2007— Biennial Review — 2009

Colorado State University

Centers, Institutes, and Other Special Units

Colorado Water Institute
-and-
Colorado State University Water Center

Reporting Period:
July 1, 2007 – June 30, 2009

Assembled and Reviewed by:
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Zach Hittle
Kevin Hackett

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Introduction

The Colorado Water Institute (CWI) is authorized and funded by Congress and the Colorado Legislature. CWI is accountable to Congress via its annual appropriation, a required annual report, and a thorough Congressionally mandated peer review conducted every five years under the auspices of the U.S. Geological Survey. Copies of CWI's Federal and State authorizing legislation are attached (Appendix Q). CWI is operated, by law, as a state-wide water research institute, obligated to connect all water expertise in Colorado's higher education system with research and education needs of Colorado's water managers and users.

The CSU Water Center was created from a CCHE Program of Excellence in Water Resources award given to CSU in 1991. CCHE funding for the Water Center ended in 1998. At that time, the Water Center Board of Directors (Deans of Engineering, Natural Resources and Agricultural Sciences and Directors of the Agricultural Experiment Station and Cooperative Extension) committed to provide $5,000 each to support continued Water Center Operations. At this time, the operation and administration of the CSU Water Center was placed under the CWI Director.

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- N 18th & 19th South Platte Forum
- O 50th & 51st Colorado Water Congress Annual Convention
- P Progress on the Lysimeter Project at Rocky Ford
- Q Federal Water Resources Research Act (42 USC Sec. 10301 et. seq.)
- R HB07-1096
- S HB08-1026
- T HB08-1405

Faculty, Personnel and Clients

Faculty and Personnel

The CWI office is located in Room E-102 of the Engineering Building on the campus of Colorado State University. CWI consists of:

- Full-time Director: Dr. Reagan Waskom
- Full-time Assistant to the Director: Nancy Grice
- Full-time Research Associates: Loretta Lohman, Faith Sternlieb and Julie Kallenberger
- Part-time Technical Writing: Laurie Schmidt
- Part-time Office Support: Jan Wright

Students are employed part time to assist in the operation of CWI, often working to prepare themselves for a career as a Colorado water manager. A number of faculty members are affiliated with the Institute/Center by virtue of research funding past or present, student fellowship awards, etc.

Clients

Faculty and Students

- 'Water' Faculty at Colorado State University — over 140 faculty located in 23 departments (Appendix D)
- 'Water' Faculty at University of Colorado, Colorado School of Mines, University of Northern Colorado, Western State College, and Fort Lewis College — over 80 faculty
- Students interested in water research and education and those seeking Colorado State University 'Water' Minor (Appendix G)
- Extension agents and specialists

Colorado Water Managers/Users

- Colorado Congressional Delegation
- Colorado Legislature - Members
- Colorado Water Conservation Board
- Colorado State Engineer's Office
- Colorado Division of Wildlife
- Colorado Department of Agriculture
- Colorado Department of Public Health and Environment
- Colorado Water Congress
- Water Conservancy/Conservation Districts
- Municipal water utilities
- Agricultural irrigation companies
- Colorado 'water-using' public

Goals and Objectives — Mission Statement

Colorado Water Institute Mission is Defined by:

- Federal Water Resources Research Act — 42 USC Sec. 10301 et. seq. (Appendix Q) — last amended on January 11, 2007, President Bush signed this act into law (by PL 106-374) (114 STAT. 1434 and the Water Resources Research Act Amendments of 2006) (PL 109-471) – a five-year authorization extension (fiscal years 2007 through 2011)
- Colorado Legislature
  - SB06-183
  - HB07-1096 (Appendix R)
  - HB08-1026 (Appendix S)
    - Bill changed name to Colorado Water Institute and expanded the mission
  - HB08-1405 (Appendix T)

CWI Mission Statement

Connect all of Colorado's higher education expertise to the research and education needs of Colorado water managers and users.

CSU Water Center Mission is Defined by:

- CSU Water Center Board of Directors

CSU Water Center Mission Statement

Promote and organize CSU's water and water-related expertise in support of integrated water research and education, paying particular attention to positioning CSU to be a strong competitor in national water and water-related research competitions.

Reporting

CWI Reports to

- Vice Provost for Outreach and Strategic Partnerships, Lou Swanson
- CWI's Advisory Committee on Water Research Policy (Appendix A), per SB06-183
- USGS External Research Officer (Per Federal Water Resources Research Act – annual proposal and report required)
- National Institutes for Water Resources annual report

CSU Water Center Reports to

- CSU Water Center's Board of Directors (Appendix B):
  - Vice President for Research, Vice Provost for Outreach and Strategic Partnerships, Deans of Natural Resources, Engineering and Agricultural Sciences, Directors of Extension, Colorado State Forest Service, and Agricultural Experiment Station

Activities, Services, Training, and Research

Colorado Water Institute

CWI activities required to implement both Federal and State Legislation including:

1. Conducted annual state-based water research competition (Appendix E)
2. Funded graduate students through grants (Appendix F)
3. Provide information and outreach programs for Colorado water managers and water users
4. Cooperate with the National Institutes of Water Resources (NIWR) to promote and coordinate national level support for University water research

CSU Water Center

The CSU Water Center, on the other hand, by being a creature of CSU alone, organizes and promotes CSU's water expertise. In particular, the CSU Water Center currently supports:

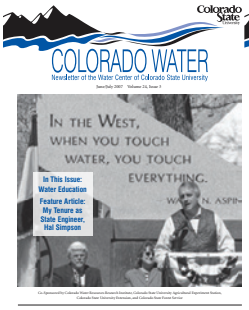
1. Administrated graduate and undergraduate 'water' scholarships funded by private donors and through federal competitions (Appendix H)
2. Administrated a Water Minor program curriculum for students at CSU (Appendix G)
3. Organized an annual, graduate level, water resources seminar — GRAD592 (Appendix I)
4. Organized Interdisciplinary faculty to prepare proposals for national competitions
5. Organized the Global Water Colloquium and Organized Agency Priority Meeting (Appendix J)
6. Prepared materials to recruit graduate students to CSU to study water resources related topics
7. Prepared nominations of outstanding CSU 'water' faculty for state and national awards
8. Promoted CSU's annual Hydrology Days symposium that brings national and international hydrological scientists to CSU (Appendix K)
9. Provide a venue for education, discussion and exposure of regional and global water resource issues through Spring Interdisciplinary Water Resources Seminars on CSU campus (Appendix I)
10. Supported the CSU Water Archives via collection, identification, and promotion (Appendix L)

Technology Transfer

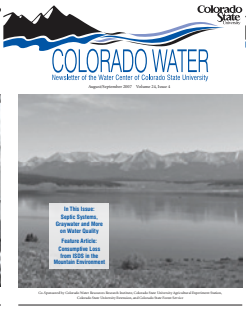
Colorado Water Newsletter

The *Colorado Water* newsletter, which was revamped in 2007, is published bimonthly and sent to over 2000 Colorado water managers and users, including all members of the Colorado Legislature and Colorado Congressional delegate (see all newsletters at: http://www.cwi.colostate.edu)

1. June/July 2007 – Water Education
2. August/September 2007 – Septic Systems, Graywater
3. October/November 2007– Groundwater
4. January/February 2008– Crop Evapotranspiration
5. March/April 2008– Water Conservation
6. May/June 2008– Water Research Updates
7. July/August 2008– Research Updates
8. September/October 2008 – International Water
9. November/December 2008– Snow
10. January/February 2009– River Restoration
11. March/April 2009 – Endangered Species
12. May/June 2009– Arkansas Basin



Volume 24 Issue 3 Water Education



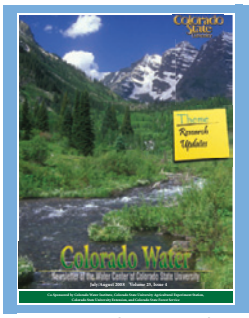
Volume 24 Issue 4 Septic Systems, Graywater

Volume 24 Issue 5 Groundwater

Volume 25 Issue 1 Crop Evapotranspiration

Volume 25 Issue 2 Water Conservation

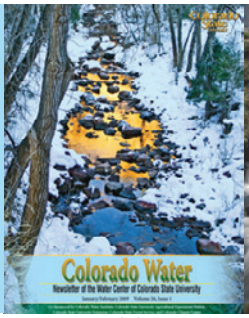
Volume 25 Issue 3 Water Research Updates



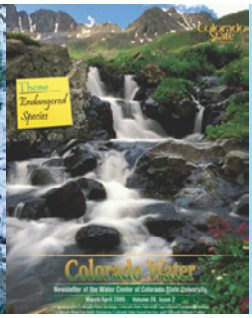
Volume 25 Issue 4 Research Updates

Volume 25 Issue 5 International Water

Volume 25 Issue 6 Snow



Volume 26 Issue 1 River Restoration



Volume 26 Issue 2 Endangered Species

Volume 26 Issue 3 Arkansas Basin

Meetings

Actively sponsored or supported water meetings in Colorado:

- USGS Water Science Day (Appendix M)
- Water Tables for Water Resources Archive (Appendix L)
- South Platte Forum (Appendix N)
- Global Water Colloquium: From Conflict to Sustainability – Challenges and Opportunities in an Interdependent World (Appendix J)
- Colorado Water Congress Annual Convention (Appendix O)
- USDA National Water Conference
- Universities Council on Water Resource Annual Conference

Water Education

- Administered undergraduate 'Water' Minor - for any CSU major (Appendix G)
- GRAD592 – Water Resources Seminar – in support of connecting CSU students with the personalities and 'real world' of water management in Colorado (Appendix I)
- Spring Interdisciplinary Water Resources Seminar (Appendix I)
- Hydrology Days Annual Meeting on CSU Campus (Appendix K)
- Information for new 'water' graduate students at CSU (for recruiting high quality 'water' students to CSU)
- Lists of CSU 'water' faculty on CWI webpage
- Administered water scholarships sponsored by Colorado water organizations (Appendix H)
- Emerging Issues in Soil and Water:
  Gary A. Peterson and Dwayne G. Westfall Annual Lecture Series
- Update on the Construction of the Weighing Lysimeter in the Arkansas Valley (Appendix P)

Websites

The CWI website has over 40,000 unique visits to the 6 websites it maintains:

- Colorado Water Institute
  http://www.cwi.colostate.edu
- Colorado State University Water Center
  http://www.watercenter.colostate.edu
- Northern Plains & Mountain Region Water
  http://www.region8water.org
- Global Water Colloquium
  http://vpr.colostate.edu/pages/water_colloq.asp
- Ag Water Conservation Clearinghouse
  http://agwaterconservation.colostate.edu
- CSU Water Faculty Expertise
  http://www.cwi.colostate.edu/
  CSUWaterFaculty/

CWI represents CSU in 5 national, 11 state, and 1 local water organizations

National:

1. National Institutes for Water Resources
2. National Co-Chair USDA-CSREES National Integrated Water Program (2006 – Present)
3. Board of Directors – Universities Council on Water Resources (2007 – Present)
4. APLU Board on Natural Resources
5. Served on review panel for NRI Water and Watersheds and NRCS CEAP program

State:

1. President, Board of Directors of the Colorado Watershed Network (2006 – 2009)
2. Board of Trustees - Colorado Foundation for Water Education (2002 – Present)
3. Board of Directors – Colorado Water Congress (2007 – Present)
4. Cooperative Extension Water Program Team
5. CAS Managed Ecosystems Strategic Planning Team
6. Co-Chair Cooperative Extension Drought Team
7. Chair of Education Committee for the Colorado Foundation for Water Education
8. Colorado AWARE Advisory Board
9. Colorado Governor's Water Availability Task Force (2002 – Present)
10. Colorado Dept of Health / EPA 319 Advisory Committee
11. NRCS State Technical Committee

Local:

1. City of Fort Collins Water Board (2003 – Present)

Budget Summary

July 1, 2007 to June 30, 2009
Colorado Water Institute — CSU Water Center

Funding	Source		Credit	Debit
CSU Water Center	MOU: Agricultural Experiment Station, College of Agriculture, College of Engineering, College of Natural Resources, Extension	$5,000 general operating funds from colleges and agencies	$ 50,000	
CWI	USGS	2:1 match required on 104B, 1:1 match required on 104G, overhead costs allowed as match on all monies	$ 184,670	
CWI	Vice Provost for Outreach and Strategic Partnerships office provides budget which we use to match USGS and provide full-time director and other direct costs		$ 394,790	$ 25,590
Other funding sources	State of Colorado		$ 650,000	
Expenditures				
	Salaries			$ 881,704
	Other direct costs	Phone, supplies, computers, software, peripherals, postage, professional development, etc		$ 169,753
	Colorado Water production			$ 80,000
	Travel			$ 54,500
	Research		$ 2,650,782	$ 2,219,986
	Education			$ 498,709
		TOTAL	**$ 3,930,242**	**$ 3,930,242**

Accomplishments and Contributions

Recent CWI-Funded Water Research Projects

1. Characterizing Non-Beneficial Evaporative Upflux from Shallow Groundwater under Uncultivated Land in an Irrigated River Valley. Jeffrey Niemann, Colorado State University: $49,942
2. Developing a GIS Database for Source-Tracking of Human Versus Agricultural Inputs of Antibiotic Resistance Genes (ARG) in the Watershed.
   Mazdak Arabi, Colorado State University: $15,280
3. Risk Assessment and Forecasting of Indian Summer Monsoon for Agricultural Drought Impact Planning. Rajagopalan Balaji, Colorado University at Boulder: $86,646
4. Water Reallocation and Bioenergy in the South Platte: A Regional Economic Evaluation.
   James Pritchett, Colorado State University: $42,881
5. Studies Supporting Sustainable Use of the Denver Basin Aquifers in the Vicinity of Castle Rock.
   Tom Sale, Colorado State University: $30,000
6. Hydrologic Analysis and Process-Based Modeling for the Upper Cache la Poudre Basin.
   Stephanie Kampf, Colorado State University: $30,000
7. New Methods for Sago Pondweed Management.
   Scott Nissen, Colorado State University: $20,000
8. Development of a Correction Function for the 3-inch, Thin-Walled, Helley-Smith Sampler Deployed on Coarse Gravel Beds. Steven Abt, Colorado State University: $21,416
9. Data Analysis and Final Report of the Nature and Implications of Irrigation Practices in Colorado's Lower Arkansas River Valley. Tim Gates, Colorado State University: $48,477
10. Willow Creek Water Quality Study. John Stednick, Colorado State University: $21,010
11. Understanding the Hydrologic Factors Affecting the Growth of the nuisance diatom Didymosphenia Geminata in Rivers. James Cullis (McKnight), Colorado University at Boulder: $5,000
12. Developing Barriers to the Upstream Migration of New Zealand mudsnail (Potamopyrgus antipodarum) Phase III. Scott Hoyer (Myrick),
    Colorado State University: $5,000
13. High Resolution Soil Moisture Retrieval in the Platte River Watersheds. Chengmin Hsu (Johnson), Colorado University at Denver: $5,000
14. Bear Creek Watershed Project. Kim Gortz-Reaves (Chase), Colorado University at Denver: $1,400
15. Potential Changes in Groundwater Acquisition by Native Phreatophytes in Response to Climate Change. Julie Kray (Cooper), Colorado State University: $5,000
16. Impact of Limited Irrigation on Health of Four Common Shrub Species. Jason Smith (Klett), Colorado State University: $5,000
17. Flow Device to Assess Biological Water Quality in Colorado Surface Water.
    Travis Steiner (Goodridge), Colorado State University: $5,000
18. Estimating Errors Associated With Calculated Sublimation From Seasonally Snow-Covered Environments. Doug Hultstrand (Fassnacht), Colorado State University: $5,000

Reports and Publications

Research reports are prepared for each CWI water research projects and for those with high public interest, a 'Water in the Balance', short and concise, research summary is published and distributed widely. Recent topics that warranted wide spread distribution of research results include: In the past two years, over 200 Completion Reports and over 100 Information Series Reports have been available in their entirety on the internet for immediate access at no charge to our customers.

1. CR209 – Some Economic Effects of Changing Augmentation Rules in Colorado's Lower
2. CR210 – Occurrence and Fate of Trace Organic Contaminants in Onsite Wastewater Treatment Systems and Implications for Water Quality Management
3. CR211 – Development of Oilseed Crops for Biodiesel Production Under Colorado Limited Irrigation Conditions
4. IS104 – 18th Annual South Platte Forum: A River of Change
5. IS105 – Colorado Water History: A Bibliography
6. IS106 – 19th Annual South Platte Forum: News, Weather and Water
7. IS107 – High Altitude Revegetation Workshop No. 18
8. SR17 – Public Perceptions, Preferences and Values for Water in the West: A Survey of Western and Colorado Residents
9. South Platte Basin: Producer Survey and Regional Economic Impact Analysis

House Bill 1177

With passage of HB1177, an act to organize water roundtables in Colorado for the purpose of developing widely accepted solutions to Colorado's water problems, CWI and the CSU Water Center organized:

1. In concert with Cooperative Extension and under the leadership of the CWI Director, organized a team of Extension personnel to connect CSU's water knowledge to needs of each of the nine roundtables
2. Organized GRAD592, CSU's annual water seminar, to issues surrounding HB 1177
3. Worked with the CIPP to develop the draft IBCC Compact Charter for the Colorado DNR
4. Participate as a member of the IBCC Public Education work group
5. Colorado Agricultural Water Summit meeting

CSU Water-Related Grant Activity

One of the functions of the Colorado Water Institute is to track and publish water related sponsored research awards in the *Colorado Water* newsletter. During the last 2 years, $28,918,957 dollars have been awarded to 265 projects in water-related research at CSU. (Appendix C)

Grants and Contracts

Funded Submitted Projects **Title**	**Sponsor**		**Amount**
Adjoint Modeling to Quantify Stream Flow Changes Due to Aquifer Pumping	DOI-USGS-Geological Survey	$	117,847
Agricultural Water Conservation Clearinghouse	Colorado State Water Conservation Board	$	10,000
Colorado Water Institute State Research Funding	State of Colorado	$	650,000
Developing a Decision Support System for the South Platte Basin	Various "Non-Profit" Sponsors	$	268,000
Development of Characterization Approaches and a Management Tool for Groundwater-Surface Water System in the Vicinit...	DOI-USGS-Geological Survey	$	132,731
Geolem Internship - USGS - WRRI Student Internship	DOI-USGS-Geological Survey	$	20,000
Coordinated Regional Water Resources Programming for the Northern Plains and Mountains Region	USDA-CSREES-Coop State Rsrch Edu & Ext	$	983,486
Willow Creek Water Quality Study	Northern Colorado Water Conservancy Dist	$	21,010
New Methods for Sago Pondweed Management	Colorado State Water Conservation Board	$	20,000
Hydrologic Analysis and Process-Based Modeling for the Upper Cache la Poudre Basin	Cache La Poudre Water Users Association	$	18,000
Alternatives to Water Transfers in the South Platte Basin using the Farmers Reservoir and Irrigation Company System	FRICO-Farmers Reservoir and Irrigation C	$	57,689
Late-Season Monitoring of Irrigation Practices Under Conventional and Improved Technologies in Colorado's Lower...	Colorado State Water Conservation Board	$	96,664
Arkansas Valley Research Center Lysimeter Project	Colorado State Water Conservation Board	$	340,000
Walking Through The Water Year	DOI-Bureau of Reclamation	$	110,720
NPS Outreach Coordinator	Colorado Dept Public Health & Environ	$	331,694
NPS Outreach Coordinator-Program Income	Colorado Dept Public Health & Environ	$	6,295
OMS Internship - USGS - WRRI Student Internship	DOI-USGS-Geological Survey	$	30,000
Risk Assessment and Forecasting of Indian Summer Monsoon for Agricultural Drought Impact Planning	DOI-USGS-Geological Survey	$	86,646
104B State Water Resources Research Institute Program Fiscal Year 2008	DOI-USGS-Geological Survey	$	92,335
104B State Water Resources Research Institute Program Fiscal Year 2009	DOI-USGS-Geological Survey	$	92,335
	Total:	**$**	**3,485,452**
Projects Submitted That Did Not Receive Funding			
Executive Water Leadership program	Coca-Cola Foundation	$	36,000
Understanding the Hydrologic Factors Affecting the Growth of the Nuisance Diatom Didymosphenia Geminata in Rivers	DOI-USGS-Geological Survey	$	66,768
Framework to Bridge Water Conflict	Compton Foundation, Inc.	$	36,740

Plans for the Next 2 Years

- CWI will continue to seek state, federal and private funding with the support of Colorado's water management community
- CWI will establish an international Irrigation Training Center at CSU
- CWI will work to mentor new faculty in Colorado water issues and management
- CWI will develop an active research and outreach effort on water conservation for Colorado
- CSU Water Center is initiating a coordinated effort to restore and strengthen its abilities to support international water activities and engagement at Colorado State University
- CSU Water Center will seek to integrate water research, teaching and outreach efforts of the Agricultural Experiment Station, Cooperative Extension, State Forest Services and other units
- CSU Water Center will work to further a Northern Colorado "Water Cluster"
- CSU Water Center will further the development of a Distance Education MSc in Watershed Management

Appendices

Appendix A

Colorado Water Institute Advisory Committee on Water Research Policy

2007-2008

Fred Anderson, Former President of the Colorado Senate
Jim Broderick, Executive Director, Southeastern Colorado Water Conservancy District
Representative Kathleen Curry, Colorado State House of Representatives Chair, House Agriculture, Livestock and Natural Resources Committee
Ralph Curtis, Rio Grande Water Conservation District
Steve Gunderson, Director, Water Quality Division, Department of Public Health and Environment
Senator Jim Isgar, Colorado State Senate Chair, Senate Agriculture, Natural Resources and Energy Committee
Jim Kircher, Director Colorado Water Science Center, USGS
Eric Kuhn, General Manager, Colorado River Water Conservation District
Chris Piper, Public Relations, Denver Water
John Porter, Retired Manager, Dolores Water Conservancy District
David Robbins, Esq. Attorney, Hill and Robbins
Harris Sherman, Executive Director, Department of Natural Resources
John Stulp, Commissioner, Department of Agriculture

Ex Officio Members:
Jeff Jahnke, Director, Colorado State Forest Service
Deborah Young, Director, Cooperative Extension
Lee Sommers, Director, Colorado Agricultural Experiment Station

2008-2009

Fred Anderson, Former President of the Colorado Senate
Jim Broderick, Executive Director, Southeastern Colorado Water Conservancy District
Representative Kathleen Curry, Colorado State House of Representatives Chair, House Agriculture, Livestock and Natural Resources Committee
Ralph Curtis, Rio Grande Water Conservation District
Steve Gunderson, Director, Water Quality Division, Department of Public Health and Environment
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John Porter, Retired Manager, Dolores Water Conservancy District
David Robbins, Esq. Attorney, Hill and Robbins
Harris Sherman, Executive Director, Department of Natural Resources
John Stulp, Commissioner, Department of Agriculture

Ex Officio Members:
Jeff Jahnke, Director, Colorado State Forest Service
Deborah Young, Director, Cooperative Extension
Lee Sommers, Director, Colorado Agricultural Experiment Station

Appendix B

CSU Water Center Board of Directors

2007-2008

Bill Farland, Vice President for Research
Hank Gardner, Associate Vice President for Research
Jeff Jahnke, Director of Colorado State Forest Service
Marc Johnson, Dean of Agricultural Science
Lyn Kathleen, Director of Colorado Institute of Public Policy
Joseph O'Leary, Dean of Natural Resources
Lee Somers, Director of Agricultural Experiment Station
Lou Swanson, Vice Provost for Outreach and Strategic Partnerships
Reagan Waskom, Director of Colorado Water Institute
Sandra Woods, Dean of Engineering
Deborah Young, Director of CSU Extension

2008-2009

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Joseph O'Leary, Dean of Natural Resources
Lee Somers, Director of Agricultural Experiment Station
Lou Swanson, Vice Provost for Outreach and Strategic Partnerships
Reagan Waskom, Director of Colorado Water Institute
Sandra Woods, Dean of Engineering
Deborah Young, Director of CSU Extension

Appendix C

CSU Water-Related Grant Activity

Last Name	First Name	Sponsor	Project	Amount
Abt	Steven	USDA	Bedload Transport in Gravel-bed Rivers & Channel Change	$ 155,031
Antolin	Michael	NSF-Biological Sciences	Shortgrass Steppe Long Term Ecological Research VI	$ 820,000
Arabi	Mazdak	Purdue University	Multi-Criteria Optimization of Watershed Management Practices for Sediment, Nu	$ 103,369
Arabi	Mazdak	Purdue University	Watershed-Scale Evaluation of BMP Effectiveness: Eagle Creek Watershed, Indiana	$ 53,125
Ballweber	Jeffery	Mississippi State University	Southeast Regional-Small Public Water Systems Technical Assistance Center: Strate	$ 101,205
Barbarick	Kenneth	City of Littleton	Cooperative Research Project - Sludge Application to Dryland Wheat Fields - 2009 F	$ 107,804
Barbarick	Kenneth	City of Littleton	Land Application of Sewage Biosolids	$ 102,077
Bartolo	Michael	Colorado Onion Association	Biology of Onion Thrips, Alternative Production Practices and Irrigation Practices - A	$ 3,000
Bauder	Troy	Colorado Department of Agriculture	Training and Education for Agricultural Chemicals and Groundwater Protection	$ 185,000
Bauerle	William	USDA-ARS-Agricultural Research Service	Measurement and Modeling Plant Water Use to Quantify Nursery Water Requirem	$ 48,750
Berg	Wesley	NASA	Assessing the Impact of Regime-Dependent Biases on Climate Variability/Trends fro	$ 100,000
Berrada	Abdelfettah	Texas A & M	Improving Canola Adaptation using Deficit Irrigation and Cropping Management in	$ 25,110
Bestgen	Kevin	DOI-Bureau of Reclamation	Abundance Estimates for Colorado Pikeminnow in the Green River Basin, Utah and	$ 140,697
Bestgen	Kevin	DOI-Bureau of Reclamation	Annual YOY Colorado Pikeminnow Fall Monitoring (Project No. 138)	$ 63,012
Bestgen	Kevin	Wyoming Game & Fish Department	Big Sandy River Larval Dispersal	$ 96,643
Bestgen	Kevin	Colorado Division of Wildlife	Eastern Plains Native Fish Investigations	$ 78,100
Bestgen	Kevin	DOI-Bureau of Reclamation	Effects of Flaming Gorge Dam Releases on Lodore/ Whirlpool Canyon Fish Commur	$ 62,111
Bestgen	Kevin R	DOI-Bureau of Reclamation	Evaluating Effects of Non-Native Predator Fish Removal on Native Fishes in the Yan	$ 183,324
Bestgen	Kevin R	DOI-Bureau of Reclamation	Floodplain Inundation & Entrainment Studies	$ 50,000
Bestgen	Kevin	DOI-BLM-Bureau of Land Management	Hornyhead Chub Distribution, Abundance, & Habitat Use in the Lower Laramie Rive	$ 160,580
Bestgen	Kevin	Bureau of Reclamation	Interagency Standardized Monitoring Program Assessment of Endangered Fish Rep	$ 162,535
Bestgen	Kevin	DOI-Bureau of Reclamation	Monitoring Effects of Flaming Gorge Dam Releases on the Lodore & Whirlpool Can	$ 63,092
Bestgen	Kevin	DOI-Bureau of Reclamation	Yampa & Middle Green CPM & RBS Larval Survey (Project No. 22f)	$ 138,208
Binkley	Daniel	USDA-USFS-Rocky Mtn. Research Station	Implications of Precipitation Changes on the Carbon Balance of Pinon-Juniper Woo	$ 128,085
BlackIV	William	The University of Liverpool	Innovative Vector Control Consortium: Improved Control of Mosquito-Borne Disea	$ 39,560
Bledsoe	Brian	NSF-GEO-Geosciences	CAREER: Stream Restoration, Ecological Engineering and Nutrient Retention of Stre	$ 88,560
Bledsoe	Brian	CA Coastal Water Research Project	Development of Tools for Hydromodification Assessment and Management	$ 449,100
Bledsoe	Brian	NSF - National Science Foundation	Field Characterization of the Hydraulics of Steep Channels	$ 49,532
Bright	Alan	USDA	CSREES-Coop State Rsrch Edu & Ext-Public Values & Attitudes Toward Agricultural V	$ 170,000
Brozka	Robert	DOD-ARMY	Aquatic Ecosystem Monitoring of Jackson Creek, Joliet Training Center, Illinois	$ 11,736
Brozka	Robert	USDA	Fisheries and Wildlife Management Support at Fort A.P. Hill, Virginia	$ 62,032
Brozka	Robert	USDA	Mitigation Wetland Monitoring and Clean Water Act Section 404 Support for Fort D	$ 30,370
Brozka	Robert	USDA-USFS-Rocky Mtn. Research Station	Watershed Management for Natural Resource Protection & Training Land Enhance	$ 108,119
Brummer	Joe	Utah State University	Integrating Perennial Living Mulches into Irrigated Cropping Systems	$ 146,684
Burke	Ingrid	City of Aurora	Aurora Sludge Reclamation Research	$ 16,500
Byrne	Patrick	USDA-CSREES-Coop State Research Edu & Ext	Enhancing Education and Research Capacity in Plant Breeding for Drought Toleranc	$ 454,932
Cabot	Perry	USDA-CSREES	Improving Canola Adaptation using Deficit Irrigation and Cropping Management in	$ 21,215
Cabot	Perry	CSU Extension	Strategies for Rotational and Permanent Fallowing of Previously Irrigated Cropland	$ 5,000
Cabot	Perry	Lower AR Valley Water Conservancy District	The Effect of Land Fallowing and Water Rights Leasing on Corn Yield, Nutrient Neec	$ 82,669
Cabot	Perry	Lower Arkansas Valley Water Conservancy District	Winter Canola Variety Trials for Biodiesel Production in the Lower Arkansas Valley	$ 16,057
Chavez	Jose	Monsanto	Remote Sensing-based Crop Water Stress Determination of Limited Irrigated MONS	$ 43,677
Cheng	Antony	USDA-USFS-Forest Research	Colorado Forest Restoration Network	$ 246,000
Christensen	Dana	Golf Association/U.S. Green Section	Development of Stress Tolerant, Turf-Type Saltgrass Varieties	$ 26,274
Clements	William	DOI-USGS-Geological Survey	Assessment of Remediation of the Arkansas River	$ 16,272
Clements	William	DOI	Eff ects of heavy metals in Rocky Mountain stream	$ 20,925
Clements	William	National Park Service	Integration Water Quality, Habitat, & Benthic Macroinvertebrate Data Access Ecolc	$ 21,362
Collett	Jeffrey	National Park Service	Airborne Nitrogen Concentrations and Deposition in Rocky Mountain National Park	$ 449,644
Collett	Jeffrey	NSF - National Science Foundation	Cloud Chemistry Measurements in the Southeast Pacific during VOCALS-REx	$ 224,502
Cooper	David	National Park Service	Assist Determine & Prioritize Wetland Restoration Projects in Kawunechee Valley	$ 3,000
Cooper	David	DOI-NPS-National Park Service	Data Collection & Wetland Mitigation Design for Two Rodeo Lagoon Wetlands	$ 9,000
Cooper	David	National Park Service	Developing Concepts for Stream Channel & Floodplain Restoration at Canyon de Cl	$ 96,724
Cooper	David	National Park Service	Developing Wetland Restoration Plan	$ 74,267
Cooper	David	Town of Telluride	Development of a Regional Restoration & Protection Program for Mountain Fens	$ 10,000
Cooper	David	National Park Service	Remove Artificial Levee & Connect Glorieta Creek to Recently Restored Floodplain	$ 8,740
Cooper	David	National Park Service	The Role of Herbivory & Hydrologic Condition in Cottonwood Establishment: Deter	$ 8,000
Cooper	David	USDA	USFS - Forest Research - Quantification of Water Needs of Riparian & Wetland Veg	$ 30,000
Cooper	David	DOI-NPS-National Park Service	Water Rights - Technical Assistance on a Diversity of Issues	$ 18,580
Cooper	David	USDA-USFS-Forest Research	Winter Recreation Impacts on Wetlands	$ 8,000
Cotton	William	NSF - National Science Foundation	Collaborative Research: Inhibition of Snowfall by Pollution Aerosols	$ 157,490
Cotton	William	NSF - National Science Foundation	Prediction of MCS Hazards and Simulations of Aerosol Influences on Severe Convec	$ 183,257
Culver	Denise	Colorado State Water Conservation Board	Identification & Assessment of Important Wetlands in the North Platte River Water	$ 182,000
Culver	Denise	Boulder County Parks & Open Spaces	Survey & Assessment of Critical Wetlands in Boulder County	$ 10,154
Culver	Denise	EPA-Environmental Protection Agency	Survey of Critical Wetlands & Riparian Areas in Gilpin County, CO	$ 114,310
Davies	Stephen	New Mexico State University	Afghanistan Water, Agriculture and Technology Transfer Program (AWATT)	$ 3,208,877
Davis	Jessica	University of Nebraska	A National Learning Center for Animal Agriculture Water Quality Issues,	$ 7,500
Deo	Shripad	Natl Oceanic & Atmospheric Admn	Advanced Hydrologic Prediction Service	$ 4,037
Doesken	Nolan	University of Nebraska	Development and Implementation of a CoCoRaHS Drought Impacts Reporting Syste	$ 43,750
Doesken	Nolan	Colorado State Water Conservation Board	Monitoring the Effects of Weather Conditions on Evapotranspiration	$ 100,818
Doesken	Nolan	University of Colorado	Subcontract , Climate Support to The Western Water Assessment (WWA)	$ 25,000
Doesken	Nolan	DOI-Bureau of Reclamation	Walking Through The Water Year	$ 70,720
Doherty	Paul	Colorado Division of Wildlife	South Platte Duck Study	$ 58,742
Douglas	Marlis	New Mexico Department of Game and Fish	Introgression in Rio Grande Cutthroat Trout From New Mexico Hatchery Broodstoc	$ 11,900
Egenhoff	Sven	Nance Petroleum Corporation	Fracture Occurence, Mechanical Stratigraphy & Reservoir Architecture in the Midd	$ 23,000
Fassnacht	Steven	State of Colorado	Estimating Errors Associated with Calculated Sublimation from Seasonally Snow-Cc	$ 5,000
Fassnacht	Steven	University of California	Los Angeles, Scaling Snow Observations From the Point to the Grid Element: Suppo	$ 32,110
Fassnacht	Steven	University of California-Los Angeles	Scaling Snow Observations From the Point to the Grid Element: Supporting NOHRS	$ 23,237
Fausch	Kurt	Bureau of Land Management	A Field Test of Effects of Grazing Management Systems on Invertebrate Prey that S	$ 62,600
Fausch	Kurt	Colorado Division of Wildlife	E. Plains Fish Habitat Survey	$ 33,000
Fausch	Kurt	Colorado Division of Wildlife	Effect of Agricultural Water Use & Drought on Groundwater that Sustains Critical H	$ 60,321
Fausch	Kurt D	USDA-USFS-Forest Research	Field Test of Riparian Vegetation Elements Needed to Support Trout Populations in	$ 25,000
Fausch	Kurt	Colorado Division of Wildlife	Plains Fish Translocation Success	$ 63,000
Fausch	Kurt	The Nature Conservancy	Review of Water Management Scenarios for the North Fork Poudre River	$ 10,000

Last Name	First Name	Sponsor	Project	Amount
Fausch	Kurt	NSF - National Science Foundation	The Effects of Trout Invasion on Stream-Riparian Ecosystems: A Global Synthesis fo	$ 6,555
Fiege	Mark	DOI-NPS-National Park Service	Environmental History of the Kawuneeche Valley and the Headwaters of the Colora	$ 49,994
Gao	Wei	USDA-CSREES-Coop State Rsrch Edu & Ext	Integrated Bioclimatic-Dynamic Modeling of Climate Change Impacts on Agricultur	$ 530,000
Garcia	Luis	Northern Colorado Water Conservancy Dist	A Remote Sensing - GIS Approach to Evaluate the Effects of Soil Salinity on Evapotr	$ 40,238
Garcia	Luis	USDA-ARS-Agricultural Research Service	Application of System Models to Evaluate and Extend Cropping Systems Studies at	$ 72,000
Garcia	Luis	DOI-Bureau of Reclamation	Arkansas River Valley S&T Research Work	$ 10,000
Garcia	Luis	Colorado State Water Conservation Board	Arkansas Valley Research Center Lysimeter Project	$ 90,000
Garcia	Luis	USDA	ARS - Agricultural Research Service - GeoLem Caching and Multithreading Developr	$ 50,000
Garcia	Luis	Various "Non-Profit" Sponsors	Developing a Decision Support System for the South Platte Basin	$ 17,500
Garcia	Luis	DOI-Bureau of Reclamation	Modification of the Integrated Decision Support Consumptive Use Model	$ 24,343
Garcia	Luis	USDA-ARS-Agricultural Research Service	Module Development for OMS (Object Management System)	$ 25,000
Garcia	Luis	DOI-Bureau of Reclamation	Multi-Temporal High-Resolution GIS-Based Spatial Evapotranspiration	$ 63,301
Garcia	Luis	DOI-Bureau of Reclamation	Subsurface Drainage Research	$ 20,000
Garcia	Luis	USDA-NRCS-Natural Resources Consvtn Srv	Support Implementation and Development of the Object Modeling System	$ 100,000
Gates	Timothy	Colorado Dept Public Health & Environ	Assessing Irrigation - Induced Selenium and Iron in the Stream - Aquifer System of t	$ 100,000
Gates	Timothy	Colorado Dept of Public Health and Environment	Data and Models for Planning of Nonpoint Source Selenium Management in the Lo	$ 501,735
Gates	Timothy	Colorado State Water Conservation Board	Data Assessment and Collection in Support of Improved Water Management in the	$ 599,931
Gates	Timothy	Colorado Division of Water Resources	Early-Season Monitoring of Irrigation Practices Under Conventional and Improved `	$ 74,233
Gates	Timothy	Desert Research Institute	Evaluation of the Use of Polyacrylamide to Reduce Seepage Losses from Earthen Irı	$ 16,580
Gates	Timothy	DOI-Bureau of Reclamation	Identification, Public Awareness, & Solution of Waterlogging & Salinity in the Arkar	$ 65,000
Gates	Timothy	Colorado State Water Conservation Board	Late-Season Monitoring of Irrigation Practices Under Conventional and Improved T	$ 96,664
Gates	Timothy	Lower AR Valley Water Conservancy Dist.	Monitoring and Modeling Toward Optimal Management of the Lower Arkansas Riv	$ 75,000
Gates	Timothy	Southeastern CO Water Conservancy District	Part 2, Monitoring and Modeling Toward Optimal Management of the Lower Arkar	$ 100,000
Goodridge	Lawrence	DOC-NOAA-Natl Oceanic & Atmospheric Admn	A Bacteriophage Linked Immunosorbent Assay for Rapid Detection of Pathogenic V	$ 105,794
Goodridge	Lawrence	NGWA-Natl Ground Water Res & Ed Found.	Database Independent Microbial Source Tracking to Determine the Source of Fecal	$ 4,000
Goodridge	Lawrence	Colorado Water Resources Research Institute	Development of a Multiplex Lateral Flow Device to Assess Biological Water Quality	$ 5,000
Goodridge	Lawrence	Scientific Methods	Rapid Concentration of Viruses from Drinking Water	$ 23,539
Ham	Jay	Kansas State University	Modifying Homeowners' Lawn-Irrigation Behavior to Conserve Water and Improve	$ 55,391
Hansen	Neil	DOI-Bureau of Reclamation	Demonstrating Limited Irrigation Technology as an Approach to Sustain Irrigated Aլ	$ 139,901
Hansen	Neil	USDA-ARS-Agricultural Research Service	Develop Knowledge Base and Quantitative Tools for Optimal Crops and Manageme	$ 30,000
Hansen	Neil	USDA-ARS-Agricultural Research Service	Irrigation, Tillage, and Weed Management to Maintain Agricultural Profitability wit	$ 5,854
Hawkins	John	DOI	Bureau of Reclamation-Yampa River Nonnative Fish Control: Translocation of Nortl	$ 22,065
Hawkins	John	DOI-Bureau of Reclamation	Middle Yampa Smallmouth Bass & Northern Pike	$ 296,595
Hawkins	John	Bureau of Reclamation	Yampa Diversion Entrainment (Project No. 146)	$ 14,000
Hawkins	John	Bureau of Reclamation	Yampa River Nonnative Fish Control: Translocation of Northern Pike from the Yamլ	$ 244,965
Henry	Charles	EPA-Environmental Protection Agency	Rapid and Continuous Analysis of the Water-Soluble Portion of Aerosols Using Lab-	$ 8,475
Hobbs	Nicholas	DOI-USGS-Geological Survey	Forecasting the Effects of Agricultural Practices on Prairie Wetlands: Implications fo	$ 10,033
Jacobi	William	Denver Water Department	Continued Investigation of the Impact of Canal Water Flow on the Health of Cotton	$ 12,889
Jacobi	William	Larimer County	Effects of Chloride Salts on Roadside Vegetation & Water	$ 47,345
Jacobi	William	Denver Water Department	Water Usage by Cottonwood Trees	$ 12,250
Jayasumana	Anura	Colorado School of Mines	Wireless Sensor Network Based Subsurface Contaminant Plume Monitoring	$ 52,393
Johnson	Brett	Bureau of Reclamation	Chemically Fingerprinting Nonnative Fishes in Reservoirs (Project No. C18/19)	$ 142,647
Johnson	Brett	Colorado Division of Wildlife	Management of Mercury Bioaccumulation in Colorado Reservoirs	$ 198,500
Johnson	Jerry	DOI-USGS-Geological Survey	NIWR Development of Oilseed Crops for Biodiesel Production under Colorado Limit	$ 12,500
Johnson	James Bradley	Colorado Department of Transportation	Phase 2 Development of the Functional Assessment of Colorado Wetlands (FACWe	$ 44,162
Johnson	James	Colorado Department of Transportation	Phase 3 Development of the Functional Assessment of Colorado Wetlands (FACWe	$ 69,999
Julien	Pierre	USDA	Hydraulic Feometry and Sediment Transport of the Rio Grande	$ 80,255
Julien	Pierre	Korea Institute of Construction Technolo	Restoration of Abandoned Channels	$ 82,749
Kampf	Stephanie	DOE-US Department of Energy	Climate Change Impacts to Hydropower Generation in Pacific Northwest River Basi	$ 121,910
Kampf	Stephanie	DOI-USGS-Geological Survey	Hydrologic Analysis and Process-Based Modeling for the Upper Cache la Poudre Ba	$ 25,000
Kelly	Eugene	USDA	Monitoring Forest Recovery and Watershed Protection in Beetle-Killed and Salvage	$ 33,300
Kelly	Eugene	USDA-USFS-Rocky Mtn. Research Station - CO	Monitoring Forest Recovery and Watershed Protection in Beetle-Killed and Salvage	$ 65,854
Koski	Anthony	National Turfgrass Federation Inc.	2008 National Bentgrass (Fairway/Tee) Test (Saline Irrigation)	$ 10,000
Koski	Anthony	USGA-US Golf Association/Green Section R	Establishment and Maintenance of Turf-type Saltgrass (Distichlis stricta): Nitrogen	$ 9,999
Kumar	Sunil	DOI-USGS-Geological Survey	Global Change Proposal: Potential Effects of Climate Change on Harmful Invasive Sլ	$ 94,660
Kummerow	Christian	NASA - National Aeronautics & Space Admin.	A Cooperative Climate Rainfall Data Center	$ 267,085
Kummerow	Christian	Princeton University	Developing Consistent Earth System Data Records for the Global Terrestrial Water	$ 41,079
Kummerow	Christian	DOC-NOAA	Development of an Improved Climate Rainfall Dataset from SSM/I	$ 104,748
Kummerow	Christian	NASA	Natl Aeronautics & Space Admin.-The Role of Warm Rain Systems in the Tropics,	$ 24,000
Kummerow	Christian	DOC	NOAA-Natl Oceanic & Atmospheric Admn-Development of an Improved Climate Ra	$ 104,739
Kummerow	Christian	NASA	Th e Next Generation Rainfall Retrieval Algorithm for Use by TRMM and GPM	$ 191,280
Kummerow	Christian	NASA - Natl Aeronautics & Space Admin.	The Next Generation Rainfall Retrieval Algorithm for Use by TRMM and GPM	$ 100,000
Lee	Brook	USDA-USFS-Rocky Mountain Research Station	Effects of Mountain Pine Beetle and Forest Management on Water Quantity, State	$ 56,825
Lemly	Joanna	Colorado Division of Wildlife	Statewide Wetland Strategies	$ 194,045
Lemly	Joanna	Colorado Department of Natural Resources	Survey of Critical Wetlands in Hinsdale County, Colorado	$ 7,163
Liston	Glen	Natl Oceanic & Atmospheric Admn	A High - Resolution Meteorological Distribution Model for Atmospheric, Hydrologic	$ 21,000
Liston	Glen	NASA - National Aeronautics & Space Admin.	Improving the Representation of Global Snow Cover, Snow Water Equivalent, and S	$ 124,972
Liston	Glen	NSF	IPY: Collaborative Research: A Prototype Network for Measuring Arctic Winter Prec	$ 180,000
Liston	Glen	NSF	National Science Foundation - Collaborative Research: Norwegian - United States II	$ 89,202
Loftis	Jim	DOI	NPS-National Park Service-Clean Water Act Impairments and Use Designations for I	$ 50,000
Loftis	Jim	DOI	NPS-National Park Service-Status and Trends of Impaired, Threatened, & Outstandi	$ 174,338
Loftis	Jim	DOI-NPS-National Park Service	Status and Trends of Impaired, Threatened, and Outstanding National/State Resou	$ 164,600
Loomis	John	DOI-USFWS-Fish & Wildlife Service	Improving Estimates of the Contribution of USFWS National Fish Hatcheries in Colo	$ 59,962
Lyon	Margarette	USDA-USFS-Forest Research	White River National Forest Fen Inventory	$ 15,000
MacDonald	Lee	USDA	Evaluating & Predicting Postfire Logging Effects on Erosion	$ 53,281
MacDonald	Lee	Vietnam Education Foundation	Hydrologic Processes & Effects of Land Use & Field Measurements in Hydrology	$ 59,765
Matsumoto	Cliff	UCAR	Inspiring the Next Generation of Explorers: Th e GLOBE Program	$ 353,308
Miller	Steven	Mississippi State University	A Rapid Prototyping Capability Experiment to Evaluate Potential Soil Moisture Retr	$ 84,000
Myrick	Christopher	DOI-Bureau of Reclamation	A Literature & Laboratory Study of Appropriate Fish Loading & Hauling Conditions a	$ 39,943
Myrick	Christopher	DOI-USFWS-Fish & Wildlife Service	A Pilot Project Testing the Use of Copper and Copper-Based Compounds to Prevent	$ 25,647
Myrick	Christopher	DOI-USGS-Geological Survey	Developing Barriers to the Upstream Migration of New Zealand Mudsnail Phase III	$ 5,000
Myrick	Christopher	Colorado Division of Wildlife	Evaluation & Development of Fish Passage Designs	$ 150,000

Last Name	First Name	Sponsor	Project	Amount
Myrick	Christopher	USFWS	Fish & Wildlife Service - A Pilot Project Testing the Use of Copper and Copper - Base	$ 43,767
Myrick	Christopher	University of Washington	Native Trout	$ 58,711
Niemann	Jeffrey	DOI	Bureau of Reclamation-Implementing a Framework to Assess Uncertainty in Hydrau	$ 49,996
Niemann	Jeffrey	DOI-Bureau of Reclamation	Implementing a Framework to Assess Uncertainty in Hydraulic and Hydrologic Mod	$ 35,000
Norton	Andrew	DOI-NPS-National Park Service	Monitoring Saltcedar (Tamarix) Biological Control (Diorhabda elongata) Insectary E	$ 14,100
Oad	Ramchand	New Mexico Interstate Stream Commission	Decision Support Systems for Efficient Irrigation Management in the Middle Rio Gr	$ 167,556
Oad	Ramchand	New Mexico Interstate Stream Commission	ecision Support Systems for Efficient Irrigation Management in the Middle Rio Grar	$ 160,893
Ojima	Dennis	USGSGeological Survey	Western Mountain Initiative: Response of Western Mountain Ecosystems to Climat	$ 4,522
Parkinson	Bruce	Dreyfus Foundation (Camille & Henry) *	A Distributed Combinatorial Search for Water Splitting Photocatalysts	$ 45,000
Paschke	Mark	DOI-NPS-National Park Service	Restoration Native Plant Communities Following Saltcedar & Russian Olive Remova	$ 49,448
Paschke	Mark	Shell Oil Company	Revegetation Research on Oil Shale Lands in the Piceance Basin	$ 1,000,000
Paustian	Keith	USDA	ARS-Agricultural Research Service-Land Use Change and Carbon and Water Dynam	$ 2,000
Pilon-Smits	Elizabeth	NSF-Biological Sciences	Ecological Aspects of Plant Selenium Hyperaccumulation: Below and Beyond	$ 124,651
Poff	LeRoy	Camp Dresser McKee	Developing Flow-Ecology Relationships for Regional Application in Rivers of Colorac	$ 21,407
Poff	LeRoy	EPA-Office of Research and Development	Predicting Relative Risk of Establishment and Persistence of Riparian and Aquatic Ir	$ 599,748
Prieksat	Mark	USDA-USFS-Rocky Mtn. Rsrch Station - CO	Clean Air, Dust Monitoring and Safe Drinking Water Compliance Study Schofield Ba	$ 138,578
Pritchett	James	DOI-USGS-Geological Survey	Water Reallocation and Bioenergy in the South Platte: A Regional Economic Evalua	$ 15,000
Pruden - Bagchi	Amy	NSF	National Science Foundation - CAREER: Antibiotic Resistance Genes (ARG) as Emerg	$ 104,935
Qian	Yaling	Bureau of Reclamation	Assessment of Inland Saltgrass Plant Performance	$ 10,000
Qian	Yaling	HRI-Horticultural Research Institute	Interactive Impacts of Salts and Surfactants in Recycled Wastewater on Landscape	$ 16,000
Qian	Yaling	Golf Association/U.S. Green Section	Multiple Stress Tolerance, Seed Dormancy Breaking, and Establishment of Seeded S	$ 22,852
Qian	Yaling	Denver Water Department	Real Time Monitoring and Management of Soil Salinity in Recycled Water Irrigated	$ 22,864
Qian	Yaling	Golf Association/U.S. Green Section	Salinity Management in Effluent Water Irrigated Turfgrass Systems	$ 54,039
Ramirez	Jorge	DOD	ARMY - ARO - Army Research Office - Quantifying the complex hydrologic response	$ 32,573
Ramirez	Jorge	NSF-EHR-Education & Human Resources	Reu Site: Research Experiences for Undergraduates: Program in Water Research at	$ 105,824
Ramirez	Jorge	USDA	Vulnerability of the United States Water	$ 75,000
Rathburn	Sara	DOI-NPS-National Park Service	Channel Restoration Planning & Preparation for Colorado River & Lulu Creek	$ 27,800
Rathburn	Sara	DOI-NPS-National Park Service	Establishing Context for River Restoration along Upper Colorado River	$ 30,783
Reardon	Kenneth	Virginia Polytechnic Institute	Advancing Genome-Enabled Tools: Guiding Inoculum Design for Sulfate-Reducing M	$ 164,470
Reardon	Kenneth	University of Colorado	Bioconversion of Extracted Algal Biomass into Ethanol	$ 50,000
Rocchio	Joseph	Colorado Division of Wildlife	CDOW Cash Match for EPA Project: Ecological Integrity Scorecard Blue River Water	$ 10,833
Roesner	Larry	City of Fort Collins	Assist Fort Collins Stormwater Utility with Review of Stormwater Best Managemen	$ 303,012
Roesner	Larry	Water Environment Research Foundation	Landscape Irrigation Using Household Graywater - Experimental Study	$ 372,882
Roesner	Larry	Water Environment Research Foundation	Linking Stormwater BMP Systems Performance to Receiving Water Protection to In	$ 334,969
Roesner	Larry	ACR	LLC, Graywater - Wetlands Monitoring and Recycling for Urban Watersheds	$ 49,900
Roesner	Larry	EPA	Protection Agency-- SWMM Runoff Manual	$ 25,000
Rondeau	Renee	The Nature Conservancy	Identifying Important Fish & Wildlife Areas Associated with Colorado Forests	$ 25,162
Salas	Jose	Bureau of Reclamation	Generating Stochastic Flows for the Truckee River System,	$ 15,000
Sale	Thomas	Town of Castle Rock	CO, Studies Supporting Sustainable Use of the Denver Basin Aquifers in the Vicinity	$ 25,000
Sanders	Thomas	DOI-NPS-National Park Service	Integration of NPS/USGS Water Resources Science Applicable to Management of P	$ 147,602
Sanders	Thomas	DOI-NPS-National Park Service	Preservaton, Protection, & Management of Water Aquatic Resources of Units of th	$ 317,773
Schneekloth	Joel	Monsanto	Response of Drought Tolerant Genetics to Water Stress	$ 65,071
Schorr	Robert	DOI-USFWS-Fish & Wildlife Service	Preble's Meadow Jumping Mice Populations on the US Air Force Academy, Colorad	$ 44,652
Schubert	Wayne	DOC-NOAA-Natl Oceanic & Atmospheric Admn	Advanced Verification Techniques for the Hurricane Weather Research and Foreca	$ 20,000
Seidl	Andrew	Upper Gunnison River Water Conservancy D	Upper Gunnison Basin Water Economics Study	$ 22,050
Sengupta	Manajit	Natl Oceanic & Atmospheric Admn	Analysis of Simulated Radiance Fields for GOES - R ABI Bands for Mesoscale Weath	$ 70,000
Snyder	Darrel	DOI-Bureau of Reclamation	Guide to Cyprinid Larvae (Project No. 149)	$ 15,771
Snyder	Darrel	DOI-Bureau of Reclamation	Identification and Curation of Larval and Juvenile Fish	$ 99,332
Snyder	Darrel	DOI-NPS-National Park Service	Improve Collections Storage at Larval Fish Laboratory	$ 28,000
Snyder	Darrel	DOI-Bureau of Reclamation	Middle Rio Grande Larval Fish Identification Guide	$ 208,091
Sommers	Lee	Colorado State Water Conservation Board	Determination of Consumptive Water Use by Alfalfa in Arkansas Valley	$ 300,000
Spencer	William	USDA-Foreign Agricultural Service	Cochran Fellowship Training Program in Irrigation/Algeria and Tunisia/July 2009	$ 19,946
Steltzer	Heidi	DOI-USGS-Geological Survey	Effects of Water Management & Climate Change on the Dynamics of Native & Inva	$ 64,573
Stephens	Graeme	NASA	CloudSat	$ 689,400
Swift	Curtis	DOI	Bureau of Reclamation-Irrigation Audit Project for the Grand Valley of Western Col	$ 5,000
Swift	David	National Park Service	Investigation of National Nitrogen Deposition Loch Valley	$ 25,069
Theobald	David	National Park Service	Assessment of Natural Resources and Watershed Conditions for Rocky Mountain N	$ 130,000
Theobald	David	The Nature Conservancy	Attribution of Colorado-Wide Hydrography	$ 5,000
Theobald	David	USDA	Fire & Water in Colorado: Resource Trends & Interactions in a Changing Landscape	$ 152,400
Thompson	David	NSF - National Science Foundation	Analyses of Climate Variability and Climate Change	$ 155,872
Thornton	Christopher	DOI	Bureau of Reclamation-Alpha Weir Field Reconnaissance,	$ 12,507
Thornton	Christopher	Norris Screen Manufacturing Inc	Coanda Intake Weir Flow Testing	$ 32,953
Thornton	Christopher	USDA-USFS-Rocky Mtn. Rsrch Station	Hydraulic Modeling of Stabilization Techniques 02-JV11221602-145	$ 92,000
Thornton	Christopher	DOI-Bureau of Reclamation	Investigation of Alphabet Wiers	$ 130,000
Thornton	Christopher	Ayres Associates	NCHRP Project 24-26: Effects of Debris on Bridge-Pier Scour,	$ 45,242
Thornton	Christopher	International Coastal Revetment Products	Overtopping and Manning Roughness Testing on Articulating Concrete Block Syster	$ 52,455
Thornton	Christopher	Urban Drainage & Flood Control District	PHASE I: Hydraulic Model Study: Type C and D Grate Inlets for Highway Median Sto	$ 65,000
Thornton	Christopher	Nebraska Public Power District	Physical Model Study of the Sutherland Reservoir Outlet Works and Stilling Basin,	$ 137,200
Thornton	Christopher	Americast	Roof Drain Testing	$ 61,115
Thornton	Christopher	USDA	SFS - Rocky Mtn. Rsrch Station - CO - Hydraulic Modeling of Stabilization Technique	$ 65,000
Thornton	Christopher	Hydrau-Tech	Valenciano Dam Spillway	$ 42,316
Tranel	Jeffrey	Colorado Department of Natural Resources	Colorado Water for the 21st Century: Educating the Public,	$ 20,294
Valliant	James	Lower AR Valley Water Conservancy Dist.	The Effect on Corn Yield, Nutrient Needs and Economics when Fallowing Land in th	$ 8,529
Vonderhaar	Thomas	DOC	NOAA-Natl Oceanic & Atmospheric Admn-IPCC Studies for Climate Observations,	$ 50,000
Waskom	Reagan	USDA-CSREES-Coop State Rsrch Edu & Ext	Coordinated Regional Water Resources Programming for the Northern Plains and M	$ 657,000
Waskom	Reagan	USDA	CSREES - Coop State Rsrch Edu & Ext - Coordinated Agricultural Water Quality Prog	$ 587,000
Waskom	Reagan	USGS	Geological Survey - OMS Internship - USGS - WRRI Student Internship	$ 20,000
Waskom	Reagan	DOI-USGS-Geological Survey	OMS Internship - USGS - WRRI Student Internship	$ 10,000
Waskom	Reagan	DOI-USGS-Geological Survey	Program Administration Project	$ 10,000
Waskom	Reagan	DOI-USGS-Geological Survey	Risk Assessment and Forecasting of Indian Summer Monsoon for Agricultural Drou	$ 86,646
Waskom	Reagan	DOI-USGS-Geological Survey	Technology Transfer & Information Dissemination	$ 52,335
Westra	Philip	Monsanto	Field Production of Tissues and Grain from Drought Tolerant Corn	$ 47,880

Last Name	First Name	Sponsor	Project	Amount
Westra	Philip	Monsanto	Phenotypic Evaluations and Ecological Interactions of Drought Tolerant	$ 15,120
Wickramasinghe	Sumith	University of Colorado	Assessment of Membrane Adsorber for Removal of Residual Trace Impurities	$ 32,500
Wickramasinghe	Sumith	National Science Foundation	REU SUPPLEMENT: New Generation Responsive Membranes for Water Treatment	$ 12,000
Wilkins-Wells	John	DOI	Bureau of Reclamation-Social Factors Affecting the Transfer of Modern Water Man	$ 5,000
Winkelman	Dana,	Colorado Division of Wildlife	Control of Whirling Disease in the White River	$ 90,000
Winkelman	Dana	Colorado Division of Wildlife	Creel Program	$ 20,000
Winkelman	Dana	Colorado Division of Wildlife	Evaluation & Control of Whirling Disease in the White River, CO	$ 30,000
Winkelman	Dana	Colorado Division of Wildlife	High Elevation Lakes/Streams Whirling Disease Sampling	$ 27,500
Winkelman	Dana	Colorado Division of Wildlife	Studies: Water Pollution and Native Plains Fishes	$ 18,000
Winkelman	Dana	Colorado Division of Wildlife	Whirling Disease-Resistant Trout Evaluation	$ 198,102
Wohl	Ellen	National Science Foundation	ARRA RAPID: Pre-Disturbance Surveys of Wood Loads in Headwater Streams of the	$ 30,435
Wohl	Ellen	USDA	Assessing Channel Changes & Bank Stability Downstream from Hog Park Reservoir,	$ 24,587
Wohl	Ellen	NSF - National Science Foundation	Influence of Post-Glacial Rebound on River Longitudinal Profiles in Sweden	$ 34,986
Wohl	Ellen	USDA	National Riparian Protocol Development	$ 27,500
Wohl	Ellen	NSF-GEO-Geosciences	Wood Loading in Headwater Neotropical Forest Streams	$ 162,036
Yang	Chih	DOD	ARMY-Corps of Engineers-Lewis & Clark Reservoir Sedimentation Study,	$ 224,043
Yang	Chih	DOD-ARMY-Corps of Engineers	Lewis & Clark Reservoir Sedimentation Study	$ 234,609
Young	Peter	Solix Biofuels, Inc.	System Analysis and Controller Synthesis for Photobioreactor Algal Growth	$ 81,687
Zeidler	James	USFS	Aquatic/Fisheries Technical Support for Fort Leonard	$ 105,709
				$ 28,918,957

Appendix D

CSU ‘Water’ Faculty

CSU Water Faculty by Expertise

Water Center

1033 Campus Delivery
E102 Engineering Building
Fort Collins, CO 80523-1033
Phone: (970) 491-6308
Fax: (970) 491-1636
Email: cwi@colostate.edu

CSU Water Faculty by Expertise

Agriculture (19 faculty)

Bartolo, Michael
Senior Research Scientist, Arkansas Valley Research Ctr
Phone: (719) 254-6312

Bauder, Troy
Extension Specialist, Soil & Crop Sciences
Phone: (970) 491-4923

Berrada, Abdel
Research Scientist, Soil & Crop Sciences
Phone: (970) 562-4255

Cabot, Perry
Extension Specialist, CSU Extension
Phone: (719) 549-2045

Davis, Jessica
Professor, Soil & Crop Sciences
Phone: (970) 491-1913

Frasier, W. Marshall
Professor, Agric & Resource Economics
Phone: (970) 491-6071

Green, Timothy
Research Hydrologist, Civil & Environmental Engineering
Phone: (970) 492-7335

Hansen, Neil
Associate Professor, Soil & Crop Sciences
Phone: (970) 491-6804

Jha, Ajay
Research Scientist II, Agric & Resource Economics
Phone: (970) 491-0923

Khosla, Raj
Associate Professor, Soil & Crop Sciences
Phone: (970) 491-1920

Level, Allison
Associate Professor, Library
Phone: (970) 491-3918

Newman, Steven
Professor of Floriculture, Horticulture & Landscape Arch
Phone: (970) 491-7118

Oad, Ramchand
Professor, Civil & Environmental Engineering
Phone: (970) 491-7682

Peterson, Gary
Department Head, Soil & Crop Sciences
Phone: (970) 491-6501

Pritchett, James
Associate Professor, Agric & Resource Economics
Phone: (970) 491-5496

Reich, Denis
Water Resources Specialist, CSU Extension
Phone: (970) 858-3629

Self, James
Research Scientist, Soil & Crop Sciences
Phone: (970) 491-5061

Tinsley, Richard
Professor Emeritus, Soil & Crop Sciences
Phone: (970) 491-6970

Waskom, Reagan
Director, Colorado Water Institute / Water Center
Phone: (970) 491-6308

Anthropology, Policy, History, Sociology (21 faculty)

Assetto, Valerie
Professor, Political Science
Phone: (970) 491-5369

Campbell, Sue Ellen
Professor, English
Phone: (970) 491-5382

Cheng, Tony
Assistant Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-1900

Fiege, Mark
Associate Professor, History
Phone: (970) 491-6468

Freeman, David
Professor Emeritus, Sociology
Phone: (970) 491-5635

Hoag, Dana
Professor, Agric & Resource Economics
Phone: (970) 491-5549

Kroll, Stephan
Assistant Professor, Agric & Resource Economics
Phone: (970) 491-0887

Leisz, Stephen
Professor, Anthropology
Phone: (970) 491-3960

Lepper, Troy
Research Associate, Sociology
Phone: (970) 491-5635

Mumme, Stephen
Professor, Political Science
Phone: (970) 491-7428

Orsi, Jared
Associate Professor, History
Phone: (970) 491-5517

Peek, Lori
Assistant Professor, Sociology
Phone: (970) 491-6777

Rettig, Patricia
Head Archivist, Library
Phone: (970) 491-1939

Rolston, III, Holmes
Distinguished Professor, Philosophy
Phone: (970) 491-6315

Seidl, Andrew
Associate Professor, Agric & Resource Economics
Phone: (970) 491-7071

Sibold, Jason
Professor, Anthropology
Phone:

Sternlieb, Faith
Research Associate, Colorado Water Institute / Water Center
Phone: (970) 491-6328

Stevis, Dimitris
Professor, Political Science
Phone: (970) 491-6082

Vlachos, Evan
Professor, Civil & Environmental Engineering
Phone: (970) 491-5247

Ward, Robert
Professor Emeritus, Civil & Environmental Engineering
Phone: (970) 491-6308

Zahran, Sammy
Assistant Professor , Sociology
Phone: (970) 491-1877

Aquatic Ecology (7 faculty)

Baron, Jill
Senior Research Ecologist, Natural Resource Ecology Lab
Phone: (970) 491-1968

Bestgen, Kevin
Director, Larval Fish Lab, Fish, Wildlife & Conservation Biology
Phone: (970) 491-1848

Clements, William
Professor, Fish, Wildlife & Conservation Biology
Phone: (970) 491-0690

Fausch, Kurt
Professor, Fish, Wildlife & Conservation Biology
Phone: 970-491-6457

Johnson, Brett
Professor, Fish, Wildlife & Conservation Biology
Phone: (970) 491-5002

Poff, LeRoy
Professor, Biology
Phone: (970) 491-2079

Snyder, Darrell
Research Associate, Fish, Wildlife & Conservation Biology
Phone: (970) 491-5091

Business (4 faculty)

Frasier, W. Marshall
Professor, Agric & Resource Economics
Phone: (970) 491-6071

Hammerdorfer, Carl
Director of GSSE, Business College
Phone: (970) 491-8734

Lambert, Huntington
Associate Vice President, Continuing Educ-Administration
Phone: (970) 297-3615

Pritchett, James
Associate Professor, Agric & Resource Economics
Phone: (970) 491-5496

Climatological Processes (9 faculty)

Cotton, William
Professor, Atmospheric Science
Phone: (970) 491-8593

Denning, A. Scott
Associate Professor, Atmospheric Science
Phone: (970) 491-6936

Doesken, Nolan
State Climatologist, Atmospheric Science
Phone: (970) 491-3690

Ramírez, Jorge
Professor, Civil & Environmental Engineering
Phone: (970) 491-7621

Randall, David
Professor, Atmospheric Science
Phone: (970) 491-8474

Rutledge, Steven
Professor, Atmospheric Science
Phone: (970) 491-8283

Stephens, Graeme
Professor, Atmospheric Science
Phone: (970) 491-8541

Thompson, David W.
Associate Professor, Atmospheric Science
Phone: (970) 491-3338

Vonder Haar, Thomas
Professor, Atmospheric Science
Phone: (970) 491-8566

Ecosystem Dynamics (4 faculty)

Baron, Jill
Senior Research Ecologist, Natural Resource Ecology Lab
Phone: (970) 491-1968

Bauerle, Bill
Associate Professor, Horticulture & Landscape Arch
Phone: (970) 491-4088

Ham, Jay
Professor, Soil & Crop Sciences
Phone: (970) 491-4112

Kelly, Eugene
Professor, Soil & Crop Sciences
Phone: (970) 491-6881

Education and Outreach (7 faculty)

Doe, William
Associate Dean, WCNR, Forest Rangeland Watershed Stwrd
Phone: (970) 491-5082

El-Hakim, Omnia
Professor, Civil & Environmental Engineering
Phone: (970) 491-2656

Kallenberger, Julie
Research Associate, Colorado Water Institute / Water Center
Phone: (970) 491-5124

Kendall, Patricia
Professor/Ext. Specialist, Food Science & Human Nutrition
Phone: (970) 491-1945

Schmidt, Laurie
Editor, Colorado Water Institute / Water Center
Phone: (970) 491-7856

Sternlieb, Faith
Research Associate, Colorado Water Institute / Water Center
Phone: (970) 491-6328

Warnock, Andrew
Research Scientist, Center For Sci, Math & Tech Ed
Phone: (970) 491-2845

Environmental Engineering (3 faculty)

Carlson, Kenneth
Associate Professor, Civil & Environmental Engineering
Phone: (970) 491-8336

Charlie, Wayne
Professor, Civil & Environmental Engineering
Phone: (970) 491-5048

Woods, Sandra
Dean, Dean of Engineering
Phone: (970) 491-3366

Fluvial Geomorphology / Sediment Transport (4 faculty)

Bledsoe, Brian
Associate Professor, Civil & Environmental Engineering
Phone: (970) 491-6580

Niemann, Jeffrey
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-3517

Rathburn, Sara
Associate Professor, Geosciences
Phone: (970) 491-6956

Yang, Chih
Borland Professor, Civil & Environmental Engineering
Phone: (970) 491-8160

Forest Ecology (4 faculty)

Binkley, Dan
Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-6519

Rideout, Douglas
Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-7234

Smith, Frederick (Skip)
Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-7505

Wardle, Tom
Assistant State Forester, Colorado State Forest Service
Phone: (970) 491-

Geosciences (9 faculty)

Borch, Thomas
Assistant Professor, Soil & Crop Sciences
Phone: (970) 491-6235

Charlie, Wayne
Professor, Civil & Environmental Engineering
Phone: (970) 491-5048

Harry, Dennis
Professor, Geosciences
Phone: (970) 491-2714

Peterson, Gary
Department Head, Soil & Crop Sciences
Phone: (970) 491-6501

Rathburn, Sara
Associate Professor, Geosciences
Phone: (970) 491-6956

Sanford, William
Associate Professor, Geosciences
Phone: (970) 491-5929

Schmidt, Laurie
Editor, Colorado Water Institute / Water Center
Phone: (970) 491-7856

Shackelford, Charles
Professor, Civil & Environmental Engineering
Phone: (970) 491-5051

Wohl, Ellen
Professor of Geology, Geosciences
Phone: (970) 491-5298

Groundwater (6 faculty)

Bau, Domenico
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-6060

Durnford, Deanna
Professor, Civil & Environmental Engineering
Phone: (970) 491-1625

Ronayne, Michael
Assistant Professor, Geosciences
Phone: (970) 491-0666

Sale, Thomas
Research Scientist, Civil & Environmental Engineering
Phone: (970) 491-8413

Sanford, William
Associate Professor, Geosciences
Phone: (970) 491-5929

Shackelford, Charles
Professor, Civil & Environmental Engineering
Phone: (970) 491-5051

Horticulture and Landscape (5 faculty)

Bauerle, Bill
Associate Professor, Horticulture & Landscape Arch
Phone: (970) 491-4088

Klett, James
Professor, Horticulture & Landscape Arch
Phone: (970) 491-7179

Koski, Anthony (Tony)
Professor, Horticulture & Landscape Arch
Phone: (970) 491-7070

Newman, Steven
Professor of Floriculture, Horticulture & Landscape Arch
Phone: (970) 491-7118

Qian, Yaling
Associate Professor, Horticulture & Landscape Arch
Phone: (970) 491-7079

Hydraulics (11 faculty)

Abt, Steven
Professor, Major General, Civil & Environmental Engineering
Phone: (970) 491-8203

El-Hakim, Omnia
Professor, Civil & Environmental Engineering
Phone: (970) 491-2656

Gates, Timothy
Professor, Civil & Environmental Engineering
Phone: (970) 491-5043

Grigg, Neil
Professor, Civil & Environmental Engineering
Phone: (970) 491-3369

Julien, Pierre
Professor, Civil & Environmental Engineering
Phone: (970) 491-6262

Meroney, Robert
Professor Emeritus, Civil & Environmental Engineering
Phone: (970) 482-9252

Roesner, Larry
Professor, Civil & Environmental Engineering
Phone: (970) 491-7430

Salas, Jose (Pepe)
Professor, Civil & Environmental Engineering
Phone: (970) 491-6057

Thornton, Christopher
Assistant Professor , Civil & Environmental Engineering
Phone: (970) 491-8394

Watson, Chester
Professor, Civil & Environmental Engineering
Phone: (970) 491-8313

Yang, Chih
Borland Professor, Civil & Environmental Engineering
Phone: (970) 491-8160

Hydrochemistry (2 faculty)

Pilon-Smits, Elizabeth
Associate Professor, Biology
Phone: (970) 491-4991

Tessari, John
Associate Professor, Env & Rad Health Sci
Phone: (970) 491-7037

Hydrology (13 faculty)

Arabi, Mazdak
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-4639

Bau, Domenico
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-6060

Cabot, Perry
Extension Specialist, CSU Extension
Phone: (719) 549-2045

Chávez, José
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-6095

Fassnacht, Steven
Associate Professor, Forest Rangeland Watershed Stwrd
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Green, Timothy
Research Hydrologist, Civil & Environmental Engineering
Phone: (970) 492-7335

Kampf, Stephanie
Assistant Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-0931

MacDonald, Lee
Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-6109

Niemann, Jeffrey
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-3517

Ramírez, Jorge
Professor, Civil & Environmental Engineering
Phone: (970) 491-7621

Salas, Jose (Pepe)
Professor, Civil & Environmental Engineering
Phone: (970) 491-6057

Sale, Thomas
Research Scientist, Civil & Environmental Engineering
Phone: (970) 491-8413

Wohl, Ellen
Professor of Geology, Geosciences
Phone: (970) 491-5298

Irrigation and Drainage (11 faculty)

Andales, Allan
Assistant Professor, Soil & Crop Sciences
Phone: (970) 491-6516

Bartolo, Michael
Senior Research Scientist, Arkansas Valley Research Ctr
Phone: (719) 254-6312

Chávez, José
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-6095

Garcia, Luis
Department Head, Civil & Environmental Engineering
Phone: (970) 491-5049

Gates, Timothy
Professor, Civil & Environmental Engineering
Phone: (970) 491-5043

Hansen, Neil
Associate Professor, Soil & Crop Sciences
Phone: (970) 491-6804

Koski, Anthony (Tony)
Professor, Horticulture & Landscape Arch
Phone: (970) 491-7070

Oad, Ramchand
Professor, Civil & Environmental Engineering
Phone: (970) 491-7682

Podmore, Terence
Professor, Civil & Environmental Engineering
Phone: (970) 491-1624

Schneekloth, Joel
Reg. Water Resource Spec., CSU Extension
Phone: (970) 345-6588

Tinsley, Richard
Professor Emeritus, Soil & Crop Sciences
Phone: (970) 491-6970

Library Materials (3 faculty)

Culbertson, Mike
Associate Professor, Library
Phone: (970) 491-1874

Level, Allison
Associate Professor, Library
Phone: (970) 491-3918

Rettig, Patricia
Head Archivist, Library
Phone: (970) 491-1939

Limnology (1 faculty)

Johnson, Brett
Professor, Fish, Wildlife & Conservation Biology
Phone: (970) 491-5002

Management and Planning (11 faculty)

Bright, Alan
Associate Professor, Human Dimensions Of Natural Resources
Phone: (970) 491-5487

Cheng, Tony
Assistant Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-1900

Doe, William
Associate Dean, WCNR, Forest Rangeland Watershed Stwrd
Phone: (970) 491-5082

Donnelly, Maureen
Associate Professor, Human Dimensions Of Natural Resources
Phone: (970) 491-2023

Fontane, Darrell
Professor, Civil & Environmental Engineering
Phone: (970) 491-5248

Freeman, David
Professor Emeritus, Sociology
Phone: (970) 491-5635

Grigg, Neil
Professor, Civil & Environmental Engineering
Phone: (970) 491-3369

Jha, Ajay
Research Scientist II, Agric & Resource Economics
Phone: (970) 491-0923

Labadie, John
Professor, Civil & Environmental Engineering
Phone: (970) 491-6898

Laituri, Melinda
Associate Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-0292

Lepper, Troy
Research Associate, Sociology
Phone: (970) 491-5635

Models / Computer Data Management / GIS (16 faculty)

Andales, Allan
Assistant Professor, Soil & Crop Sciences
Phone: (970) 491-6516

Arabi, Mazdak
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-4639

Dean, Denis
Associate Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-2378

Fontane, Darrell
Professor, Civil & Environmental Engineering
Phone: (970) 491-5248

Hiemstra, Christopher
Research Scientist II, CIRA
Phone: (970) 491-3647

Kampf, Stephanie
Assistant Professor, Forest Rangeland Watershed Stwrd
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Khosla, Raj
Associate Professor, Soil & Crop Sciences
Phone: (970) 491-1920

Labadie, John
Professor, Civil & Environmental Engineering
Phone: (970) 491-6898

Laituri, Melinda
Associate Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-0292

Leisz, Stephen
Professor, Anthropology
Phone: (970) 491-3960

Nuckols, John (Jay)
Professor, Env & Rad Health Sci
Phone: (970) 218-4757

Roesner, Larry
Professor, Civil & Environmental Engineering
Phone: (970) 491-7430

Ronayne, Michael
Assistant Professor, Geosciences
Phone: (970) 491-0666

Sibold, Jason
Professor, Anthropology
Phone:

Stephens, Graeme
Professor, Atmospheric Science
Phone: (970) 491-8541

Wilson, Kenneth
Department Head, Fish, Wildlife & Conservation Biology
Phone: (970) 491-7755

Non-Point Source Pollution Control (4 faculty)

Bauder, Troy
Extension Specialist, Soil & Crop Sciences
Phone: (970) 491-4923

Bledsoe, Brian
Associate Professor, Civil & Environmental Engineering
Phone: (970) 491-6580

MacDonald, Lee
Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-6109

Stednick, John
Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-7248

Pedology (1 faculty)

Kelly, Eugene
Professor, Soil & Crop Sciences
Phone: (970) 491-6881

Recreational Resources (3 faculty)

Donnelly, Maureen
Associate Professor, Human Dimensions Of Natural Resources
Phone: (970) 491-2023

Loomis, John
Professor, Agric & Resource Economics
Phone: (970) 491-2485

Manfredo, Michael
Department Head, Human Dimensions Of Natural Resources
Phone: (970) 491-0474

Resource Economics (5 faculty)

Goemans, Christopher
Assistant Professor , Agric & Resource Economics
Phone: (970) 491-7261

Hoag, Dana
Professor, Agric & Resource Economics
Phone: (970) 491-5549

Kroll, Stephan
Assistant Professor, Agric & Resource Economics
Phone: (970) 491-0887

Rideout, Douglas
Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-7234

Seidl, Andrew
Associate Professor, Agric & Resource Economics
Phone: (970) 491-7071

Snow Hydrology / Glaciers (3 faculty)

Doesken, Nolan
State Climatologist, Atmospheric Science
Phone: (970) 491-3690

Fassnacht, Steven
Associate Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-5454

Hiemstra, Christopher
Research Scientist II, CIRA
Phone: (970) 491-3647

Statistics (1 faculty)

Loftis, Jim
Professor, Civil & Environmental Engineering
Phone: (970) 491-2667

Stream and Riparian Zone Biology / Wetlands (4 faculty)

Bestgen, Kevin
Director, Larval Fish Lab, Fish, Wildlife & Conservation Biology
Phone: (970) 491-1848

Fausch, Kurt
Professor, Fish, Wildlife & Conservation Biology
Phone: 970-491-6457

Kondratieff, Boris
Professor of Entomology, Bioagric Sciences & Pest Mgmt
Phone: (970) 491-7314

Poff, LeRoy
Professor, Biology
Phone: (970) 491-2079

Toxicology and Microbiology (9 faculty)

Clements, William
Professor, Fish, Wildlife & Conservation Biology
Phone: (970) 491-0690

Goodridge, Lawrence
Assistant Professor, Animal Sciences
Phone: (970) 491-6271

Pilon-Smits, Elizabeth
Associate Professor, Biology
Phone: (970) 491-4991

Ramsdell, Howard
Associate Professor, Env & Rad Health Sci
Phone: (970) 491-5698

Reardon, Kenneth
Associate Department Head, Chemical & Biological Engineering
Phone: (970) 491-6505

Reif, D.V.M., John
Professor, Env & Rad Health Sci
Phone: (970) 491-2940

Stromberger, Mary
Associate Professor, Soil & Crop Sciences
Phone: (970) 491-5283

Wickramasinghe, Ranil
Associate Professor, Chemical & Biological Engineering
Phone: (970) 491-5726

Yang, Raymond S.
Professor, Env & Rad Health Sci
Phone: (970) 491-5652

Water and Waste Water Treatment (5 faculty)

Borch, Thomas
Assistant Professor, Soil & Crop Sciences
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Carlson, Kenneth
Associate Professor, Civil & Environmental Engineering
Phone: (970) 491-8336

Linden, James
Professor Emeritus, Chemical & Biological Engineering
Phone: (970) 491-5175

Reich, Denis
Water Resources Specialist, CSU Extension
Phone: (970) 858-3629

Sharvelle, Sybil
Assistant Professor, Civil & Environmental Engineering
Phone: (970) 491-6081

Water Conservation (5 faculty)

Kallenberger, Julie
Research Associate, Colorado Water Institute / Water Center
Phone: (970) 491-5124

Klett, James
Professor, Horticulture & Landscape Arch
Phone: (970) 491-7179

Schneekloth, Joel
Reg. Water Resource Spec., CSU Extension
Phone: (970) 345-6588

Walker, Lloyd
Extension Ag Engineer, Civil & Environmental Engineering
Phone: (970) 491-6308

Waskom, Reagan
Director, Colorado Water Institute / Water Center
Phone: (970) 491-6308

Water Quality Management / Monitoring (10 faculty)

Davis, Jessica
Professor, Soil & Crop Sciences
Phone: (970) 491-1913

Kondratieff, Boris
Professor of Entomology, Bioagric Sciences & Pest Mgmt
Phone: (970) 491-7314

Linden, James
Professor Emeritus, Chemical & Biological Engineering
Phone: (970) 491-5175

Loftis, Jim
Professor, Civil & Environmental Engineering
Phone: (970) 491-2667

Nuckols, John (Jay)
Professor, Env & Rad Health Sci
Phone: (970) 218-4757

Qian, Yaling
Associate Professor, Horticulture & Landscape Arch
Phone: (970) 491-7079

Self, James
Research Scientist, Soil & Crop Sciences
Phone: (970) 491-5061

Stednick, John
Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-7248

Walker, Lloyd
Extension Ag Engineer, Civil & Environmental Engineering
Phone: (970) 491-6308

Ward, Robert
Professor Emeritus, Civil & Environmental Engineering
Phone: (970) 491-6308

Watershed Restoration and Management (4 faculty)

Savidge, Julie
Associate Professor, Forest Rangeland Watershed Stwrd
Phone: (970) 491-6510

Vaske, Jerry
Professor, Human Dimensions Of Natural Resources
Phone: (970) 491-2360

Wallace, George
Associate Professor, Human Dimensions Of Natural Resources
Phone: (970) 491-5165

Wilson, Kenneth
Department Head, Fish, Wildlife & Conservation Biology
Phone: (970) 491-7755

Appendix E

State-Wide Faculty Request for Proposals

Colorado Water Resources Research Institute

FY 2008 Request for Proposals

CLOSING DATE: SEPTEMBER 20, 2007

Proposals are invited for the Colorado Water Resources Research Institute FY 2008 water research program.

The Colorado Water Resources Research Institute (CWRRI) is established under the federal Water Resources Research Act, as amended, and is authorized by the Colorado legislature, most recently in 2006, under S.B. 06-183. At the federal level, CWRRI is one of 54 water institutes administered by the U.S. Geological Survey in the Department of Interior. Under Section 104(b) of the Water Resources Research Act, CWRRI is to '…plan, conduct, or otherwise arrange for competent research…' that fosters the entry of new scientists into water resources fields, the preliminary exploration of new ideas that address water problems or expand understanding of water and water-related phenomena, and disseminates research results to water managers and the public. The research program is open to faculty in any institution of higher education in Colorado that has 'demonstrated capabilities for research, information dissemination, and graduate training … to resolve State and regional water and related land problems.'

Priority Research Topics:

For the FY 2008 competition, the CWRRI Advisory Committee for Water Research Policy has identified needs for new water knowledge that will assist in answering the following questions:

What are the water quality concerns relative to oil shale development, what is the extent of these problems in western Colorado and what is the potential for mitigation?

What new tools, methods and demonstration projects are needed to analyze the changes and vulnerability of water systems in Colorado to climate variability, including new or improved hydrologic models that convert changes in temperature and precipitation into changes in streamflow?

What is the array of technically feasible Ag water conservation strategies and options for Colorado and what are the basin level impacts of implementing these measures?

How can we refine current groundwater augmentation accounting procedures and methods for replacing depletions caused by ground water pumping?

What are the direct and indirect water related impacts and needs surrounding bioenergy production in Colorado?

Funds Available:

The FY08 CWRRI Request for Proposals is supported by the State of Colorado, with

supplemental funding provided through the U.S. Geological Survey, pending federal budget allocations. It is anticipated that approximately $150,000 in funds will be available for the FY08 competition. CWRRI research funds are awarded through a competitive process guided by the CWRRI Advisory Committee on Water Research Policy. Proposals that contain matching funds from Colorado water and water-related organizations are strongly encouraged.

Proposal Review Process:
All proposals are due in the CWRRI office by September 20, 2007 at 5:00pm (MDT).
Proposals will be peer reviewed before final review and ranking by the CWRRI Advisory Committee for Water Research Policy. The general criteria used for proposal evaluation include: (1) scientific merit; (2) responsiveness to RFP; (3) qualifications of investigators; (4) originality of approach; (5) budget; and (6) extent to which Colorado water managers and users are collaborating.

Eligibility:
The competition is open to regular, full-time faculty at Colorado's research universities.

Applications Not Eligible For Funding:
A. Applications for research on health effects involving human subjects.
B. Applications for research involving oceanography.
C. Applications submitted by an investigator that has not met reporting requirements on a previous award from the USGS or CWRRI.

Project Budget Amount and Duration:
The total life of the project must not exceed 24 months in duration. The total budget request cannot exceed $50,000 dollars during the 24 month period. Projects of shorter duration and/or budgets less than $50,000 will also be considered. Project start date will be January 1, 2008.

Proposal Submission:
Proposals, in both hard and electronic copy, are to be submitted no later than 5:00pm, MDT September 20, 2007.

Hard Copy Submission:
Colorado Water Resources Research Institute
E102 Engineering Building
1033 Campus Delivery
Colorado State University
Fort Collins, Colorado 80523-1033

Electronic Submission:
Email to: nancy.grice@research.colostate.edu

Questions: If there are questions about this solicitation, contact Reagan Waskom by phone at (970) 491-6308 or by e-mail at: reagan.waskom@Colostate.edu

CWRRI Awards Funding

FY08 Research Projects

CWRRI was fortunate to receive additional funds from the State of Colorado in FY08 to expand the research portfolio. Under Section 104(b) of the Water Resources Research Act, CWRRI is to "plan, conduct, or otherwise arrange for competent research…" that fosters the entry of new scientists into water resources fields, the preliminary exploration of new ideas that address water problems or expand understanding of water and water-related phenomena, and disseminates research results to water managers and the public. The research program is open to faculty in any institution of higher education in Colorado that has "demonstrated capabilities for research, information dissemination, and graduate training … to resolve State and regional water and related land problems."

The general criteria used for proposal evaluation included:
(1) scientific merit
(2) responsiveness to RFP
(3) qualifications of investigators
(4) originality of approach
(5) budget
(6) extent to which Colorado water managers and users are collaborating

A call for proposals went out last July and was responded to by eight high quality requests totaling over $350,000 in requested support. A peer review process and ranking by the CWRRI Advisory Committee resulted in funding 4 projects for FY08. Project titles and investigators and listed below. For more information on any of these projects, contact the PI or Reagan Waskom at CWRRI. Special thanks to the individuals who provided peer reviews of the project proposals.

Developing a GIS Database for Source-Tracking of Human Versus $15,280

Amy Pruden, Colorado State University
Mazdak Arabi, Colorado State University

Hydrologic Analysis and Process-Based Modeling for the Upper Cache la Poudre Basin $35,000

Stephanie Kampf, Colorado State University

Observing and Modeling Non-Beneficial Evaporative Upflux from Shallow Ground Water under Uncultivated Land in an Irrigated River Valley $40,000

Jeffrey D. Niemann, Colorado State University
Timothy K. Gates, Colorado State University
Luis A. Garcia, Colorado State University

Water Reallocation and Bioenergy in the South Platte: A Regional Economic Evaluation $47,981

James Pritchett, Colorado State University

State-Wide Student Request for Proposals

Colorado Water Resources Research Institute
FY08 Student Water Research Grant Program

Request for Proposals

The Colorado Water Resources Research Institute is pleased to announce a request for proposals for the FY08 Student Water Research Program.

Program Description

This program is intended to encourage and support graduate and undergraduate student research in disciplines relevant to water resources issues and to assist Colorado institutions of higher education in developing student research expertise and capabilities. It is intended to help students initiate research projects or to supplement existing student projects in water resources research. Proposals must have a faculty sponsor and students must be enrolled full-time in a degree program at one of Colorado's nine public universities (ASC, CSM, CSU, CU, FLC, MSC, MSCD, UNC, or WSC).

Funding

Budgets may include, but are not limited to, expenditures for student salaries, supplies, and travel. Funds will not be approved for faculty salaries. Each award is limited to a maximum of $5,000. Awards may be effective as early as April 1, 2008 and research projects should be completed by March 31, 2009. For these research grants, only direct costs are allowed. Facilities & Administrative (F&A) costs may be shown as institutional cost share.
Institutions are encouraged to participate in project costs although cost sharing is not required.

Eligibility

Students must be enrolled full-time in a degree program at one of the nine Colorado public universities. Proposals must have a faculty sponsor from the applicant's institution. The faculty sponsor is responsible for ensuring that the proposal has been processed according to their university's proposal submission policies and procedures.

Deliverables

Upon completion of the research project, recipients will be required to submit a final project report, which will include a narrative on research activities and results. **Projects must be completed and results reported by March 31, 2009.** Students may be asked to present an oral report on their work to the CWRRI Advisory Board.

Submission Process

All proposals must be submitted online

Proposal Deadline

February 29, 2008 at 5:00pm MT

Expected Award/Start Date

Start Date: April 1, 2008
End Date: March 31, 2009

Announcement of Awards

The student applicant and faculty sponsor will be notified as to the status of their application by March 31, 2008 via email.

Program Contact Information

For questions concerning the program, please contact
Dr. Reagan Waskom, Director
reagan.waskom@colostate.edu

Nancy Grice, Assistant to the Director
nancy.grice@colostate.edu

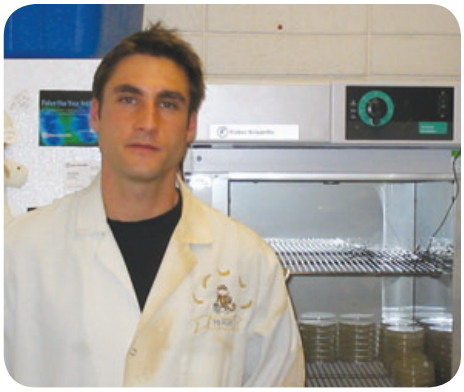
Phone: 970-491-6308
Fax: 970-491-1636

CWRRI Announces Funded Student Projects

The Colorado Water Resources Research Institute is pleased to announce the funding of 3 undergraduate student projects this year. This program is intended to encourage and support graduate and undergraduate student research in disciplines relevant to water resources issues and to assist Colorado institutions of higher education in developing student research expertise and capabilities. It is intended to help students initiate research projects or to supplement existing student projects in water resources research. The FY08 student projects are listed below:

Flow Device to Assess Biological Water Quality in Colorado Surface Water

by Travis Steiner, Department of Animal Sciences, CSU
Faculty Sponsor: Lawrence Goodridge, Department of Animal Sciences, CSU



The World Health Organization estimates that 50,000 deaths per day are due to water related diseases. The detection of waterborne pathogens continues to be difficult. Since most of the pathogens present in water are of fecal origin, the detection of fecal contamination has been the main aim of the testing methodologies. Historically, bacterial indicators have been used to detect fecal contamination. However, there are major problems with the current use of indicator bacteria to detect fecal pollution. Many of these bacteria are routinely isolated from environments that have not been impacted by fecal pollution. In addition, these bacteria are not reliable indicators of the presence of enteric viruses in water. The FRNA bacteriophages (phages) have emerged as indicators of fecal contamination, due to their morphological similarities to human enteric viruses, and the fact that their presence in water typically represents a recent fecal contamination event. Also, the FRNA phages can be differentiated into 4 distinct serogroups, with serogroups I and IV occurring in animal wastewater, and groups II and III typically found in wastewater from human sources. Therefore, if these phages can be detected and simultaneously serogrouped, a new indicator assay will have been developed, that not only detects fecally polluted waters, but also determines the source of the contamination (based on the serogroup of the detected phage).

Studies Supporting Sustainable Use of the Denver Basin Aquifers in the Vicinity of Castle Rock

by Kim Lemonde, Civil and Environmental Engineering, CSU
Faculty Sponsor: Dr. Tom Sale, Civil and Environmental Engineering, CSU

The vision of this project is to advance our understanding of the hydrogeology of the Denver Basin Aquifer in the vicinity of the Castle Rock, Colorado.

The following tasks will be undertaken:

1. Mapping geologic trends to better resolve the long-term capacities of the aquifers to store and release water
2. Further resolution of geologic trends using geophysical logs
3. Collection and interpretation of hydrologic data
4. Further interpretation of water level data
5. Correlation of observations from geologic, geophysical, hydrologic data, and water level data sets

Estimating Errors Associated With Calculated Sublimation From Seasonally Snow-Covered Environments

by Douglas M. Hultstrand, Geosciences, CSU
Faculty Sponsor: Steven Fassnacht, Forest Rangeland & Watershed, CSU

In the mountainous regions of the western United States, a majority of annual precipitation falls as snow and is stored in high-elevation mountain snowpacks. One component of the alpine water balance that is still poorly understood is the amount of water exchanged between seasonal snowpacks and the atmosphere through sublimation. Sublimation losses from the snowpack can constitute a significant component of the water balance in seasonally snow-covered alpine environments. Net sublimation losses from seasonal snowpacks have been estimated to be between 10-50% of the seasonal snow accumulation. Errors associated with snowpack sublimation estimates are crucial for quantifying alpine water balances and estimation of water availability.

FY09 Student Water Research Grant Program

Request for Proposals

The Colorado Water Institute is pleased to announce a request for proposals for the FY09 Student Water Research Program.

Program Description

This program is intended to encourage and support graduate and undergraduate student research in disciplines relevant to water resources issues and to assist Colorado institutions of higher education in developing student research expertise and capabilities. It is intended to help students initiate research projects or to supplement existing student projects in water resources research. Proposals must have a faculty sponsor and students must be enrolled fulltime in a degree program at one of Colorado's nine public universities (ASC, CSM, CSU, CU, FLC, MSC, MSCD, UNC, or WSC).

Funding

Budgets may include, but are not limited to, expenditures for student salaries, supplies, and travel. Funds will not be approved for faculty salaries. Each award is limited to a maximum of $5,000. Awards may be effective as early as April 1, 2009 and research projects should be completed by March 31, 2010. For these research grants, only direct costs are allowed. Facilities & Administrative (F&A) costs may be shown as institutional cost share. Institutions are encouraged to participate in project costs although cost sharing is not required.

Eligibility

Students must be enrolled full-time in a degree program at one of the nine Colorado public universities. Proposals must have a faculty sponsor from the applicant's institution. The faculty sponsor is responsible for ensuring that the proposal has been processed according to their university's proposal submission policies and procedures.

Deliverables

Upon completion of the research project, recipients will be required to submit a final project report, which will include a narrative on research activities, results, and financial accounting of all expenditures. **Projects must be completed and results reported by March 31, 2010.** Students may be asked to present an oral report on their work to the CWI Advisory Board.

Submission Process

All proposals must be submitted online by February 27, 2009. Please visit http://cwi.colostate.edu for submission site.

Proposal Deadline

Friday, February 27, 2009 at 5:00 PM (MT)
Expected Award/Start Date
Start Date: April 1, 2009
End Date: March 31, 2010

Announcement of Awards

The student applicant and faculty sponsor will be notified as to the status of their application by March 31, 2009 via email.

Program Contact Information

For questions concerning the program, please contact:

Dr. Reagan Waskom, Director
reagan.waskom@colostate.edu

Nancy Grice, Assistant to the Director
nancy.grice@colostate.edu

Phone: 970-491-6308
Fax: 970-491-1636
Web: http://cwi.colostate.edu

CWI Announces Funded Student Projects

The Colorado Water Institute is pleased to announce the funding of six student projects this year. This program is intended to encourage and support graduate and undergraduate research in disciplines related to water resources and to assist Colorado institutions of higher education in developing student research expertise. The purpose of the funding is to help students initiate new research projects or to supplement existing student projects focused on water resources research. The FY09 funded projects and funding recipients are listed below:

James Cullis
Department of Civil, Environmental, & Architectural Engineering, University of Colorado

Faculty Sponsor: Diane McKnight

Understanding the Hydrologic Factors Affecting the Growth of the Nuisance Diatom *Didymosphenia Geminata* in Rivers

Didymosphenia geminata, also known as "didymo" or "rock snot," is a nuisance algal species that occurs in many mountain streams in the western U.S. It tends to produce large amounts of extracellular stalk material, and while it is not considered to be toxic, the growth of these large algal mats has a significant impact on the aesthetics of a stream and on the sustainability of stream ecosystems and water supply infrastructure. Not much is known about this species, as it has only become a significant problem in the past 10 to 15 years. This research will look specifically into the hydrologic factors affecting the growth of this nuisance species at a number of study sites in Boulder Creek, Colorado, with a particular focus on the role of flood-induced bed disturbance as a primary control of growth. The overarching research hypothesis is that high levels of shear stress and bed disturbance due to flood events are necessary to control the growth and bloom tendency of *D. geminata*, and that these levels can be provided through environmental flood releases from reservoirs to maintain functioning stream ecosystems and water supply systems.

Bear Creek Watershed Project

Kimberly Gortz-Reaves, College of Architecture and Planning, University of Colorado (Faculty Sponsor: Charlie Chase)

Bear Creek watershed encompasses four counties and more than eight cities and towns. The extent to which public and private land use managing agencies or organizations involved with the watershed offer "on-the-ground" projects for young people and community groups to participate in (e.g., habitat restoration, stream bank stabilization, or other watershed conservation projects) is unknown. Furthermore, there is no existing system to provide coordination for watershed-wide projects. The purpose of this research project is to identify stakeholders and potential partners operating in the Bear Creek watershed and their needs, resources, and capacities. The project will be facilitated by the Bear Creek Watershed Partnership (BCWP), which is aimed at connecting youth-based stewardship and leadership programs to opportunities offered by Bear Creek watershed stakeholders. To date, facilitating partners include City of Denver Parks and Recreation, University of Colorado at Denver, National Park Service RTCA, AmeriCorps, FrontRange Earth Force, and Groundwork Denver. To date, there has been limited program coordination among municipalities and other public and private agencies within the Bear Creek watershed. The objective is to contact agencies and associations, build a database of information based on conversations with contacts, create a stronger partnership effort, and develop a GIS-web based interactive map with the gathered information. The long-term goal is to create a forum in which partners will be able to share or coordinate their objectives, improve management strategies, and post stewardship projects for youth.

Jason F. Smith
Department of Horticulture and Landscape Architecture, CSU

Faculty Sponsor: James E. Klett

Impact of Limited Irrigation on the Health of Four Common Shrub Species

The shrub water study was started in 2005 in response to the 2002 drought to evaluate the actual water requirements of some commonly used landscape plants. Currently, most water use statements for landscape plants are based on personal opinions or observations, and few studies have evaluated the water use of landscape plants. This research involves determining the water use values for some common landscape shrubs from a replicated study. The research is continuing in 2009 and will evaluate the growth of Redosier dogwood, smooth hydrangea, Diablo ninebark, and arctic blue willow when subjected to four different amounts of irrigation (0%, 25%, 50%, and 100%), based on the evapotranspiration rate of Kentucky bluegrass. By the end of 2009, accurate water requirements for these four species will be determined after a season of collecting various types of data. If the study results show that these shrubs do well with 0% or 25% of the evapotranspiration rate of Kentucky bluegrass, then they would be well suited for planting in many Colorado landscapes that require little to no irrigation. However, if these shrubs are found to need 50% or 100%, then the use of these shrubs could be limited for landscape use in Colorado.

Potential Changes in Groundwater Acquisition by Native Phreatophytes in Response to Climate Change

Throughout western North America, arid regions are likely to experience changes in the timing and amount of precipitation as global surface temperatures increase. Altered rainfall and runoff patterns will exacerbate current stresses on water resources from growing human demands and could produce long-term changes in water availability for ecosystems, agriculture, and municipalities. In Colorado's arid San Luis Valley (SLV), competing water interests will be particularly sensitive to climate change. The SLV receives only 180-250 mm of precipitation annually; yet, a shallow unconfined aquifer recharged by snowmelt supports over 600,000 acres of irrigated agriculture, substantial water transfers out of the valley, and native rangeland for livestock grazing. The dominant native plants in the SLV are phreatophytes, plants that use groundwater. Evapotranspiration by phreatophyte communities accounts for more than one-third of the total annual groundwater consumption. Some SLV phreatophytes can also utilize predictable pulses of summer monsoon rain to reduce or supplement their groundwater use. Thus, changes in monsoon rainfall patterns may produce changes in groundwater acquisition of phreatophytes, which could have considerable effects on the SLV groundwater budget and regional agriculture. Our research investigates the response of four native phreatophytes to changes in growing season precipitation using a rainfall manipulation experiment. Our goal is to understand how plant community adjustment to climate change in the SLV would affect regional groundwater resources, and to incorporate this understanding into the Rio Grande Decision Support System groundwater management model.

Julie Kray
Department of Forest Rangeland and Watershed Stewardship, CSU

Faculty Sponsor: David J. Cooper

Chengmin Hsu
Department of Civil Engineering,
University of Colorado Denver

Faculty Sponsor: Lynn E. Johnson

High-Resolution Soil Moisture Retrieval in the Platte River Watersheds

An accurate estimate of soil moisture is necessary for various hydrometeorological, ecological, and biogeochemical modeling and applications. Unfortunately, continentally available soil moisture data (AMSR-E) are currently derived using passive remote sensing technology that has a very rough resolution (i.e., 25 km). This rough resolution character of the AMSR-E products makes them difficult to use for hydrological and ecological purposes at the watershed scale. In this project, I propose to: (1) improve and update the AMSR-E soil moisture products by assimilating the AMSR-E products into the NOAH land surface model, (2) downscale the coarse resolution soil moisture outcome to a higher resolution product (e.g., 240-meter resolution), and (3) validate the final product with the joint soil moisture observations obtained from NRCS Soil Climate Analysis Network (SCAN) and from soil moisture monitoring stations in Nebraska by the High Plains Regional Climate Center (HPRCC). The study area will include portions of the North and South Platte River Basins and a portion of the Republican River Basin. The work proposed in this project constitutes a first attempt to understand the spatial structure of brightness temperature and soil moisture images when applied at a higher resolution. It will also test the capability of the NOAH land surface model to generate high-resolution surface soil moisture. More importantly, the work will be a foundation for the future estimation of root-zone soil moisture.

Developing Barriers to the Upstream Migration of New Zealand Mudsnail (*Potamopyrgus antipodarum*); Phase II: Laboratory and Field Evaluations of Mudsnail Response to Copper-based Materials under Varied Water Quality Conditions

The objective of this research is to evaluate the ability of copper-based substrates to prevent the upstream spread of the invasive New Zealand mudsnail (*Potamopyrgus antipodarum*). Over the last 20 years, mudsnails have spread rapidly across the western U.S., prompting management agencies to close several streams and fish hatcheries. There is currently a need for effective methods to prevent further invasion into novel waterbodies. Preliminary research results suggest that several copper-based substrates may be useful in stopping the upstream spread of this organism. I am currently studying how physicochemical parameters, including pH, temperature, and water hardness, affect the mudsnail's response to the copper materials. We are hopeful that copper-based substrates can eventually be integrated into mudsnail management plans once the barrier ability of each of the materials has been evaluated.

Scott Hoyer
Department of Fish, Wildlife, and Conservation Biology, CSU

Faculty Sponsor: Christopher Myrick

Appendix G

Undergraduate Water Minor Program Curriculum at CSU

Water is critical to the economic, societal, and environmental well-being of all humans. This is particularly so in the Western United States where a rich and evolving water management history continues to unfold. Western water management is complex and affects individual lives and communities in diverse ways.

In semi-arid Colorado, water is available at all times during the year only if it is "controlled" in some manner by humans. Such control also influences the amount and timing of water available for maintaining ecosystem health. Colorado balances the competing needs for water using a water management system that includes such concepts as: appropriation doctrine, water allocation, water rights, beneficial use of water, and minimum stream flows. Many organizations are involved in managing Colorado's water including the State Engineer's Office, Colorado Water Conservation Board, conservancy/conservation districts, water utilities, ditch companies, and federal agencies.

Water management in the western United States and Colorado is not guided by any one discipline, but rather utilizes knowledge from many disciplines. New uses of water — for meeting ecological and recreational needs, for example — are competing with more established uses, such as municipal and agricultural, in ways that demand skills not previously required of water managers.

Today's water professional needs a grasp of the history of water management in the West: the legal and administrative structure established to allocate and control the distribution of water; the economics of water development and protection; the relationship of water development and protection; the relationship of water to ecological conditions; and land-use impacts on water quality and water use. Students planning careers in water resources need to have an area of specialization (a university major) as well as a head start in understanding these complex aspects of modern western water management.

Colorado State University is recognized as one of the world's leading institutions of higher education for water professionals, with over 130 faculty who apply their disciplines to water and who offer more than 150 water-oriented courses each year. The majors offered at Colorado State University, from fishery and wildlife biology to civil engineering to sociology, offer students interested in a career in water management the disciplined rigor needed to be successful.

The purpose of Colorado State University's Water Resources Interdisciplinary Studies Program (WRISP) is to offer undergraduate students, regardless of their major, and opportunity to introduce themselves to the many dimensions of water management. By taking advantage of the outstanding water expertise available at Colorado State University, students can familiarize themselves with the many dimensions of Colorado's water management system. In this way students can better prepare themselves for careers in water management or graduate study in a water-related area.

WRISP students will complete 21 credits in core and elective courses that are particularly relevant to today's water manager. Completion of the program is certified on the student's academic record.

Key Advisor List

The following faculty are available to discuss how current or future undergraduate's discipline (major) relates to water resources.

College of Agricultural Sciences

Agricultural and Resource Economics
John Loomis, B325 Clark Building
Soil and Crop Sciences
Soils- Grant Cardon, C108 Plant Sciences
Crops- Dan Smith, C106 Plant Sciences

College of Applied Human Sciences

....

College of Business

....

College of Engineering

Agricultural Engineering
Jim Loftis, 100 Glover Building
Chemical Engineering
Vince Murphy, 148 Glover Building
Civil Engineering
Jose Salas, B103 Engineering Building
Engineering Science
Reagan Waskom, E102 Engineering Building

College of Liberal Arts

English
John Calderazzo, 315 Eddy Building
History
Mark Fiege, B340 Clark Building
Philosophy
Holmes Rolston III, 50 Eddy Building
Political Science
Sandy Davis, C335 Clark Building
Sociology
David Freeman, C224 Clark Building
Technical Journalism
Marilee Long, C230 Clark Building

College of Natural Sciences

Biology
Paul Kugrens, E340 Anatomy - Zoology Building
Statistics
Hari Iyer, 202 Statistics Building

College of Veterinary Medicine & Biomedical Sciences

Environmental Health
Jay Nuckols, 147 Enironmental Halth
Microbiology
Don Klein, B209 Microbiology

Warner College of Natural Resources

Watershed Science
Freeman Smith, 334 Natural Resources
Fishery and Wildlife Biology
Will Clements, 236 Wagar Building
Forestry
Don Crews, 102 Natural Resources
Natural Resources Recreation and Tourism
Glenn Haas, 233 Forestry
Natural Resource Management
Don Crews, 102 Natural Resources
Range Ecology
Robert Woodmansee, 239 Natural Resources

Program Requirements

Core Courses

Course	Title	Cr	AUCC	Sem.
AREC 342[P]	Water Law, Policy, and Institutions	3		F
AREC 442[P]	Water Resource Economics	3		S
GR 342	Geography of Water Resources	3		F
LAND 220[P] / LIFE 220[P]	Fundamentals of Ecology[1]	3		F
SOC 461[P]	Sociology of Water Resources	3		F, S, SS
WR 304	Principles of Watershed Management[2]	3	3A	F, S
	Electives	3		
	Total	**21**		

Elective Courses

Course	Title	Cr	Sem.
AREC 340[P] / ECON 340[P]	Introduction: Economics of Natural Resources	3	S
AREC 346[P] / ECON 346[P]	Economics of Outdoor Recreation	3	F
AREC 375[P]	Agricultural Law	3	F, S
ATS 350	Introduction to Weather and Climate	2	F, S
BZ 315[P]	Marine Ecology	3	F
BZ 321[P]	Aquatic Vascular Plants	3	F
CIVE 322[P] / ENVE 322[P]	Basic Hydrology	3	F, S
CIVE 413[P]	Environmental River Mechanics	3	S
CIVE 423[P]	Groundwater Engineering	3	S
CIVE 440[P]	Nonpoint Source Pollution	3	F
GR 210	Physical Geography	3	S
POLS 361[P]	U.S. Environmental Politics and Policy	3	F, S, SS
PSY 316[P]	Environmental Psychology	3	F, S, SS
SOC 320[P]	Population-Natural Resources and Environment	3	F
SOCR 370[P]	Irrigation Principles	2	S
SOCR 371[P]	Irrigation of Field Crops	1	F
WR 416[P]	Land Use Hydrology	3	F
WR 417[P]	Watershed Measurements	3	F
WR 418[P]	Land Use and Water Quality	3	S

[P] This course has at least one prerequisite. Check the Courses of Instruction section of the catalog or http://catalog.colostate.edu to see the course prerequisites.

[1] BZ 440 or ERHS 446 or MIP 300 may be substituted for LAND 220/ LIFE 220.

[2] CIVE 322/ENVE 322 or WR 416 may be substituted for WR 304.

Appendix H

Upper Yampa Water Conservancy District (UYWCD) John Fetcher Scholarship

Upper Yampa Water Conservancy District Scholarship Awarded to CSU Student

The Upper Yampa Water Conservancy District (UYWCD) continues to fund a scholarship in support of CSU students preparing for careers in water-related fields. The scholarship program is administered by the CSU Water Center.

The scholarship provides financial assistance to committed and talented students who are pursuing water-related careers at CSU. The UYWCD $2,500 scholarship is open to any major at CSU. Criteria for the scholarships require the recipient to be a full-time student enrolled at CSU; financial need may be considered; preference is given to students from the Yampa Valley area; and a minimum GPA of 3.0 is required. The scholarships are for one year.

The Upper Yampa Water Conservancy District Scholarship Recipient for the 2007-08 academic year is Samantha Winter. A senior majoring in civil engineering at CSU, Samantha is from Steamboat Springs, Colorado. Her areas of interest in water include small-scale water system design and implementation, aquaculture, irrigation engineering, and water conservation. Samantha currently works as a GIS student technician at the USDA-APHIS, where she works in their information technology program. Past accomplishments include volunteer work as a tutor, participation in Engineers Without Borders, international work in Latin America, study abroad in England, and numerous scholarship awards and achievements. Samantha plans to pursue

a career in sustainable development of water resources with Native American tribes and in the international arena.

We had a number of outstanding applicants for this year's Upper Yampa Water Conservancy District scholarship, and we congratulate Samantha and wish her success in her studies. The ongoing support of CSU students by the UYWCD is acknowledged and greatly appreciated.

Upper Yampa Water Conservancy District Scholarship Awarded to CSU Student

The Upper Yampa Water Conservancy District (UYWCD) funds an annual scholarship in support of CSU students preparing for careers in water-related fields. The scholarship program is administered by the CSU Water Center and provides financial assistance to committed and talented students who are pursuing water-related careers at CSU. The UYWCD $3,000 scholarship is open to any major at CSU. Criteria require the recipient to be a full-time student enrolled at CSU with a minimum GPA of 3.0. Financial need may be considered, and preference is given to students from western Colorado. The scholarship duration is one year.

The Upper Yampa Water Conservancy District Scholarship recipient for the 2008–09 academic year is Kyle Eitel. A senior majoring in civil engineering at CSU, Kyle was born and raised in Craig, Colorado. During the summers of 2007 and 2008, he participated in an internship at Colowyo Mine in Meeker, Colorado, where he gained valuable experience with GPS and SurvCAD and assisted with project management. His coursework at CSU has stimulated his interest in water-related engineering topics, and he hopes to further his studies and pursue a career in fluid mechanics, hydraulics, and water resources management and securities. Kyle has been a member of the American Society of Civil Engineers (ASCE) Chi Epsilon,

the civil engineering honors society, and the National Honor Society. On a personal level, he enjoys the outdoors, particularly activities and recreation involving water.

The CSU Water Center and Colorado Water Institute congratulate Kyle and wish him success in his future academic studies and career. The ongoing support of CSU students by the UYWCD is acknowledged and greatly appreciated.

Upper Yampa Water Conservancy District Scholarship Awarded to CSU Student

The Upper Yampa Water Conservancy District (UYWCD) funds an annual scholarship in support of CSU students preparing for careers in water-related fields. The scholarship program is administered by the CSU Water Center and provides financial assistance to committed and talented students who are pursuing water-related careers at CSU. The UYWCD $3,000 scholarship is open to any major at CSU. Criteria require the recipient to be a full-time student enrolled at CSU with a minimum GPA of 3.0. Financial need may be considered, and preference is given to students from the Yampa Valley area. The scholarship duration is one year.

The Upper Yampa Water Conservancy District Scholarship recipient for the spring semester of 2009 is Michael Macklin. A senior majoring in political science with an interdisciplinary study in water resources, Mike was born in La Junta, Colorado, and raised in Springfield, Colorado. For the past four years, while attending Colorado State University, he has worked at the Colorado State 4-H Office, where he has helped coordinate state and national 4-H youth development events. His studies in water resources and political science led him to Lincoln University in Lincoln, New Zealand, for a semester of study in natural resource and water economics during the spring of 2008. Mike has been active in Alpha Gamma Rho, an agriculturally based fraternity, and has served as an ASCSU Senator for the College of Agriculture for two years. Following graduation, Mike plans to pursue a law degree with an emphasis on water law in the fall of 2009. Mike's love for small towns and rural America has driven his passion to protect the farmers and ranchers of rural America.

The CSU Water Center and Colorado Water Institute congratulate Mike and wish him success in his future academic studies and career. The ongoing support of CSU students by the UYWCD is acknowledged and greatly appreciated.

Appendix I

GRAD592: Fall 2007 & 2008
Spring Seminar: Spring 2008 & 2009

GRAD 592
INTERDISCIPLINARY WATER RESOURCES SEMINAR

Monday, 4:00 – 5:30pm
A-206 Clark Building
Colorado State University, Fort Collins, CO

Fall 2007 theme:
Colorado Water Development in the 21st Century

The purpose of the 2007 Interdisciplinary Water Resources Seminar (GRAD 592), through a series of invited speakers, is to examine how new water supplies are being developed in Colorado during the current era and to study an array of projects that are in various stages of development. These projects include: Animas La Plata, Elkhead Reservoir, Reuter Hess Reservoir, NISP, Barr Lake pipeline, the Prairie Water project and others. More specifically, the seminar will:

1. Examine the steps and processes involved in water supply development;
2. Understand the legal and environmental aspects of water development;
3. Discuss the intra and interstate issues that increase the complexity of water supply planning in the 21st Century;
4. Examine current Colorado water projects to understand the issues of public water supply, drought protection, environmental mitigation, transfer of agricultural water, endangered species needs, interstate compacts, water quality protection and other topics.

Students interested in taking the one-credit seminar should sign up for GRAD 592, Water Resources Seminar, CRN 61105. The seminar will be held 4:00pm Monday afternoons in Room A-206 Clark Bldg. (Students who have enrolled in GRAD 592 in the past, can also enroll for this offering)

All interested faculty, students and off-campus water professionals are encouraged to attend and participate.

20-Aug	Dave Little, Denver Water	Life After Two Forks – What happened and how the Two Forks veto changed our approach to water resources planning
27-Aug	Rick Brown, Colorado Water Conservation Board	Colorado's water development needs for the 21st Century
3-Sep	Labor Day	No Class
10-Sep	Dave Merritt, Colorado River Water Conservation District	Intrabasin, interbasin and transmountain water movement to meet growing water demands – Case studies: Wolford Mt Reservoir, Union Park and the Gunnison pumpback
17-Sep	Mark Pifher, Aurora Water	The Prairie Waters Project—A sustainable approach to increasing water demands

24-Sep	Dan Birch Colorado River District	Elkhead Reservoir Enlargement – Partnerships and "Multiple use" as a mechanism to build new projects
1-Oct	Frank Jaeger Parker Water	Permitting, water acquisition and other legal aspects of developing water projects – Case study, Rueter Hess Reservoir
8-Oct	Dave Kaunisto, East Cherry Creek Valley Water & San District	Urban partnership and competition for a limited water supply – Barr Lake pipeline project
15-Oct	Carl Brouwer, Northern Colorado Water Conservancy District	Navigating the EIS process – Northern Integrated Supply Project
22-Oct	Sean Cronin, Greeley Water	Integrated Water Resources Planning in Northern Colorado
29-Oct	Wayne Vanderschuere, Colorado Springs Utility	Development of new water resources, Southern Delivery System, planning, process, and challenges
5-Nov	Jay Winner, Lower Arkansas Water Conservancy District	The Super Ditch - Ag Transfer as a new source of M&I Water
12-Nov	Kelly DiNatale, CDM	South Metro water needs and supply options
19-Nov	Thanksgiving Break	No Class
26-Nov	John Hendrick, Centennial Water & San	Highlands Ranch: 0 to 100,000 in 30 years
3-Dec	David Robbins, Council for the SW Colorado Water Conservation District	Animas La Plata Project – Last of the big federal projects in Colorado?
10-Dec	Finals week – no class	Class assignments due

GRAD592
Interdisciplinary Water Resources Seminar

Fall 2008 Theme: Global Water Issues and Challenges
Mondays at 4:00 PM, Clark A 206

The purpose of the 2008 Interdisciplinary Water Resources Seminar (GRAD592), through a series of invited speakers, is to examine the state of global water resources and the institutional responses to water shortage, water quality concerns, drought, and climate change. More specifically, the seminar will:

- Examine water resource case studies from a variety of nations and perspectives
- Understand the global environmental challenges of water management and development
- Discuss various approaches employed by governmental and non-governmental organizations to manage water supply and sanitation challenges
- Explore various opportunities to work and serve in international water management

25 Aug.	No class
1 Sept.	*Labor Day*—No class
8 Sept.	**The Looming Global Water Crisis**—Ellen Wohl, CSU
15 Sept.	**Integrated Water Resources Management in South America**—Neil Grigg, CSU
22 Sept.	**Global Change, Global Water and Responses to Stress and Scarcity**—Evan Vlachos, CSU
29 Sept.	**Water Organizations and the Developing World**—David Freeman, CSU
6 Oct.	**Water for People**—Colleen Stiles, Executive Director
13 Oct.	**Irrigation Water Management and Agriculture**—Terry Podmore, CSU
20 Oct.	**Engineers Without Borders/CSU Global Impact program**—Gabriel Miller & Brian Bledsoe, CSU
27 Oct.	**Transboundary Water Management on the U.S.-Mexico Border**—Stephen Mumme, CSU
3 Nov.	**Water Quality in a Changing Environment**—KJ Reddy, University of Wyoming
10 Nov.	**Water Development in the Peace Corps**—Ben and Kelly Latham, CSU
17 Nov.	**River Basin Decision Support Systems: the Nile**—Larry Brazil, Riverside Technology
24 Nov.	*Thanksgiving Break*—No class
1 Dec.	**Global Change and Global Water**—Scott Denning, CSU
8 Dec.	**Service/Career Opportunities in International Water**—Peter McCornick, Duke Univ
15 Dec.	*Finals Week*—No class

Presentations will be posted online each week if available.
http://www.cwi.colostate.edu/grad592.asp

All interested faculty, students, and off-campus water professionals are encouraged to attend.
For more information, contact Reagan Waskom at reagan.waskom@colostate.edu or visit the CWI web site.

SPRING 2008

INTERDISCIPLINARY WATER RESOURCES SEMINAR

NOON-1:00PM IN THE LORY STUDENT CENTER

31-JAN RM.203	**Luis Garcia** Department Head of Civil & Environmental Engineering, CSU NAS – Study on Colorado River & Climate Change
7-FEB **RM.208**	**David Yates** Hydrologist, NCAR, Research Application Program Incorporating Climate Change Information in Water Utility Planning: A Collaborative,
14-FEB **RM.208**	**Evan Vlachos** Sociology, CSU Managing Transboundary Waters in the context of extreme hydrological events
21-FEB RM.203	**John Stednick** Forest Rangeland & Watershed Stewardship, CSU Effect of Mt. Pine Beetle on Water Quantity and Quality
28-FEB RM.203	**Bill Hansen & Dan McGlothlin** NPS The National Park Service's Experience in Applying Science in Water Rights
6-MAR **RM.226**	**Robert Young** Professor Emeritus, Agricultural and Resource Economics Economic Value of Water
13-MAR RM.203	**Valerie Assetto** Political Science, CSU International Water Governance
20-MAR	**Spring Break**
27-MAR	**Seminar Cancelled** Please participate in Hydrology Days (http://hydrologydays.colostate.edu) Celebrate 50 years of the Watershed Science Program!
3-APR RM.203	**Rodrigo Maia** Civil Engineering, University of Porto, Portugal Water Management Challenges in the Iberian Peninsula
10-APR **RM.208**	**Bret Bruce & Pete McMahon** USGS Denver High Plains Regional Ground Water Study-Current Understanding and Future Directions
17-APR RM.203	**Chris Goemans** Agricultural & Resources Economics, CSU The Medium Term Impact of Natural Disasters in Brazil
24-APR RM.203	**TBA**
1-MAY RM.203	**Bob Raynolds** Denver Museum of Natural Science Climate Change and Issues of Water Availability
8-MAY RM.203	**Roger Pulwarty** NOAA National Drought Information Systems Lori Peak-Hazards, Disasters & the Case of

Spring 2009
Interdisciplinary Water Resources Seminar

Sponsored by: CSU Water Center, USDA-ARS, Civil and Environmental Engineering, and Forest, Rangeland, and Watershed Stewardship

Thursdays from Noon to 1:00 PM

January 29 LSC 222	Cancelled — **Tissa Illangasekare**, Colorado School of Mines **Process Understanding, Model Validation and Up-scaling of Flow and Transport in Heterogeneous Subsurface Systems**
February 5 LSC 222	**Benedito Braga**, University of Sao Paulo **Managing Water in the 21st Century: Challenges and Opportunities**
February 12 LSC Virginia Dale	**Perry Cabot**, CSU Extension **Water Quality Issues on Fountain Creek**
February 19 LSC Virginia Dale	**James Pritchett**, Agricultural and Natural Resources Economics, CSU **Survey of Water Attitudes and Values of Western Households**
February 26 LSC 226	**Jeff Niemann**, Civil and Environmental Engineering, CSU **Controls on Soil Moisture in a Semiarid Setting and an Associated Method for Soil Moisture Estimation**
March 5 LSC 222	**Scott Miller**, University of Wyoming **LiDAR in Hydrology: Improving Accuracy or Just Cost?**
March 12 LSC 222	**Mazdak Arabi**, Civil and Environmental Engineering, CSU **Non-point Source Web Based Evaluation Tool**
March 19	*No Seminar - Spring Break*
March 26	*Hydrology Days*
April 2 LSC 222	**Ginger Paige**, University of Wyoming **Measurement and Modeling of Surface Water Processes on Rangeland Watersheds**
April 9 LSC Virginia Dale	**Mike Ronayne**, Geosciences, CSU **Solute Transport in Fluvial Aquifers**
April 16 LSC 222	**Pieter Johnson**, University of Colorado - Boulder *Topic To Be Announced*
April 23 LSC 226	**Jack Morgan**, ARS **Global Change: It's Essentially About Water**
April 30 LSC 222	**Katie Walton-Day**, USGS Denver **Use of Isotopes to Identify Surface-Groundwater Connections**
May 7 LSC 222	**Marie Livingston**, University of Northern Colorado *Topic To Be Announced*

All interested faculty, students, and off-campus water professionals are encouraged to attend.
For more information, contact Reagan Waskom at reagan.waskom@colostate.edu or visit the CWI web site.

Appendix J

Global Water Research Colloquium

Meeting Briefs: Reflections from the Global Water Research Colloquium

by Faith Sternlieb, Research Associate, CWRRI / CSU Water Center

Keynote speaker Brian Richter of The Nature Conservancy confers with colloquium co-sponsor, Jim Cooney and Reagan Waskom.

The CSU Global Water Research Colloquium – From Conflict to Sustainability: Challenges and Opportunities in an Interdependent World, held at the Hilton, Fort Collins on March 25, 2008 was sponsored by the Colorado State University Vice President for Research, the Office for International Programs and the CSU Water Center. The Colloquium's primary goal was to highlight current water research at CSU and bring the university community together to discuss ways in which faculty and students can collaborate on local, regional, national and international water projects. Whether research occurs at a micro or macro scale, implications from such collaborations may have a global impact as communities across the globe become increasingly ecologically and socially interdependent.

A few of the highlights from the Colloquium include: Keynote Speaker Brian Richter, Director of the Sustainable Waters Program for The Nature Conservancy; the Art Poster Competition, directed by graphic design art professors Phil Risbeck and Jason Frazier; and the technical posters from five of eight colleges across CSU. The winners of the art post completion are Elizabeth Schmidt, Amber Crowe and Erin Dubinski. In addition to our keynote speaker, we were very pleased to host two distinguished guests. Professor Rodrigo Maia from the University of Porto in Portugal is a visiting scholar in Engineering at CSU and was able to attend the Colloquium. Eugene Z. Stakhiv from the Army Corps of Engineering participated in our fourth panel discussion and announced the formation of the UNESCO International Center for Integrated Water Resources Management (ICIWaRM). ICIWaRM is a conglomeration of professional organizations, governmental agencies and research institutions working together on interdisciplinary projects towards advanced solutions for global water issues.

The discussion that resulted from the 4th Session Panel led to a series of articulated concerns, questions and possible solutions regarding the future of international water research at CSU. Interdisciplinarity as a fundamental requirement for both curriculum development and experiential learning recurred as a common theme. A few ways to facilitate the internationalization of such an interdisciplinary approach include both top down incentives from the administration and ground up initiatives by faculty as well as direct links to stakeholders. Additionally, fellowships and visiting scholars while revisiting well established partnerships with previous funding sources such as USAID will be instrumental in building relationships with new partners such as non-governmental organizations and learning institutions at large. Finally, encouraging transparent internal communication networks university-wide will foster both collaboration and cooperation while improving academic integrity in research, field work, outreach and education.

Ellen Wohl discusses river health and climate change with fellow panelists, LeRoy Poff and Graham Stephens

As a part of CSU's internationalization strategy, the Global Water Advisory Committee would like to continue the momentum initiated with the Colloquium by offering an outlet for collaboration on potential projects regarding international water research via monthly Global Water Roundtable gatherings. Throughout the upcoming year, the VPR, OPI and the CSU Water Center in cooperation with colleges across campus will organize such venues to connect established water experts and alumni at large with new researchers and faculty at CSU to bring forth a new generation of CSU water professionals.

Art professor Phil Risbeck discusses art student involvement in the Colloquium.

Appendix K

Hydrology Days at CSU

AGU Hydrology Days 2008
March 26-28, 2008
Colorado State University

Sponsored by
Hydrology Section of the American Geophysical Union
For registration information, visit: www.hydrologydays.colostate.edu

Hydrology Days has been held on the campus of Colorado State University each year since 1981. 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

AGU Hydrology Days 2009
March 25–27, 2009

Hydrology Days has been held on the campus of Colorado State University each year since 1981. 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.

For information regarding this event and registration please visit www.hydrologydays.colsotate.edu.

Appendix L

3rd and 4th Annual Water Tables with the Water Resources Archive

Third Annual Water Tables Benefit: A Night of History and Heritage

by CSU Libraries Staff

Water Tables made another big splash this year. The annual benefit, hosted by Colorado State University Libraries, attracted nearly two hundred respected guests from across the state and raised more than $30,000 for the CSU Water Resources Archive, which preserves materials critical for documenting the state's water history.

"Water Tables allows the Archive to make connections with friends in Colorado's water community," said Patty Rettig, the institution's head archivist. "The collections here are important, and this event helps people learn more about them."

During the cocktail hour, hosted in the Morgan Library, guests were able to tour the archive and invited to inspect materials documenting the state's water heritage, including items related to interstate water compacts, reclamation projects, groundwater, and the environment. On display was an array of historic items, including an exhibit featuring Colorado water leaders and innovators Ival V. Goslin and Ralph L. Parshall.

Now in its third year, Water Tables surpassed previous records for attendance and donations. Guests were treated to good food, lively conversation and networking opportunities in what has become a showcase for distinguished personalities in the Colorado water community.

Among those in attendance was Dick MacRavey, a fixture at the Colorado Water Congress for nearly fifty years. MacRavey recently donated to the archive several personal items documenting his long and celebrated career in water policy and administration. Other guests included water engineers, lawyers, administrators, farmers and ranchers, and interested citizens.

A highlight of the evening came when Dick Farr remembered his late father WD, a respected figure in Colorado's water history who is best remembered for his leadership and his ability to unite the state's fractious water interests behind common causes. The Farr family recently announced its decision to donate the papers of WD to the Water Resources Archive.

CSU Vice President Joyce Berry views historic documents in the Archive with table host John Hill during the opening of Water Tables 2008.

"Dad would be thrilled to know the work you all are doing," said Farr.

In addition, more than a dozen CSU graduate students were able to attend the event thanks to the benefit's silver sponsors. Students Carol Hutton and Nick Kryloff offered remarks highlighting the importance of archival collections for historical research.

Dick MacRavey and Dick Farr converse after addressing the crowd during Water Tables 2008. Dick Farr represented the Farr family in announcing the donation of his father's papers to the Archive.

CSU graduate student Nick Kryloff emphasizes the importance of the Archive to primary research.

The 2008 Water Tables hosts--experts in all fields related to water who moderated discussions for guests.

"At the archive I found a wealth of untapped information here that made my graduate research possible," Kryloff said. Hutton, a first-year graduate student still deciding on a research topic, received encouragement and advice from some of the state's top water professionals.

Dave Stewart, head of the event's planning committee, similarly emphasized the importance of the Water Resources Archive for CSU students. "Tonight is really all about the students," Stewart said. "And tonight we are helping to develop a key resource for them to use."

Guests enjoyed a three-course dinner, as well as discussions at each table about important water issues—from reclamation and environmentalism to imminent personalities in western water history. Each table was hosted by water experts from a wide range of disciplines, including water history, policy, and administration.

Many attendees commented on the organization and classiness of the event, as well as the extensive knowledge of their table hosts.

"The evening was enjoyable, and it was a credit to CSU and its library system," noted Ken Wright of Wright Water Engineers, event sponsor and Archive donor whose materials are housed in the Archive. "The 19 or so tables all had good discussion moderators who had been thoughtfully selected. We are already looking forward to the 2009 Water Tables."

The benefit has grown significantly since its inception in 2006, thanks to the guidance of the Water Tables Planning Committee and the support of the event's sponsors. With its success this year, Water Tables promises to continue to raise awareness of the materials at the Water Resources Archive and to attract outstanding members of the state's water community.

Table Hosts

Dick Bratton, John Hill, Karl Dreher, Sara Duncan, Jo Evans, Alan Hamel, Mark Harvey, Diane Hoppe, Dave Little, Don Lopez, Dan Luecke, Dan Merriman, Del Nimmo, Don Pisani, Leroy Poff, Jack Ross, Steven Schulte, Dan Tyler, Brian Werner, Ellen Wohl

Water Tables Planning Committee

Mike Applegate, Mark Fiege, Webb Jones, Mary Lou Smith, Dave Stewart, Robert Ward

Sponsors

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Harrison Resource Corporation
Leonard Rice Engineers, Inc.
Odell Brewing Company
Tetra Tech, Inc.
TST, Inc. Consulting Engineers
Mr. and Mrs. Robert Ward
Wright Water Engineers, Inc.

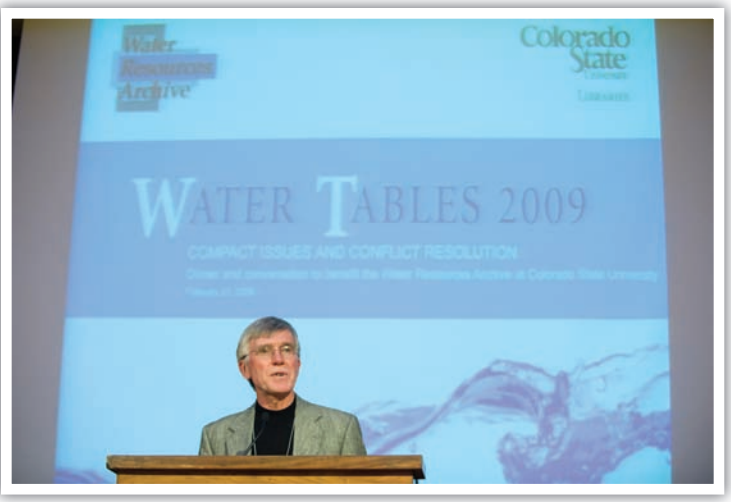
Water Tables Raises $29,000 for Water Resources Archive

by Colorado State University Libraries staff

On February 21, 2009, more than 160 water experts and honored guests gathered to support the Water Resources Archive at Colorado State University Libraries. *Water Tables 2009: Compact Issues and Conflict Resolution* was a huge success, raising more than $29,000. The donation of Maury Albertson's papers to the Water Resources Archive was also announced.

Water engineers, ranchers, lawyers, professors, and students kicked off the event, now in its fourth year, with a reception at Morgan Library and tours of the Water Resources Archive. Dinner and a night of conversation were then hosted at the Lory Student Center ballroom at CSU. Thanks to the generosity of many individual and corporate sponsors, 25 graduate students were able to attend the event and interact with current leaders in the water industry.

The Archives featured two exhibits: one discussed the *Wyoming v. Colorado* court case of 1911, and the other featured highlights from the Maurice Albertson Papers. The first exhibit, *Headlines of History: Exploring the Evolution from Conflicts to Compacts*, contained original Supreme Court documents that led to a change in water law philosophy for Colorado's lead attorney on the case, Delph E. Carpenter. On display from the Delph Carpenter Papers were materials related to the case, which showed his efforts with the 11-year-long court battle and how he came to the conclusion that water compacts would better serve states and water users.



Robert Ward, former director of the Colorado Water Institute and CSU Faculty Emeritus, speaks to attendees at Water Tables 2009.

Ruth and Ken Wright look at an historic water document exhibit at Water Tables 2009.

The second exhibit, a table display of documents and artifacts from the Maurice Albertson Papers, reflected on the former CSU professor's achievements in teaching, research, and international development. Following a moment of silence for Albertson, who passed away in January at age 90, it was only fitting that his widow, Audrey Faulkner, discussed her husband's contribution to water resources at CSU and around the globe. While over 200 boxes had been donated by Albertson before he passed away, Faulkner assured head archivist Patty Rettig that many more boxes will be donated to the archive—a testament to Albertson's contribution to water resources research and education. Faulkner told guests how her husband's passion for water arose during the Great Depression when his father took him on tours of previously drought-ridden areas that were suddenly flooded. Her remarks about his life's dedication to water solutions in the West and throughout the world truly fit the evening's theme of conflict and compacts and were well received by all who attended.

At dinner, esteemed hosts at each table discussed past and current water conflict and compact issues, including topics related to climate, habitat, population, agriculture, law, and management. The hosts' expertise and insight made for lively, entertaining, and enlightening conversation. A tremendous success for both the CSU Libraries and the Water Resources Archive, Water Tables 2009 will provide the Archive with much needed funding for student assistants, supplies, and outreach activities. As a true testament to an enjoyable evening, guests left the event already anticipating Water Tables 2010.

Appendix M

USGS Water Science Day

U.S. Geological Survey Science Day 2009:

New challenges, new approaches to understand Colorado Water

Tuesday, June 2, 2009
Building 810, Denver Federal Center, Lakewood, Colorado
Sponsored by the U.S. Geological Survey Colorado Water Science Center

Please register by May 19 and join us on June 2

This one-day event will include presentations of USGS water activities of broad interest in Colorado. There will be time for discussion about application of these activities to your specific needs. See the final agenda, abstracts of presentations, and other information at:

http://co.water.usgs.gov/scienceday09/

Registrations must be received by May 19. You can register by contacting Patti Speckman in one of the following ways: 1) Complete and return the bottom of this page; 2) Call (303) 236-4882 x258; or 3) email to paspeckm@usgs.gov. The registration fee of $20 will be collected in cash when you arrive on June 2. Please provide your lunch selections to Patti at the same time you register. The lunch menu is posted at the website listed above.

Maps showing the location of the Denver Federal Center and the location of Building 810 are posted at the website listed above.

We look forward to seeing you at U.S. Geological Survey Science Day 2009.

Name of organization: _____

Name of attendees from your organization: _____

Contact person: _____

Address: _____

Phone number(s): _____

Emails address(es): _____

Lunch selection(s): _____

Send to: Patti Speckman; USGS-WRD CWSC; P.O. Box 25046, MS 415, DFC; Lakewood, CO 80225

Appendix N

18th & 19th South Platte Forum

A RIVER OF CHANGE

The 18th Annual South Platte Forum
October 24-25, 2007—Radisson Conference Center—Longmont, Colorado

A Change of Pace—*projects*
Peter Binney, City of Aurora
Alan Berryman, Northern Colorado Water Conservancy District
Carl Brouwer, Northern Colorado Water Conservancy District
Lisa McVickers, P.C.

An Inconvenient Climate
Brad Udall, CU-NOAA Western Water Assessment
Greg McCabe, U.S. Geological Survey
Marc Waage and Bob Steger, Denver Water
David Clow, U.S. Geological Survey

Change Your Ways—*regulations*
Patti Tyler, U.S. Environmental Protection Agency
Amy Woodis, Metro Wastewater Reclamation District
Gabe Racz, Trout, Raley, Montano, Witwer & Freeman P.C.

Changing Faces
Harris Sherman, Department of Natural Resources
John Stulp, Department of Agriculture

Changing Hearts and Minds—*education*
Don Glaser, Colorado Foundation for Water Education
Curry Rosato, Keep It Clean Partnership
Brent Mecham, Northern Colorado Water Conservancy District

Fields of Change
James Pritchett , Colorado State University
Frank Jaeger, Parker Water and Sanitation District
Neil Hansen, Colorado State University

Modeling the Change
Suzanne Paschke, U.S. Geological Survey
Chris Goemans, Western Water Assessment
Ray Alvarado, Colorado Water Conservation Board

Call for Posters

You are invited to submit a one-page abstract to the organizing committee by Aug. 1, 2007. Selected posters will be displayed throughout the forum with a staffed poster session from 4:45—6:00 p.m., Wed., Oct. 24. Authors will be notified of acceptance by Sept. 1. Send your abstract to Jennifer Brown, Jennifer@jjbrown.com.

REGISTRATION FEES

Registration fees include meals, breaks and reception.

Early Registration - by Oct. 1.....$100
Registration after Oct. 1.....$115

Register at www.southplatteforum.org.

FOR MORE INFORMATION

Visit www.southplatteforum.org to see schedule updates, register and get more information.
Or contact Jennifer Brown, (402) 960-3670, Jennifer@jjbrown.com

Sponsored By

Northern Colorado Water Conservancy District
Colorado Water Resources Research Institute
Metro Wastewater Reclamation District
CSU Cooperative Extension
Parker Water and Sanitation District
U.S. Fish and Wildlife Service
City of Aurora
Colorado Division of Wildlife
Denver Water
U.S. Geological Survey
U.S. Bureau of Reclamation

WWW.SOUTHPLATTEFORUM.ORG

Photos courtesy of southplatteoutfitters.com.

19th Annual South Platte River Forum

by Laurie Schmidt, Colorado Water Institute

"News, Weather and Water" was the theme of the 19th Annual South Platte Forum, held on October 22-23, 2008, in Longmont, Colorado. More than 200 attendees participated in 10 themed sessions during the two-day meeting.

The meeting opened on Wednesday, October 22, with a session titled Weather at the Top of the Hour, in which David Yates, National Center for Atmospheric Research, provided an overview of what we know about local global warming trends and climate models. He discussed the complexities of climate models, particularly with regard to the precipitation variable. Addressing recent news that climate change will lead to much more arid conditions in the Colorado Plateau region, he said, "The assertion that the southwest U.S. will definitely get drier is not a robust finding, and the water vapor variable is very difficult to model."

Tom Perkins, Natural Resource Conservation Service, discussed the dramatic impact that spring weather can have on Colorado snowmelt and runoff. "Extreme spring precipitation —wet or dry—is the biggest source of April 1 forecast errors," he said. Colorado State Climatologist Nolan Doesken talked about the challenges faced by Colorado water resources professionals due to the state's highly variable climate. The final morning session focused on the South Platte Decision Support System and a Judicial Review Forum.

During the lunch break, the Platte River Greenway Foundation was honored with the Friends of the South Platte Award in recognition of its contributions to the South Platte River Basin. Jeff Shoemaker, who accepted the award on behalf of the Platte River Greenway Foundation, was presented with a framed "South Platte Sunset" photo donated by Colorado photographer John Fielder. After the award presentation, former CSU football coach Sonny Lubick gave the keynote presentation, entertaining attendees with colorful anecdotes from his years of coaching.

In an afternoon session titled Letters to the Editor, CSU professor Neil Grigg discussed economic activity in the South Platte Basin and the management measures that will make a difference in economic value, including a more reliable water supply, redistribution, and improved water quality. Next, using South Platte River Segment 15 as an example, Jim Dorsch of Metro Wastewater Reclamation District addressed the importance of water to habitats and biology. The session concluded with a talk by Bruce Bosley, Colorado State University Extension, on the impacts of irrigation dry-ups on land and people.

The final session on Wednesday focused on water quality issues and included presentations by Karl Mauch, Colorado Department of Agriculture; Larry Barber, U.S. Geological Survey; and Laurie Rink, Mile High Wetlands Group, LLC. Barber discussed the fate of consumer product chemicals in surface waters impacted by wastewater treatment plant effluents and presented evidence that a number of these chemicals impact the endocrine systems of fish and other aquatic organisms.

On Thursday, the Forum reconvened with an update from Jerry Kenny on the progress and prospects for the Platte River recovery implementation program. A report on Quagga and Zebra mussels from Mary Fabsiak of the City of Westminster detailed the threat of these invasive species to water systems in the state and the efforts underway to manage and track their transmission from one waterbody to another. CSU professor John Stednick outlined the results of his two-year study on the impact of the pine beetle infestation on forested watersheds. While measurable impact on water yield appears to be variable between catchments, some of the water quality impacts observed across watersheds are cause for some concern.

Nolan Doesken discusses climate at the South Platte Forum.

Highlights of the Thursday sessions included Colorado State Representative Randy Fischer and Department of Natural Resources Executive Director Harris Sherman providing views on the political landscape of water in Colorado and how it might affect South Platte management. The Forum wrapped up with perspectives from members of the South Platte and Metro Roundtables and new state agency directors. The 2008 South Platte Forum, like the previous 18 events, provided participants with an opportunity to network with colleagues and catch up on events and issues related to the Basin.

The 2009 South Platte Forum will be held on October 21-22, 2009. Stay tuned to www.southplatteforum.org for details.

Appendix O

50th & 51st Colorado Water Congress Annual Convention

Colorado Water Congress
50th Annual Convention

January 23-25, 2008

The 50th Annual Convention of the Colorado Water Congress kicked off with a Legislative Breakfast. Senator Jim Isgar and Representative Kathleen Curry reviewed the pending water legislation for 2008 and answered questions from a record crowd of 540 attendees.

Governor Bill Ritter opened the general session by stating that, "Water is one of the most significant issues facing Colorado. Water is a scarce resource due to growth, drought, and climate change. Colorado has much to lose if we do not address climate change and make the most of conservation, reuse, and efficiency. Water conservation is one of the cornerstones of Colorado's water future. We are over appropriated in the South Platte, Rio Grande, and Arkansas basin and finding it difficult to integrate groundwater and surface water administration. Furthermore, we cannot move forward on oil shale without understanding the water requirements and where it will come from."

Governer Bill Ritter addresses the Water Congress

From left: Michelle Pierce, Gunnison; Mike Gibson, Rio Grande; Dave Merrit, Colorado; Gary Barber, Arkansas; Harris Sherman; Steve Harris, S. West; Bill Jerke, S. Platte; Tom Sharp, Yampa/White; John Hendrix, Metro

Department of Natural Resources - Executive Director Harris Sherman followed up and thanked the water community for all their help during his first year. He acknowledged the new water leadership in the state - Jennifer Gimbel, CWCB Director; Alex Davis, Assistant Director for water at DNR; Dick Wolfe, State Engineer.

Sherman noted the seriousness of the challenges we face in securing an adequate water supply for Colorado. "Collaborative processes such as Roundtables are the best opportunity to find lasting solution to our water problems." However, the future of IBCC and Roundtable process is still in question. It is a unique process that is risky, but benefits are becoming evident, specifically 1) new players in discussion, 2) basins have been able to study needs, 3) funding has helped greatly, 4) setting up framework for cross-basin

Dan Merriman and Lewis Entz

Don Ament receiving the Aspinall Award

Robert Ward and Kevin McBride confer

dialog. Sherman stated that "Water is not the factor that determines growth, but it should be part of the mix."

The nine Chairs of the Basin Roundtable formed a panel to informally discuss their successes and failures. Common themes from the Roundtable chairs included concurrence that the process serves as a forum for constructive conversations and that the new funding has been very helpful. The process of trust building and education has also been beneficial, but is time consuming.

Higher Education was exceptionally well represented on the program with three CU, eleven CSU and one CSM faculty to present their new research findings. The conference wrapped up with an update by former Department of Interior Assistant Secretary, Mark Limbaugh, providing an update on federal affairs. The 2008 CWC Aspinall Award Recipient, Don Ament was honored for his many years of effort on behalf of Colorado water.

Colorado Water Congress 51st Annual Convention

by Laurie Schmidt, Colorado Water Institute

The 51st Annual Convention of the Colorado Water Congress was held on January 28-30, 2009, at the Hyatt Regency Denver Tech Center. With the theme "Water Buffaloes in the Mist: On Solid Ground in an Uncertain Time," the meeting kicked off with a legislative breakfast, during which Senator Jim Isgar and Representative Kathleen Curry reviewed water legislation for 2009.

Tim Storey, National Conference of State Legislatures, opened the general session by discussing national election trends, priorities, and budgets for state legislatures. He listed the top nine legislative issues for 2009 as state budget gaps, transportation and infrastructure, access to higher education, health costs and reform, energy alternatives, sentencing and corrections, home ownership, working families, and unemployment. State budget gaps on a national level are expected to reach $84 billion in 2010, he said. Pam Inmann followed Storey with a discussion of the strategic agenda for the Western Governors Association.

Thursday's luncheon keynote speaker was the Honorable Terrance Carroll, Speaker of the Colorado House of Representatives, who discussed "beginning with a vision" and entertained attendees with humorous anecdotes about his knowledge of water (or lack thereof) and his observations on water bills and the legislature. The afternoon general session included a presentation by Colorado pollster Floyd Ciruli, who presented the results of a survey titled "What Coloradans Think about Water."

Don Ament (left) presents Tillie Bishop with the 2009 Wayne Aspinall Water Leader of the Year Award at the Colorado Water Congress 51st Annual Convention on January 30, 2009.

The general session on Friday morning featured talks by Rick Cables, Regional Forester with the U.S. Forest Service; Sally Wisely, Colorado State Director for the BLM; and Larry Walkoviak, Upper Colorado Regional Director for the Bureau of Reclamation. Cables focused on the importance of Colorado's forests to the future of the state's water. "The reach of the watersheds in our state is huge—143 counties in 10 states use a piece of Colorado's water," he said. Referring to Colorado's high country and forests as the "water towers of the West," Cables discussed the impacts of forested lands on water quality and quantity. Addressing the current mountain pine beetle outbreak, he highlighted the indirect impacts of dead trees, including blocked access to 3,500 miles of roads and power lines when the trees fall, and increased wildfire threat. "Denver Water can tell you—post-Hayman Fire—that the cost of dredging reservoirs after the fact (post-fire) is hugely expensive," he said. (Cables' talk can be read in its entirety in this issue of *Colorado Water*.)

Wisely discussed the value of partnerships and working together to create a sustainable future, saying "The bottom line of our (BLM) multi-use mission must be sustainability." Walkoviak reviewed priorities for the Upper Colorado region, including project maintenance, such as for the Animas La-Plata, and project completion. He also discussed the ongoing challenge of equalization efforts to keep a balance between Lake Powell and Lake Mead.

The conference wrapped up during Friday's luncheon with a keynote address by the Honorable Hank Brown, after which Tilman "Tillie" Bishop, former Mesa County commissioner and state lawmaker, was presented with the 2009 Wayne Aspinall Water Leader of the Year Award.

Appendix P

Progress on the Lysimeter Project at Rocky Ford

Progress on the Lysimeter Project at Rocky Ford

by Allan Andales, Assistant Professor, Department of Soil and Crop Sciences, Colorado State University

Accurate estimates of crop consumptive water use are needed to effectively manage irrigation in the Arkansas River Basin of Colorado and to maintain compliance with the Arkansas River compact with Kansas. Consumptive water use is normally defined as water that is lost from the crop root zone of the soil through the processes of soil surface evaporation and transpiration from crop leaves. The two processes occur simultaneously and are difficult to separate. Therefore, the term evapotranspiration (ET) is commonly used to refer to both processes.

The concept of "reference crop ET" was developed in the 1970s to represent the potential amount of ET from a standardized un-stressed crop, given adequate water and actual weather conditions at a particular location. Historically, alfalfa has been used as the reference crop in Colorado. The ET of other crops can then be estimated by multiplying reference crop ET by a crop coefficient (Kc). At any given point in the growing season, the Kc for a crop is simply the ratio of its ET over reference crop ET. The Kc can be thought of as the fraction of the reference crop ET that is used by the actual crop. Values of Kc typically range from 0.2 for young seedlings to 1.0 for crops at peak vegetative stage with canopies fully covering the ground.

The American Society of Civil Engineers (ASCE) standardized reference ET equation (from here on referred to as the ASCE standardized equation) has been approved by the U.S. Supreme Court as the method of determining reference crop ET for compact compliance. This equation calculates the daily or hourly alfalfa reference ET based on inputs of solar radiation, air temperature, wind speed, and humidity data that are usually available from weather stations. However, it has not been tested in the Arkansas Basin. Furthermore, localized crop coefficients that can be used to estimate the ET of crops grown in the area are not available. A validated ASCE standardized equation, along with locally derived crop coefficients, can be a widely applicable tool for irrigation management in the Arkansas River Basin of Colorado.

Figure 1. This image shows the retainer tank of the reference lysimeter after being set on the foundation. (Image courtesy of Lane Simmons)

An accurate way to measure alfalfa reference ET and the ET rates of other crops is to use a precision weighing lysimeter that directly measures ET based on changes in weight of an intact block of soil (monolith) containing an actively growing crop. By 2003, plans for building two weighing lysimeters in the Arkansas River Basin were in full swing, one to be used for measuring alfalfa reference ET and the other for measuring ET of other crops. In 2006, construction of the precision weighing lysimeter for measuring crop ET was completed at CSU's Arkansas Valley Research Center (AVRC) at Rocky Ford, Colorado. The monolith tank dimensions of the crop lysimeter are 10 feet wide by 10 feet long by 8 feet deep (3 m x 3 m x 2.4 m). By 2007, construction began on the reference lysimeter for measuring alfalfa reference ET. The monolith tank dimensions of the reference lysimeter are 5 feet wide x 5 feet long x 8 feet deep (1.5 m x 1.5 m x 2.4 m).

Completion of the Reference Lysimeter

The reference lysimeter monolith tank and retaining (outer) tank were constructed at the USDA-Agricultural Research Service workshop in Fort Collins, Colorado. Work began in 2007 and was completed in spring 2008. The monolith tank was then transported to the installation site at AVRC. On June 23, 2008, the tank was hydraulically pulled into the ground to fill the tank with an undisturbed block of soil (monolith). Excavation for the installation of the retainer tank proceeded shortly afterwards. The laying of the reinforced concrete foundation for the retainer tank was slightly delayed because of shallow groundwater at approximately 14 feet below the ground surface, but the retaining tank was eventually transported to the installation site and set on the foundation in September 2008 (Figure 1).

The weighing mechanism on which the monolith tank was to be set was assembled in December 2008. It consists of a mechanical lever scale-load cell combination that operates similar to a truck scale. The load cell output is in millivolt

Figure 2. In this photo, the soil monolith tank is being installed in the retainer tank of the reference lysimeter. The monolith tank was set on the weighing mechanism inside the retainer tank. The manhole (right of photo) allows access to the underground chamber that houses the weighing mechanism, drainage tanks, and data loggers. (Image courtesy of Lane Simmons)

Figure 3. This image shows calibration of the reference lysimeter weighing scale. Certified weights of varying size were placed on top of the monolith to derive the relationship between load cell output and monolith tank weight. (Image courtesy of Lane Simmons)

per volt. Changes in weight of the monolith tank (caused by evapotranspiration of water, for example) cause changes in the load cell output. The load cell output can thus be calibrated to give equivalent weights of the monolith tank. Partial backfilling of the excavated soil and painting of the retainer tank interior were also done in December. The soil monolith tank was set on the weighing scale on December 17, 2008 (Figure 2).

In February 2009, a steel "top hat" was installed to fit around the top of the monolith tank to prevent water from entering through the small clearance between the monolith and retaining tanks. A thin rubber sheet was applied along the top edge of the monolith tank and surrounding top hat edge to seal the small clearances between them without restricting the movement of the monolith tank. On March 24, 2009, the weighing scale was calibrated using certified weights (Figure 3).

Weather and soil sensors are currently being installed and will be connected to the data loggers mounted in the underground chamber of the retainer tank. Weather and soil heat flow data from the sensors will be used in the ASCE standardized equation. Oats will be planted on the reference lysimeter and surrounding field to keep them under a short-duration crop during the summer. The reference lysimeter and surrounding field will then be seeded to alfalfa in August 2009. They will be permanently cropped to alfalfa for making measurements of alfalfa reference ET each growing season.

Preliminary Comparison of ASCE Standardized Equation ET Estimates with Lysimeter Data for 2008

The 2008 growing season was the first full season of data collection from the crop lysimeter. The hourly alfalfa ET rates measured from the lysimeter throughout the season provided a basis for evaluating the accuracy of the ASCE standardized ET equation. Because the equation estimates ET from a tall reference crop that is assumed to be at a constant height of 20 inches (0.5 meter), similar to full cover alfalfa, lysimeter ET data taken before alfalfa achieved full cover, or a couple of weeks after cutting, could

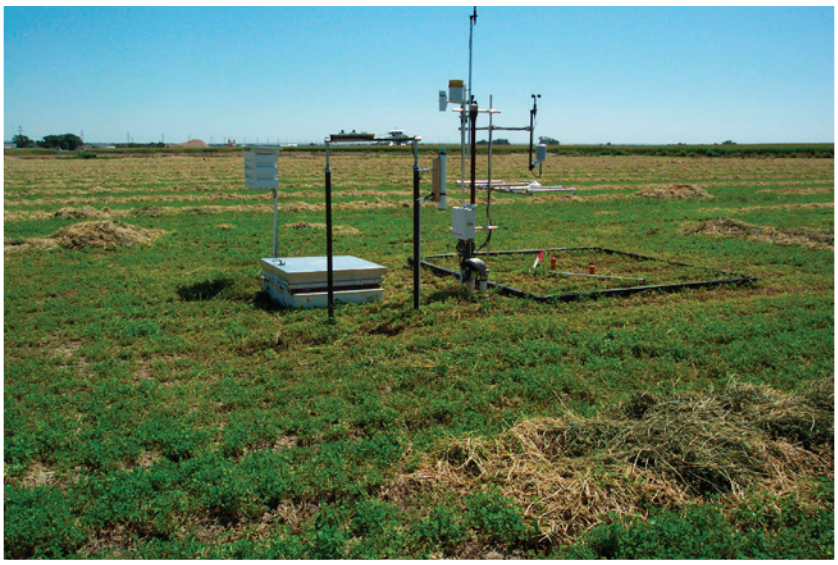


Figure 4. This view of the crop lysimeter is looking to the east. The manhole for accessing the data logger, weighing mechanism, and drainage tanks is on the left; and micrometeorological (weather) sensors are mounted above the lysimeter.

not be compared with equation estimates. Hourly weather data measured by the sensors mounted directly above the monolith (Figure 4) were used in the hourly version of the ASCE standardized equation and included solar radiation, air temperature, wind speed at 2-meter height, vapor pressure (a measure of humidity), and heat flow at the soil surface.

June 7, 2008, (Figure 5) is an example of a day (early season) when hourly ET estimates from the ASCE standardized equation and hourly measurements from the lysimeter matched well throughout the day. Wind conditions were relatively calm, and humidity was relatively stable.

In contrast, June 2 (Figure 6) was also early in the season but had elevated afternoon temperatures, higher afternoon wind speeds, and a drop in humidity. There was a drop in solar radiation after 12:00 hours due to increased cloud cover, which was reflected in the drop in both the lysimeter and ASCE standardized ET rates. However, the ASCE standardized ET equation seemed to be overly sensitive to higher wind speed and decreased humidity that occurred after 14:00 hours. The equation over-predicted ET under these conditions.

Based on preliminary analysis of the 2008 data, the ASCE standardized equation generated alfalfa reference ET estimates that agreed well with lysimeter measurements when sensible heat advection (movement of warm air mass from another area) was not significant. The equation tended to over-estimate hourly ET rates when high wind speeds (> 5 m s-1) occurred with elevated air temperature and decreased humidity. On the other hand, the equation under-estimated mid-day alfalfa ET rates on some days late in the season (data not shown), possibly because of the assumed canopy height (0.5 m) being lower than the actual canopy height and/or soil water and leaf transpiration dynamics not being accounted for in the equation. Further analyses are needed to evaluate the accuracy of the ASCE standardized ET equation in estimating alfalfa reference ET for different conditions in the Arkansas River Basin.

Technical Meeting and Open House

On the morning of April 3, 2009, 14 individuals working directly with or having interest in the weighing lysimeters

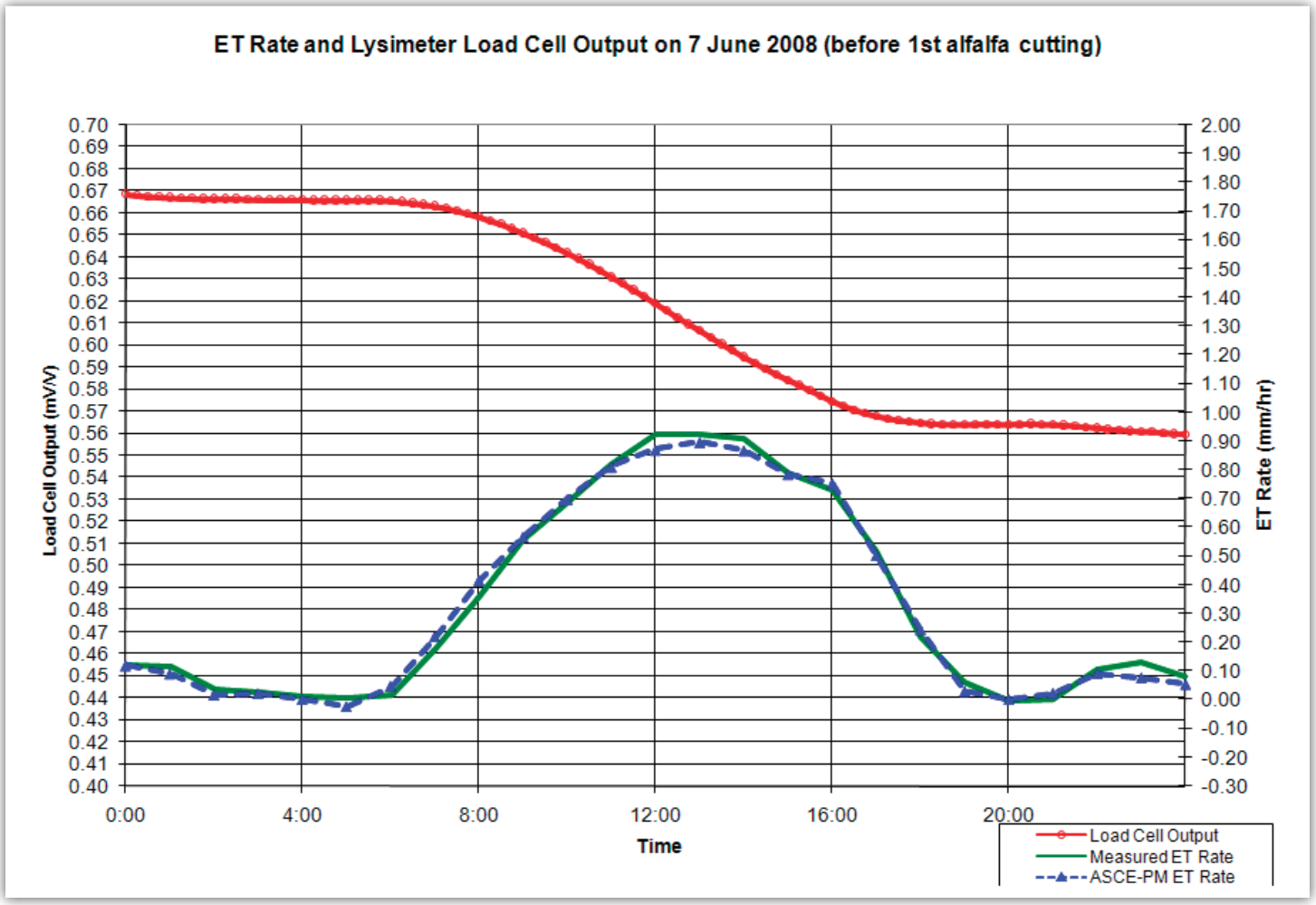


Figure 5. Example lysimeter load cell output (top line) and corresponding hourly ET rates measured by the lysimeter (solid line) and estimated by the ASCE standardized reference ET equation (dashed line).This example shows very good agreement between the ASCE standardized ET equation and lysimeter measurements.

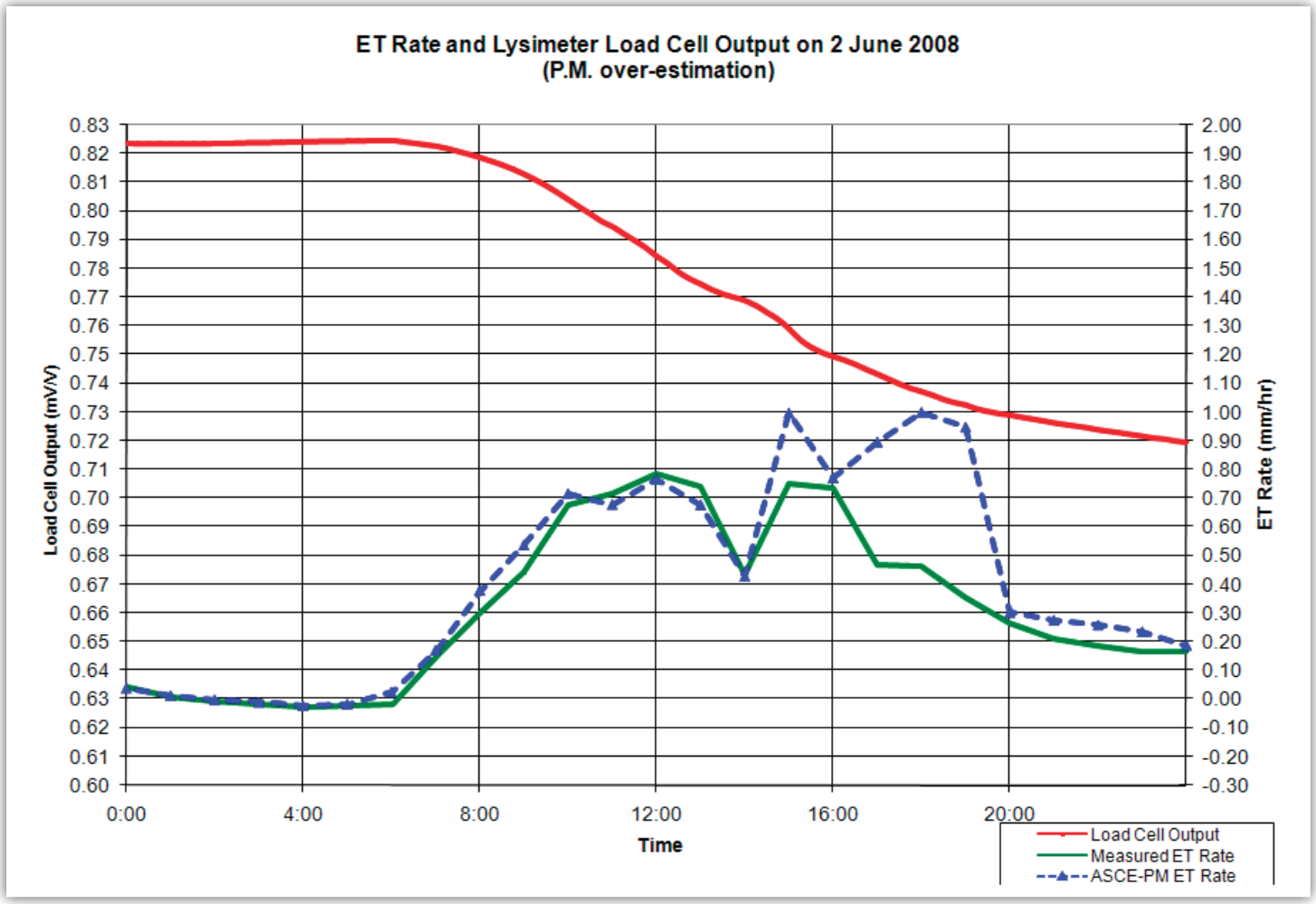


Figure 6. Example of over-estimation of afternoon hourly ET rates by the ASCE standardized reference ET equation (dashed line), compared to measured alfalfa ET from the lysimeter (solid line). In the afternoon of June 2, 2008, dry, warm wind originating from a nearby prairie blew from the southwest.

held a technical meeting. Representatives from CSU, Colorado Division of Water Resources, and USDA-Agricultural Research Service talked about the operation of the two lysimeters, preliminary analyses of 2008 data, and future data collection and management. In the afternoon, local producers, state personnel, and representatives of water conservancy districts were updated on the lysimeter construction and data collection. Attendees then visited the lysimeter site and were given the opportunity to view the underground chamber of the reference lysimeter that was nearing completion. Approximately 27 people attended the event.

Future Plans

The reference lysimeter will be permanently cropped to alfalfa to make measurements of alfalfa reference ET each growing season. The crop lysimeter will be cropped to alfalfa through 2011 to verify that the reference lysimeter is measuring similar alfalfa ET rates. Beginning in 2012, the crop lysimeter and surrounding field will be planted to corn and other major crops in the Arkansas Valley (wheat, sorghum, onions, etc.) to determine their crop coefficients. Simultaneous measurements of alfalfa reference ET from the reference lysimeter and crop ET from the crop lysimeter are needed to calculate crop coefficients. It will take at least two years per crop (planted in the crop lysimeter) to generate reliable crop coefficient values that cover the entire growing season.

Acknowledgements

The lysimeter project is a joint effort between the Colorado Water Conservation Board, Colorado Division of Water Resources (CDWR), Colorado Water Institute, and Colorado State University. Technical support has also been provided by USDA-Agricultural Research Service engineers and scientists in Fort Collins, Colorado, and Bushland, Texas. Lane Simmons, Michael Bartolo, and Abdel Berrada of CSU; and Dale Straw and Thomas Ley of CDWR contributed to the data collection described in this article.

Federal Water Resources Research Act (42 USC Sec. 10301 et. seq.)

Note: Chapter 109 - Water Resources Research (42 USC 10301) was amended by the Water Resources Research Act Amendments of 2000 (Public Law 106-374) (114 STAT. 1434 and the Water Resources Research Act Amendments of 2006 (Public Law 109-471). President Bush signed this Act into law on January 11, 2007.

TITLE 42 — THE PUBLIC HEALTH AND WELFARE
(42 USC Sec. 10301 et. seq.)

CHAPTER 109 — WATER RESOURCES RESEARCH

Sec. 10301. Congressional findings and declarations

The Congress finds and declares that -

(1) the existence of an adequate supply of water of good quality for the production of materials and energy for the Nation's needs and for the efficient use of the Nation's energy and water resources is essential to national economic stability and growth, and to the well-being of the people;

(2) the management of water resources is closely related to maintaining environmental quality, productivity of natural resources and agricultural systems, and social well-being;

(3) there is an increasing threat of impairment to the quantity and quality of surface and groundwater resources;

(4) the Nation's capabilities for technological assessment and planning and for policy formulation for water resources must be strengthened at the Federal, State, and local governmental levels;

(5) there should be a continuing national investment in water and related research and technology commensurate with growing national needs;

(6) it is necessary to provide for the research and development of technology for the conversion of saline and other impaired waters to a quality suitable for municipal, industrial, agricultural, recreational, and other beneficial uses;

(7) the Nation must provide programs to strengthen research and associated graduate education because the pool of scientists, engineers, and technicians trained in fields related to water resources constitutes an invaluable natural resource which should be increased, fully utilized, and regularly replenished; and

(8) long-term planning and policy development are essential to ensure the availability of an abundant supply of high quality water for domestic and other uses; and

(9) the States must have the research and problem-solving capacity necessary to effectively manage their water resources.

[Source: Pub. L. 98-242, title I, Sec. 102, Mar. 22, 1984, 98 Stat. 97; Pub. L. 104-147, Sec. 1, May 24, 1996, 110 Stat. 1375.]

[Amendments: 1996 - Par. (2). Pub. L. 104-147, Sec. 1(1), inserted ", productivity of natural resources and agricultural systems," after "environmental quality". Pars. (8), (9). Pub. L. 104-147, Sec. 1(2)-(4), added pars. (8) and (9).]

Sec. 10302. Congressional declaration of purpose

It is the purpose of this chapter to assist the Nation and the States in augmenting their water resources science and technology as a way to -

(1) assure supplies of water sufficient in quantity and quality to meet the Nation's expanding needs for the production of food, materials, and energy;

(2) discover practical solutions to the Nation's water and water resources related problems, particularly those problems related to impaired water quality;

(3) assure the protection and enhancement of environmental and social values in connection with water resources management and utilization;

(4) promote the interest of State and local governments as well as private industry in research and the development of technology that will reclaim waste water and to convert saline and other impaired waters to waters suitable for municipal, industrial, agricultural, recreational, and other beneficial uses;

(5) promote more effective coordination of the Nation's water resources research program;

(6) promote the development of a cadre of trained research scientists, engineers, and technicians for future water resources problems; and

(7) encourage long-term planning and research to meet future water management, quality, and supply challenges.

[Source: Pub. L. 98-242, title I, Sec. 103, Mar. 22, 1984, 98 Stat. 97; Pub. L. 101-397, Sec. 1(a), Sept. 28, 1990, 104 Stat. 852; Pub. L. 104-147, Sec. 2, May 24, 1996, 110 Stat. 1375.]

[References In Text: This chapter, referred to in text, was in the original "this Act", meaning Pub. L. 98-242, Mar. 22, 1984, 98 Stat. 97, known as the Water Resources Research Act of 1984. For complete classification of this Act to the Code, see Short Title note set out under section 10301 of this title and Tables.]

[Amendments: 1996 - Par. (5). Pub. L. 104-147, Sec. 2(1), struck out "to" before "promote" and "and" after "program;". Par. (6). Pub. L. 104-147, Sec. 2(2), substituted "; and" for period at end. Par. (7). Pub.

L. 104-147, Sec. 2(3), added par. (7). 1990 - Par. (5). Pub. L. 101-397 substituted "to promote more effective coordination of" for "coordinate more effectively".]

Sec. 10303. Water resources research and technology institutes

(a) Establishment; designation of site by State legislature or Governor

Subject to the approval of the Secretary of the Interior (hereafter in this chapter referred to as the "Secretary") under this section, one water resources research and technology institute, center, or equivalent agency (hereafter in this chapter referred to as the "institute") may be established in each State (as used in this chapter, the term "State" includes the Commonwealth of Puerto Rico, the District of Columbia, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Mariana Islands and the Federated States of Micronesia) at a college or university which was established in accordance with the Act approved July 2, 1862 (12 Stat. 503) (7 U.S.C. 301 et seq.), or at some other institution designated by act of the legislature of the State concerned. If there is more than one such college or university in a State established in accordance with such Act of July 2, 1862, the institute in such State shall, in the absence of a designation to the contrary by act of the legislature of the State, be established at the one such college or university designated by the Governor of the State. Two or more States may cooperate in the establishment of a single institute or regional institute, in which event the sums otherwise allocated to institutes in each of the cooperating States shall be paid to such single or regional institute.

(b) Scope of research; other activities; cooperation and coordination

Each institute shall -

(1) plan, conduct, or otherwise arrange for competent applied and peer reviewed research that fosters –
- (A) improvements in water supply reliability;
- (B) the exploration of new ideas that –
  - (i) address water problems; or
  - (ii) expand understanding of water and water-related phenomena;
- (C) the entry of new research scientists, engineers, and technicians into water resources fields; and
- (D) the dissemination of research results to water managers and the public.

(2) cooperate closely with other colleges and universities in the State that have demonstrated capabilities for research, information dissemination, and graduate training in order to develop a statewide program designed to resolve State and regional water and related land problems.

Each institute shall also cooperate closely with other institutes and other organizations in the region to increase the effectiveness of the institutes and for the purpose of promoting regional coordination.

(c) Grants; matching funds

From the sums appropriated pursuant to subsection (f) of this section, the Secretary shall make grants to each institute to be matched on a basis of no less than 2 non-Federal dollars for every 1 Federal dollar, such sums to be used only for the reimbursement of the direct cost expenditures incurred for the conduct of the water resources research program.

(d) Submission and approval of water research program; requisite assurances

Prior to and as a condition of the receipt each fiscal year of funds appropriated under subsection (f) of this section, each institute shall submit to the Secretary for his approval a water research program that includes assurances, satisfactory to the Secretary, that such program was developed in close consultation and collaboration with the director of that State's department of water resources or similar agency, other leading water resources officials within the State, and interested members of the public. The program described in the preceding sentence shall include plans to promote research, training, information dissemination, and other activities meeting the needs of the State and Nation, and shall encourage regional cooperation among institutes in research into areas of water management, development, and conservation that have a regional or national character.

(e) Evaluation of water resources research program

The Secretary shall conduct a careful and detailed evaluation of each institute at least once every 3 years to determine that the quality and relevance of its water resources research and its effectiveness at producing measured results and applied water supply researc*h* as an institution for planning, conducting, and arranging for research warrants its continued support under this section. If, as a result of any such evaluation, the Secretary determines that an institute does not qualify for further support under this section, then no further grants to the institute may be made until the institute's qualifications are reestablished to the satisfaction of the Secretary.

(f) Authorization of appropriations in general

(1) There is authorized to be appropriated to carry out this section, to remain available until expended, $12,000,000 for each of fiscal years 2007 through 2011.

(2) Any sums appropriated under this subsection but which fail to be obligated by the close of the fiscal year for which they were appropriated shall be transferred by the Secretary and available for obligation during the succeeding fiscal year under the terms of subsection (g) of this section.

(g) Additional appropriations where research focused on water problems of interstate nature

(1) There is further authorized to be appropriated to the Secretary of the Interior the sum of $6,000,000 for each of fiscal years 2007 through 2011 only for reimbursement of the direct cost expenses of additional research or synthesis of the results of research by institutes which focuses on water problems and issues of a regional or interstate nature beyond those of concern only to a single State and which relate to specific program priorities identified jointly by the Secretary and the institutes. Such funds when appropriated shall be matched on a not less than dollar-for-dollar basis by funds made available to institutes or groups of institutes, by States or other non-Federal sources. Funds made available under this subsection shall remain available until expended.

(2) Research funds made available under this subsection shall be made on a competitive basis subject to the merit of the proposal, the need for the information to be produced, and the opportunity such funds will provide for training of water resources scientists or professionals.

(h) Coordination

(1) In general

To carry out this chapter, the Secretary -

(A) shall encourage other Federal departments, agencies (including agencies within the Department of the Interior), and instrumentalities to use and take advantage of the expertise and capabilities that are available through the institutes established by this section, on a cooperative or other basis;

(B) shall encourage cooperation and coordination with other Federal programs concerned with water resources problems and issues;

(C) may enter into contracts, cooperative agreements, and other transactions without regard to section 5 of title 41;

(D) may accept funds from other Federal departments, agencies (including agencies within the Department of the Interior), and instrumentalities to pay for and add to grants made, and contracts entered into, by the Secretary;

(E) may promulgate such regulations as the Secretary considers appropriate; and

(F) may support a program of internships for qualified individuals at the undergraduate and graduate levels to carry out the educational and training objectives of this chapter.

2) Reports

The Secretary shall report to Congress annually on coordination efforts with other Federal departments, agencies, and instrumentalities under paragraph (1). As part of the annual budget submission to Congress, the Secretary shall also provide a crosscut budget detailing the expenditures on activities listed under subsection (a)(1) and a report which details the level of applied research and the results of the activities authorized by this Act, including potential and actual –

(A) increases in annual water supplies;
(B) increases in annual water yields;
(C) advances in water infrastructure and water quality improvements; and
(D) methods for identifying, and determining the effectiveness of, treatment technologies and efficiencies.

(3) Relationship to State rights

Nothing in this chapter shall preempt the rights and authorities of any State with respect to its water resources or management of those resources.

[Source: Pub. L. 98-242, title I, Sec. 104, Mar. 22, 1984, 98 Stat. 98;Pub. L. 101-397, Sec. 1(b)-(h), (m), Sept. 28, 1990, 104 Stat. 852, 853; Pub. L. 104-147, Sec. 3-6, May 24, 1996, 110 Stat. 1376.]

[References In Text: Act approved July 2, 1862, referred to in subsec. (a), is act July 2, 1862, ch. 130, 12 Stat. 503, as amended, popularly known as the "Morrill Act" and also as the "First Morrill Act", which is classified generally to subchapter I (Sec. 301 et seq.) of chapter 13 of Title 7, Agriculture.]

[Amendments: 2006 – Pub. L. 109-471, Section 2(a) substituted "As part of the annual budget submission to Congress, the Secretary shall also provide a crosscut budget detailing the expenditures on activities listed under subsection (a)(1) and a report which details the level of applied research and the results of the activities authorized by this Act, including potential and actual – (A) increases in annual water supplies; (B) increases in annual water yields; (C) advances in water infrastructure and water quality improvements; and (D) methods for identifying, and determining the effectiveness of, treatment technologies and efficiencies."]

[Amendments: 2006 – Pub. L. 109-471, Section 2(b), Evaluation of Water Resources Research Program substituted: "3…at producing measured results and applied water supply research."

[Amendments: 2006 – Pub. L. 109-471, Section 2(c), Authorization of Appropriations substituted: "There is authorized to be appropriated to carry out this section, to remain available until expended, $12,000,000 for each of fiscal years 2007 through 2011."]

[Amendments: 2006 – Pub. L. 106-47, Section 2(d), Additional Appropriations Where Research Focused on Water Problems of Interstate Nature substituted: "$6,000,000 for each of fiscal years 2007 through 2011."

[Amendments: 2000 – Pub. L. 106-374, Section 1 substituted "$9,000,000 for fiscal year 2001, $10,000,000 for fiscal years 2002 and 20003, and $12,000,000 for fiscal years 2004 and 2005, ".]

[Amendments: 2000 – Pub. L. 106-374, Section 2 substituted "$3,000,000 for fiscal year 2001, $4,000,000 for fiscal years 2002 and 2003, and $6,000,000 for fiscal years 2004 and 2005 ".]

[Amendments: 1996 - Subsec. (c). Pub. L. 104-147, Sec. 3, substituted "2 non-Federal dollars for every 1 Federal dollar" for "one non-Federal dollar for every Federal dollar during the fiscal years ending September 30, 1985, and September 30, 1986, one and one-half non-Federal dollars for each Federal dollar during the fiscal years ending September 30, 1987, and September 30, 1988, and two non-Federal dollars for each Federal dollar during the fiscal year ending September 30, 1989 and thereafter".

Subsec. (f)(1). Pub. L. 104-147, Sec. 4, substituted "of $5,000,000 for fiscal year 1996, $7,000,000 for each of fiscal years 1997 and 1998, and $9,000,000 for each of fiscal years 1999 and 2000" for "of $10,000,000 for each of the fiscal years ending September 30, 1989, through September 30, 1995,".

Subsec. (g)(1). Pub. L. 104-147, Sec. 5, substituted "of $3,000,000 for each of fiscal years 1996 through 2000" for "of $5,000,000 for each of the fiscal years 1991, 1992, 1993, 1994, and 1995".

Subsec. (h). Pub. L. 104-147, Sec. 6, added subsec. (h). 1990 - Subsec. (a). Pub. L. 101-397, Sec. 1(b), substituted "Federated States of Micronesia" for "Trust Territory of the Pacific Islands".

Subsec. (b). Pub. L. 101-397, Sec. 1(c), inserted "promoting" after "for the purpose of" in last sentence.

Subsec. (b)(1). Pub. L. 101-397, Sec. 1(d), amended par. (1) generally. Prior to amendment, par. (1) read as follows: "plan, conduct, or otherwise arrange for competent research with respect to water resources, including investigations and experiments of either a basic or practical nature, or both; promote the dissemination and application of the results of these efforts; and provide for the training of scientists and engineers through such research, investigations, and experiments, and".

Subsec. (c). Pub. L. 101-397, Sec. 1(e), substituted for period at end "and thereafter, such sums to be used only for the reimbursement of the direct cost expenditures incurred for the conduct of the water resources research program."

Subsec. (e). Pub. L. 101-397, Sec. 1(f), amended subsec. (e) generally, substituting provisions directing that evaluation be conducted at least once every 5 years for provisions directing evaluation within two years after establishment of institute and at least once every four years thereafter and striking out provisions relating to composition and function of evaluation team and setting forth criteria for determination.

Subsec. (f)(1). Pub. L. 101-397, Sec. 1(g), substituted "September 30, 1989, through September 30, 1995," for "September 30, 1985, through September 30, 1989".

Subsec. (f)(2). Pub. L. 101-397, Sec. 1(h), substituted reference to subsec. (g) of this section for reference to section 10305 of this title.

Subsec. (g). Pub. L. 101-397, Sec. 1(m), added subsec. (g).]

Sec. 10304. Research concerning water resource-related problems deemed to be in national interest

(a) Grants; matching funds

(1) In addition to the grants authorized by section 10303 of this title, the Secretary is authorized to make grants, on a dollar-for-dollar matching basis, to the institutes established under such section, as well as other qualified educational institutions, private foundations, private firms, individuals, and agencies of local

or State government for research concerning any aspect of a water resource-related problem which the Secretary may deem to be in the national interest. Such grants shall be made with such advice and review by peer or other expert groups of appropriate interdisciplinary composition as the Secretary deems appropriate on the basis of the merits of the project and the need for the knowledge such project is expected to produce upon completion.

(2) Research funded under this section should to the extent possible utilize the best qualified graduate students so the Nation profits from the education and training benefits resulting from the use of the latest in technological developments in solving water problems.

(b) Applications for grants

Each application for a grant under this section shall state the nature of the project to be undertaken, the period during which it will be pursued, the qualifications of the personnel who will direct and conduct it, the importance of the project to the Nation as well as to the region and State concerned, its relation to other research projects previously or currently being pursued, and the extent to which it will provide an opportunity for the training of water resources scientists.

(c) Authorization of appropriations

There is authorized to be appropriated to the Secretary the sum of $10,000,000 for the purpose of carrying out this section for each of the fiscal years ending September 30, 1985, through September 30, 1995, such sums to remain available until expended.

[Source: Pub. L. 98-242, title I, Sec. 105, Mar. 22, 1984, 98 Stat. 100; Pub. L. 101-397, Sec. 1(i), (j), Sept. 28, 1990, 104 Stat. 853.]

[Amendments: 1990 - Subsec. (a)(3). Pub. L. 101-397, Sec. 1(i), struck out par. (3) which read as follows: "In cases where the Secretary determines, in accordance with criteria established by him, that research under this section is of a basic nature which would not otherwise be undertaken, the Secretary may approve grants under this section with a matching requirement other than that specified in paragraph (1) of this subsection."

Subsec. (c). Pub. L. 101-397, Sec. 1(j), substituted "$10,000,000" for "$20,000,000" and "1995" for "1989".

Sec. 10305. Development of water-related technology

(a) Grants; matching funds

(1) The Secretary shall make grants in addition to those authorized under sections 10303 and 10304 of this title for technology development concerning any aspect of water resources including water-related technology which the Secretary may

deem to be of State, regional, or national importance. Activities funded under this section may be carried out by educational institutions, private firms, foundations, individuals, or agencies of State or local government. Care shall be taken to protect proprietary information of private individuals or firms associated with the technology.

(2) The Secretary may establish any condition for the matching of funds by the recipient of any grant or contract under this section which the Secretary considers to be in the best interest of the Nation considering the information transfer and technology needs of the Nation. However, in the case of institutes established by section 10303 of this title no match greater than that required under section 10303 of this title may be required.

(b) Applications for grants

Each application for a grant under this section shall state the nature of the project to be undertaken, the qualifications of the personnel who will direct and conduct it, facilities of the organization performing any technology development, the importance of the project to the Nation, region, and State concerned, and the potential benefit to be accrued.

(c) Authorization of appropriations

There is authorized to be appropriated to the Secretary the sum of $6,000,000 for the purpose of carrying out this section for each of the fiscal years ending September 30, 1990, through September 30, 1995; such sums to remain available until expended.

[Source: Pub. L. 98-242, title I, Sec. 106, Mar. 22, 1984, 98 Stat. 100; Pub. L. 101-397, Sec. 1(n), Sept. 28, 1990, 104 Stat. 853.]

[Amendments: 1990 - Pub. L. 101-397, in amending section generally, in subsec. (a)(1) struck out provision directing that grant be made on basis of merit and feasibility of project, in subsec. (a)(2) inserted provisions relating to match in the case of institutes established by section 10303 of this title, and in subsec. (c) substituted provisions authorizing $6,000,000 appropriation for fiscal years 1990 through 1995, for provisions authorizing the same sum for fiscal years 1985 through 1989, and struck out provisions authorizing obligation of funds under this section and par. (1) and (2) designations.]

Sec. 10306. Administrative costs

From the sums appropriated pursuant to this chapter, not more than 7.5 per centum shall be utilized for administrative costs.

[Source: Pub. L. 98-242, title I, Sec. 107, Mar. 22, 1984, 98 Stat. 101.]

Sec. 10307. Types of research and development

The type of research and development to be undertaken under the authority of sections 10304 and 10305 of this title and to be encouraged by the institutes established under section 10303 of this title shall include the following:

(1) Aspects of the hydrologic cycle;

(2) Supply and demand for water;

(3) Demineralization of saline and other impaired waters;

(4) Conservation and best use of available supplies of water and methods of increasing such supplies;

(5) Water reuse;

(6) Depletion, contamination, and degradation of groundwater supplies;

(7) Improvements in the productivity of water when used for agricultural, municipal, and commercial purposes;

(8) The economic, legal, engineering, social, recreational, biological, geographic, ecological, and other aspects of water quality and quantity problems;

(9) Scientific information dissemination activities, including identifying, assembling, and interpreting the results of scientific and engineering research on water resources problems; and

(10) Providing means for improved communication of research results, having due regard for the varying conditions and needs for the respective States and regions.

[Source: Pub. L. 98-242, title I, Sec. 108, Mar. 22, 1984, 98 Stat. 101; Pub. L. 101-397, Sec. 1(k), (l), Sept. 28, 1990, 104 Stat. 853.]

[Amendments: 1990 - Par. (6). Pub. L. 101-397, Sec. 1(k), which directed that ", contamination," be inserted after "depletion", was executed by making the insertion after "Depletion" to reflect the probable intent of Congress. Par. (8). Pub. L. 101-397, Sec. 1(l), inserted "quality and quantity" after "water".]

Sec. 10308. Patent policy

Notwithstanding any other provision of law, the Secretary shall be governed by the provisions of sections 5908 (except subsections (l) and (n)) and 5909 of this title with respect to patent policy and to the definition of title to and licensing of inventions made or conceived in the course of work performed, or under any contract or grant made, pursuant to this chapter. Subject to such patent policy, all research or development

contracted for, sponsored, cosponsored, or authorized under authority of this chapter shall be provided in such manner that all information, data, and know-how, regardless of their nature or mediums, resulting from such research and development shall (with such exceptions and limitations, if any, as the Secretary may find to be necessary in the interest of national defense) be usefully available for practice by the general public.

[Source: Pub. L. 98-242, title I, Sec. 109, Mar. 22, 1984, 98 Stat. 101.]

Sec. 10309. New spending authority; amounts provided in advance

Any new spending authority described in subsection (c)(2)(A) or (B) of section 651 of title 2 which is provided under this chapter shall be effective for any fiscal year only to such extent or in such amounts as are provided in advance in appropriations Acts.

[Source: Pub. L. 98-242, title I, Sec. 111, Mar. 22, 1984, 98 Stat. 101.]

Appendix R

HB07-1096

NOTE: This bill has been prepared for the signature of the appropriate legislative officers and the Governor. To determine whether the Governor has signed the bill or taken other action on it, please consult the legislative status sheet, the legislative history, or the Session Laws.

HOUSE BILL 07-1096

BY REPRESENTATIVE(S) Fischer, Curry, Kefalas, McNulty, Labuda, McGihon, Buescher, Gibbs, Hodge, Looper, and Swalm;
also SENATOR(S) Bacon, Isgar, and Johnson.

CONCERNING THE FUNDING OF THE COLORADO WATER RESOURCES RESEARCH INSTITUTE, AND MAKING AN APPROPRIATION THEREFOR.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. 39-29-109 (7), Colorado Revised Statutes, is amended to read:

39-29-109. Severance tax trust fund - created - administration - use of moneys - definitions - repeal. (7) (a) Subject to the maintenance of the end balance requirement of paragraph (f) of subsection (1.5) of this section and a two-year reserve pursuant to sub-subparagraph (A) of subparagraph (III) of paragraph (c) of subsection (1) of this section, five hundred thousand dollars from the operational account of the severance tax trust fund shall be appropriated for fiscal year 2006-07 AND ONE HUNDRED FIFTY THOUSAND DOLLARS FROM THE OPERATIONAL ACCOUNT OF THE SEVERANCE TAX TRUST FUND SHALL BE APPROPRIATED FOR FISCAL YEAR 2007-08 for purposes specified in article 35 of title 23, C.R.S.

Capital letters indicate new material added to existing statutes; dashes through words indicate deletions from existing statutes and such material not part of act.

(b) This subsection (7) is repealed, effective ~~July 1, 2007.~~ JULY 1, 2008.

SECTION 2. Appropriation. In addition to any other appropriation, there is hereby appropriated, out of any moneys in the operational account of the severance tax trust fund created in section 39-29-109 (1) (a) (II), Colorado Revised Statutes, not otherwise appropriated, to the department of higher education, for allocation to the water resources institute established pursuant to article 35 of title 23, Colorado Revised Statutes, for the fiscal year beginning July 1, 2007, the sum of one hundred fifty thousand dollars ($150,000), or so much thereof as may be necessary, for the implementation of this act.

SECTION 3. Safety clause. The general assembly hereby finds,

determines, and declares that this act is necessary for the immediate preservation of the public peace, health, and safety.

Andrew Romanoff SPEAKER OF THE HOUSE OF REPRESENTATIVES	Joan Fitz-Gerald PRESIDENT OF THE SENATE
Marilyn Eddins CHIEF CLERK OF THE HOUSE OF REPRESENTATIVES	Karen Goldman SECRETARY OF THE SENATE

APPROVED_____

Bill Ritter, Jr.
GOVERNOR OF THE STATE OF COLORADO

Appendix S

HB08-1026

NOTE: This bill has been prepared for the signature of the appropriate legislative officers and the Governor. To determine whether the Governor has signed the bill or taken other action on it, please consult the legislative status sheet, the legislative history, or the Session Laws.

HOUSE BILL 08-1026

BY REPRESENTATIVE(S) Fischer, Kefalas, McGihon, Solano, Levy, Butcher, Carroll M., Borodkin, Curry, Frangas, Gagliardi, Gallegos, Green, Labuda, Marostica, Massey, McFadyen, Merrifield, Pommer, and Scanlan; also SENATOR(S) Schwartz, Bacon, Tochtrop, and Williams.

CONCERNING THE COLORADO WATER RESOURCES RESEARCH INSTITUTE, AND, IN CONNECTION THEREWITH, CHANGING THE NAME OF THE INSTITUTE TO THE COLORADO WATER INSTITUTE, EXPANDING THE DUTIES OF THE INSTITUTE, AND AUTHORIZING THE INSTITUTE AS A CONTRACTING ENTITY FOR WATER RESEARCH.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. 23-31-801, Colorado Revised Statutes, is amended to read:

23-31-801. Colorado water institute - creation. (1) There is hereby created the Colorado water ~~resources research~~ institute, referred to in this part 8 as the "institute", for the FOLLOWING purposes:

(a) ~~of~~ Developing, implementing, and coordinating water and water-related research programs ~~in the state~~ IN COLLABORATION WITH OTHER STATE INSTITUTIONS OF HIGHER EDUCATION and transferring the

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Capital letters indicate new material added to existing statutes; dashes through words indicate deletions from existing statutes and such material not part of act.

results of research and new technologies to potential users;

(b) CREATING AND OPERATING A WATER RESEARCH INFORMATION AND EDUCATION CENTER AS A STATEWIDE CLEARINGHOUSE AND ARCHIVE FOR WATER RESOURCES, WATER QUALITY, AND WATER-RELATED POLICY ISSUES, INCLUDING THE TRAINING OF FUTURE GENERATIONS OF WATER SCIENTISTS, MANAGERS, PLANNERS, AND EDUCATORS; AND

(c) CONDUCTING SCIENTIFIC RESEARCH AND POLICY ANALYSIS IN AREAS INCLUDING, BUT NOT LIMITED TO, WATER DEVELOPMENT AND STORAGE AND SURFACE WATER AND GROUND WATER HYDROLOGY, WATER RESOURCES MANAGEMENT, WATER QUALITY AND AQUATIC HABITAT MANAGEMENT AND PROTECTION, WATER HISTORY AND PALEOHYDROLOGY, DROUGHT PLANNING AND MITIGATION, AND CLIMATE CHANGE AND ADAPTATION.

(2) The institute shall be a unit of the Colorado state university under the supervision and control of the university's administration and the board of governors of the Colorado state university system.

(3) The principal administrative officer of the institute shall be a director, who shall be appointed by the president of the Colorado state university with the approval of the board of governors of the Colorado state university system and who shall be under the direct supervision of the president of Colorado state university or a vice-president thereof designated by the president. To meet the purposes of the institute, the director, with the advice of the advisory committee established pursuant to section 23-31-802, shall develop appropriate policies and procedures for identification of priority research problems; for collaborating with water MANAGERS AND user associations, DROUGHT AND CLIMATE CHANGE PLANNING ORGANIZATIONS, other universities, federal, state, and local government agencies, and the general assembly in the formulation of its research program; for selection of projects to be funded; and for the dissemination of information and transfer of technology ~~which~~ THAT is produced by the research.

(4) It is the duty of the institute to:

(a) Consult with state and local government agencies, water MANAGERS AND user associations, DROUGHT AND CLIMATE CHANGE

PLANNING ORGANIZATIONS, WATER QUALITY PLANNING ORGANIZATIONS, the general assembly, and other potential users of research in identifying and prioritizing ~~water problems for research~~ THE STATE'S WATER SCIENTIFIC AND POLICY-RELATED RESEARCH NEEDS;

(b) Negotiate and administer contracts with other ~~universities~~ STATE INSTITUTIONS of ~~the state~~ HIGHER EDUCATION for the conduct of research projects;

(c) Disseminate new information and facilitate transfer and application of new technologies as they are developed;

(d) Provide for liaison between Colorado and the federal research funding agencies as an advocate for ~~Colorado~~ COLORADO'S water research needs;

(e) Facilitate and stimulate SCIENTIFIC research AND POLICY ANALYSIS that:

(I) Deals with policy issues facing the general assembly;

(II) Supports state water, PUBLIC HEALTH, AND WATER QUALITY PROTECTION agencies' missions with WATER research on WATER-RELATED problems encountered and expected, INCLUDING BUT NOT LIMITED TO THE EFFECTS OF CLIMATE CHANGE ON WATER QUALITY, WATER AVAILABILITY, RUN-OFF TIMING, DROUGHT PLANNING, AND FUTURE COMPACT COMPLIANCE;

(III) Provides water planning and management organizations with tools to increase efficiency and effectiveness of water planning and management;

(IV) ENGAGES AND TRAINS FUTURE GENERATIONS OF THE STATE'S WATER PROFESSIONALS AND EDUCATORS; AND

(V) EXAMINES THE INTERCONNECTIONS BETWEEN CLIMATE CHANGE, WATER SUPPLY, AND WATER QUALITY AND PROVIDES TOOLS NEEDED BY WATER MANAGERS AND POLICYMAKERS FOR ADAPTING TO GLOBAL CLIMATE CHANGE;

(f) ESTABLISH AND MAINTAIN A CLEARINGHOUSE AND ARCHIVE OF

WATER RESEARCH, WATER QUALITY, AND CLIMATE PROJECTION DATA.

(5) The institute is authorized to employ such professional, clerical, and other personnel needed to carry out the provisions of this part 8.

(6) The institute is authorized to expend state funds appropriated by the general assembly for cost-sharing on projects funded with federal or private moneys.

(7) STATE FUNDS GRANTED, APPROPRIATED, OR OTHERWISE MADE AVAILABLE FOR WATER RESEARCH CONDUCTED AT THE STATE'S INSTITUTIONS OF HIGHER EDUCATION MAY PASS THROUGH THE ADMINISTRATIVE CONTROL OF THE INSTITUTE IF THE GRANT, APPROPRIATION, OR OTHER FUNDING DOCUMENT SO SPECIFIES. IF PARTICULAR FUNDS ARE SO RESTRICTED, THE INSTITUTE MAY SERVE AS AN ADMINISTRATIVE ENTITY OF SUCH FUNDS FOR STATE AGENCIES THAT SEEK TO UTILIZE COLORADO UNIVERSITIES OR COLLEGES FOR WATER RESEARCH. AS SUCH, THE INSTITUTE SHALL HAVE THE POWER TO ACCEPT GRANTS, DONATIONS, APPROPRIATIONS, AND OTHER FUNDING FROM ANY ENTITY. THE INSTITUTE MAY PROVIDE OVERSIGHT FOR SUCH FUNDING BY ENSURING RESEARCH PROJECTS COMMENCE AND ARE COMPLETED WITHIN THE SCOPE OF AGREEMENTS, INVOICES, CONTRACTS, PURCHASE ORDERS, INTERGOVERNMENTAL AGREEMENTS, OR OTHER FISCAL DEVICES USED TO FUND RESEARCH. THE INSTITUTE IS AUTHORIZED TO ASSESS A FEE TO IMPLEMENT ITS ADMINISTRATIVE AUTHORITY. SUCH FEE MAY NOT EXCEED TWENTY PERCENT OF THE TOTAL COST OF THE PROJECT BEING ADMINISTERED BY THE INSTITUTE. THE ADVISORY COMMITTEE CREATED IN SECTION 23-31-802 SHALL ANNUALLY REVIEW AND ESTABLISH THE ADMINISTRATION FEE.

SECTION 2. 23-31-802, Colorado Revised Statutes, is amended to read:

23-31-802. Advisory committee on water research policy. (1) There is hereby created the advisory committee on water research policy, ~~that~~ WHICH shall consist of at least ~~ten~~ ELEVEN members. EIGHT OF THE MEMBERS SHALL BE appointed by the director of the institute. THE REMAINING MEMBERS SHALL BE THE EXECUTIVE DIRECTOR OF THE DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, THE EXECUTIVE DIRECTOR OF THE DEPARTMENT OF NATURAL RESOURCES, AND THE COMMISSIONER OF AGRICULTURE, OR THEIR DESIGNEES.

(2) APPOINTED members of the advisory committee shall serve terms of four years. Members shall serve without compensation and are not entitled to reimbursement of expenses incurred in the performance of their duties.

(3) The advisory committee shall recommend policy guidelines for implementing the functions of the institute; SHALL CONFER WITH STATE GOVERNMENTAL AGENCIES, NONGOVERNMENTAL AGENCIES, AND STATE INSTITUTIONS OF HIGHER EDUCATION TO SET COLORADO'S WATER RESEARCH PRIORITIES; and shall evaluate the programs of the institute. The advisory committee shall also advise and counsel the director of the institute and shall make recommendations to assist the director in carrying out the purposes of this part 8.

SECTION 3. 23-31-803, Colorado Revised Statutes, is amended to read:

23-31-803. Water research fund. (1) There is hereby established in the state treasury the water research fund, referred to in this part 8 as the "fund". The fund shall consist of FEES RECEIVED BY THE INSTITUTE PURSUANT TO SECTION 23-31-801 (7) AND gifts, grants, and donations accepted by the institute. The moneys in the fund are hereby continuously appropriated to the institute, and the institute may expend moneys from the fund for any purpose consistent with this article. Any interest derived from the deposit and investment of moneys in the fund shall be credited to the fund. At the end of any fiscal year, all unexpended and unencumbered moneys in the fund shall remain therein and shall not be credited or transferred to the general fund or any other fund.

(2) ~~It is the intent of the general assembly that no general fund dollars be appropriated for the water resources research institute.~~

SECTION 4. Safety clause. The general assembly hereby finds,

determines, and declares that this act is necessary for the immediate preservation of the public peace, health, and safety.

Andrew Romanoff SPEAKER OF THE HOUSE OF REPRESENTATIVES	Peter C. Groff PRESIDENT OF THE SENATE
Marilyn Eddins CHIEF CLERK OF THE HOUSE OF REPRESENTATIVES	Karen Goldman SECRETARY OF THE SENATE

APPROVED_____

Bill Ritter, Jr.
GOVERNOR OF THE STATE OF COLORADO

Appendix T

HB08-1405

NOTE: This bill has been prepared for the signature of the appropriate legislative officers and the Governor. To determine whether the Governor has signed the bill or taken other action on it, please consult the legislative status sheet, the legislative history, or the Session Laws.

An Act

HOUSE BILL 08-1405

BY REPRESENTATIVE(S) Fischer, Buescher, Curry, Frangas, Green, Kefalas, King, Labuda, Madden, McFadyen, McGihon, and Merrifield; also SENATOR(S) Shaffer, Bacon, Boyd, Gibbs, Johnson, Romer, Schwartz, and Tochtrop.

CONCERNING THE FUNDING OF THE COLORADO WATER INSTITUTE, AND MAKING AN APPROPRIATION THEREFOR.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. 39-29-109 (7), Colorado Revised Statutes, is amended to read:

39-29-109. Severance tax trust fund - created - administration - use of moneys - definitions - repeal. (7) (a) (I) Subject to the maintenance of the end balance requirement of paragraph (f) of subsection (1.5) of this section and a two-year reserve pursuant to sub-subparagraph (A) of subparagraph (III) of paragraph (c) of subsection (1) of this section, five hundred thousand dollars from the operational account of the severance tax trust fund shall be appropriated for fiscal year 2006-07 and one hundred fifty thousand dollars from the operational account of the severance tax trust fund shall be appropriated for fiscal year 2007-08; for purposes specified in article 35 of title 23, C.R.S., AS SAID ARTICLE EXISTED PRIOR TO ITS

Capital letters indicate new material added to existing statutes; dashes through words indicate deletions from existing statutes and such material not part of act.

REPEAL IN 2007.

(II) SUBJECT TO THE MAINTENANCE OF THE END BALANCE REQUIREMENT OF PARAGRAPH (f) OF SUBSECTION (1.5) OF THIS SECTION AND A TWO-YEAR RESERVE PURSUANT TO SUB-SUBPARAGRAPH (A) OF SUBPARAGRAPH (III) OF PARAGRAPH (c) OF SUBSECTION (1) OF THIS SECTION, FOR THE 2008-09 FISCAL YEAR, FIVE HUNDRED THOUSAND DOLLARS FROM THE OPERATIONAL ACCOUNT OF THE SEVERANCE TAX TRUST FUND SHALL BE APPROPRIATED TO THE WATER RESEARCH FUND CREATED IN SECTION 23-31-803 (1), C.R.S., TO BE USED FOR PURPOSES SPECIFIED IN PART 8 OF ARTICLE 31 OF TITLE 23, C.R.S.

(b) This subsection (7) is repealed, effective ~~July 1, 2008~~ JULY 1, 2010.

SECTION 2. 23-31-803 (1), Colorado Revised Statutes, as amended by House Bill 08-1026, enacted at the Second Regular Session of the Sixty-sixth General Assembly, is amended to read:

23-31-803. Water research fund. (1) There is hereby established in the state treasury the water research fund, referred to in this part 8 as the "fund". The fund shall consist of fees received by the institute pursuant to section 23-31-801 (7), APPROPRIATIONS MADE TO THE FUND PURSUANT TO SECTION 39-29-109 (7), C.R.S., and gifts, grants, and donations accepted by the institute. The moneys in the fund are hereby continuously appropriated to the institute, and the institute may expend moneys from the fund for any purpose consistent with this article. Any interest derived from the deposit and investment of moneys in the fund shall be credited to the fund. At the end of any fiscal year, all unexpended and unencumbered moneys in the fund shall remain therein and shall not be credited or transferred to the general fund or any other fund.

SECTION 3. 39-29-109.3 (2), Colorado Revised Statutes, as enacted by House Bill 08-1398, enacted at the Second Regular Session of the Sixty-sixth General Assembly, is amended BY THE ADDITION OF A NEW PARAGRAPH to read:

39-29-109.3. Operational account of the severance tax trust fund - repeal. (2) Subject to the requirements of subsections (3) and (4) of this section, if the general assembly chooses not to spend up to one hundred

percent of the moneys in the operational account as specified in subsection (1) of this section, the state treasurer shall transfer the following:

(j) (I) FOR THE STATE FISCAL YEAR COMMENCING JULY 1, 2008, FIVE HUNDRED THOUSAND DOLLARS TO THE WATER RESEARCH FUND CREATED IN SECTION 23-31-803 (1), C.R.S.

(II) THIS PARAGRAPH (j) IS REPEALED, EFFECTIVE JULY 1, 2010.

SECTION 4. 23-31-803 (1), Colorado Revised Statutes, as amended by House Bill 08-1026, enacted at the Second Regular Session of the Sixty-sixth General Assembly, is amended to read:

23-31-803. Water research fund. (1) There is hereby established in the state treasury the water research fund, referred to in this part 8 as the "fund". The fund shall consist of fees received by the institute pursuant to section 23-31-801 (7), TRANSFERS MADE TO THE FUND PURSUANT TO SECTION 39-29-109.3 (2) (j), C.R.S., and gifts, grants, and donations accepted by the institute. The moneys in the fund are hereby continuously appropriated to the institute, and the institute may expend moneys from the fund for any purpose consistent with this article. Any interest derived from the deposit and investment of moneys in the fund shall be credited to the fund. At the end of any fiscal year, all unexpended and unencumbered moneys in the fund shall remain therein and shall not be credited or transferred to the general fund or any other fund.

SECTION 5. Appropriation. In addition to any other appropriation, there is hereby appropriated, out of any moneys in the operational account of the severance tax trust fund created in section 39-29-109, Colorado Revised Statutes, not otherwise appropriated, to the water research fund, created in section 23-31-803, Colorado Revised Statutes, for the fiscal year beginning July 1, 2008, the sum of five hundred thousand dollars ($500,000), for the work of the Colorado research institute at Colorado state university in the department of higher education, for the implementation of this act.

SECTION 6. Effective date. (1) This act shall take effect upon passage; except that:

(a) Sections 1, 2, and 5 of this act shall not take effect if House Bill

08-1398 is enacted at the Second Regular Session of the Sixty-sixth General Assembly and becomes law.

(b) Sections 3 and 4 of this act shall take effect only if House Bill 08-1398 is enacted at the Second Regular Session of the Sixty-sixth General Assembly and becomes law.

SECTION 7. Safety clause. The general assembly hereby finds,

determines, and declares that this act is necessary for the immediate preservation of the public peace, health, and safety.

Andrew Romanoff SPEAKER OF THE HOUSE OF REPRESENTATIVES	Peter C. Groff PRESIDENT OF THE SENATE
Marilyn Eddins CHIEF CLERK OF THE HOUSE OF REPRESENTATIVES	Karen Goldman SECRETARY OF THE SENATE

APPROVED_____

Bill Ritter, Jr.
GOVERNOR OF THE STATE OF COLORADO