

Decision Analysis Working Group

Version 1-28-13

Purpose and Scope

The Decision Analysis Working Group is tasked with reviewing the framework of the decision analysis and with vetting data and assumptions to be included within it. It is intended to be a small team of experts with significant academic and/or career experience related to decision analysis and risk assessment. The city has hired a decision analysis consultant who will be providing overall project guidance, and this group would both evaluate aspects of that consultant's work and carry out aspects of it by providing research support and expert feedback. This group may help prepare materials for and/or review materials from the other working groups, who are the subject matter experts in their relevant project areas. This group will not be discussing assumptions and strategies related to acquisition of assets or stranded costs as these topics are confidential and privileged attorney-client matters.

WORK PRODUCT:

The work products for this group are primarily based on review and research. This group will review materials for the working groups and from the decision analysis consultant. The outputs from this group will be used to inform the decision analysis model, which will be either probabilistic analysis software or augmented financial model.

Working Group Meetings

This group will meet formally approximately three times from December through March. Other tasks and updates in between meetings will take place via e-mail and through the Basecamp web application.

Current Working Group Members

COMMUNITY MEMBERS

Pete Baston – IDEAS, LLC
Tom Feiler – Clipper Windpower, Inc.
David Kline – National Renewable Energy Laboratory
Tom Leifer – QI Path
Frank Selto – University of Colorado
Zane Selvans – Clean Energy Action
JoAnn Silverstein – University of Colorado
Edith Zagona – University of Colorado

CONSULTANTS

Greg Hamm – Stratelytics, LLC

STAFF

Heather Bailey – Executive Director of Energy Strategy and Electric Utility Development

Kelly Crandall – Sustainability Specialist
Sarah Huntley – Media Relations/Communications Coordinator

Working Group Member Bios

PETE BASTON

Pete, the founder of IDEAS, is a Senior Executive Consultant with over 25 years of Quality Assurance experience at the highest level of operations. This experience encompasses:

- Immersion in best practices and workflow deployment using advanced digital technology systems for business development, business turnaround and risk management
- Due diligence for financial institutions, foundations and re-insurance companies
- Project development and best practices implementation in multiple industries including energy systems, engineering and construction, manufacturing, healthcare, petrochemical, information technology, telecommunications, and many more.

Pete was born in England and raised from the age of four in Rhodesia, Africa. He served intermittently as a conscript in a logistics and transport division of the Rhodesian citizen army from 1965 to 1979. During that time, he acquired four college degrees and formed his first business, an independent subsidiary of the Ajax Group, a Rhodesia-based commercial and military construction conglomerate. His consulting firm was the chief troubleshooter and quality assurance auditor for the conglomerate, resolving engineering, project management and materials acquisition problems. In 1975, Peter Baston Consulting established a subsidiary in South Africa, which expanded its client base to include a number of South African and international clients, including Fluor, Soros, Maurabeni, Hyundai, Asea Brown Boveri, Bechtel and others. At the same time, its project base expanded to include design and construction of petrochemical and power plants as well as large commercial structures.

His experience in Africa, where a shortage of resources absolutely required that engineering projects be done right the first time because there were no additional funds available to correct mistakes, gave Pete an enduring passion for “doing it right in the real world” and a reputation for accomplishing the seemingly impossible with minimal resources. Shuttling between England and Africa, he often says, meant learning to operate in perfectly opposed environments: how to get nothing done with lots of resources, or how to get everything done with minimal resources. This has translated into a life-long commitment to Quality Assurance as applied engineering. For Pete, Quality Assurance is the anchor for everything that a company does, and the key to consistent and enduring profitability. Deming’s 14 points are the manifesto that has accompanied him all over the world, and which he has integrated into field implementation and operations on every project he’s managed.

In 1979, with Rhodesia fast descending into political, military and economic chaos, Peter left Rhodesia with what he was allowed to carry out: \$1,000 in cash and two suitcases. After a year and a half doing free-lance consulting throughout Europe, Pete was recruited to the US by the California division of Fluor Engineering to provide Quality Assurance oversight and expertise on assignment to a variety of teams. For a number of years he served as a troubleshooter and market development consultant for the Fluor Power Services Division and its research arm, Buildings of

the Future, as well as for Nation's Bank. In this capacity, he was certified as a quality auditor and performed due diligence reviews and construction project audits on billion dollar construction projects. After the oil market crash, his assignment expanded from servicing petrochemical and power plants to creating and marketing new, advanced products and services for Fortune 500 companies in a broad variety of industries. He developed and implemented the US marketing, design and deployment strategy for newly-formed subsidiary J.M. Group, incorporating rigorous Quality Assurance practices to protect profitability and taking the subsidiary from \$0 to \$232M annual sales in three years. In 1986, Pete founded his own manufacturing, design and service firm, Monkradle, to develop, manufacture and market advanced support equipment and systems to promote best practices and Quality Assurance in the utility, petrochemical, aerospace, civil engineering, defense and other industries.

In the early 1990s, as it became apparent that computers and information technology would eventually drive Quality Assurance and all of the industrial design and maintenance industry, he sold his company and took an extended sabbatical to learn digital technology from the ground up at the University of California San Diego, Northwestern University, the University of British Columbia and MIT. Pete pursued an independent and eclectic course of studies that eventually led to a list of technical certifications as long as his arm. In 1996, on a visit to Los Alamos National Labs and the Santa Fe Institute, he decided to settle in New Mexico. Over the following decade, Pete took on a number of large technical concept development, Quality Assurance and problem-solving projects with government agencies and private companies. In 2010, IDEAS moved its base of operations to Boulder, Colorado, a center for development of the most advanced parametric technology in the world. Pete believes parametric technology will be the cornerstone for future development of advanced best practices using digital workflow. IDEAS is already developing this type of technology as part of its integrated intelligent QA management systems (*iQA*TM).

Pete is a frequent speaker and lecturer on Quality Assurance and the integration of technology into QA and business systems.

TOM FEILER

EMPLOYMENT HISTORY

- Director, Business Development, Clipper Windpower, Inc., 2002-present
- Managing Director of Research and Consulting, Rocky Mountain Institute, 1999 - 2002
- Independent Consultant, Feiler and Associates, Boulder, CO, 1993-1999
- Senior Consultant, Cambridge Energy Research Associates, Inc., Cambridge, MA, 1990-1993
- Associate, Cambridge Energy Research Associates, Inc., Cambridge, MA, 1988-1990
- Energy and Utility Analyst, The Energy and Environmental Policy Center, Harvard University, Cambridge, MA, 1987-1988
- Teaching Fellow, Harvard University, Cambridge, MA, 1987-1988

EDUCATION

- The Fletcher School of Law and Diplomacy, MA, Law and Diplomacy, 1987
- University of Denver, BA, Political Science, 1984

- University of Denver, BA, Philosophy, 1984

PROFESSIONAL EXPERIENCE

Mr. Feiler leads Clipper Windpower's development activities in the Midwest United States. He manages a portfolio of more than 8,000 MW of assets. He is responsible for all activities associated with the origination and development processes including: market analysis, prospecting, land acquisition, wind resource assessment, transmission planning, siting and permitting, customer relations, and sales. Mr. Feiler also has broad responsibilities in turbine marketing and sales including strategic business planning, market and customer intelligence, government relations, and regulatory affairs.

Nationally recognized as an expert on energy policy, Mr. Feiler is a frequent speaker and author of many publications related to the electric power, natural gas, and other regulated industries, including strategic planning, industry trends, regulatory policy analysis, market developments, risk analysis, integrated resource planning, and technology development. He has also provided expert testimony and litigation support to a number of state and federal government agencies including the United States Senate and the Federal Energy Regulatory Commission. Mr. Feiler was recognized by *The Economist* for having co-authored "The Economist 2002 Book of the Year" *Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size*.

SELECTED CONSULTING PROJECTS

Ford/GE Plug Power. Mr. Feiler led a team of engineers, economists, and regulatory experts to develop the business model for fuel cell-based electricity generators in distributed applications. The analysis included detailed computer simulation modeling of electricity distribution systems, financial modeling of "options" values for electric energy and capacity, engineering cost savings, product design, utility grid interconnection, power electronics for generation and load control, and internet-based network systems for integration.

Optima Energy: For the largest electric generating company in Australia, Mr. Feiler designed and implemented pool-based bidding strategies, including design of sophisticated bulk power market simulation models, financial planning, and resource optimization models. Recent evidence from all pool-based bulk power markets, as well as other competitive commodity markets, was used to design scenarios for sensitivity analysis and financial planning.

AEP Resources: Mr. Feiler conducted a market valuation study of the hydroelectric generating resources that were privatized by the Federal government of Brazil.

Author of ***Retail Power Market in the U.S.***, featured prominently in Congressional and Administration policy discussions regarding costs of electric industry restructuring – cited on the front page of the *Wall Street Journal*. The study provided an in-depth assessment of retail and wholesale electricity markets, estimated the potential stranded investment for all 3,200 electric utilities, and analyzed which electric utility companies will be competitively positioned and which will be vulnerable in more open and competitive markets.

Transmission Markets in the United States. Authored an in-depth analysis of the transmission network in North America and how transmission costs and constraints will affect the competitive markets for electricity.

City of San Francisco: Led team in preparing a comprehensive “energy resource investment strategy” (ERIS). The Strategy was used to guide long-term energy initiatives, including municipalization of the electric distribution utility, as well as the expenditure of the \$100 million renewable energy bond fund. The Strategy prioritized the City’s electric resource options based on cost, performance and environmental impact.

PUBLIC POLICY AND REGULATION

United States Senate. Mr. Feiler managed the *National Energy Policy Initiative* to help break the impasse on national energy policy and develop a stakeholder-based national energy policy. The Initiative convened a highly respected and diverse group of national energy industry executives, government leaders and policy experts to develop a set of guiding principles, overarching objectives, and specific policy proposals to deliver to the American people the desired energy services in ways that are secure, reliable, affordable, safe, clean, and fair. The effort is cosponsored by senior Democratic and Republican leaders in Congress.

State Legislatures of Colorado and Alaska. Mr. Feiler conducted independent studies of the economic, legal, and regulatory issues associated with restructuring the electric power industries in each state. These comprehensive studies analyzed a broad range of issues including affordability, universal service, employment, taxes and fees, stranded investment, access to transmission and distribution facilities, service quality standards, renewable energy sources and the environment, and impacts on rural communities and customers.

PUBLICATIONS

- Small is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size, RMI, 2002.
- Cleaner Energy, Greener Profits: Fuel Cells as Cost-Effective Distributed Energy Resources, Rocky Mountain Institute, 2001.
- The New Playing Field for HVAC Services, E Source, 1998.
- Protecting Consumers in Deregulated Markets, The Competition Policy Institute, 1997.
- A New Era of Competition in Gas Markets, The Interstate Natural Gas Association of America Foundation, 1996.
- Energy Choices in a Competitive Era, Center for Energy and Economic Development, 1995.
- Transmission Markets in the U.S. 1995. Resource Data International, Inc., October.
- The Competitive Effects of Restructuring. 1995. *Electric Utility Fortnightly*, July 15.
- Finding Success after Utility Deregulation. 1995. *Coal Magazine*, April.
- Electric Stranded Investment: Not as Much as You Think. 1995. *Public Utilities Fortnightly*, January 15.
- Retail Power Markets in the U.S. 1994. Resource Data International, Inc., December.
- The New Era of Competition Could Cost Billions. 1994. *Coal Magazine*, September.
- Utility Coal-Supply Contracts Could Strand Billions. 1994. *Public Utilities Fortnightly*, September 15.

- Bright Future for Coal Power in the West. 1994. *Public Utilities Fortnightly*, July 15.
- Power-Purchase Contracts Could Strand Billions. 1994. *Public Utilities Fortnightly*, November 15.
- Breaking the Future Trap: Strategic Planning in an Uncertain Future. 1993. Electric Power Research Institute.
- North American Electric Power Trends. 1992. Cambridge Energy Research Associates and Arthur Andersen Worldwide Organization.
- European Electric Power Trends. 1992. Cambridge Energy Research Associates and Arthur Andersen Worldwide Organization.
- Quiet Revolution: Integrated Resource Planning and the Future of U.S. Electric Power. 1992. Cambridge Energy Research Associates.
- Integrated Resource Planning Practices: State-by-State Variations. 1992. Cambridge Energy Research Associates.
- The Generation Gap: Electric Power and Natural Gas in the 1990s. 1991. Cambridge Energy Research Associates.
- Lightening the Load: The Electric Power Industry and Demand-Side Management. 1991. Cambridge Energy Research Associates.
- The Bull Market for Gas Turbines. 1991. Cambridge Energy Research Associates.
- A Nuclear Power Renaissance in the U.S.? Opportunities and Obstacles. 1991. Cambridge Energy Research Associates.
- European Electric Power Trends. 1991. Cambridge Energy Research Associates and Arthur Andersen Worldwide Organization.
- Warning Light: New England and the Electricity Future. 1990. Cambridge Energy Research Associates.
- Electric Power Trends. 1989. Cambridge Energy Research Associates and Arthur Andersen Worldwide Organization.

DAVID KLINE

David M. Kline, Ph.D. has more than thirty years experience in the analysis of public policy toward energy research and development, demonstration and deployment, focusing for the last 21 years on renewable energy technologies at the National Renewable Energy Laboratory (NREL). Since 1999, his work has focused on market-oriented strategies for the transfer of clean energy technologies from developed to developing countries. He currently works primarily with partners in China, where he manages a portfolio of cooperative projects on renewable energy policy, planning, deployment, technology development, and standards. He has published and presented extensively on public policy on renewable energy, technology change and adoption, oil markets, and natural gas transportation networks. David also manages the Markets and Policy Impacts Analysis Group, which provides a wide range of analysis to support energy decision makers in the U.S. and abroad.

Prior to NREL, David led natural gas planning and forecasting for the California Energy Commission (CEC), where he coordinated a large-scale energy modeling effort to inform California Public Utility Commission policy on natural gas transmission into the state. He served as one of CEC's expert witnesses in the relevant docket, which was decided in favor of the position advocated by CEC.

David holds a BA in Mathematics, and an MS and Ph.D. in Management Science and Engineering from Stanford University, where his research focused on the resource economics of world oil markets.

David participates on the Decision Analysis working group as a private citizen. None of his contributions should be construed as reflecting the opinions or analysis of NREL or any other organization.

TOM LEIFER

Tom founded QI Path originally in 2003. He designed the QI Path FMEA system while conducting improvement projects as a consultant for a hospital client in Colorado in 2006. With more than 20 years of professional experience in strategy development, systems design and process improvement, Tom has applied his drive, energy and cross-industry experience to improving quality and safety in healthcare since 2002. He has held management positions at Thomson Micromedex (now Thomson Reuters), DigitalMed, Inc. (a Tenet Healthcare company), and Qwest Communications. His recent engagements include work with hospitals and health systems in Massachusetts, New York, Pennsylvania, Colorado, Oregon and California.

FRANK SELTO

Frank Selto is Professor of accounting at the University of Colorado, Boulder, where he has taught management accounting at all levels since 1985. He earned BSME, MSME, MBA and PhD degrees – before the availability of personal computers. His first computer was an Apple II, and he still prefers Apple products.

His teaching always includes a heavy use of spreadsheet modeling and analysis. He is a co-author of an intermediate level cost management text (McGraw-Hill) that has been adopted internationally. He is a co-author of an advanced management accounting text that is in production (Pearson Ed). He has published widely in areas of management accounting in leading international academic and professional journals. He has served on several editorial review boards. He has consulted with leading (and some lagging) industrial firms, entrepreneurs, colleges, and citizen groups in areas of costing, management control, balanced scorecards, and financial feasibility.

ZANE SELVANS

EXPERIENCE

2012-2013 Clean Energy Action Boulder, CO

Assistant Research Director

- Research state and local policy options related to energy and climate change, including financing for building energy efficiency, carbon taxes, and feed-in-tariffs for renewable energy generation.

- Communication of energy policy options, climate science, and issues related to the legislative and regulatory environment to the public and policymakers.

2012-2013 City of Boulder Boulder, CO

Transportation Advisory Board Member

- Advise Boulder City Council on matters related to transportation.
- Research and outreach related to the implementation of a maintenance fee to fund operations and maintenance of the city's transportation infrastructure.
- Explore possible revisions to city-wide parking policies and goals.
- Participate in the revision of the city's Transportation Master Plan.

2011-2012 Selvans Analytics, LLC Boulder, CO

Chief Scientist

- Public education and outreach in support of the Boulder Light and Power ballot initiatives. Participated in debates and discussion fora, contributed editorials and online commentary.
- Performed coal cost modeling and analysis for Bardwell Consulting in support of various Colorado Public Utility Commission (CPUC) dockets. Used USGS, US EIA data, CPUC filings and spreadsheet-based models to evaluate and analyze Xcel Energy resource plans.

2010-2013 Community Cycles Boulder, CO

Volunteer Instructor and Facilitator, Advocacy Committee Member

- Taught workshops on a variety of utilitarian cycling topics including winter cycling and bicycle touring.
- Repaired donated bicycles for sale in the Community Cycles showroom.
- Provided mechanical guidance to members working on their own bicycles in the shop.
- Back-end technical support of the Community Cycles website.
- Repaired bicycles for children in low-income neighborhoods throughout Boulder as part of the Rolling Bicycle Clinics program.
- Attended public meetings and design charettes representing the organization and Boulder cyclists in general.

2002-2009 Laboratory for Atmospheric and Space Physics Boulder, CO

Research Assistant

- Investigated the history of tidally-induced tectonics on icy satellites in the outer solar system.
- Created digital maps of geologic features on Jupiter's moon Europa based on imaging from NASA's Galileo spacecraft.
- Developed a closed-form model of Europa's frequency-dependent response to a time-varying gravitational potential, treating the icy shell as a Maxwell viscoelastic material.
- Tested the statistical significance of geometric correlations between tectonic features and tidal stresses using Monte Carlo methods and a specialized metric of shape similarity based on the Hausdorff distance.

- Devised novel algorithms for inferring temporal relationships within complex networks of intersecting geologic units, representing the mapped units and their ambiguous superposition relations as weighted directed acyclic graphs.
- Prepared and delivered oral and graphical presentations summarizing research at professional meetings as well as at smaller departmental seminars and colloquia.
- Provided support and documentation for software releases.
- Provided text, analysis and figures in support of successful NASA grant proposals.

2003-2004 Boulder Housing Coalition Boulder, CO

Board Member

- Played an advising role, representing persons interested in market-rate equity housing cooperatives.
- During this period the board oversaw the successful acquisition of the organization's second property, financed with tax-exempt bonds valued at over one million dollars, issued in cooperation with the City of Boulder.

EDUCATION

- **2002-2009 Ph.D., University of Colorado Boulder, CO:** *Geological Sciences*
- **1993-1998 B.S., California Institute of Technology Pasadena, CA:** *Engineering & Applied Science*

SKILLS

- Programming in Python and C. Scripting in Perl and Unix shells.
- Familiar with object-oriented design principles.
- Scientific computation including Monte Carlo statistical sampling, efficient multi-dimensional parameter space search, vectorized calculation, heuristic graph algorithms, construction of heuristic fitness functions.
- Quantitative analysis using Scientific Python. Plotting and data visualization with Matplotlib. Network analysis using NetworkX.
- Mathematical background including calculus, linear algebra, ordinary and partial differential equations, graph theory, probability and statistics.
- Broad background in the physical and earth sciences including thermodynamics, geophysics, cosmochemistry, atmospheric physics, isotopic geochemistry.
- Mapping and geospatial analysis using ESRI ArcGIS, qGIS and the open source geospatial (OSGEO) libraries.
- Communication of technical and quantitative concepts to both expert and lay audiences, through writing, presentations, and hands-on workshops.
- Financial modeling employing concepts such as discounted cash flows, net present value, internal rates of return, portfolio asset allocation, efficient frontiers, decision trees and real options pricing.
- Basic fluency in spoken and written Spanish.

JOANN SILVERSTEIN

JoAnn Silverstein is Professor in the Department of Civil, Environmental, and Architectural Engineering at UCB, Director of the Program in Environmental Design, and Director of the Residential Academic Program, Sustainable by Design. She has received a BA degree in Psychology (Stanford University), BS, MS and Ph.D. degrees in Civil Engineering from the University of California at Davis. Dr. Silverstein came to UCB as an Assistant Professor in 1982, and her research and teaching area is Civil/Environmental Engineering. She has taught 20 different courses from freshman to advanced graduate level on these topics and carried out more than 25 funded research projects focused on the application of microbial processes to remove contaminants from water and wastewater, treat wastewater for beneficial reuse, and restore damaged environmental sites. She and her students have developed statistical methods for evaluating reliability and resilience of wastewater treatment systems and methods for comparison of centralized and decentralized wastewater collection and treatment facility networks. Dr. Silverstein participated in the development of a new graduate certificate in Civil Engineering at CU, "Managing Water Utilities." Dr. Silverstein has written over 60 articles in refereed journals, proceedings, and books and has advised 24 Ph.D. students who have graduated since 1989, 13 of whom now hold academic positions in the US, Korea, Turkey, Saudi Arabia, and Kuwait. She currently serves on Executive Committee of the Mortenson Center in Engineering for Developing Communities, the Research Advisory Board of the National Water Research Institute, and is a member of the American Academy of Environmental Engineers.

EDITH ZAGONA

Research Professor, Department of Civil, Environmental and Architectural Engineering
Director, Center for Advanced Decision Support for Water and Environmental Systems
University of Colorado

EDUCATION

- University of Colorado, Boulder, CO: Ph.D. in Civil and Environmental Engineering, 1992, Water Resources concentration.
- Colorado State University, Ft. Collins, CO: M.S., Civil Engineering, 1983: Hydraulics concentration.
- University of Arizona, Tucson, Arizona: B.S. Civil Engineering 1978 ; B.A. Philosophy, 1975

PROFESSIONAL APPOINTMENTS

- Research Professor, Department of Civil, Environmental and Architectural Engineering, University of Colorado. Appointed 2010.
- Director, Center for Advanced Decision Support for Water and Environmental Systems, Department of Civil, Environmental and Architectural Engineering, College of Engineering and Applied Sciences, University of Colorado at Boulder (CU-CADSWES), 2001 to present.
- Research Associate, CU-CADSWES, 1992-2000
- Professional Research Assistant, CU-CADSWES, 1989-1992
- Graduate Research Assistant, CU-CADSWES, 1988-1989

- U.S. Bureau of Reclamation Design and Planning Coordinator, Central Arizona Projects Office, 1986-87
- U.S. Bureau of Reclamation Hydraulic Engineer, Engineering and Research Center, 1978-84

PROFESSIONAL ACCOMPLISHMENTS

Specialist in development of decision support tools for water resources management. PI and principal inventor of RiverWare®, used by major water resources management, consultants and institutions for managing river and reservoir systems. Extensive experience in needs analysis, design, development, testing and deployment of DSS tools for river and reservoir management with TVA, Bureau of Reclamation and U.S. Army Corps of Engineers, the three largest water management agencies in the U.S. Experience with development of training materials for DSS tools, and training managers and end users. Hands-on software and model development; use of many existing modeling tools; management of software development by team of professional developers. Advisor to modelers and managers of river systems in U.S. and abroad.

Development of DSS tools for hydropower modeling and optimization of hydropower scheduling for large utilities. Director of academic research center and lead investigator for \$1.5 million per year contracts and grants; collaborations with other faculty and guidance of graduate student research projects. Developing and teaching technical classes at University. Several years experience as hydraulic engineer in public sector and experience with design of large projects and public involvement in large projects. Technical advisor to Nile Basin Initiative DSS. Member of DOE Peer Review Panel for Wind and Water Power Program.

TEACHING

- **Academic Courses:** Applied Fluid Mechanics, Open Channel Hydraulics, Dam Engineering, Water Resources Development
- **Outreach Courses:** RiverWare training courses, taught at CADSWES and elsewhere; reservoir management, a senior-level course using RiverWare

GRADUATE STUDENT RESEARCH

Directed or co-directed graduate student research on following topics: A methodology for assessing the value of integrating hydropower and wind generation; Midterm Probabilistic Forecasting in the Colorado River Basin; Future Reliability of Environmental Flows in the Colorado River Basin; Modeling Groundwater-surface water interactions in an operational setting by linking RiverWare and Modflow; Intra-annual to inter-decadal variability in the Upper Colorado hydroclimatology: diagnosis, forecasting and implications for water resources management; Analysis of coordinated operation of Lakes Powell and Mead under low reservoir conditions; Network stochastic programming for valuing reservoir storage; Interannual variability of the North American Monsoon Hydroclimate and application to water management in the Pecos River basin; Using large-scale climate information to forecast seasonal streamflow in the Truckee and Carson Rivers; An operations model for temperature management in the Truckee River below Reno.

SELECTED PUBLICATIONS AND SOFTWARE

- Magee, T., M. Clement and E. Zagona, RiverWare Model Development for Integrated Hydropower and Wind Generation Analysis on the Columbia Basin, Final Report to UT-Battelle/Oakridge National Laboratory, December, 2011.
- Zagona, E., (PI and principal inventor), W. Oakley, T. Magee, P. Lynn, P. Weinstein, D. Neumann, N. Wilson, RiverWare® software, copyrighted, and licensed through the University of Colorado Office of Technology Transfer, copyright 1998-2012. <http://cadswe.colorado.edu/riverware>.
- Regonda, S., E. Zagona and B. Rajagopalan, Prototype Decision Support System for Operations on the Gunnison Basin with Improved Forecasts, *J Water Resources Planning and Management*, 137 (5), 2011.
- Nowak, K., B. Rajagopalan and E. Zagona, Wavelet Auto-Regressive Method (WARM) for multi-site streamflow simulation of data with non-stationary spectra, *Journal of Hydrology*, 410 (1-2) 1-12, 2011.
- Valerio, A., H. Rajaram and E. Zagona, Incorporating groundwater-surface water interaction into river management models, *Groundwater*, 48 (5): 661-673, 2010.
- Zagona, Magee, Frevert, Fulp, Goranflo and Cotter. RiverWare. Chp 21 of Watershed Models, edited by V.Singh and D. Frevert, CRC Press, 2005.
- Zagona, E.A., Fulp, T.J., Shane, R., Magee, T. and Goranflo, H.M “RiverWare: A Generalized tool For Complex Reservoir System Modeling,” *J Am Water Resources Assoc*, AWRA 37(4):913-929, 2001.
- Zagona, E., Balaji, R., Setzer, S., RiverWare Decision Support Tools for Planning Sustainable River Development with Hydropower.” In *Proceedings of the High-level International Forum on Water Resources and Hydropower*, October 16-18, Ministry of Water Resources, Beijing, China. 2008.
- Neumann, D. W., Zagona, E. A., and Rajagopalan, B., A Decision Support System to Manage Summer Stream Temperatures. *Journal of the American Water Resources Association*,42(5):1275-1284, 2006.
- Carron, J., E. Zagona, and T. Fulp (2006), Modeling Uncertainty in an Object-Oriented Reservoir Operations Model, *Journal of Irrigation & Drainage Engineering*, 132 (2): 104-111.
- Frevert, D., T. Fulp, E. Zagona, G. Leavesley, and Harry Lins (2006), Watershed and River Systems Management Program - An Overview of Capabilities, *J of Irrigation & Drainage Engr*, 132(2): 92-97.

PROFESSIONAL AFFILIATIONS AND MEMBERSHIPS

- American Geophysical Union, American Society of Civil Engineers, American Water Resources Association, Colorado Foundation for Water Education, Colorado River Water Users Association , International Water Resources Association, Universities Council on Water Resources

PROFESSIONAL REGISTRATION State of Colorado, since 1983.