

Curriculum Vitae for
TIMOTHY K. GATES

Professor

Water Resources Systems Analyst

Civil and Environmental Engineering Department

Colorado State University

Fort Collins, Colorado 80523-1372

(970)491-5043 FAX (970)491-7727

Email: timothy.gates@colostate.edu

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Summary of Experience and Qualifications

Timothy K. Gates is a water resources systems analyst and a Professor of Civil and Environmental Engineering at Colorado State University. His research focuses on how water resources systems impact and are impacted by irrigated agriculture and has included field monitoring, modeling, and analysis of shallow groundwater flow and salt transport; management of water quality (especially salinity, selenium, uranium, and nutrients) for irrigated agriculture; measurement and regulation of open-channel flows; stochastic simulation and optimization of water resources systems; multi-objective river basin planning; and field monitoring and evaluation of irrigation and drainage systems. Dr. Gates has directed or co-directed research and training projects with total funding of over \$11 million over the last 34 years. He has taught academic courses in open-channel flow, fluid mechanics, hydraulic engineering, hydraulic structures/systems, hydrology, groundwater engineering, and solid dynamics. In addition, he has served as an independent consulting engineer with the United States Agency for International Development; the United Nations Develop. Program; Camp, Dresser & McKee, Inc.; Keller-Bliesner Engineering; D'Appolonia Environ. Services; the Denver Water Dept., the Governance Committee of the Platte River Cooperative Agreement, Devon Energy, Pennaco, Riverside Ditch Company, ARCADIS & GM, Greg Lewicki and Associates, Pueblo Wastewater, Boxelder Sanit. District, Central Mutual Insurance Co., Rocky Mountain Environ., Pueblo Board of Water Works, and Colorado Springs Utilities. He has worked on projects related to irrigation-and-drainage hydraulics, river hydraulics, seepage from earthen channels, salinization of irrigated agricultural regions, water quality for irrigated agriculture, irrigation-induced pollutant loading to rivers, modeling of open-channel flow, and river-basin modeling. He has designed and conducted numerous short courses and special training programs in open-channel flow, irrigation and drainage engineering, and groundwater. Dr. Gates spent a total of about four years in Egypt working on various irrigation projects. He also has consulted in India, Sri Lanka, Australia, and Pakistan on irrigation and water resources projects and has presented visiting lectures on these subjects in China at Wuhan University and at the Beijing Institute of Technology and on hydraulic structures and systems at the Water Resources University of Vietnam.

Education

PhD	Civil Engineering, University of California, Davis, California 1988
MS	Agricultural Engineering, Colorado State University 1980
BS	Agricultural Engineering, Louisiana Tech Univ. 1978 (<i>Summa Cum Laude</i>)

Employment Summary

July 2001 -Present

Professor

July 1994 – July 2001

Associate Professor

February 1988 - July 1994

Assistant Professor

Civil and Environ. Engineering Department

Colorado State University

Teach courses in hydraulic engineering, fluid mechanics and solid mechanics. Conduct research in design and operation of open-channel water-delivery systems, stochastic simulation and optimization of water resources systems, multi-objective river basin planning, irrigation and drainage in salinity-affected regions, and water quality for irrigated agriculture. Advise PhD and MS students. Consult in water resources and irrigation projects.

July 1993 – December 2004

Co-Director
Colorado Institute
for Irrigation Management
The Water Center
Colorado State University

Developed and directed short courses in irrigation and drainage management for foreign professionals. Conduct international training and development projects in irrigation management.

August 1991 – December 1998

Associate Director
International School for
Water Resources
The Water Center
Colorado State University

Directed non-degree technical training programs in water resources and related fields for foreign professionals.

August 1997 - January 1998

Visiting Scientist
Charles Sturt University
Wagga Wagga, New South Wales,
Australia
Division of Water Resources, CSIRO
Griffith, New South Wales, Australia

Conducted research and consulted on simulation and optimization of water and salinity management in irrigated areas of the Murray-Darling river basin in southeast Australia.

June 1985 - February 1988

Post Grad Res. & Teaching Asst.
Dept. of Land, Air, and Water
Resourc. UC-Davis

Developed and applied numerical models for stochastic simulation and optimization of irrigation and drainage management in salinity-affected regions. Assisted with field and modeling studies of seepage from evaporation basins for containment of subsurface drainage effluent.

May 1984 - August 1984

Research Associate and Trainer
Civil Engineering Department
Colorado State University

Instructed professionals from India in an interdisciplinary training course on diagnostic analysis of irrigation systems. Presented field and analytical methods for engineering analysis of water-delivery systems for irrigation

January 1981 - May 1984

Hydraulic and Irrigation Engineer
Egypt Water Use & Management
Project, Cairo

Directed collection and analysis of hydrologic data for three irrigated regions in the Nile Valley and Delta. Developed models for hydraulic design and evaluation of water-delivery systems. Designed and supervised construction of an improved open-channel water delivery network. Played major role in organizing and synthesizing six years of research results into summary findings and recommendations to Egypt.

February 1980 - December 1980

Research Associate
Dept. of Agricultural & Chem. Eng.
Colorado State University

Prepared technical manuals for use in field study, evaluation & improvement of surface irrigation systems. Acted as a technical editor in the development of video tapes for training in evaluation of on-farm irrigation systems.

Funded Research at Colorado State University

Projects as Principal Investigator

Characterizing Agro-Environmental Threats from Salinity in the South Platte River Basin. *Sponsor:* Colorado Agricultural Experiment Station, 2022- 2025, \$90,000.

Finding Ways to Mitigate Irrigation-Induced Uranium Contamination in an Irrigated River Valley while Sustaining Crop Productivity. *Sponsor:* Colorado Agricultural Experiment Station, 2017- 2020, \$90,000.

US-Pakistan Center for Advanced Studies in Water, *Sponsor:* US Agency for International Development through University of Utah, 2015 – 2019, \$1,599,136.

Finding Ways to Mitigate Irrigation-Induced Uranium Contamination in Colorado's Lower Arkansas River Valley, *Sponsor:* Colorado Department of Public Health and Environment through Colorado Geological Survey, 2016 – 2019, \$87,500.

Water Quality and Productivity Enhancement in an Irrigated River Basin through Participatory Conservation Planning and Analysis, *Sponsor:* United States Department of Agriculture, 2014 – 2019, \$659,954.

Hydrologic and Water Quality Data Collection in Colorado's Upper Arkansas River Basin. *Sponsor:* Colorado Water Conservation Board, 2017 – 2018, \$9,430.

Data Collection and Analysis in Support of Improved Water Management in the Arkansas River Basin, *Sponsor:* Colorado Water Institute, United States Geological Survey, 2014 – 2016, \$100,000.

Reconnaissance and Scoping for Assessing the Impact of Current and Altered Irrigation Practices on Groundwater Conditions and Return Flows to the Yampa and White Rivers, Colorado, *Sponsor:* Yampa/White Basin Roundtable, 2015, \$12,249.

Identifying Arkansas River Selenium and Nitrogen Best Management, *Sponsor:* Colorado Department of Public Health and Environment (Nonpoint Source Program and Water Quality Improvement Fund), 2013 – 2015, \$316,082.

Building and Assessing an Accounting Tool for Water from Lease-Fallowing in Colorado's Lower Arkansas River Valley, *Sponsor:* Upper Arkansas Valley Water Conservancy District, 2012 – 2015, \$227,551.

Describing and Developing Plans to Mitigate Selenium and Salinity Contamination in an Irrigated River Valley. *Sponsor:* Colorado Agricultural Experiment Station, 2008- 2015, \$193,500.

Identification, Public Awareness, and Solution of Waterlogging and Salinity in the Arkansas River Valley. *Sponsor:* United States Bureau of Reclamation. 1999-2014, \$751,630.

Data Assessment and Collection in Support of Improved Water Management in the Arkansas River Basin, *Sponsor:* Colorado Water Conservation Board, 2009 – 2013, \$599,900.

Assessment of the Impacts of the Arkansas Valley Conduit and Excess Capacity Master Contract on Ground Water, Return Flow and Solute Loads, and Crop Productivity in the Irrigated Stream-Aquifer System of Colorado's Lower Arkansas River Valley, *Sponsor*: MWH, 2010 – 2013, \$24,438.

Monitoring and Modeling Toward Optimal Management of the Lower Arkansas River, Part I. *Sponsor*: Lower Arkansas Valley Water Conservancy District, 2004 – 2011, \$175,000.

Data and Models for Planning of Nonpoint Source Selenium Management in the Lower Arkansas River Basin, Colorado. *Sponsor*: Colorado Department of Public Health and Environment, 2009 – 2012, \$502,000.

Subregional- and Basin-Scale Technical Assessment of Irrigation-Induced Salinity and Pollutant Loading in the Arkansas River Valley (Multidisciplinary Initiative). *Sponsor*: Colorado Agricultural Experiment Station, 2002 – 2012, \$140,000.

Data Analysis and Final Report of State of Colorado-Funded CSU 2004-2008 Irrigation Studies in Colorado's Lower Arkansas River Valley." *Sponsor*: Colorado Water Conservation Board, 2009 – 2010, \$48,477.

Late Season Monitoring of Irrigation Practices Under Conventional and Improved Technologies in Colorado's Lower Arkansas River Valley. *Sponsor*: Colorado Water Conservation Board, 2008, \$96,700.

Early Season Monitoring of Irrigation Practices Under Conventional and Improved Technologies in Colorado's Lower Arkansas River Valley. *Sponsor*: Colorado Division of Water Resources, 2008, \$74,200.

Evaluation of the Use of Polyacrylamide to Reduce Seepage Losses from Earthen Irrigation Canals in the Lower Arkansas River Valley, Colorado. *Sponsor*: Desert Research Institute, Las Vegas, NV, 2006 – 2008, \$46,600.

Evaluation of the Impact of Best Management Practices on Ground Water and River Water Quality in an Irrigated Valley. *Sponsor*: Colorado Department of Public Health and Environment, 2005 – 2008, \$100,000.

Defining and Engineering Solutions for Agroecological Threats from Salinity and Selenium in an Irrigated River Valley. *Sponsor*: Colorado Agricultural Experiment Station, 2005 - 2008, \$100,500.

Assessing Irrigation-Induced Selenium and Iron in the Stream-Aquifer System of the Lower Arkansas River Basin, Colorado. *Sponsor*: Colorado Department of Public Health and Environment, 2003 – 2008, \$457,000.

Monitoring and Modeling Toward Optimal Management of the Lower Arkansas River, Part II. *Sponsor*: Southeastern Colorado Water Conservancy District, 2005 - 2008, \$400,000.

Evaluating Strategies to Mitigate Waterlogging and Salinization in Colorado's Lower Arkansas River Valley, Phase III. *Sponsor*: Colorado Water Resources Research Institute, 2004 - 2005, \$52,000

Evaluating Strategies to Mitigate Waterlogging and Salinization in Colorado's Lower Arkansas River Valley, Phase II. *Sponsor:* Colorado Water Resources Research Institute, 2003 - 2004, \$52,000

Evaluation of Soil Salinity on Irrigated Lands in the Arkansas River Valley. *Sponsor:* United States Bureau of Reclamation, 2002-2003, \$12,000.

Evaluating Strategies to Mitigate Waterlogging and Salinization in Colorado's Lower Arkansas River Valley, Phase I. *Sponsor:* Colorado Water Resources Research Institute, 2002 - 2003, \$50,000

Managing Irrigation-Induced Salinity and Pollutant Loading to Enhance the Agroecosystem of the Lower Arkansas River Basin. *Sponsor:* Colorado Agricultural Experiment Station, 2002 – 2005, \$126,000.

Evaluation of Seepage Losses from the Fort Lyon Canal. *Sponsor:* Fort Lyon Canal Company, 2001, \$14,800.

Hierarchical Strategies for Recovery of a Salinity-Affected Irrigated Valley. *Sponsor:* United States Department of Agriculture, 2001-2004, \$363,000.

Analytical and Organizational Support for Strategies to Solve Saline Shallow Groundwater Problems in the Arkansas River Valley. *Sponsor:* Colorado Agricultural Experiment Station, 1999-2002, \$220,000.

Identification and Solution of Waterlogging and Salinity Problems in the Lower Arkansas River Valley, Colorado. *Sponsor:* Colorado Agricultural Experiment Station, 1999-2002, \$143,000.

Description and Interpretation of Salinization in the Lower Arkansas River Valley, Colorado. *Sponsors:* Colorado Water Resources Research Institute, U. S. Geological Survey. 1999-2002, \$158,900.

Analysis of Soil and Water Salinity in Bent County, Colorado. *Sponsor:* Colorado State Soil Conservation Board, 1999-2000, \$16,200.

Development of Recommended Water Quality Criteria for the South Platte Water Conservation Project. *Sponsor:* Northern Colorado Water Conservancy District, 1998, \$33,500.

Decision Support System for Regional Water Quantity/Quality Evaluation of Best Management Practices in Irrigated Agriculture. *Sponsor:* Colorado Agricultural Experiment Station, 1996-1999, \$150,000.

Stochastic Analysis of Parameters for Dam Safety Evaluation. *Sponsor:* United States Bureau of Reclamation, 1996-1997, \$10,000.

Impact of Urban-Water Transfer and Return-Flow Quality on Irrigated Agricultural Systems. *Sponsor:* Colorado Agricultural Experiment Station, 1992-1996, \$53,500.

Cooperative Regional Water Management through a Federated-Distributed Database. *Sponsor:* Colorado Water Resources Research Institute, 1992-1992, \$14,000.

Data Collection and Organization in Support of an Assessment of the Water Situation in the United States. *Sponsor:* USDA Forest Service, 1991-1992, \$20,000.

Impact Assessment of Urban Return Flow Quality on Agricultural Water Use. *Sponsors:* Colorado Agricultural Experiment Station, Central Colorado Water Conservancy District, Consolidated Ditch Company, Farmers Reservoir and Irrigation Company, and Northern Colorado Water Conservancy District, 1990-1992, \$38,500.

Prototype Federated Water Database System. *Sponsor:* Colorado Water Resources Res. Inst., 1991-1992, \$15,000.

Feasibility of a Water Database for the South Platte River Basin. *Sponsor:* Colorado Water Resources Research Institute, 1990-1991, \$15,000.

Assessment and Enhancement of Computer-Aided Management of Irrigation-Water Distribution. *Sponsor:* Colorado Agricultural Experiment Station, 1989-1992, \$52,000.

Projects as Co-Principal Investigator

Using Remote Sensing Data to Highlight Salinization Patterns Across an Irrigated River Basin in Relation to Contributing Factors. *Sponsor:* Colorado Water Conservation Board, 2023- 2024, \$50,000.

Addressing the Flow Measurement Conundrum to Enhance Agricultural Water Management. *Sponsor:* Colorado Agricultural Experiment Station, 2022- 2025, \$90,000.

Lab and Field Evaluation of Biopolymers to Reduce Seepage in Colorado Irrigation Canals. USGS NIWR via Colorado Water Center, 2022 – 2023, \$9,997.

Developing Best Practices for Managing Canal Seepage Using Biopolymer Sealants. *Sponsor:* Colorado Agricultural Experiment Station, 2020- 2023, \$90,000.

Assessment of Acoustic Flow Measurement Devices Used for Agricultural Water Management. *Sponsor:* Colorado Agricultural Experiment Station, 2019 - 2022, \$90,000.

Enhanced Selenium Characterization and Modeling for the Lower Arkansas River Basin. *Sponsor:* CDPHE, 2017 – 2020, \$270,015.

Relationship Between Irrigation Return Flows, Riparian Vegetation Water Use, and Soluble Pollutant Removal in the Lower Arkansas River Basin. *Sponsor:* Colorado Water Institute, 2019 – 2020, \$50,000.

Impact of Riparian Vegetation on the Irrigation-Influenced Water Balance in the Lower Arkansas River Valley. *Sponsor:* Colorado Agricultural Experiment Station, 2017- 2020, \$90,000.

Improved Assessment of Nitrogen and Phosphorus Fate and Transport for Irrigated Agricultural Watersheds in Semi-Arid Regions. *Sponsor:* USDA NIFA AFRI, 2013 – 2017, \$489,180.

Observing and Modeling Non-Beneficial Evaporative Upflux from Shallow Ground Water under Uncultivated Land in an Irrigated River Valley. *Sponsor:* Colorado Water Resources Research Institute and U. S. Geological Survey, 2008, \$40,000.

Characterizing Non-Beneficial Evaporative Upflux from Shallow Groundwater Under Uncultivated Land in an Irrigated River Valley. *Sponsor:* Colorado Water Resour. Research Institute and U. S. Geol. Survey, 2007, \$49,900.

Toward Successful Pilot Implementation of Strategies for Remediation of a Salinity-Threatened Irrigated Watershed. *Sponsor:* United States Department of Agriculture, 2004-2007, \$495,000.

Monitoring of Irrigation Amount, Timing, and Crop Yield in the Arkansas River Valley. *Sponsor:* Colorado Water Conservation Board, 2004 – 2007, \$270,000

Meeting Time-Dependent Instream Flow Requirements in a Fully Appropriated Multi-State River Basin. *Sponsor:* U. S. Geological Survey, 1998-2000, \$292,000.

Effects of Irrigation with Urban Exchange Waters on Soil and Water Quality. *Sponsor:* Colorado Agricultural Experiment Station, 1997-1999, \$77,600.

Middle East Water: Efficiency of Use in the Agricultural Sector. *Sponsor:* Office of Transnational Security and Technology Issues, 1994-1996, \$66,000.

Initiating a Water Management Decision Support System for the Platte river Basin. *Sponsor:* Colorado Water Resources Research Institute, 1993-1995, \$29,000.

Development of a Resource Management Support System for Irrigated Agriculture. *Sponsor:* National Science Foundation, 1991-1996, \$522,800.

Development of a Dam Safety Database Manag. System. *Sponsor:* U.S. Bureau of Recl., 1990 -1994, \$80,000.

Sediment and Microbial Fouling of Groundwater Recharge Facilities. *Sponsor:* Waterways Experiment Station, U.S. Army Corps of Engineers, 1989-1991, \$250,000.

Consulting Experience (Outside of Colorado State University Contracts)

May 2020 – Present

Expert Consultant

Colorado Springs Utilities

Colorado Springs, Colorado

Evaluated the likely impact of the proposed Lower Arkansas Water Management Assoc. water rights change case, involving Colorado Springs Utilities, on water quality in Colorado's Arkansas River.

February – August 2019

Expert Consultant

Pueblo Board of Water Works

Pueblo, Colorado

Evaluated the likely impact of the proposed Bessemer Canal exchange on water quality in Colorado's Arkansas River.

June 2009

Expert Consultant

Rocky Mountain Environmental

Labor Coalition

Littleton, Colorado

Provided consultation on selenium mobilization, transformation, and transport processes in the stream-aquifer system of the Arkansas River in Colorado.

July 2008 – February 2009
Expert Consultant
Central Mutual Insurance Co. via
Levy, Morse, & Wheeler, PC
Englewood, Colorado

Provided expert testimony on impact of deep percolation from an irrigated field near Golden, Colorado on high ground water, contributing to drainage problems on adjacent developed property.

June 2008
Consultant
Boxelder Sanitation District
Fort Collins, Colorado

Reviewed selenium concentrations and loads in Boxelder Creek and the Cache la Poudre River related to irrigation practices as affecting compliance with regulatory standards.

March – June 2007
Consultant
Pueblo Wastewater
Pueblo, Colorado

Reviewed and evaluated selenium and sulfate loading to the Arkansas River for City of Pueblo testimony to Colorado Water Quality Control Commission Triennial Review.

August – September 2006
Consultant
Greg Lewicki and Assoc.
Parker, Colorado

Reviewed and evaluated computed water surface profiles on the Colorado River for flood plain assessment near Rifle, Colorado.

September 2004 – November 2006
Consultant
ARCADIS & GM, Inc.
Highlands Ranch, Colorado

Advised on monitoring and modeling of irrigation-induced Selenium concentrations in the Arkansas River, in Fountain Creek, and in their alluvial aquifers.

February 2005 – July 2005
Consultant
Riverside Ditch Co.
Buena Vista, Colorado

Advised on estimation of seepage losses and management of irrigation flow deliveries along the Riverside Ditch diverting from the Arkansas River.

April – September 2003
Expert Witness Consultant
Devon Energy, Pennaco

Reviewed appeal of NPDES permit for discharge of coal bed methane well effluent to Wildcat Creek, Wyoming. Advised regarding salinity of the effluent in comparison to salinity of natural flows in the creek and impacts on irrigation diversions.

October 1998 – January 1999
Engineering Consultant
Denver Water Department
Denver, Colorado

Consulted on the suitability of the quality of Denver's exchange waters for agricultural use along the South Platte River.

September 1999
Engineering Consultant
Governance Committee of the
PlatteRiver Coop. Agreement
Cheyenne, Wyoming

Reviewed the Draft Water Conser./Supply Report and evaluated strategic plans for meeting in-stream flow requirements in the Platte River using water reuse, groundwater, and reservoir projects.

October - November 1995
Engineering Consultant
Subcontract to **D'Appolonia**
Environmental Services
Monroeville, Pennsylvania

Consulted on sediment-affected seepage and salinization in the Mendoza River (Argentina) and its serviced irrigation canals. (Executed in Fort Collins, Colorado)

November 1994 - June 1995
Engineering Consultant
Subcontract to **Keller-Bliesner Engrg.**

Consulted on strategic planning for water conservation operations, and integrated water use and efficiency in Egypt's Nile Valley. (Executed in Fresno, Calif. and Fort Collins, Colorado)

December 1993 - January 1994
Engineering Consultant and Trainer
UNDP Project on Automated Oper.
of Irrigation Canal Systems
Central Water & Power Research Station
Pune, India

Provided training and technical advice regarding modeling, regulation, and monitoring of irrigation canal systems.

August - December 1993
Engineering Consultant
Subcontract to **Camp, Dresser**
& McKee, Denver, CO

Consulted on assessment of water quality requirements for agricultural reuse of effluent from Metro Wastewater Reclamation District plant.

July 1991
Engineering Consultant
Subcontract to **USAID**, India
(Executed in Fort Collins, Colorado)

Prepared documents on reconnaissance and data collection for planning and design of subsurface drainage systems for controlling waterlogging and salinization in irrigated agricultural regions.

October - December 1986
Engineering Consultant
USAID Sri Lanka Irrigation Systems
Diagnostic Analysis Project
Colombo, Sri Lanka

Summarized and analyzed data regarding the performance of irrigation-water-delivery systems at project sites and prepared two associated technical reports.

Honors and Awards

Civil and Environmental Engineering Faculty Award for Excellence in Research 2019
Civil and Environmental Engineering Outstanding Faculty Service Award 2017
Best Research Paper Award, *Journal of Irrigation and Drainage Engineering*, ASCE 2015
Borland Chair in Water Resources, Dept. Civil and Environ. Engrg, Colorado State Univ. 2013 – 2016
Civil and Environmental Engineering Outstanding Faculty Performance Award 2014
Civil and Environmental Engineering Faculty Award for Excellence in Research 2008
Civil Engineering Outstanding Faculty Performance Award 2006
Chi Epsilon James M. Robbins Excellence in Teaching Award, Rocky Mountain District 2004
Civil Engineering Faculty Award for Excellence in Teaching 2002
Chi Epsilon Gold Key Award for Best Civil Engineering Professor 2001
Best Research Paper Award, *Journal of Irrigation and Drainage Engineering*, ASCE 1996

Engineering Dean's Council Award for Outstanding Civil Engineering Faculty, Colorado State Univ. 1995
 Member of Tau Beta Pi, Chi Epsilon, Sigma Xi, Alpha Epsilon, Phi Kappa Phi, Mortar Board
 Recipient of Internat. Research Fellowship (1984-1985, 1985-1986), US Agency for Internat. Devel./CSU
Summa Cum Laude Graduate, Louisiana Tech University 1978

Professional Affiliation and Activities

Member, American Society of Civil Engineers (1980 - Present)
 Advisor, Tau Beta Pi, Colorado State University (2013 – 2016)
 Member and Past Chairman, Technical Committee on Planning and Mngmt. of Irrigation and Drainage Systems, Water Resources Engineering Division, American Soc. of Civil Engineers (1990 - 2000)
 Member, U.S. Committee on Irrigation and Drainage (1992 - 2001)
 Member and Past Chairman, Technical Committee on Probabilistic Approaches in Water Resources Engineering, Water Resources Engineering Division, American Society of Civil Engineers (1994 - 2000)
 Assoc. Editor, *J. of Irrigation and Drainage Engineering*, Am. Soc. of Civil Engineers (1994 - 1998)

Teaching and Advising Experience (Colorado State University)

Graduate Courses Taught

CE 514 Hydraulic Structures/Systems
 CE 612 Open-Channel Flow
 CE 635 Quantitative Hydrogeology

Undergraduate Courses Taught

EG 101 Engineering Principles I
 CE 261 Engineering Mechanics: Dynamics
 CE 262 Engineering Mechanics
 CE 300 Fluid Mechanics
 CE 358 Mechanics of Materials for Non-engineers
 CE 401 Hydraulic Engineering
 CE 422 Engineering Hydrology
 CE 423 Groundwater Engineering

Graduate Research Advised and Co-Advised

PhD

Faizal I. W. Rohmat, Ph.D. Summer 2019 (Co-Adviser)	Machine Learning Methods to Facilitate Optimal Water Allocation and Management in Irrigated River Basins to Comply with Water Law
Saman Tavakoli, Ph.D. Summer 2018 (Co-Adviser)	Simulating the Fate and Transport of Salinity Species in a Semi-Arid Agricultural Groundwater System: Model Development and Application
Eric D. Morway, Ph.D. Spring 2014	Regional-Scale Groundwater Flow and Salt Transport Models for Exploring Agro-Environmental Remediation Strategies in an Irrigated River Valley
Ryan T. Bailey, Ph.D. Summer 2012	Regional Selenium Cycling in an Irrigated Agricultural Groundwater System: Conceptualization, Modeling, and Remediation
A. H. Alzairree Ph.D. Spring 2012 (Co-Adviser)	Stochastic Analysis of Flow and Salt Transport in Irrigation-Drainage Systems

Enrique Triana, Ph.D. Spring 2008 (Co-Adviser)	A Spatial Decision Support System for Basin Scale Assessment of Improved Management of Water Quantity and Quality in Stream-Aquifer Systems
J. Philip Burkhalter, Ph.D. Fall 2005	Defining and Engineering Solutions for Agroecological Impacts of Salinity and Waterlogging in an Irrigated River Valley
Pei-Chih Chiang, Ph.D. Summer 2003	Calibrated Stochastic Simulation of River Pollution Control Strategies
Enrique Moncada, Ph.D. Spring 1999	Planning Reservoir Operations with Imprecise Objectives
Muhammad A. Alzahrani, Ph.D. Fall 1995	Stochastic Modeling of Unsteady Open-Channel Flow
L. Gabriel T. de Azevedo, Ph.D. Summer 1994	Integration of Water Quantity and Quality in Multi-Sector River Basin Planning
Samir I. Ahmed, Ph.D. Fall 1992	Hydraulic and Hydrologic Uncertainty in Analysis of Irrigation Delivery System Performance
Abdelmohsen, A. Alshaikh, Ph.D. Fall 1992	Stochastic Optimal Design of Hydraulic Structures in Irrigation-Water-Delivery Systems
Farida A. El-Hessy, Ph.D. Spring 1991	Irrigation and Drainage Management in the Presence of a Saline Shallow Water Table
MS (Thesis)	
Brian D. Craig, M. S. (Co-Adviser)	Exploring the Contribution of Crop Water Use to Remotely-Sensed Estimates of Soil Salinity in Irrigated Agriculture
Joseph E. Pugh, M. S. Summer 2021 (Co-Adviser)	Experimental Investigations for Improving the Accuracy of Flow Measurements in Irrigation Canals
Joseph M. Sinclair, M. S. Summer 2021 (Co-Adviser)	New Insights into Flow Over Sharp-Crested and Pivot Weirs Using Computational Fluid Dynamics
Abdullah B. Javed, M. S. Spring 2020	Modeling the Distribution of Major Salt Ions in Regional Agricultural Groundwater and Surface Water Systems: Model Calibration and Application
Caner Kutlu, M. S. Spring 2019	Calibration and Uncertainty of a Head-Discharge Relationship for Overshot Gates Under Field Conditions

<p>Ibraheem Qurban, M. S. Summer 2018 (Co-Adviser)</p>	<p>Finding Water Management Practices to Reduce Selenium and Nitrate Concentrations in the Irrigated Stream-Aquifer System Along the Lower Reach of Colorado's Arkansas River Valley</p>
<p>Christopher D. Shultz, M. S. Fall 2017</p>	<p>Finding Land and Water Management Practices to Reduce Selenium and Nitrate Concentrations in an Agricultural River Valley Applying a Regional-Scale Stream-Aquifer Model</p>
<p>Miles B. Daly, M. S. Spring 2017 (Co-Adviser)</p>	<p>Occurrence and Transport of Salinity and Selenium in a Irrigated Agricultural System with Subsurface Drainage</p>
<p>Erica C. Romero, M. S. Fall 2016</p>	<p>Analysis of Selenium Cycling and Remediation in the Lower Arkansas River Valley, Colorado Using Field Methods and Numerical Modeling</p>
<p>Brent E. Heesemann, M. S. Fall 2016</p>	<p>Assessing Best Management Practices for the Remediation of Selenium in Surface Water in an Irrigated Agricultural River Valley: Sampling, Modeling, and Multi-Criteria Decision Analysis</p>
<p>David A. Criswell, M. S. Fall 2016</p>	<p>Assessing Irrigation-Influenced Groundwater Flow and Transport Pathways Along a Reach of the Arkansas River in Colorado</p>
<p>Chad A. Martin, M. S. Spring 2015</p>	<p>Uncertainty in Measuring Seepage from Earthen Irrigation Canals Using the Inflow-Outflow Method and in Evaluating the Effectiveness of Polyacrylamide Applications for Seepage Reduction</p>
<p>Alexander P. Huizenga, M. S. Spring 2015 (Co-Adviser)</p>	<p>Monitoring Groundwater-Surface Water Interaction and Nutrient Mass Exchange in the Riparian Corridor of the Lower Arkansas River Valley, Colorado</p>
<p>Cale A. Mages, M. S. Fall 2014</p>	<p>Comparison of the Glover-Balmer Solution with a Calibrated Groundwater Model to Estimate Aquifer-Stream Interactions in an Irrigated Alluvial Valley</p>
<p>Brent M. Cody, M.S. Fall 2010</p>	<p>Sources, Occurrence, and Mobilization of Selenium in Colorado's Lower Arkansas River Valley</p>
<p>Joseph P. Donnelly, M.S. Spring 2005</p>	<p>Assessing Irrigation-Induced Selenium and Iron in the Lower Arkansas River Valley in Colorado</p>
<p>Daniel J. Gillham, M.S. Spring 2004 (Co-Adviser)</p>	<p>Data and Modeling of Irrigated Fields with Saline High Water Tables</p>
<p>Daniel L. Buhman, M.S. Spring 2001</p>	<p>Stochastic Variability in Fluvial Hydraulic Geometry and Correspondence with Geomorphologic Variables</p>

William J. Owen, M.S. Spring 1996	Uncertainty in Assessment of Subjective Reservoir Management Objectives
Lisa Poppenga, M.S. Fall 1994	Statistical and Expert System Components of a Decision Support System for Dam Safety Evaluation
William C. Haskell, M.S. Fall 1994	Statistical Characterization of Seepage Losses in Open Channels
Perry Eisenach, M.S. Spring 1994	Strategies to Monitor Water Quality in Irrigated Agricultural Systems in Colorado
Essam A. Khalifa, M.S. Spring 1992	Enhancement of Hydraulic Analysis and User Interface for an Irrigation Canal Network Model
Walter E. Heyder, M.S. Summer 1991	Multicriterion Strategic Planning for Irrigation Water Delivery System Improvement

MS (Non-Thesis)

1988 – 2021: 21 Students graduated

Special Training Courses Conducted

Administrative Director and Trainer

Short course on Automated Control of Irrigation Canals, Colorado Institute for Irrigation Management -- April - June, 1996

Training Director

Short course on Hydraulic Modeling of Irrigation Canal Systems, Colorado Institute for Irrigation Management -- April - May, 1996

Administrative Director and Trainer

Short course on Performance and Evaluation of Irrigation Systems, Colorado Institute for Irrigation Management -- September, 1995

Administrative Director

Short course on Water Treatment Management, International School for Water Resources -- March, 1995

Training Co-Director

Short course on Modeling, Regulation and Monitoring of Irrigation Canal Systems, Central Water and Power Research Station -- Pune, India, January, 1994

Training Director

Short course on Rehabilitation of Irrigation-Water-Delivery Systems, Inter. School for Water Resour. -- May, 1993

Training Director

Short course on Modeling, Regulation and Monitoring of Irrigation-Water-Delivery Systems, Colorado Institute for Irrigation Management -- February, 1993

Training Director

Short course on Drainage and Salinity Control of Irrigated Lands, Colorado Institute for Irrigation Management -- September, 1992

Training Director

Short course on Modeling and Evaluation of Irrigation-Water-Delivery Systems, Colorado Institute for Irrigation Management -- June - July, 1991

Training Director

Special Course on Analysis and Modeling of Groundwater Flow, International School for Water Resources -- January - May, 1989

Instructor

USDA International Short Course on Irrigation Systems Management -- June, 1988; June, 1989

Instructor

Short course on Conjunctive Use of Groundwater and Surface Water for Irrigation Systems, Colorado Institute for Irrigation Management -- May, 1988; May, 1989

Timothy K. Gates

Professional Publications

Refereed Articles (in order of publication)

*** indicates graduate student advisee of T. K. Gates where subject of paper is based upon graduate work

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3. Grismer, M.E., and **Gates, T.K.** 1988. "Estimating saline water table contributions to crop water use". *California Agriculture*, 42(2): 23-24.
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5. **Gates, T.K.**, and Grismer, M.E. 1989. "Irrigation and drainage strategies in salinity-affected regions". *Journal of Irrigation and Drainage Engineering*, 115(2): 255-284.
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7. Molden, D.J., and **Gates, T.K.** 1990. "Performance measures for evaluation of irrigation-water - delivery systems". *Journal of Irrigation and Drainage Engineering*, 116(6): 804-823.
8. Mankarious, W.F., **Gates, T.K.**, and Rady, M.A.H. 1991. "Irrigation of small-level basins in Egypt". *Journal of Irrigation and Drainage Engineering*, 117(3): 361-376.
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16. Warner, J.W., **Gates, T.K.**, Namvargolian, R., Miller P. and Comes, G. 1994. "Sediment and microbial fouling of experimental groundwater recharge trenches". *Journal of Contaminant Hydrology*, 15(4): 321-344.
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Lund, A. A. R. *, Scalia, J., and **Gates, T. K.** (2024). "Toward identifying biopolymer sealants for effective canal seepage control." To be submitted to *Agric. Water Mgmt.* (Jan 2024).

Tavakoli Kivi, S., **Gates, T. K.**, Bailey, R. T., and Qurban, I. * "Assessing the effect of reduced soil salinity on evapotranspiration and crop yield over an irrigated region." To be submitted to *J. Hydrology.*

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