DEBORAH L. HATHAWAY

Hydrologist

AREAS OF EXPERTISE

- Regional Water Supply Assessment
- Groundwater Models for Problem-Solving
- Water Rights Evaluations
- Surface-Water/Groundwater Interaction
- Riparian Zone Hydrology
- Environmental Assessment, Remediation

SUMMARY OF QUALIFICATIONS

Ms. Hathaway manages and conducts hydrologic investigations involving groundwater, water-supply development, water rights, irrigation hydrology, riparian and in-stream flow conditions, contaminant transport, and groundwater remediation, including providing technical support on these issues for litigation. Her quantitative water-resource evaluations have involved groundwater modeling, regional and basin-scale water budget analysis, conjunctive use modeling, water supply alternatives analysis, probabilistic analysis of surface-water supplies; and field investigations design. Ms. Hathaway's remedial investigation, design, and construction projects have included evaluation of the source, extent, fate and transport, and potential receptors of environmental contamination; selection of remedial approach; assessment of soil and groundwater remedial options; oversight of remediation; and performance evaluation during system operation.

Ms. Hathaway has provided expert testimony regarding surface-water and groundwater issues. She has conducted QA/QC and peer reviews, has led stakeholder workshops, and has provided public presentations on water resource and water supply matters.

YEARS OF EXPERIENCE: 30+

EDUCATION

MS, Civil Engineering (Hydrology and Water Resources), Colorado State University,1982
MA, Secondary Education, Science University of New Mexico, 1977
BA, Spanish Literature, University of Colorado, 2009
BA, St. John's College, Santa Fe, 1974

REGISTRATIONS

Professional Engineer
Colorado No. 31578
New Mexico No. 10150
Certified Professional Hydrologist
American Institute of Hydrology, No. 966

PROFESSIONAL HISTORY

S.S. Papadopulos & Associates, Inc., Vice President, 1994 to present; Senior Hydrologist, 1988–1994
University of Colorado, Instructor, Fall 2003, Geology 3030, *Introduction to Hydrogeology*
New Mexico State Engineer Office, Technical Division, 1984–1988
Water Rights Division, 1982–1984
U.S. Geological Survey, Water Resources Division, 1979–1981

REPRESENTATIVE EXPERIENCE

S.S. Papadopulos & Associates, Inc., Boulder, CO

WATER RESOURCE AND WATER SUPPLY ANALYSIS, PLANNING AND MANAGEMENT; LITIGATION SUPPORT

- **Hydrologic Support to the New Mexico Interstate Stream Commission (NMISC):** *Served as Program Manager for multiple surface-water and groundwater evaluations along the Rio Grande. Projects include:*
  - ***Analysis of NEPA Water Operations Alternatives*** —Served on the Upper Rio Grande Water Operations Review EIS Water Operations Team to evaluate the opportunities for optimizing operations of surface-water facilities to meet water supply, flood control and environmental needs. Reviewed methods and results associated with the application of the URGWOM planning model (*Riverware*) for alternatives analysis.
  - ***Irrigation Efficiency Study*** — Directed a comprehensive evaluation of the Middle Rio Grande Conservancy District's irrigation system efficiency and metering program. Reviewed historical supply-and-demand and system operations data and, in conjunction with agricultural engineers, evaluated opportunities for efficiency improvement. In conjunction with Colorado State University, supported the development of a Decision Support Model for optimal demand-driven irrigation scheduling under supply-limited conditions.

- ***River, Canal, and Drain Seepage Studies*** — Directed an extensive field program to assess river and conveyance channel seepage conditions over a period of two irrigation seasons and the intervening non-irrigation season.
- ***Groundwater Assessment*** — Directed a groundwater resource assessment in two basins to support regional water planning needs.
- ***Strategic Planning and Litigation Support*** — Identified data gaps relevant to the NMISC mission, developed preliminary scope for field programs to evaluate surface-water/groundwater interactions, and implemented a monitoring program and evaluation of flows related to endangered species issues. Provided litigation support relating to evaluation of stream conditions and proposed critical habitat and hydrology as related to endangered species issues.

- **Groundwater/Surface-Water Interaction Modeling to Support River Restoration Planning,** San Joaquin River, California — For the U.S. Bureau of Reclamation, directed the development and application of multiple three-dimensional groundwater models of the riparian zone along a 150-mile reach of the San Joaquin River, incorporating river boundary conditions identified in HEC-2 model simulations. The models were developed for simulating groundwater/surface-water interactions and riparian conditions associated with stream restoration alternatives. In a subsequent work phase, used the models to address questions posed by the Friant Water User's Association during litigation. Following settlement of litigation, applied the models in a CEQA environmental impact analysis to address questions of river losses and bank seepage.
- **Fractured Bedrock Water Rights Evaluation,** Leadville Water, Colorado — On behalf of an objector group including municipalities and water conservation districts, prepared an expert report and provided deposition testimony regarding a water rights application for appropriation of water and associated stream depletion impacts. Provided hydrologic and geochemical evaluations of the source of mine tunnel discharge, and provided calculations on stream depletion impacts relevant to applicant's request for a non-tributary determination in Water Court.
- **Stream-Connected Alluvial Basin Water Rights Evaluation, Low Line Ditch Company,** Colorado — Prepared expert report and provided deposition testimony related to a water rights application and plan for water supply augmentation. Provided expert review of the applicant's engineering calculations, and evaluated the use of the AWAS model for calculation of stream depletion and accretion in the South Platte River alluvial aquifer. Responded to objector report.
- **Basin-wide Groundwater Assessments for Tribal Water Rights Adjudication,** Montana — For the Confederated Salish and Kootenai Tribes, evaluated groundwater resources for multiple regional groundwater basins within Reservation boundaries. Directed the development and calibration of three basin-scale groundwater models. Evaluated alternate water use scenarios and impacts of land and water use on groundwater storage and instream flows. Provided technical support to Tribe regarding groundwater/surface-water interaction as related to water rights negotiations.
- **Assessment of Near-River Groundwater Conditions for the Middle Rio Grande Endangered Species Act Collaborative Program,** New Mexico — Directed the development of eight riparian groundwater models spanning the Middle Rio Grande region from north of Albuquerque to Elephant Butte Reservoir. Riparian groundwater models were designed to incorporate boundary conditions from complimentary models, including a USGS regional groundwater model and a FLO-2D model of river stage/flooded area under variant flood release conditions. The models, which were calibrated with paired groundwater-level and river-stage data, were used to evaluate altered river seepage and shallow groundwater conditions given hydrologic changes potentially associated with the re-establishment of Silvery Minnow and Southwest Willow Flycatcher habitat. Application of the model included assessment of the impacts of river re-alignment on groundwater and wetlands conditions considering stream loss/gains relevant to downstream delivery obligations under Interstate Stream Compact.

- **Water Supply and Regional Planning Study,** New Mexico — For the U.S. Army Corps of Engineers, directed a comprehensive basin-scale water-resource planning study for a region extending along the Rio Grande from Cochiti to Elephant Butte Reservoir. The study characterized the probabilistic conjunctive use water supply under the constraints of the Rio Grande Compact, given historical, present, and hypothetical future conditions. Activities included research and compilation of an extensive metadata database of water-resource data; quantification of a basin-wide probabilistic water budget; review of existing groundwater models; simulation of groundwater pumping under hypothetical regional planning scenarios; risk analysis modeling of water supply; and, organization and facilitation of stakeholder workshops. Later project phases involved the assessment of regional water planning alternatives and the evaluation of conservation options with regard to impacts on stream flow and aquifer depletion.
- **Coalbed Methane Stream Depletion Studies,** San Juan, Raton, and Piceance Basins — For the Colorado Oil and Gas Conservation Commission and Colorado Division of Water Resources, assessed the potential for stream depletion as a result of removal of water by coalbed methane wells located in sedimentary rock formations. Findings from this study would assist regulatory decision-making and would delineate "non-tributary" management areas. Quantitative analyses included review of existing models, evaluation of production and pressure data for coalbed methane wells having variable pumping histories, and estimation of stream depletion impacts from groundwater withdrawals.
- **Evaluation of Impacts of Pool Stage on Groundwater Conditions,** Louisiana — For the U.S. Department of Justice, conducted an evaluation of groundwater conditions associated with the increase in pool elevation behind Lock and Dam 3 on the Red River, Louisiana. Prepared an expert report and provided expert testimony in District Court regarding groundwater changes at specific property locations.
- **Evaluation of Impacts of Land Use and Conservation Measures on Tribal Water Supply,** Kansas — For the Native American Rights Fund, evaluated surface-water and groundwater resources in alluvial and bedrock formations located on the Kickapoo Reservation, assessed the impact of watershed conservation practices on watershed yield, and evaluated factors impacting the availability of drinking water supplies. Provided technical support in negotiations.
- **Water Supply Evaluations for the Consejo de Desarrollo Económico de Mexicali**, Mexico — Evaluated the sustainability of groundwater resources of the Mexicali Valley, Mexico, considering present uses, water quality conditions and Treaty provisions; assessed the hydrologic impacts of the planned lining of the All-American Canal on aquifer water supply. Reviewed existing groundwater models, implemented model updates, and conducted evaluations with the updated model. Prepared expert report.
- **Kingdom of Saudi Arabia** — Evaluated the groundwater management plan for multi-layered aquifer systems and reviewed water supply projections.
- **Basin-Scale Hydrologic and Water Rights Evaluations,** Lower Rio Grande Basin, NM — For the State of New Mexico, conducted quantitative water-resource evaluations that addressed conjunctive use of groundwater and surface-water resources. Directed the development, updating and refinement of a basin-wide groundwater model that included detailed representation of river, irrigation canals and drains. Chaired a Calibration Committee of experts who provided peer review during and following model development. Evaluated historical records of flow conditions, water delivery for agriculture and municipal uses, seepage conditions and aquifer-stream interactions. Reviewed water-quality data and assessed water-quality concerns. Provided technical support in water rights management, mediation and litigation.

GROUNDWATER REMEDIATION, MINING HYDROLOGY, CONTAMINANT TRANSPORT, LITIGATION SUPPORT

- **Groundwater Investigation, Remediation Training,** China — Provided workshop training to

technical staff of China's Ministry of Environment Protection and Ministry of Water Resources on groundwater assessment, investigation and remedial strategies, and the use of groundwater models for remedial design and performance evaluation.

- **Impacts of Relic Mine Tailings, NRDA Claim,** Utah — Evaluated the impacts of relic mine tailings on groundwater quality for allocation of responsibility as part of a Natural Resources Damage Claim. Provided peer review and oversight to the consulting company conducting field investigation. Responsible for hydrogeologic and geochemical investigations utilizing site-specific and regional data to identify attenuation of metals and sulfates in groundwater.
- **Former Manufactured Gas Facilities and Creosoting Operations,** Utah and Idaho — Evaluated the origin, timing, extent, and impact of creosote and coal tar DNAPLs on groundwater quality. Provided expert report for use in litigation to recover remediation costs from insurance carriers.
- **Impacts of Hard-Rock Mining Activities on Water Quality,** Berkeley Pit, Montana — Evaluated the impact of historic and recent hard-rock mining activities on pit-lake water levels and water quality. Conducted and directed field investigations, reviewed historical mining documents and maps, conducted hydrologic modeling, and integrated geochemical evaluations for technical support in litigation for allocation of liability between current and previous owners. Evaluated impacts of current mine operations on remedial options.
- **Remedial Investigation and Design for PCE in Groundwater,** Colorado — At a manufacturing facility, directed remedial investigation, remedial design, and installation of groundwater recovery system to address PCE-impacted groundwater. Directed groundwater modeling of impacted area, prepared groundwater monitoring plans, and conducted capture-zone analyses for the existing remedial well systems. Assessed fate and transport of plume and impacts to drinking-water wells.
- **Environmental Investigation and Remedial Pre-Design for BTEX Contamination of Soil and Groundwater at Natural Gas Compressor Station Sites,** Colorado — Designed and implemented an investigation to identify the extent of free product in soil and dissolved plumes in groundwater. Directed pre-design field programs to assess geochemical conditions and conducted pilot tests of remedial technologies. Supervised site project managers in the drilling of horizontal wells and the construction and start-up of soil vapor extraction and air-sparging remedial systems.
- **Environmental Investigation and Groundwater Modeling of PCE and TCE in Fractured Bedrock,** Massachusetts — At the Resolve Site, assessed geochemical and hydrogeologic data from fractured bedrock environment to identify the potential extent of PCE and TCE as DNAPL and dissolved-phase contaminants. Analyzed aquifer tests, developed and calibrated a three-dimensional numerical groundwater flow and particle-tracking model. Conducted capture-zone modeling analyses of alternate extraction well scenarios and designed an extraction well system considering performance objectives, wetland issues, and risk of DNAPL remobilization. Served as Expert Committee member and prepared presentations for PRP steering committee and the U.S. Environmental Protection Agency's (USEPA) on remediation risks and goals at DNAPL sites.
- **Groundwater Remedial Investigation and Design, Capture Zone Modeling,** Washington — At the Heath Tecna manufacturing site (a RCRA facility), directed groundwater investigations, designed the extraction well system, and provided oversight of remedial action implementation for Corrective Measures System. Investigations included evaluation of aquifer performance tests and water-quality analyses, two- and three-dimensional modeling analyses to characterize the groundwater flow system and optimize placement of recovery wells, and fate-and-transport modeling.
- **Litigation Support, MW Manufacturing Site,** Pennsylvania — Evaluated the U.S. Environmental Protection Agency's RI/FS for this former recycling facility. Provided technical arguments to USEPA in support of modifications to the proposed groundwater extraction system to achieve more efficient and cost-effective control of PCE-impacted groundwater considering hydrogeologic uncertainties and presence of DNAPL. Prepared work plan pre-design investigation and remedial

design.

- **PCBs in Fractured Bedrock Environment, Eastern United States** — At 18 hazardous waste sites, evaluated site characterization data and coordinated modeling analyses of the fate and transport of PCBs through the unsaturated and saturated zone to receptor wells. Evaluation results were used in risk assessment analyses in support of negotiated clean-up levels.
- **Groundwater Remediation at the Heleva Landfill Site,** Pennsylvania — Evaluated groundwater flow and transport in a complex bedrock environment consisting of a sequence of Paleozoic sedimentary formations that were characterized by faulting, fractures, folding and karst activity. Conducted groundwater-flow modeling, evaluated predictions of landfill leachate-production under various remedial scenarios, and determined optimal well configuration and pumping rates for extraction wells. Modified the remedial design resulting in an Amended Administrative Order for site remediation. Conducted capture-zone analyses and prepared Preliminary Design for groundwater extraction. Directed fate-and-transport modeling to evaluate contaminant attenuation. Served as expert witness for insurance litigation related to cost recovery.
- **Fate and Transport Modeling of Petroleum Products in Groundwater,** Indiana — Performed three-dimensional groundwater flow modeling and contaminant fate-and-transport modeling as part of a feasibility study for cleanup of BTEX and MTBE in groundwater from a petroleum product distribution terminal. Assessed biodegradation parameters through modeling of past contaminant distributions. Modeling results were used to evaluate the effectiveness and cost efficiency of proposed remediation plans. Negotiated with the Indiana Department of Environmental Management to gain acceptance for an interim remedial system that was subsequently implemented.

New Mexico State Engineer Office, **Technical Division**, Santa Fe, New Mexico

Conducted and directed projects involving quantitative groundwater hydrology and hydrogeologic impacts of water resource appropriations. Responsibilities included the development of regional and site-specific numerical models of groundwater flow and quality, the formulation and direction of groundwater studies required for water rights hearings and interstate stream litigation, evaluation of stream depletion impacts from well pumping, presentation of expert testimony, modification of off-the-shelf numerical simulation models for specific groundwater analyses, and development of groundwater databases for use in calibration of groundwater models.

New Mexico State Engineer Office, Water Rights Division, Santa Fe, New Mexico

Reviewed water-rights applications to evaluate the impact of proposed water developments on existing water rights. Made recommendations based on evaluation of engineering, hydrologic, legal, and administrative factors. Conferred and corresponded with the public on water rights matters. Coordinated presentation of Water Rights Division testimony for administrative hearings. Provided expert testimony on water rights and on surface-water and groundwater hydrology in district court and at administrative hearings.

U.S. Geological Survey, Water Resources Division, Santa Fe, New Mexico

Analyzed hydraulic/hydrologic data to identify stream stage at flood frequencies and average and peak flows in ungaged streams as a function of climatological and other variables. Wrote FORTRAN programs and prepared results for publication.

LANGUAGES

Spanish

PROFESSIONAL SOCIETIES

Association of Groundwater Scientists and Engineers
Colorado Groundwater Association

PUBLICATIONS & PRESENTATIONS

Hathaway, D.L., G. Barth, and K. Kirsch, 2016. Evaluating Flow Diversion Impacts to Groundwater-Dependent Riparian Vegetation with Flow Alteration and Groundwater Model Analysis. *Journal of the American Water Resources Association (JAWRA)*, v. 52, no. 6, pp. 1311-1326. DOI: 10.1111/1752-1688.12454. December 2016.

Hathaway, D., G. Barth, and K. Kirsch, 2015. Assessment of Potential Gila River Flow Alteration on Riparian Groundwater Conditions. Presentation at the National Ground Water Association (NGWA) Conference on Hydrology and Water Quality in the Southwest, Albuquerque, NM, February 23-24, 2016.

Hathaway, Deborah L., G. Barth, and M. Karanovic, 2014. A Groundwater Management Toolbox: Anticipating Coordinated Management of Indian and Non-Indian Water Rights. Presentation at the National Ground Water Association (NGWA) Conference on Characterization of Deep Groundwater, Denver CO, May 8, 2014.

Barth, G., D. Hathaway, and S. Makepeace, 2012. Assessing Ecosystem Benefits of Irrigation System Efficiency: Lessons for Colorado from Montana. Presentation at the *2012 Sustaining Colorado Watersheds Conference,* Avon, CO, October 9–11, 2012.

Hathaway, D., and G. Barth, 2011. High-Resolution Modeling of Groundwater Responses to Streamflow and Channel Conditions in New Mexico. Presentation at the American Water Resources Association (AWRA) 2011 Annual Water Resources Conference, Albuquerque, NM, November 7–10, 2011.

Hathaway, Deborah L., 2011. Transboundary Groundwater Policy: Developing Approaches in the Western and Southwestern United States, including Border Regions. *Journal of the American Water Resources Association* (JAWRA), pp. 1–11. DOI: 10.1111/j:1752-1688.2010.00494x.

Hathaway, D.L., G. Barth, and S. Makepeace, 2010. Groundwater Resources in the Jocko Basin, Flathead Indian Reservation, Montana. Presentation at the National Ground Water Association Summit, Denver, CO, April 2010.

Llewellyn, D., G. Barth, D. Hathaway, and E. Jones, 2010. Application of Shallow, Riparian Groundwater Models to Evaluate Maintenance and Alignment Alternatives for the Rio Grande Channel, Central New Mexico. Presentation at the National Ground Water Association Ground Water Summit, Denver, CO, April 2010.

Hathaway, D., N. Shafike, and K. MacClune, 2009. Enhanced Groundwater Modeling Methods for Analyses in Ecohydrology. Presentation at the Joint International Convention of the IAHS Scientific Assembly and IAH Congress, Hyderabad, India, September 6-12, 2009. in *Ecohydrology of Surface and Groundwater Dependent Systems: Concepts, Methods and Recent Developments,* IAHS Publication 328.

Hathaway, D.L., 2009. Water Supply Limitations in the Albuquerque Area. in *New Mexico Bureau of Geology and Mineral Resources, Decision-Makers Field Guide 2009*.

Hathaway, D., P. Barroll, G. Barth, and K. MacClune, 2009. Identifying the Canary in the Lower Rio Grande Basin: Hydrologic Signals to Support Groundwater Management in a Transboundary Stream-Aquifer System. Presentation at the National Ground Water Association Summit, Tucson, AZ, April 19–23, 2009.

Hathaway, D., K. MacClune, E. Jones, and N. Shafike, 2009. Quantifying Groundwater/Surface-Water Interactions Along the Rio Grande to Access the Sustainability of Desired Flows for River

Management and Restoration. Presentation at the National Ground Water Association Summit, Tucson, AZ, April 19–23, 2009.

Hathaway, D., G. Barth, and K. MacClune, 2008. High Resolution Groundwater Models of the San Joaquin River Riparian Zone for Evaluation of Surface-Water/Groundwater Interactions under Alternate River Flow Regimes. Presentation at the California Central Valley Groundwater Modeling Workshop of the California Water and Environment Modeling Forum, Berkeley, CA, July 10–11, 2008.

Barth, G., P. Barroll, D. Hathaway, T. Maddock III, N. Shafike, J.P. King, J. Shomaker, and B. Liu, 2008. Building a New Groundwater Flow Model for the Rincon and Mesilla Bolsons. Presentation at MODFLOW and More 2008: *Ground Water and Public Policy,* International Ground Water Modeling Center, Colorado School of Mines, Golden, CO, May 18–21, 2008, pp. 252–256.

Hathaway, D., A. Hui, et al. 2007. The Malingua Pamba Water Project: Improving the Reliability of Water Delivery to a Rural Village in the Ecuadorian Andes *(abstract)*. in *Proceedings of the American Water Resources Association 2007 Annual Water Resource Conference*, Albuquerque, NM, November 2007.

Barth, G., C. Schott, K. MacClune, D. Hathaway, and F. Grigsby, 2007. Assessing Mountain Pine Beetle Infestation: Anticipated Hydrologic Impacts and Suggestions for Minimizing Watershed Impacts, Sustaining Colorado Watersheds. Presentation at Sustaining Colorado Watersheds, Breckenridge, CO, October 2–4, 2007.

Hathaway, D.L., 2007. Chapter Four: Balancing the Budget: Options for the Middle Rio Grande's Future. in *Water Resources of the Middle Rio Grande—San Acacia to Elephant Butte—Decision-Makers Field Guide 2007*. L. Price, P. Johnson, and D. Bland, eds. Socorro, NM: New Mexico Bureau of Geology and Mineral Resources.

Hathaway, D., and K. MacClune, 2007. Chapter Two: The Middle Rio Grande Water Budget: A Debt Deferred. in *Water Resources of the Middle Rio Grande—San Acacia to Elephant Butte—Decision-Makers Field Guide 2007*. L. Price, P. Johnson, and D. Bland, eds. Socorro, NM: New Mexico Bureau of Geology and Mineral Resources.

Hathaway, D.L., 2007. Cessation of Transboundary Seepage from the All-American Canal: Consideration of Impacts to the Mexicali Aquifer Given Changing Watershed Conditions. Presentation at the National Groundwater Association Groundwater Summit, Albuquerque, NM, April 30–May 2, 2007.

Barth, G., K. MacClune, D. Hathaway, and F. Grigsby, 2007. Making the Most of a Simple Model: Using Extensive Data Sets and Parameter Estimation to Get Basin-Scale Insight on Outcrop Recharge. Presentation at the National Groundwater Association Summit, Albuquerque, NM, April 30–May 2, 2007.

Hathaway, D., K. MacClune, N. Shafike, G. Barth, and M. Novotny, 2006. Application of High Resolution Groundwater Models of the Near-River Zone to Problems in River Restoration and Water Management: Lessons Learned *(abstract)*. in *Proceedings of the American Water Resources Association's 2006 Annual Water Resource Conference*, Baltimore, MD, November 2006. Middleburg, VA: American Water Resources Association, TPS-06-3, CD-ROM.

Hathaway, D., 2006. Trans-Boundary Evaluation of Impacts to an International Groundwater Resource: Gains and Losses Associated with the All-American Canal *(abstract)*. in *Proceedings of the American Water Resources Association's 2006 Annual Water Resource Conference*, Baltimore, MD, November 2006. Middleburg, VA: American Water Resources Association, TPS-06-3, CD-ROM

MacClune, K., D. Hathaway, and D. Llewellyn, 2006. Considering Impacts of Climate Change: Use of Paleohydrologic Reconstructions to Shape Hydrologic Inputs for Water Planning and

Management Models. Poster presentation at the South Platte River Forum: *From the Gold Rush to the Urban Crush*, Longmont, CO, October 25–26, 2006.

MacClune, K. and D. Hathaway, 2006. New Mexico Rio Grande Water Operations Modeling: Creating a Synthetic Flow Sequence Representative of Regional Paleo-Hydrology for Alternatives Analysis *(abstract)*. Presentation at the Geological Society of America Special Meeting: *Managing Drought and Water Scarcity in Vulnerable Environments — Creating a Roadmap for Change in the United States*, Longmont, CO, September 18–20, 2006. in *Geological Society of America Specialty Meetings Abstracts with Programs*, v. 3.

Hathaway, D., G. Barth, F. Grigsby, and K. MacClune, 2006. MODFLOW…NOT: A Simple But Effective Solution to a Regulatory Question. Presentation at MODFLOW and More 2006: *Managing Ground-Water Systems,* International Ground Water Modeling Center, Colorado School of Mines, Golden, CO, May 22–24, 2006, v. 1, pp. 137–141.

Barth, G., K. MacClune, N. Shafike, and D. Hathaway, 2006. Beyond Simulated Versus Observed: Gaining Insight to Shallow Ground Water/Surface-Water Exchange Using Visualization and Sensitivity Analysis. Presentation at MODFLOW and More 2006: *Managing Ground-Water Systems*, International Ground Water Modeling Center, Colorado School of Mines Golden, CO, May 22–24, 2006, v. 1, pp. 84-88.

MacClune, K., G. Barth, N. Shafike, and D. Hathaway, 2006. High-Resolution Groundwater Models for the Assessment of Riparian Restoration Options and River Conveyance Efficiency. Presentation at MODFLOW and More 2006: *Managing Ground-Water Systems*, International Ground Water Modeling Center, Colorado School of Mines Golden, CO, May 22–24, 2006, v. 1, pp. 159-163.

Hathaway, D. and K. MacClune, 2005. Probabilistic Analysis of Multi-Region Conjunctive Use Water Supply and Evaluation of Long-Term Regional Water Plans. Presentation at the 2005 California Water and Environmental Modeling Forum, Pacific Grove, CA, March 1–3, 2005.

Hathaway, D., N. Shafike, K. MacClune, T-S. Ma, and G. Barth, 2005. High-Resolution Groundwater Models for the Assessment of Riparian Restoration Options and River Conveyance Efficiency. Presentation at the 2005 California Water and Environmental Modeling Forum, Pacific Grove, CA, March 1–3, 2005.

MacClune, K., and D. Hathaway, 2003. Application of Paleo-Climate Data to Water Planning and Management. Presentation at the 2003 American Water Resources Association Annual Conference, San Diego, CA, November 3–6, 2003.

Hathaway, D., K. MacClune, and K. Flanigan, 2003. Multi-Region Water Supply Alternatives Analysis in a Probabilistic Framework. Presentation at the 2003 American Water Resources Association Annual Conference, San Diego, CA, November 3–6, 2003.

Hathaway, D.L., 2003. Transient Groundwater Riparian Conditions and Sensitivity to Changes in Hydrology, Geomorphology, and Vegetation. Presentation at the 2003 American Water Resources Association Annual Conference, San Diego, CA, November 3–6, 2003.

Schmidt-Peterson, R., N. Shafike, P. Pegram, D. Hathaway, F. Grigsby, R. Bowman, L. Wilcox, T. Newton, and K. Schafer, 2003. Groundwater/Surface-Water Monitoring in the Middle Rio Grande Basin. *Southwest Hydrology*, v. 2, no. 1.

Blum, V., D. Hathaway, and K. White, 2002. Modeling Flow at the Stream-Aquifer Interface: A Review of this Feature in Tools of the Trade. Presentation at the American Water Resource Association (AWRA) Summer Specialty Conference, Keystone, CO, July 1–3, 2002. in *AWRA Proceedings: Ground-Water/Surface-Water Interactions*, pp. 7–12.

Hathaway, D., and K. Flanigan, 2002. Legal and Physical Constraints on the Conjunctive Use Water Supply of the Middle Rio Grande Region. Presentation at the American Water Resource

Association (AWRA) Summer Specialty Conference, Keystone, CO, July 1–3, 2002. in *AWRA Proceedings: Ground-Water/Surface-Water Interactions*, pp. 225–230.

Hathaway, D., and T-S. Ma, 2002. Transient Riparian Aquifer and River Exchanges along the San Joaquin River. Presentation at the American Water Resource Association (AWRA) Summer Specialty Conference, July 1–3, 2002, Keystone, CO. in *AWRA Proceedings: Ground-Water/Surface-Water Interactions*, pp. 169–174.

Lewis [MacClune], K., D. Hathaway, and N. Shafike, 2002. Evapotranspiration-Driven Diurnal Fluctuations in Groundwater Levels at San Marcial, New Mexico. Presentation at the American Water Resource Association (AWRA) Summer Specialty Conference, July 1–3, 2002, Keystone, CO. in *AWRA Proceedings: Ground-Water/Surface-Water Interactions*, pp. 115–120.

Hathaway, D.L., 2002. Myths of Sustainable Water Management: A Hydrologist's Perspective *(abstract)*. in *Conference Proceedings from Allocating and Managing Water for a Sustainable Water Future: Lessons from Around the World*, Boulder, CO, June 11–14, 2002. Natural Resources Law Center, University of Colorado Law School.

Lewis [MacClune], K., and D. Hathaway, 2002. New Mexico Climate and Hydrology: Is the Historic Record Valid for Predictive Modeling? *Hydrologic Science &Technology*, v. 19, no. 1-4, p. 57.

Lewis [MacClune], K., and D. Hathaway, 2002. Using Paleo-Climate Records to Assess the Current Hydrology of the New Mexico Middle Rio Grande. *Southwest Hydrology,* v. 1, no. 2, p. 20.

Hathaway, D.L., 2001. Probabilistic Modeling of the Middle Rio Grande Water Supply. Presentation at the Annual Water Resource Conference: in *Abstract Proceedings*, American Water Resources Association, November 2001.

Hathaway, D.L., 2001. Probabilistic Water Budget for the Middle Rio Grande. in *Water, Watersheds and Land Use in New Mexico, Impacts of Population Growth on Natural Resources, Santa Fe Region, New Mexico*. Decision-Makers Field Guide No. 1, New Mexico Bureau of Mines and Mineral Resources.

Hathaway, D. and T.S. Ma, 2001. Sensitivity of Shallow Groundwater Elevations in the San Joaquin River Riparian Zone to River Flow and Regional Groundwater Conditions *(abstract)*. Presentation at Managing California's Groundwater: The Challenges of Quality and Quantity, 23rd Biennial Groundwater Conference and 10th Annual Meeting of the Groundwater Resources Association of California, October 2001.

Ma, T.S., D. Hathaway, and A. Hobson, 2001. MODFLOW Simulation of Transient Surface-Water/Groundwater Interactions in a Shallow Riparian Zone Using HEC-2-Based Water Surface Profiles. Presentation at MODFLOW 2001 and Other Modeling Odysseys, Colorado School of Mines, Golden, CO, September 2001. in *Conference Proceedings*, International Ground Water Modeling Center (IGWMC), Colorado School of Mines, Golden, CO, Seo, Poeter, Zheng, and Poeter, eds. v. 1, pp. 425–431.

Hathaway, D.L., 1999. The Middle Rio Grande Water Supply Study. in *Proceedings, The Rio Grande Compact: It's the Law*! Presentation at the 44th Annual New Mexico Water Conference, New Mexico Water Resources Research Institute and New Mexico Riparian Council, La Fonda on the Plaza, Santa Fe, NM, December 2–3, 1999.

Hathaway, D.L., 1995. Hydraulic Containment of Groundwater Contamination: Design and Performance Evaluation. Presentation at the Groundwater Forum, U.S. Environmental Protection Agency Technical Support Project General Meeting, Boston, MA.

Hathaway, D., and M. Riley, 1995. Evaluating the Performance of Hydraulic Containment Systems. Presentation at the American Institute of Hydrology Annual Meeting, Denver, CO, May 14–18, 1995.

Hathaway, D.L., and M. Wolff, 1995. Comments on Parameter Uncertainty: A Post-Audit of Groundwater Contaminant Fate and Transport Model Projections. in *Proceedings of the*

American Geophysical Union, Front Range Hydrology Days, Colorado State University, Fort Collins, CO.

Zheng, C., and D. Hathaway, 1991. MT3D: A New Modular Three-Dimensional Transport Model and its Application in Predicting the Persistence and Transport of Dissolved Compounds from a Gasoline Spill, with Implications for Remediation *(abstract)*. *Ground Water*, v. 29, no. 5, p. 755.

Andrews, C., D. Hathaway, and S. Papadopulos, 1990. Modeling the Migration and Fate of Polychlorinated Biphenyls in the Subsurface. in *Proceedings of the PCB Forum, Second International Conference for the Remediation of PCB Contamination*, Houston, TX, April 2-3, 1990, pp. 64–82.

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