invited speakers included Peter Gleick, of the Pacific Institute for Studies in Development, Environment, and Security. Dr. Gleick's keynote address was an interesting and engaging overview of the current state of the world's water resources. In keeping with the interdisciplinary nature of the Student Water

Symposium, he touched on social, political and ecological components of the changing world of water. Other invited speakers were panelists Professor Emeritus Gilbert White from CU-Boulder, and Professor Neil Grigg and Assistant State Climatologist Nolan Doesken from CSU. Their lively panel discussion addressed the question of whether natural disasters are inevitable.



Graduate students Jeremiah Szynskie, Garey Fox, Jennifer Lee, and Annie Epperson welcome Keynote Speaker Peter Gleick



Mike Applegate, of Applegate Group, Inc., spends a moment with Gilbert White, Professor Emeritus at the University of Colorado and natural hazards expert

Each year the Symposium awards certificates of achievement to exemplary oral and poster presenters. This year certificates went to Garey Fox, Marci Koski, Shawn White, and Erik Tate-Boldt. Congratulations to these excellent student presenters!

On a personal note, as a member of the organizing committee for this event, I would like to thank all of the departments who offered support and assistance, as well as recognize the efforts of all the student volunteers who made the event possible. Our invited speakers provided us the priceless opportunity to learn outside the classroom. Most importantly, I thank the students who took advantage of this chance to hone their presentation skills in this informal atmosphere. Without them we would have no reason to go on. I look forward to seeing all of you at next year's Symposium—our sixth!



Left: Marci Koski, graduate student in CSU's Department of Fishery & Wildlife Biology, gives her poster presentation on the effects of eutrophication and climate change on kokanee



Left: Marci Koski accepts award from Annie Epperson for best poster presentation

Right: Carolyn Hartl, graduate student in CSU's History Department, described her summer working as an intern for the U.S. Bureau of Reclamation



Right: Garey Fox's graduate research concerns conjunctive groundwater/surface water use in the Western United States and advances in the analytical modeling of stream/aquifer interaction.





Top left (from left): Neil Grigg, Gilbert White and Nolan Doesken, Assistant State Climatologist, participated on the panel, "Are Natural Disasters Inevitable?"

Top right: Peter Gleick chats with Neil Grigg, CSU Civil Engineering

Left: Annie Epperson congratulates Ellen Wohl and Freeman Smith at presentation ceremony

Ellen Wohl and Freeman Smith Recognized for Contributions to Interdisciplinary Water Education, Research, and Outreach

This year's recipients of the Water Center Award, presented annually at the Student Water Symposium, were Ellen Wohl and Freeman Smith of CSU's Department of Earth Resources. The award gives students the opportunity to acknowledge the contributions of their professors to interdisciplinary higher-education goals. Professor Wohl and Professor Smith were both nominated by students in the Earth Resources Department for the award.

Dr. Wohl's students cited her dedication to teaching and research that has promoted an understanding of the physical and biotic processes of mountain rivers. As an adviser, said her students, Dr. Wohl is equally adept at providing guidance to engineers or stream ecologists, and

is known for her guidance, accessibility, support, responsiveness and flexibility.

Dr. Smith's students highlighted his activities that "...foster connections between departments on campus and students within the [Watershed Sciences] program." His contributions to outreach resulted in the development of the *Colorado Water Knowledge* website, which has received worldwide recognition and acclaim – it was designated one of the best children's sites by Yahoo.com, by StudyWeb, and by the National Science Teacher's Association. The Scottish Office of Education Department included the website on a CD-Rom for secondary school and geography teachers. His accessibility was noted by many of his students, who said they were impressed that he always found time for them.

CWRRI

C
U
B
H
A
F
F
E
N
Z
H
Z
H
C
O

NATURAL RESOURCES LAW CENTER
UNIVERSITY OF COLORADO SCHOOL OF LAW, BOULDER COLORADO

What: International Conference: "Allocating and Managing Water for a Sustainable Future: Lessons From Around the World"

Where: University of Colorado Campus, Fleming Law Building, Lindsley Memorial Courtroom

When: June 11-14, 2002

Information: 303-492-1288
Call for papers information: 303-492-1293

URL: www.colorado.edu/Law/NRLC/2002Conference.html

Mail: NRLC, 401 UCB, University of Colorado Law School
Boulder CO 80309-0401

New Report Addresses Water and Growth in Colorado

The Natural Resources Law Center announces the publication of *Water and Growth in Colorado: A Review of Legal and Policy Issues*. Based on approximately 70 interviews with a "who's who" of Colorado water leaders as well as a review of recent water studies and legal documents, *Water and Growth in Colorado* describes existing water problems and potential solutions. While many of the issues identified are not the direct result of population growth, the rapid increase in municipal water demands has brought a greater sense of urgency to almost all facets of Colorado water development and management.

Recent census figures rank Colorado as the nation's third fastest growing state by percent, trailing only Nevada and Arizona. Eight of the nation's 18 fastest growing counties are in Colorado, led by national leader Douglas County. State population projections suggest an additional 1.7 million residents (approximately a 41 percent increase) can be expected over the next two decades. Most of these new residents will locate along the Front Range, a region with limited and already overburdened natural water supplies. Population growth on the West Slope is also expected to rise sharply, actually surpassing the growth rate of the Front Range in terms of percentages.

In many locales, the result of this growth is increased competition for limited water supplies between the municipal, agricultural, and environmental sectors, and between the East and West Slope. Among Front Range municipal water providers, the nature and intensity of this competition varies greatly from city to city due to different water rights portfolios and infrastructures. Many of the associated legal and policy issues involve trans-basin diversions, environmental protection, water quality management, and interstate obligations. Coping strategies generally focus on new development of surface and groundwater, reallocating supplies from agriculture to municipal use, and conservation and efficiency. Each type of solution, however, raises new problems and concerns, as new management strategies must be reconciled with existing water use regimes.

The 191-page report is available for \$20 (plus \$4 postage and handling), or \$10 (plus \$3 postage and handling) in the CD format, from the Natural Resources Law Center (303-492-1286 or 303-492-1272, nrlc@spot.colorado.edu). A 16 page "Summary Report," responses to frequently asked questions about water and growth in Colorado, and additional information can be viewed at

<http://www.Colorado.EDU/Law/NRLC/waterandgrowth.html>.

A chapter in the just-published "Justice and Natural Resources: Concepts, Strategies, and Applications," edited by Kathryn Mutz, Gary Bryner and Douglas Kenney (all of NRLC) is devoted to water problems faced by low-income people in Colorado. Titled "Water, Poverty, Equity, and Justice in Colorado," the piece is authored by James Wescoat, Jr., Sarah Halvorson, Lisa Headington, and Jill Replogle. The chapter focuses on several key theoretical questions, among them: What types of low-income water problems constitute environmental injustices, as compared with the other ways of framing those problems? What are the conceptual strengths and weaknesses of alternative ways of framing low-income water problems? And, what forums and remedies does each conceptual approach offer? The book is available through Island Press: www.islandpress.org.

UNIVERSITY OF NORTHERN COLORADO

Tom Cech, Executive Director of the Central Colorado Water Conservancy District, will teach WATER MANAGEMENT AND POLICY for the third year in a row at the University of Northern Colorado in Greeley. The graduate class, ESCI 574-

011 (3 semester hours, registration # 2745) will be offered Monday nights from 6-9 pm starting January 14th in Room 3570 of Ross Hall. For further information about the class, contact Tom Cech at (970) 330-4540 (WORK). The UNC Registration Center can be reached at (970) 351-2521.

NEW FACULTY PROFILE

by Marian Flanagan

ERIC SCHUCK DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS COLORADO STATE UNIVERSITY

In the fall of 2001, the Department of Agriculture and Resource Economics welcomed Eric C. Schuck as its newest faculty member. Eric earned a B.A., Magna Cum Laude with Departmental Honors, in Economics from Pacific Lutheran University in 1993. In 1995, he received an M.A. in Economics from the University of Montana where he studied resource economics. His thesis examined methods for valuing recreational activities. In 1999 Eric received a PhD in Agricultural Economics from Washington State University. He spent two years as an assistant professor at North Dakota State prior to moving with his wife Calanthe (Cally) Turner, and their two children, son Skyler (2 years old) and daughter Zoe (6 months old), to Fort Collins, in August.

Eric is a water economist who specializes in irrigation water pricing. His primary field of expertise is in the Bureau of Reclamation's water pricing reforms in California, and how irrigators respond to changes in water prices. Eric especially loves studying the unintended consequences of these changes. "People don't realize that responses to changes in water prices can be really dynamic," he pointed out. For instance, rising prices may reduce consumption for the short term, but when farmers adjust their irrigation systems, change the crops they grow, invest in wells, or use different responses to compensate, the outcome may or may not result in overall reductions in water use.



Eric studies these responses by developing computer models that predict what kind of irrigation system farmers will use given the crops they grow, the physical attributes of their fields, and water costs. He then analyzes what level of runoff and supply of return flows to expect downstream, as well as ground water effects.

Presently, Eric is doing water-pricing research by setting prices and studying how people respond to them. He is looking at changes in irrigation technology, changes in cropping patterns, and investments in wells, as well as water quality and regulations on manure storage facilities for animal research. His future research will involve selenium leaching in the Gunnison area and salinity leaching in the Arkansas River Basin.

Eric and his wife are originally from the State of Washington. They met at Pacific Lutheran where they were both on the track team. Eric also was a rower at the collegiate level for an eight-man lightweight rowing team. They both enjoy outdoor activities and are looking forward to visiting the Rocky Mountains of Colorado.



**RESEARCH EXPERIENCES FOR UNDERGRADUATES
PROGRAM IN WATER RESEARCH
AT
COLORADO STATE UNIVERSITY
Summer 2002**



PROGRAM DESCRIPTION

The Water Center at Colorado State University is seeking applications for its 2002 NSF Research Experiences for Undergraduates program in Water Research at Colorado State University. Fifteen selected undergraduate students will undertake an individual research project in water research under the supervision of a Colorado State University faculty member. The research will be performed at Colorado State University during 8 weeks in the summer (June and July).

In addition to their research experience, students will participate in weekly workshops, seminars and discussions on topics in water research, and field excursions to introduce them to important water issues. Students will present the results of their research (in the form of papers or posters) at an end of program symposium. Students will be encouraged to present their work also at the CSU Student Water Symposium during Fall Semester 2002, and to participate in the 2003 edition of the AGU Hydrology Days at Colorado State University.

REU students will receive a stipend of \$2,400 for participation in the program. Students will be provided with housing during the 8-week summer program. Reimbursement for child care expenses may be available on request.

ELIGIBILITY REQUIREMENTS

- At least a junior standing in an appropriate major at the time of application with good academic standing. Students must have at least one semester left prior to graduation as of June 1, 2002.
- Application form completed and submitted on-line with a copy of transcripts and two letters of reference.
- One to two page essay describing student's interest in water research.

APPLICATION PROCEDURE

Only on-line applications will be accepted. In order to apply, point your web browser to the following URL: <http://WaterREU.colostate.edu/> and follow the directions provided. The process includes filling out a short on-line form, providing copies of official transcripts, and obtaining two letters of reference.

APPROPRIATE MAJORS FOR THE PROGRAM

The following is an incomplete list of the majors that are appropriate for this program. If you are not sure if you are in an appropriate major, contact one of the individuals listed below.

Agricultural Economics, Agricultural Engineering, Agricultural Science, Atmospheric Science, Biochemistry, Biological Science, Bioresource Engineering, Civil and Environmental Engineering, Chemical Engineering, Chemistry, Ecology, Environmental Science, Fishery Biology, Forestry, Geology, Water Resources and Hydrologic Science and Engineering, Microbiology, Natural Resources Recreation and Tourism, Range and Forest Management, Range Ecology, Soil and Crop Sciences, Watershed Science, Wildlife Biology.

For more details about the program, including a list of previous research topics, point your web browser to the following URL: <http://WaterREU.colostate.edu/>. For additional questions you may contact:

DR. JORGE A. RAMIREZ
Colorado State University
Civil Engineering Department
970-491-7621
ramirez@engr.colostate.edu

DR. JUDY HANNAH
Colorado State University
Earth Resources Department
970-491-5661
jhannah@cnr.colostate.edu

MS. MARILEE ROWE
Colorado State University
Civil Engineering Department
970-491-5247
mrowe@engr.colostate.edu



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

Awards for period September 27-November 21, 2001

Title	PI	Dept.	Sponsor
Lightning & Radar Observations from Ground-Based & Spaceborne Platforms: Applications for Tropical Rainfall...	Rutledge, Steven A	Atmos. Sci.	NASA
Fort Bend & Beaver/Badger Watershed Plans	Smith, Freeman M	Earth Res.	USDA-NRCS
Monitoring of the Little Snake River & Tributaries	Bledsoe, Brian	Civil Engr.	Three Forks Ranch Corp.
Establishing the Status & Trends of Impaired, Threatened, & Outstanding National/State Resource Waters in the ...	Loftis, Jim C	Civil Engr.	NPS
Provide the Latest Information Technology Available to the Natural Resource Program Center (NRPC)	Loftis, Jim C	Civil Engr.	NPS
Assessment of the Benefits & Costs of Pressurized Dual Water Systems	Wilkins-Wells, John	Civil Engr.	St. Vrain & Left Hand WCD
Interactions of the Monsoons & Anticyclones in the Coupled Atmosphere-Ocean System	Randall, David A	CIRA	NOAA
The Response of North American Monsoon to Boundary & Regional Forcing	Pielke, Roger A	CIRA	NOAA
Developing a Mesoscale Observing Network over the North Atlantic Continent and Adjacent Ocean Areas to...	Vonderhaar, Thomas	CIRA	NOAA
Enhancement of Satellite Data Processing & Analysis Capabilities in Central America	Vonderhaar, Thomas	CIRA	NOAA
Impact of Interactive Vegetation on Predictions of North American Monsoons	Denning, A Scott	CIRA	NOAA
Air-Sea Interaction Remote Sensing Processes	Vonderhaar, Thomas	CIRA	NOAA
Examination of the Linkages between the Northwest Mexican Monsoon & Great Plains Precipitation	Cotton, William R	CIRA	NOAA
U.S. Weather Research Program Joint Grants Program Severe Weather Research	Vonderhaar, Thomas	CIRA	NOAA
Coupling between Monsoon Convection & Subtropical Highs in the PACS Region on Subseasonal to Interannual Time Scales	Johnson, Richard H	CIRA	NOAA
Enhanced Communications at CIRA for the Development of Real-time Evaluation of Advanced Microwave Sounder ...	Vonderhaar, Thomas	CIRA	NOAA
Selenium in the Upper Colorado River Basin: Public Education & Remediation	Loftis, Jim C	Civil Engr.	USDA-CSREES

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

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

UNIVERSITY DEPARTMENTS, INSTITUTES AND CENTERS: Colorado State: BSPM-Bioagricultural Sciences & Pest Management, CBE-Chemical & Bioresource Engr., CSMTE-Center For Science, Mathematics & Technical Education, 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, SCS-Soil & Crop Sciences. University of Colorado: ACAR-Aero-Colorado Center for Astrodynamic Research, AOS-Atmospheric & Oceanic Sciences, CADSWES-Center for Advanced Decision Support for Water and Environmental Systems, CEAE-Civil, Environmental, and Architectural Engineering, CIRES-Cooperative Institute for Research in Environmental Sciences, 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/Seep/Spring/Biological Inventories in Several Colorado Counties	Culver, Denise	FWLB	BLM
Characterization & Quantification of Streamflow Features & Variability for Historic Gunnison River Flows	Garcia, Luis	Civil Engr.	USBR
Precision Farming to Protect Water Quality & Conserve Resources	Westfall, Dwayne	SCS	USDA-ARS
Quantifying Space-Time Variability in Agricultural Landscapes	Salas, Jose	Civil Engr.	USDA-ARS
New Economic Budgeting & Risk Assessment Components for GPFarm	Hoag, Dana	DARE	USDA-ARS
Monitoring Runoff & Erosion in the Upper South Platte Restoration	Macdonald, Lee	Earth Res.	USFS
Use of Low-Cost Data to Simulate Fractured-Aquifer Watersheds for Management of Water Quality & Quantity	Ward, Robert	CWRRI	USGS
Comparison of Reclamation Treatments at Buffalo Creek Wildfire Site	Barbarick, Kenneth	SCS	EPA
Water in the Earth System: A National Science Digital Library K-12 Collections Project	Geary, Edward	CSMTE	NSF
Ensemble Simulations of Regional Climate...	Pielke, Roger	Atmos. Sci.	NASA
Preble's Mouse Surveys in Trout Creek	Schorr, Robert	FWLB	USFS
Establishment of Baseline Water Quality Conditions in NPS	Hannah, Judith	Earth Res.	NPS
Monitoring Ecological & Physico-chemical Effects of the Cerro Grande Fire	Clements, William	FWLB	USFS
Natural Heritage Inventory & Assessment of Wetlands in Gunnison County	Culver, Denise	FWLB	CDNR
Comprehensive Statewide Wetlands Classification & Characterization	Culver, Denise	FWLB	CDNR
Management Alternatives for the Cache la Poudre River Corridor	Bertschy, William	Housing	NPS
County Land Use Impacts on Irrigation Districts	Wilkins-Wells, John	Sociology	USBR
Cloud Studies with an Airborne Cloud Radar	Stephens, Graeme	Atmos. Sci.	CA Inst. of Tech.
Dynamics of Tropical Cyclones & the Hadley Circulation	Schubert, Wayne	Atmos. Sci.	NSF
Coordinated Agricultural Water Quality Programming for EPA Reg. VIII	Walker, Lloyd	Civil Engr.	USDA
Wetland, Aquatic & Riparian Protocols	Wohl, Ellen	Earth Res.	Univ. of WY
Numerical Simulation & Analysis of Mesoscale Convective Systems & Severe Storms	Cotton, William	Atmos. Sci.	NSF
Characterize Channel Disturbance Regimes in Hydroclimatically Extreme Regions	Wohl, Ellen	Earth Res.	DOD-ARMY

UNIVERSITY OF COLORADO, BOULDER, COLORADO 80309
Awards for September, 2001

Title	PI	Dept.	Sponsor
Hydraulic Geometry of Gravel-Bed Rivers	Pitlick, John	Geography	USFS
Improving Simulation of Sea Ice Lead Conditions and Turbulent Fluxes...	Maslanik, James	CIRES	NASA
Ice Shelves and Landfast Ice on the Antarctic Perimeter: Characteristics and the Effects of Climate Change...	Scambos, Theodore	CIRES	NASA
Validation Studies and Sensitivity Analysis for Retrievals of Snow Albedo and Snow Covered Area from EOS AM-1 Instruments	Nolin, Anne	CIRES	NASA
The Development of Operational Adjoint Method-Based Ensemble Prediction Techniques for El Nino Southern Oscillation	Moore, Andrew	CIRES	NSF
Modular Ocean Data Assimilation	Moore, Andrew	CIRES	NSF
Theoretical Archetypes for Understanding Interactions Between Sea-Ice and Large-Scale Atmospheric Dynamics	Lin, Johnny Wei-Bing	CIRES	NSF
A Decision-Making Framework for Stream Restoration from Acid Mine Drainage	Flores, Nicholas	IAAR	NSF

Title	PI	Dept.	Sponsor
The NE Sector of the Laurentide Ice Sheet - Dating Outlet and Local Glacier Moraines...	Miller, Gifford	IAAR	NSF
Interannual Changes of Stratospheric Dynamical and Chemical Structure and Relationship to Changes of the Residual Circulation	Callaghan, Patrick	PAOS	NSF
Evaluation of Conventional and Alternative Coagulants in Particulate and Organic Removal	Sinha, Shahnawa	CEAE	City of Denver
Experimental Antarctic Mesoscale Prediction Systems (AMPS)	Cassano, John	CIRES	Ohio State Univ.



EPA STAR PROGRAM FUNDS ENVIRONMENTAL STATISTICS PROJECTS AT COLORADO STATE AND OREGON STATE

The Environmental Protection Agency STAR Program has funded two new research efforts, one at Colorado State University and the other at Oregon State University, which will focus on environmental statistics oriented toward aquatic resources. The two programs share similar goals, but take different approaches. While the CSU program will be oriented toward model-based approaches, the OSU program will be oriented toward design-based model-assisted approaches.

The CSU research effort, called Space-Time Aquatic Resources Modeling and Analysis Program (STARMAP), will be housed at the Department of Statistics. The program has three major goals:

- Conduct research and development on statistical modeling tools appropriate for the setting,
- Train future generations of environmental statistics, and
- Engage in outreach to the States and Tribes.

The research and development effort will be conducted under the auspices of three projects: Combining Environmental Data Sets; Local Inferences from Aquatic Studies; and Development and Evaluation of Aquatic Indicators. The plan is to transfer the needed statistical expertise through a combination of supervised application of statistical tools and structured distance learning techniques, especially using web-based learning materials. The funding level for the grant is \$3 million for four years, which will provide support for approximately 2.5 postdoctoral fellows and two PhD students for the duration of the project.

The OSU companion project is funded at the same rate of \$3 million for four years, and will be housed at OSU's Department of Statistics. Three state agencies will identify areas where statistical expertise will be especially beneficial, and act as "laboratories" for testing distance-learning methods – the Oregon Department of Fish and Wildlife, the California State Water Resources Control Board, and the San Francisco Estuary Institute. The interaction of these three agencies and the program has the potential to develop into model archetypes for state and local-level monitoring programs.

The two principal investigators are Scott Urquhart of CSU and Don Stevens of OSU. The two programs will be closely coordinated, and results will be shared at joint annual meetings.





WATER NEWS DIGEST *by Marian Flanagan*

CLOUD SEEDING

Cloud seeding program to be shared between Purgatory, water district

Durango Mountain Resort and the Southwestern Water Conservation District (SWWCD) will share costs of a cloud-seeding program for the second consecutive year. The resort and district will split most of the estimated \$60,000 cost of the program, which they hope will provide more snow for skiers and greater runoff for irrigators. Directors of the Animas-La Plata Water Conservancy District unanimously approved spending \$1,392 for the program. SWWCD president Fred Kroeger said the district's share of the cost, about \$30,000, would be worth the chance of inducing more precipitation in what promises to be a drier-than-expected year. This year's cloud-seeding program will run from November through January, the traditional cloud-seeding season. Durango Mountain Resort resumed cloud seeding last year after a 15-year hiatus. The combination of seeding, which studies show can increase precipitation 10 percent or more, and generous weather systems last winter produced 286 inches of snow at the resort, 26 inches above average. SWWCD in September approved spending \$57,107 for half the cost of two cloud-seeding programs. One program, for \$60,724, is for the Upper East Fork Hermosa drainage, Dolores and La Plata river basins, the cost of which will be split with Durango Mountain Resort. The A-LP Water Conservancy District contributed \$1,392. The second cloud seeding, costing \$53,490, is for the Telluride area, and will be split with the Dolores Water Conservancy District and Telluride Ski & Golf Co.

Durango Herald, 11/14/01

FLOODS

Basalt flood study says Highway 82 creates trouble

A new study has determined that several businesses and a handful of residences in Basalt are in unexpected danger of flooding from the Roaring Fork River because of the construction of the Highway 82 Bypass. Consultants for the Basalt town government claim that when the Colorado Department of Transportation (CDOT) built the bypass south of town in the late 1980s, it drastically altered how the river will react to a 100-year flood. As a result, the floodplain established by FEMA in 1987 is now outdated on the south side of the river. The new study will be sent to FEMA, which may use the study to determine its Flood Insurance Rate Maps that are used to determine which properties should or must get flood insurance. Regulations may make development difficult in threatened areas now that developers are required to show they will not add to the downstream flooding potential. In conjunction with the flood study, Basalt is working on a river master plan that proposes numerous safety, aesthetic and environmental changes that could be made along the Roaring Fork and Fryingpan rivers in town. They also are urging the CDOT to make changes to a levee at the upper bypass bridge. Reconstructing the levee to a height three feet above the 100-year flood level would keep the water to the north of the bypass, in its natural channel. The Town Council is considering a staff proposal to spend \$50,000 next year to start implementing the master plan. Millions of dollars from grants and other sources would be needed to make the changes.

The Aspen Times, 9/27/01

LITIGATION

Kansas/Colorado water case headed for mediation

Kansas and Colorado will try to resolve their long-standing dispute over the Arkansas River through a mediator rather than in court, the states' chief lawyers announced. Attorneys General Ken Salazar of Colorado and Carla Stovall of Kansas filed a motion in U.S. Supreme Court this week asking to defer setting a trial date until next year so the sides would have time for settlement talks. Kansas sued Colorado in 1985, claiming that for years Colorado farmers dug wells that diverted millions of gallons of Arkansas River water to their fields. The Supreme Court ruled in 1995 that Colorado violated the Arkansas River Compact by taking more than its share of water. The states still have to agree on how much water Colorado must deliver to Kansas. Both states agreed to have former Montana Attorney General Joe Mazurek serve as mediator.

The Pueblo Chieftain, 9/29/01

US Supreme Court approves North Platte River settlement

Following the recommendation of a special master appointed to the case, the high court ended 15 years of litigation that has cost Nebraska and Wyoming about \$20 million. Under the settlement, Wyoming will administer water rights in accordance with the



decree, with some changes. Nebraska had asked to cut Wyoming water users back to 1930 levels and for \$100 million in damages. Under the settlement, no Wyoming water users will be cut off and the state will pay nothing to Nebraska.

Fort Collins Coloradoan, 11/14/01

WATER DEVELOPMENT/SUPPLY

City awarded Fossil Creek water rights

The North Poudre Irrigation Co. has approved a lease proposal from the city of Fort Collins placing the city in sole control of the surface water rights to Fossil Creek Reservoir. The lease was approved by a 4-1 vote of the North Poudre board of directors. It encompasses both the surface water rights and an approximately 50-foot ring of shoreline around the reservoir. The lease agreement means motorized boating soon will be a thing of the past at Fossil Creek Reservoir. The deal also allows plans to move forward for preserving the reservoir as a habitat for waterfowl and wildlife. The sole responsibility for management rests with the city of Fort Collins, while the county will remain manager of jointly owned lands surrounding the reservoir. The city will lease the Fossil Creek surface water rights for an initial term of five years, with the option to renew the lease for two additional five-year terms and one additional four-year term. The city's lease begins Jan. 1, but there's no timeline yet for building the bird-viewing blinds or observation deck planned for the shoreline.

Fort Collins Coloradoan, 10/4/01

USBR authorizes construction of Animas-la Plata; A-LP opponents protest

The US Bureau of Reclamation has authorized construction on the Animas-la-Plata water project, although digging is at least a year away. Congress authorized the \$343.8-million project last year after the Clinton administration supported a scaled-back version. While November 9 marked the official start of construction on A-LP, any actual earthwork in Ridges Basin, where a reservoir will be built to hold water from the Animas River, won't take place for at least a year. In all, the project is expected to cost \$343.8 million. State and local governments and water districts that will construct the Animas-La Plata Water Project agreed on the amount each would pay before construction begins on the controversial Ridges Basin reservoir. The Colorado Water Resources and Power Development Authority will pay \$7.3 million, and save roughly \$2.5 million by paying early, said Pat Schumacher, Bureau of Reclamation manager for Durango. The San Juan Water Commission plans to pay \$6.9 million before construction begins, and will also save about \$2.5 million, Schumacher said. There is some risk involved in paying early because the money will be used to begin building A-LP, and if the project winds up not being completed for some reason, the money already spent is lost. The State of Colorado could pay \$23.9 million up front – nearly 11 percent of the total cost of the project – but has no plans to do so. Instead, the state may decide to purchase part of the project at a higher cost once it is under construction, Schumacher said. Likewise, the La Plata County Conservancy of New Mexico has not indicated a desire to pay up front. According to the amended cost-sharing agreement, the conservancy would have to pay \$3.6 million – or 1.6 percent of the total cost. Schumacher said having all entities agree on wording for the cost-sharing agreement was a major accomplishment considering how many agencies are involved. More than 100 people waving signs marched through Durango chanting, “no more dams,” to protest the official start of construction of the Animas-La Plata Project. Protesters mailed more than 500 letters to the U.S. Congress and bureau headquarters in opposition to the cost and environmental effects of A-LP. The letters asked for an investigation by the General Accounting Office into the project's funding. Living Rivers, an environmental group in Moab, Utah, with the support of 35 other businesses and environmental groups, sponsored the protest.

Durango Herald, 10/5/01, 11/10/01; *Fort Collins Coloradoan*, 11/10/01

County consortium to bid for water

Thornton has announced that it potentially would auction an annual renewable supply of 8,300 acre-feet of water, the largest sale of renewable water rights in the region in several decades. Water providers in Castle Rock, Roxborough, Highlands Ranch and Douglas and Arapahoe counties are joining efforts to submit a bid as partners of the Douglas County Water Resource Authority. The authority was established over the past couple years as a joint effort to get perpetual renewable water supplies for the south metro area. The Douglas County municipalities rely primarily on nonrenewable, underground water supplies. South metro bids will be considered along with competing bids from water providers in Aurora, Northglenn, Brighton, Lakewood, Englewood and Wheatridge. Sealed bids were due Nov. 16. At one point, Aurora leased the water rights that are up for bid and said it should have priority buyer consideration from Thornton, but Thornton's water resource administrator said the city would consider all bids. Thornton wants not only cash for the rights to supplies from its South Park Water System, but also the promise of return flows. Estimates for the water rights range from \$50 to \$125 million. Thornton said it wants to work with a bidder "not necessarily on the basis of the highest price offered," but one who can provide treated effluent in return and show how they would

get the South Park water to households and back to Thornton after use and treatment. Thornton's water sale depends on the outcome of a lawsuit with Denver. After South Platte River water flows from 11 South Park ranches in Thornton's South Park Water System, it eventually reaches the Front Range and flows through Denver. By the time the water gets to Thornton's north treatment plant, it has more effluent runoff than Thornton wants. The upfront sale of such a large amount of water rights is an opportunity that has not come along in more than 20 years. The Douglas County Water Resource Authority members also have been contributing thousands of dollars to study ways to bring water over the Continental Divide from the agricultural Western Slope of Colorado, a historically controversial issue.

Douglas County News Press, 10/17/01, 11/20/01, *Denver Post*, 10/15/01

Mexican water needs could impact Grand Junction

Demands for water in Mexico could potentially affect the Grand Valley's economy, according to water lawyer Jim Lochhead, a former director of the Colorado Department of Natural Resources. Lochhead was hired by the city of Grand Junction to keep an eye on water issues in the state and nation and update the Grand Junction City Council. U.S. environmental groups are seeking more water from the Colorado River for Mexico to restore wetland habitat for plant and animal species where the Colorado River meets the Gulf of California, according to Lochhead. Mexico receives 1.5 million acre-feet of Colorado River water annually, under contract requirements with the U.S. The Mexican government supports environmentalists' request for more water. Most of the water delivered to Mexico is diverted from the river shortly after it crosses the border and before it reaches the delta, where it needs to go to restore habitat, Lochhead said. Lochhead represents Colorado in negotiations between states as well as between the United States and Mexico. He encouraged the city to maintain its water rights, as there is potential in Colorado for endangered species issues to affect farming in the Grand Valley.

Grand Junction Daily Sentinel, 11/6/01

WATER QUANTITY/QUALITY

Task force continues to tackle selenium problem

Members of the Gunnison Basin Selenium Task Force are part of a continuing effort to reduce levels of selenium in areas where it has been shown to have a high concentration. Selenium has been proven to be more poisonous than arsenic or mercury in high concentrations, although in minor amounts it is an essential trace nutrient for humans and animals, according to task force literature. Selenium is a problem because elevated levels have been shown to cause reproductive failure and deformities in fish and aquatic birds. The task force was formed to bring Selenium levels in the Gunnison River Basin into compliance with requirements imposed in 1997 by the Colorado Water Quality Control Commission, which established a Selenium standard of 5 parts per billion (ppb) for the Gunnison River Basin. "The overall goal of the project is finding ways to reduce Selenium in affected reaches while maintaining the economic viability of the area," said Selenium Task Force Coordinator Karla Brown of Colorado State University's Cooperative Extension. Task force members are testing a product called Polyacrylamide (PAM), originally used to control erosion on agricultural land, as a means of preventing seepage from irrigation canals, thus reducing Selenium loading into agricultural areas. "The test results lead me to believe that treated canals and laterals will continue to seal with no additional treatment before water flow startup, as long as the water contains sediment," said Task force member Lloyd Garner, adding that pond tests showed similar results. "Simulated pond tests show that sediment must be added to help fill the voids. Our pond sealing test tank was 95 percent effective in sealing over a 24-hour period." Dave Butler of the USGS said preliminary test results conducted during irrigation season show a 24 percent decrease in Selenium levels, with a 17 percent decrease over the course of one year. Other PAM studies will be conducted, Butler said, including a demonstration project in Loutzenhizer Basin, which has the highest Selenium loading level of any area tributary. During the summer irrigation season, Selenium concentrations in the Loutzenhizer Basin are 30 ppb, and during the winter concentrations are 150 ppb, Butler said. PAM will be applied to 13-15 miles of canals in March 2002 and will be monitored on a bi-weekly basis. Task force member Paul von Guerard of the USGS outlined a PAM transport study, which will be conducted to assess the long-term effects of PAM moving through irrigation canals. The study will begin in spring 2002. Other projects involving Selenium involve using mitigating plants and deep-rooted trees planted as buffers to reduce soil loss in riparian areas. The trees are expected to reduce erosion while reducing Selenium and salt loading in area streams. Canola and kenaf are two test crops being grown and analyzed for Selenium content as part of mitigation efforts.

Montrose Daily Press, 10/4/01



BLM cleans up Nelson Tunnel

Outside the boundaries of the Leadville Superfund site, runoff from Sugarloaf Mining District's tunnels and mine dumps has been contaminating the Lake Fork waterway for more than 100 years. Previously, with a diversity of ownership ranging from private lots to Bureau of Land Management (BLM) and U.S. Forest Service land, no effort was made to clean the old tunnels and dumps. This year, the BLM decided to tackle the Nelson Tunnel site, which it owns. The effort was voluntary, and six landowners worked with the BLM to allow access to the site. Sixty days and roughly \$100,000 later, the job is complete. The Natural Resource Management Institute (NRMI), based at Colorado Mountain College, will begin monitoring the watershed to ascertain whether the remediation actually works to filter metals out of the water. The BLM is interested in participating in a clean up of the Dinero site, another site that is situated directly in a streambed as well. Remaining projects in this watershed would also need to be done as a partnership with the federal agencies and private landowners in the district.

Leadville Herald Democrat, 11/12/01

Group gets money for Summitville cleanup

Residents of the Alamosa area affected by pollution from the Summitville Mine will form a task force in February to decide how to spend \$5 million in cleanup funding. The money is part of a \$21.5 million damage settlement paid by former mine operators to settle suits filed by the state attorney general's office and the Environmental Protection Agency. Managers of the Superfund cleanup project at the site said this month's early results of test stocking of trout in a reservoir downstream from the mine show the fish thriving. The water had once been so toxic all the fish in the Terrace Reservoir died. Since the late 1980s, the now-defunct gold mine has washed metals from exposed rock into waters feeding the Alamosa River. By 1990, the poorly constructed mine leached so much pollution that Terrace Reservoir, once a haven for anglers, became a graveyard for fish. In 1992, the operation plummeted into bankruptcy and the federal Environmental Protection Agency took it over.

Durango Herald -Associated Press (AP), 11/19/01

EPA announces stricter standard for arsenic level

The Bush administration will accept a new, tougher arsenic standard for drinking water that was issued in the last days of the Clinton presidency. Environmental Protection Agency Administrator Christie Whitman said the decision will reduce the maximum of arsenic allowed in drinking water from 50 parts per billion – a level set in 1942 – to 10 parts per billion by 2006. In September, the National Academy of Sciences issued a report to Whitman saying the agency had greatly underestimated the cancer risks of arsenic in drinking water. The risks are much higher than the agency had acknowledged, even for low levels of arsenic in tap water, the report said. Officials of the Colorado Department of Public Health and Environment say the state won't have many problems meeting the standard.

Denver Post, 11/1/01

No sanctions for bacteria experiment near Cherry Creek Reservoir

State health officials will not punish either Aurora or a contractor for dumping "helpful" bacteria into a pond near Cherry Creek Reservoir without a permit. The July experiment in the Shop Creek detention pond was to demonstrate the bacteria's effectiveness in controlling phosphate pollution. It resulted in no apparent harm to people or fish. David Holm, director of the

Water Quality Control Division, said a regulator wrongly gave the city verbal permission to conduct the experiment. The contractor is vying for a contract to control naturally occurring pollutants in the reservoir, the most heavily visited state park and a critical sport-fish nursery. Officials claim the bacterial solution, often used to clean up small ponds at golf courses and detention basis, is safe and biodegradable. The unorthodox experiment was successful.

The Aurora Sentinel, 10/26/01

City says fish kill unavoidable

Thousands of fish lay dead or dying Nov. 6 after Aurora city workers drained a large pond on the north side of the golf course, but city and state officials said there is little that can be done in such a situation. "That pond hasn't been drained in 15 or 20 years," Aurora Golf Course Manager Dennis Lyon said. "The pond is about 30 years old and it needs to be dredged. There's lots of silt and organic matter in it. It's a normal activity," he added. Lyon said his employees and their counterparts in the Utilities Division were surprised by how many carp lived in the pond. He said city employees who caught several of them by hand in the

nearby Highline Canal originally introduced the common carp to the pond years ago. "As a staff, we feel bad about the fish, but there's really not a lot we could do. To introduce the carp somewhere else would be more detrimental." Lyon said a few hundred of the fish were relocated to other city ponds but that common carp are not a beneficial species of fish, unlike grass carp that eat algae, weeds and fecal matter. The city regularly buys grass carp for such purposes, Parks Director Jack Cooper said. Grass carp also are sterile; therefore they don't breed exponentially as do common carp. Colorado Division of Wildlife spokesman Todd Malmsbury said although the amount of carp killed was unfortunate, the city was within its rights when it drained the pond. But animal welfare activists disagree and said there should have been something done to avoid the death of such a large number of fish, not matter their value.

The Aurora Sentinel, 11/7/01

WATER TRANSFERS

Ag future tough in Lower Ark Valley

Otero County is working on forming a nonprofit conservation trust, where farmers could place part or all of their land, which would place deed restrictions on the property. For example, a farmer with 1,000 acres might not be allowed to have more than two houses on the land. Officials are looking at whether to allow the farmer to lease his water. If that were to work out, the farmer would gain revenue from leasing some or all of his water, yet still could continue farming if there were water left over or if the farmer had water from other sources. The leading alternative is the establishment of conservation easements, which would tie water rights to the property. Farmers also would qualify for tax credits up to a maximum of \$260,000 over 20 years.

The Pueblo Chieftain, 10/1/01

City, water board strike deal on Rocky Ford water

Otero County and the Southeastern Colorado Water Conservancy District (SCWCD) will drop their opposition to Aurora's plan to transfer water from southeastern Colorado in exchange for more than \$5 million in assistance. Aurora struck the deal in late October with Otero County and the SCWCD on its plan to buy most of the shares in the Rocky Ford Ditch Co. The Aurora City Council unanimously passed two resolutions outlining two deals. Aurora already owns 58 percent of the Rocky Ford Ditch and wants to raise its stake to 94 percent. The state Water Court must approve the plan. The ditch company provides irrigation water from the Arkansas River. Purchase of the water will dry up 2,800 acres of farmland in southeastern Colorado, and residents in fear Aurora's purchase of more than 5,000 acre-feet of ditch water from area farmers would have a serious negative impact on the local economy. Although the city is not legally required to mitigate the effects on the area, Aurora has pledged the money to lessen the impact. Aurora will pay Otero County \$125,000 for an expansion study of the Frying Pan-Arkansas water project and \$35,000 per year beginning in 2003 to replace lost tax revenue on the land that will be taken out of agriculture. Aurora will also pay the district \$1 million up front and another \$1.25 million over 25 years once the agreement is enacted. Otero County will withdraw its objection to Aurora's transfer of the water, and the SCWCD has agreed to reach a similar settlement by early next year. Aurora's purchase would supply enough water for roughly 20,000 people.

The Aurora Sentinel, 11/06/01

WETLANDS

Copper Mountain wetland relocation will soon be complete

Copper Mountain community planners have closed a .71-acre wetland area for a housing development at Lewis Ranch, located at the west end of the Copper Mountain Village. Officials now plan to re-create 1.8 acres in three half-acre sites around the village.

Developers have attained a 404 special permit from the Army Corps of Engineers and have acquired community input and approval. Digging for the first site began in June. Ecologists hope to have relocation complete before snowfall begins. The Lewis Ranch wetlands are being replaced at a 2-1 ratio -- for every acre of wetlands that is moved, the contract requires two times the amount to be replaced elsewhere. Officials hope to preserve this asset by creating wetland quality as good as the original lands. Wetlands have a number of functions; preserving various species of wildlife, improving water quality and serving as water retention areas. Ecologists also plan to bring in a variety of new native species to allow a greater functional diversity. The new wetlands in the Village at Copper will serve the same function as they have in the past. They will continue to improve water quality and act as an animal habitat, but the primary function will be to retain water as it moves on to Tenmile Creek.

Summit Daily News, 10/2/01



County accepts Bratton's deal for wetlands mitigation

The Gunnison County Board of Commissioners has decided to accept a proposal by local attorney and landowner Dick Bratton for mitigation of wetlands affected by planned improvements at the airport. Although a contract has yet to be signed, county staff and commissioners will begin negotiations with Bratton's company, Garfield Investments and Minerich Land and Cattle Company very soon. Commissioner Fred Field noted that because Bratton's mitigation will be made on land just three miles east of the airport, adjacent property could be enhanced and the view corridor will be protected. The county is required by the US Army Corps of Engineers to mitigate approximately 25 acres of wetlands at the Gunnison County Airport that will be disturbed when proposed expansion and safety improvements are implemented on the airport's runways, expected to begin in 2003. The county is responsible for 10 percent of the cost of the mitigation and the FAA will pick up the remaining 90 percent.

Gunnison Country Times, 11/8/01

MISCELLANEOUS**Glaciers found hiding in national park**

A new geological survey of Rocky Mountain National Park has determined the environmental treasure is teeming with hidden glaciers. According to geologist Jon Achuff, who has monitored the 267,000-acre park since March for the Geological Society of America, there are at least 120 "debris" or rock glaciers scattered throughout the park. The findings may change greatly the way researchers view the park, as well as enhance the understanding of glacier behavior. Achuff's study has expanded the number of known glaciers at Rocky Mountain National Park nearly tenfold. One of the primary glacier complexes lies beneath the boulder fields of Longs Peak, a 14,255-foot mountain scaled by thousands of hikers each summer. Achuff believes the boulder fields conceal a massive chunk of glacier ice. "The Longs Peak rock glacier may be 100 feet thick and extend for more than a mile," he said. Further research will be needed to determine the exact depth and extent of the park's many secret glaciers, but for now Rocky Mountain National Park officials are pleased to discover a new facet in their rugged back yard. The discovery also gives officials another resource to study and safeguard. The research also indicates that glaciers at Rocky Mountain National Park are not receding as has occurred in other areas such as Glacier National Park in Montana. "The glaciers here are blessed, in part, by a cooler microclimate in Rocky Mountain National Park. The hidden glaciers, meanwhile, rely on rocks and other mountain debris to provide a layer of protective insulation that reduces melting," Achuff said. A Swiss climber raised the theory of a hidden glacier beneath Longs Peak in the 1950s, but no complex examination was undertaken until this year. Park officials don't expect the discoveries to limit tourism or climbing opportunities at Longs Peak. Only time and further study will tell how the newly found rock glaciers affect the region's watersheds.

The Colorado Springs Gazette, 10/5/01

Water treatment plant beefs up security

Heightened concern about terrorism has prompted the Pueblo Board of Water Works to increase its round-the-clock security at its West 11th Street treatment plant following an October weekend incident in which three men appeared to be trying to get into the plant grounds but fled when approached by security guards. There was no direct evidence that the three unknown men intended to do any harm to the plant or water supply; however, the incident was reported to the FBI, according to Alan Hamel, the plant's executive director. "Although we are taking precautions to guarantee our water safety, I want to emphasize that our treatment plant is secure and we have not been advised of any threat to the public water supply," Hamel said.

The Pueblo Chieftain, 10/9/01

Third consecutive year of on-target hurricane predictions

For the third consecutive year, Colorado State University hurricane forecaster William Gray and his colleagues were on target with their predictions for the hurricane season. In early June and early August 2001, Gray and his colleagues predicted this season would have 12 named storms, seven hurricanes and three intense hurricanes for the season. As of today, this year's hurricane season (which officially ends Nov. 30) has seen 14 named storms, eight hurricanes and four intense hurricanes. In an average year, there are 9.3 named storms, 5.8 hurricanes and 2.2 intense hurricanes. Now in his 18th year of forecasting Atlantic Basin storms, Gray and his colleagues, Chris Landsea, Eric Blake, John Sheaffer and Philip Klotzbach, have shown that recent ongoing research indicates that there are indeed meaningful multi-month precursor signals for the prediction of Atlantic basin hurricane activity and U.S. landfall probability. They believe they are continuing to develop a better understanding of our country's hurricane problem through the insights derived from making these forecasts. The complete hurricane forecast and related research and press releases are available on the Web at typhoon.atmos.colostate.edu. An initial forecast for the 2002 hurricane season is scheduled for posting on the Web on Dec. 7, 2001.

MEETINGS

February 27 - March 1, 2002
Washington, D.C.
5th National Mitigation Banking Conference

Solutions to mitigation banking issues - problems faced by bankers, industry regulators and the public - topics include the NAS/GAO Reports, Emerging Markets, Federal Regulatory & Legislative Update, Federal Policy vs. Local Implementation, Standard Criteria for Determining Success for Banks, Long-term Tax Implications & Strategies, What's Working & What's Not, Non-traditional Partnerships. Plus keynote speakers including Congressman Sherwood Boehlert (R-23rd, NY), EPA Administrator Christine Todd-Whitman (invited) and Pearlie Reed, Chief of Natural Resources Conservation Service (invited). For those new to mitigation banking, "A Mitigation/Conservation Banking Primer". Special congressional field trip offered. Full semi-final program at <http://www.terrene.org> (click on National Mitigation Banking Conferences). Contact: Carlene Bahler, Terrene Institute, 4 Herbert Street, Alexandria, VA, 22305; (703) 548-5473, (703) 548-6299 (fax); cbahler@erols.com.



Ogallala Aquifer Symposium -- *Economics of the Ogallala Aquifer*
Thursday, February 21, 2002 -- Northeastern Junior College, Sterling, CO

General Session - 8:30 a.m.

Current Colorado Water Issues
Water as a Resource
Water Banking in Colorado
Hydrology of the Ogallala Aquifer

Session 1 - 10:30 a.m.

Rural Community Water Issues
Imperial, NE - Drought Management
Ogallala, NE - Water Quality

Session 2 - 10:30 a.m.

Impacts of Republican River Litigation
Updates on Republican River Litigation
Republican Water Flow Model
Potential Power Concerns

12:45 p.m. South Platte Compact Update - Don Ament

Session 3 - 1:15 p.m.

Managing Your Water and Nutrients
Irrigating with High Nitrate Water
Nutrient Management with Manure
Aquifer Contamination Risks

Session 4 - 1:15 p.m.

Water - Ogallala's Gold
Land Value vs. Water Policy
Water Banking in Nebraska
Economics of Managing Limited Water

Open Forum on Water Issues - 3:00 p.m.

Our turn to hear your voice

Name _____

Address _____

City/State/Zip _____

Home Phone: _____

Business Phone _____

Fax No. _____

Registration Fee: Lunch, Breaks & Handouts
Before February 7th - \$20/person or \$30/couple
Late Registration Fee - \$30/person or
\$40/couple
Payable to:

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

For More
Information
Contact:

Joel Schneekloth
9700-345-0508

Gisele Jefferson
970-345-2287

Ron Meyer
719-346-5571



**COLORADO WATER CONGRESS
PRELIMINARY CWC 2002 CONVENTION PROGRAM
Northglenn, Colorado**

THURSDAY, JANUARY 24, 2002 -- THEME: A Time of Sorrow and a Time of Confidence

- 7:30 a.m. Registration Opens
8:00 a.m. Colorado Water Conservation Board Meeting
- 8:30 a.m. Four Concurrent Workshops - i.e., (1) History – As Seen by the Aspinall Recipients; (2) Engineering & Management Developments; (3) Protecting Your Water Rights: On Guard; and, (4) Roundtable for Ditch Companies.
- 10:15 a.m. Five Concurrent Workshops - i.e., (1) Engineering & Management Developments; (2) Endangered Species Issues; (3) Direct Democracy: The Impact of the Initiative Process; (4) Water Education; and, (5) Water Conservation/Conservancy District Issues.
- 12:15 p.m. GENERAL SESSION LUNCHEON – “A Water Success Story” -- Dennis Majors, Implementation Office Delta Implementations CALFED BAY – DELTA Program, Sacramento, CA.
- 2:15 p.m. GENERAL SESSION I -- Keynote speaker – Attorney General Ken Salazar will deliver the keynote address.
- 2:45 p.m. General Session Speakers will be: (1) “Open Up Colorado’s Petition Process” – Walter F. Imhoff, Chairman, Save Our Constitution, and Managing Director of the Hanifen Imhoff Division of Stifel, Nicolaus & Co. (2) “Water Supply Security” – David Forbes, Chief Executive Officer, Quo Vadis International; and, (3) “The International Scene and Its Ramifications on Water”—Professor Evan Vlachos, Colorado State University.
- 4:00 p.m. Five Concurrent Workshops - i.e., (1) Engineering & Management Developments; (2) The Colorado Water Conservation Board Issues; (3) Ground Water Issues; (4) Water Quality & Drinking Water Issues; and (5) the Ditch Bill Issues: An Update.
- 6:00 p.m. RECEPTION

FRIDAY, JANUARY 25, 2002

- 7:00 a.m. LEGISLATIVE BREAKFAST -- Speakers will be Sen. Lewis H. Entz, Sen. Jim Isgar, Sen. Jim Dyer, Sen. Terry Phillips, Rep. Diane Hoppe, Rep. Al White, and Rep. Carl Miller. Ag Commissioner Don Ament will serve as moderator.
- 8:30 a.m. GENERAL SESSION II -- A Panel on “New Opportunities:” (1) “Water Trust” – Peter Nichols, Executive Director Water Trust and CWC Board Member, Carbondale; and, (2) “Water Education Opportunities” – Tom Cech, Chairman CWC Water Education Committee and Executive Director, Central Colorado Water Conservancy District, Greeley; and (3) “Creating and Transmitting Water Knowledge: The Role of the University in the Partnership” - Dr. Tony Frank, Vice President for Research & Information Technology, Colorado State University.
- 10:45 a.m. GENERAL SESSION III -- A Panel on “The Challenges for the Colorado Conservation Board” – Participants will be Colorado Water Conservation Board members and Rod Kuharich will serve as moderator.
- 12:15 p.m. THE WAYNE N. ASPINALL LEADERSHIP LUNCHEON – (Invited) the Honorable Gale Norton, Secretary of Interior. The Twenty-second Annual “Wayne N. Aspinall Water Leader of the Year” award will be presented at this luncheon. In addition, several other awards will be made at the luncheon.
- 1:45 p.m. CWC Annual Business Meeting. -- Proposed 2002 Water Congress Policies; CWC Board elections
- 2:00 p.m. CWC Board of Directors’ Meeting.

Contact: Dick MacRavey at Phone: (303) 837-0812 Fax: (303) 837-1607,
E-Mail: macravey@cowatercongress.org. or see website at www.cowatercongress.org.

CALLS FOR PAPERS


15th High Altitude Revegetation Workshop March 6-7, 2002 – Fort Collins, Colorado

The High Altitude Revegetation Committee through Colorado State University organizes this biennial workshop and annual summer field tour. Keynote speaker will be Dr. Randy Westbrooks, Invasive Plant Coordinator for the U.S. Geological Survey. The workshop includes a tour on March 7 to observe and demonstrate the use of equipment used in soil preparation and planting for successful revegetation. The workshop will also include papers and exhibitor displays. To volunteer a poster paper, contact Jeff Packa (303/770-0747), Krystyna Urbanska in Switzerland (urbanska@geobot.umn.ethz.ch or FAX 632-1215), or Gary Thor (garythor@lamar.colostate.edu or 970/484-4999). To reserve a commercial exhibit space, contact Mark Schuster (303/572-5523) or Mark Phillips (303/665-2618).



USCID Water Management Conference – Helping Irrigated Agriculture Adjust to TMDLs October 23-26, 2002 – Sacramento, California

The announcement is available online at www.uscid.org/~uscid -- link to Meetings; or contact Larry D. Stephens at Phone 303/628-5430, FAX 303/628-5431, or E-mail stephens@uscid.org.



American Water Resources Association – Colorado Section Annual Symposium, March 15, 2002 Mt. Vernon Country Club, near Golden, Colorado *Water Resources in Colorado: Success through Cooperation – What has worked (and what hasn't?)*

The goal of this symposium is to draw on the experiences or expertise of individuals, groups, or entities who have tried to resolve conflict through cooperation. What has worked? How and why did it work? Are there some common principles in each successful resolution? What hasn't worked and why not? Have there been successes arising from the ashes of failure? Some presentation suggestions include:

Water User Forums

Colorado River "SWAT" Group
Clear Creek Water Users Association
Upper South Platte River Water Users
Cache la Poudre River Water Management
Eagle River Assembly
Boulder Creek
Arkansas River Basin Forum
Rio Grande River

Lemonade from Lemons

Two Forks Veto
Arkansas River Litigation

Cooperative Study Efforts

South Metro Conjunctive Use
Upper Colorado River Study


Task-Oriented Groups

Flood and Drought Task Force
South Platte Wild and Scenic Water User Group
T & E Recovery Programs
Colorado River
South Platte River
Grand Valley "Check" Case
Green Mountain Reservoir Issues

Tell us your story. You are invited to make a presentation about your experiences with cooperation. Please submit up to a 1-page abstract on your proposed presentation by **Friday, November 30, 2001**. Abstracts will be compiled and made available at the symposium. Approximately 15 minutes will be allowed for each presentation, followed by brief opportunities for questions. Send your abstract and registration to:

**American Water Resources Association, Colorado Section
P.O. Box 9881, Denver, CO 80209-0881**

For further information, contact Bill Bates at 303/628-6547 (E-mail bill.bates@denverwater.org).



AWRA's Annual Summer Conference
"GROUND WATER/SURFACE WATER INTERACTIONS"
July 1-3, 2002 – Keystone, Colorado

To be considered for placement in the program, please go to the AWRA website at www.awra.org for instructions for preparation and submission of your abstract online. Abstracts must be received at the AWRA Headquarters on or before JANUARY 31, 2002. Presenting authors are expected to register and pay the appropriate registration fee.


For inquiries and questions contact:

Jerry F. Kenny, Chair, Conference Technical Program Committee, Phone 303/764-1525, FAX 303/860-7139, E-mail jkenny@hdrinc.com.

Patricia A. Reid, AWRA Program Coordinator, Phone 540/687-8390, FAX 540/687-8395, E-mail pat@awra.org.

Michael J. Kowalski, AWRA Director of Operations, Phone 540/687-8390, FAX 540/687-8395, E-mail mike@awra.org.

Hydrology Days 2002



22nd Annual
 American Geophysical Union
Hydrology Days 2002
 April 1-4, 2002
Cherokee Park Room
 Lory Student Center
 Colorado State University
 Fort Collins, Colorado USA

Dedicated to
Professor
Ignacio Rodríguez-Iturbe

For Questions or comments regarding Hydrology Days contact
Prof. Jorge A. Ramirez
hydrologydays@engr.colostate.edu
 Or browse
<http://HydrologyDays.ColoState.edu/>

Colorado State University

For detailed information about the Year 2002 edition of Hydrology Days please point your web browser to our web page at the following URL address:

<http://HydrologyDays.ColoState.edu/>

The web page also provides information about on-line registration, and on-line submission of abstracts and papers. Please share this invitation with your friends and colleagues and encourage them to participate.

On behalf of the Organizing Committee of Hydrology Days, I would like to invite you to participate in the Year 2002 edition of the AGU Hydrology Days, which will be held at Colorado State University during April 1-4, 2002. Hydrology Days is a unique celebration of multi-disciplinary hydrologic science and its closely related disciplines. The Hydrology Days vision is to provide an annual forum for outstanding scientists, professionals and students involved in basic and applied research on all aspects of water to share ideas, problems, analyses and solutions. The focus includes the water cycle and its interactions with land surface, atmospheric, ecosystem, economic and political processes, and all aspects of water resources engineering, management and policy.

The Hydrology Days Award is presented each year to an outstanding individual in recognition of his/her contributions to hydrology and related fields. In recognition of his outstanding contributions to hydrologic science in the areas of surface hydrology, hydro-climatology, fluvial and river basin geomorphology, dynamics of fractal processes, eco-hydrology, and analysis and modeling of space-time rainfall fields, the 2002 Hydrology Days Award will be presented to **Professor Ignacio Rodríguez-Iturbe**. The award will be presented during a special technical session in which Professor Rodríguez-Iturbe will present a talk titled: "**Hydrologic Dynamics and Ecosystem Structure**".

I am looking forward to your participation. Best regards,

Jorge A. Ramirez
 Chair, Organizing Committee

CALENDAR



Jan. 17-18	LAW OF THE RIO GRANDE, Albuquerque, NM. See the website www.cle.com or call (800)873-7130.
Jan. 23-25	COLORADO WATER CONGRESS 2002 CONVENTION, Northglenn, CO. Contact: Dick MacRavey at Phone: (303) 837-0812 Fax: (303) 837-1607, E-Mail: macravey@cowatercongress.org , or see website at www.cowatercongress.org .
Jan. 23-24	WATER RIGHTS, COLORADO RIVER ALLOCATION, AND THE ROLE OF HOOVER DAM, Las Vegas, NV. Contact: Univ. of Nebada, Las Vegas, Div. Of Continuing Education, 4505 Maryland Pkwy., Box 451019, Las Vegas, NV 89154-1019. FAX 702/895-4195.
Jan. 27-30	CONFERENCE ON TAILINGS AND MINE WASTE '02, CSU, Fort Collins, CO. Contact: Linda Hinshaw at Phone 970/491-6081, FAX 970/491-3584, E-mail lhinshaw@engr.colostate.edu , or see website at http://www.tailings.org .
Feb. 22-23	8TH XERISCAPE CONFERENCE, Albuquerque, NM. Contact: Scott Varner, Xeriscape Council of New Mexico, Phone 505/294-7791. Website http://www.xeriscapenm.com .
Mar. 6-7	15TH HIGH ALTITUDE REVEGETATION WORKSHOP, Fort Collins, CO. See website at www.highaltitudereveg.com or call Gary Thor at 970/484-4999, E-mail garythor@lamar.colostate.edu .
May 7-9	HARDROCK MINING 2002 -- Issues Shaping the Industry, Westminster, CO. Contact: Larry Stephens, Phone 303/628-5430, FAX 303/628-5431, website http://www.usdams.org .
Mar. 15	AWRA-Colorado Section Annual Symposium, WATER RESOURCES IN COLORADO: SUCCESS THROUGH COOPERATION -- WHAT HAS WORKED (AND WHAT HASN'T), Golden, CO. Contact Bill Bates at 303/628-7547 or E-mail bill.bates@denverwater.org .
June 24-28	22ND ANNUAL MEETING AND CONFERENCE, U.S. Society on Dams, San Diego, CA. Contact: Larry Stephens, Phone 303/628-5430, FAX 303/628-5431, or E-mail stephens@usdams.org
July 1-3	AWRA Annual Summer Conference, GROUND WATER/SURFACE WATER INTERACTIONS, Keystone, CO. For details, see the website http://www.awra.org .
July 10-13	ENERGY, CLIMATE, ENVIRONMENT AND WATER -- ISSUES AND OPPORTUNITIES FOR IRRIGATION AND DRAINAGE, San Luis Obispo, CA. Contact: Larry Stephens at Phone 303/628-5430, FAX 303/628-5431, E-mail stephens@uscid.org . Internet: http://www.uscid.org/~uscid .
July 23-26	INTEGRATED TRANSBOUNDARY WATER MANAGEMENT, Traverse City, MI. For further details, access the website at http://www.uwin.siu.edu/ucowr/ . To receive future announcements, E-mail ewri@asce.org or ucowr2002@siu.edu , or call UCOWR headquarters at 618/536-7571.
July 24-26	COLORADO WATER WORKSHOP, Gunnison, CO. Contact: Lucy High, Director, Colorado Water Workshop, Western State College, Gunnison, CO 81231, Phone 970/641-8766, FAX 970/641-6280, E-mail water@western.edu .
Oct. 23-26	USCID WATER MANAGEMENT CONFERENCE, Helping Irrigated Agriculture Adjust to TMDLs, Sacramento, CA. Contact: Larry Stephens at Phone 303/628-5430, FAX 303/628-5431, E-mail stephens@uscid.org . Internet: http://www.uscid.org/~uscid .

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

