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**Professor, UWRL/Civil and Environmental
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Areas of Specialization

- Individual and portfolio dam safety risk assessment and management
- Life-loss estimation software for dam and levee safety risk assessment
- Software for dam safety risk analysis and portfolio risk management and decision support
- Spillway evaluation flood determination and dam breach modeling
- Engineering hydrology, hydraulics, and sedimentation engineering
- Water resources engineering and forecast-based reservoir operations software

Professional Summary

Dr. Bowles is a Professor of Civil and Environmental Engineering at Utah State University and Managing Principal with RAC Engineers and Economists which specialize in individual and portfolio dam safety evaluation, risk assessment and risk management. He is also Director of the Institute for Dam Safety Risk Management at Utah State University. From 1992-1996, he served as Director of the Utah Water Research Laboratory and the Utah Center for Water Resources Research, the second largest water research institute in the U.S.A.

His 37 years of professional experience include five years in full-time design, construction, and consulting engineering in the U.K. and the U.S. While with Law Engineering, he was a member of their senior corporate management team, Branch Manager of Denver Operations, Engineering Department Manager, and a Senior Hydrologist/Engineer. Dr. Bowles is registered as a Professional Engineer (Civil) in the State of Utah and is certified as a Professional Hydrologist by the American Institute of Hydrology. He is a Fellow of the American Society of Civil Engineers (ASCE) and the American Water Resources Association (AWRA), a Diplomate, Water Resources Engineer (D.WRE) of the American Academy of Water Resources Engineers (AAWRE) and is a member of many other professional organizations.

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[Institute for Dam Safety Risk Management](#)

Awards

- Citizen's Award for Exceptional Service, U.S. Bureau of Reclamation, 1997.
- Governor's Medal for Science and Technology, State of Utah, 2003.
- Certificate of Appreciation for Patriotic Civilian Service to the U.S. Army Corps of Engineers, 2007.
- Diplomate, Water Resources Engineer (D.WRE) of the American Academy of Water Resources Engineers (AAWRE) as an "Eminent Practitioner", 2008.

Summary of Experience

Dr. Bowles' academic work currently emphasizes the development and improvement of practical management procedures and engineering tools for dam safety risk assessment and management. His consulting activities complement his academic work through providing opportunities to "field test" new procedures and tools, and to gain diverse experience in the dam safety management practices of many governmental and private dam owners, engineering firms, and regulatory agencies in the U.S. and overseas. Selected experience in several areas is summarized below.

Dam Safety Risk Assessment and Risk Management

- Project Manager for the Risk-based Evaluations of Potential Operating Restrictions for Lake Cumberland (Wolf Creek Dam) and Center Hill Lake with Uncertainty Analysis for the Nashville District, US Army Corps of Engineers, Nashville, Tennessee.

- Risk Assessment Facilitator for the first FERC risk assessment for the NIPSCO Norway and Oakdale hydroelectric dams for the investigation of alternatives for resolving spillway adequacy issues with MWH, Chicago, Illinois.
- Project Manager for Development of Reservoir Safety Portfolio Risk Assessment Management Information System and review of UK Defra QRA, United Utilities, Warrington, England.
- Expert Advisor for the Inquiry into Bulk Water Charges to the South West Irrigation Cooperative (Harvey Water) resulting from the Western Australia Water Corporation's planned dam safety expenditures including evaluation of a cross-government approach to expenditure on life safety, cost allocation and impact analysis, for the Economic Regulation Authority, Perth, Western Australia with to Marsden Jacob Associates
- Consultant for the Project on Integrated Water Management Reinforcement in Mexico for Development of a Regulatory Impact Analysis Methodology to Evaluate the Benefit/Cost Ratio of a Dam Safety Regulation, World Meteorological Organization for the National Water Agency (CAN), Mexico.
- Development of a generalized event tree analysis tool, DAMRAE (DAM safety Risk Analysis Engine) for the U.S. Army Corps of Engineers.
- Development of a simulation procedure for life-loss estimation (LIFESim) for use in dam safety risk assessment for the U.S. Army Corps of Engineers and ANCOLD.
- Development of portfolio risk management decision support software for a large dam owner.
- Consultant to the U.S. Army Corps of Engineers for their first dam safety risk assessments on individual dams and a portfolio of dams, for development and application of a portfolio risk assessment process, for development of procedures for evaluation of residual risk associated with flood risk reduction projects, and for extreme flood characterization.
- Project Manager, Risk-based Evaluation of Operating Restrictions for Success Lake. Sacramento District, U.S. Army Corps of Engineers
- Project Manager, Portfolio risk assessment for 178 dams for United Utilities, England
- Advisor on dam safety risk management and potential failure modes analysis for Ontario Power Generation, Toronto, Canada.
- Project Manager, Update of Portfolio Risk Assessment and Advisor on Dam Safety Remediation Program for Western Australia Water Corporation.
- Project Manager, Risk assessment of Alamo Dam, U.S. Army Corps of Engineers, Los Angeles District.
- Project Manager, Risk assessment of Hills Creek Dam, U.S. Army Corps of Engineers, Portland District.
- Project Manager, Portfolio risk assessment for 25 dams, Fort Worth District, U.S. Army Corps of Engineers
- Project Manager, Portfolio risk assessment for 18 dams in the Huntington District, U.S. Army Corps of Engineers and screening-level engineering assessment of 35 dams.
- Project Manager, Portfolio risk assessment for 15 dams, Baltimore District, U.S. Army Corps of Engineers.
- Risk Assessment Advisor, Portfolio Evaluation of 20 dams for Coliban Water, Victoria.
- Project Manager, Portfolio Evaluation of 17 South Australian Water Corporation Large Dams.
- Project Manager, Risk assessment of Hume and Dartmouth Dams, Department of Land and Water Conservation, New South Wales, and Goulburn-Murray Water Authority, Victoria
- Advisor, Development of Risk Assessment and Public Protection Guidelines, U.S. Bureau of Reclamation
- Facilitator, Mormon Island Auxiliary Dike Risk Assessment, Folsom Project for evaluation of potential operating restrictions, US Bureau of Reclamation, Denver, Colorado.
- Risk Assessment Consultant, Portfolio Evaluation of 15 Snowy Mountain Hydro-Electric Authority's Referable Dams.
- Preliminary risk analysis of 40 dams for the State Engineer, State of Utah.
- Consultant to the State of Victoria, Australia, for their state-wide implementation of new risk-based dam safety management guidelines for the newly established water authorities.

- Advisor on dam safety program issues for South Australian Water Corporation
- Organizer and facilitator of an international extreme flood estimation workshop, U.S. Bureau of Reclamation.
- Review of risk-based criteria for consideration by the Utah State Engineer (State Dam Safety Regulator)
- Invited Contributor - Event Tree Section - "Risk Assessment Commentary" and Co-author - Chapters on the "Roles of Probability and Judgement", Canadian Electricity Association (CEA), Risk Assessment Guidelines.
- Risk Assessment Project Manager and facilitator, Statewide Review of Dam Safety for over 270 large dams, Office of Water Reform, State of Victoria to provide:
 - The safety status of referable dams.
 - The general status and operational service performance of all headworks assets.
 - The analysis of the overall status of risks, costs, and adequacy of maintenance of headworks against appropriate best practices/guidelines.
 - The development of an approach to provide consistency and acceptable risk management of headworks including establishing principles and guidelines.
 - The assessment of future costs and works programs at various risk levels against current business investment plans and assessing implications for: pricing, longer term asset and operational integrity, due diligence, and business viability.
- Project Manager, Incremental consequence assessment and risk assessment at Ming Teh Dam, Taiwan Provincial Water Conservancy Bureau
- Risk Assessment Advisor, Risk Assessment of Horseshoe and Bartlett Dams for Salt River Project, Arizona, USA
- Risk Assessment Manager, Risk Assessment of Tongue River Dam, State of Montana, USA
- Project Manager, Risk Assessment of Bear River and Hams Fork Dams and presentation to FERC in Washington DC, Utah Power and Light Company, USA.
- Development of probabilistic slope stability analysis techniques for the U.S. Bureau of Mines and the U.S. Army Corps of Engineers and application to the evaluation of two tailings dams in Arizona.
- Cooperative study with the U.S. Bureau of Reclamation during the pioneering development stages of the Bureau's "*Guidelines to Decision Analysis*" (USBR, ACER Memorandum No. 7, 1986).

Expert Reviews

- Expert Review Panel Member and Advisor on Risk Assessment for the Embankment Risk Profile-Team, South Florida Water Management District's Acceler8 Program and Jacksonville District, USACE
- Expert Review Panel Member, Dam Security Project (DAMSE), European Commission
- Expert Reviewer and Advisor for the Risk Analysis and Management for Critical Asset Protection (RAMCAP) Phase III for Dams, Locks and Levees, Department of Homeland Security
- Member, The National Academies Committee for Assessment of the Bureau of Reclamation's Security Program Board on Infrastructure and the Constructed Environment.
- Chair, Panel of Experts, Future Operations Strategy Review, Risk assessment of changing from decentralized to centralized operation of the California State Water Project. California Department of Water Resources.
- Expert Reviewer and Advisor to Headquarters, U.S. Army Corps of Engineers for the implementation of Dam and Levee Safety Portfolio Risk Assessment for the USACE Special Assistant for Dam Safety and senior leaders, the USACE Policy and Procedures Team, the USACE Methodology Development Team, and the USACE Screening Portfolio Risk Analysis Teams.
- Independent Technical Reviewer for Risk and Reliability and Life-Loss Consequences aspects of the performance evaluation of the New Orleans Hurricane Protection System pre and post-Katrina for Headquarters, US Army Corps of Engineers, Washington, D.C.
- Expert Reviewer and Advisor, Mid-Term River Operations Model of the Lower Colorado

- River Basin with Uncertainty Analysis. U.S. Bureau of Reclamation
- Reviewer of Regulatory Policy Framework for Dam Safety: Revision of some Standards-Based Policies and the Progressive Introduction of Risk Assessment Practice, New South Wales Dam Safety Committee
- Member, Performance Monitoring Program Advisory Team, Potential Failure Models Analysis and Performance Parameters. Federal Energy Regulatory Commission
- Independent Appraisal of the Romanian Risk Assessment Approach for Mine Tailings Dams. The World Bank
- Reviewer, Portfolio Risk Assessment for General Manager Planning and Development. Water Corporation of Western Australia
- Reviewer, Business Case for the Proposed Forth Dams Spillway Upgrading Project for the CEO. Hydro Tasmania
- Chair, Expert Review Panel, Ross River Dam Stages 2 – 5 Upgrades Design and Construction, North Queensland Water
- Chair, Expert Review Panel for Investigation of Safety Issues and Remedial Works Design for Happy Valley Dam. South Australian Water Corporation
- Review Consultant, Ross River Dam Options Study and Risk Assessment, North Queensland Water
- Member, Expert Review Panel for Preliminary Risk Assessment for Wivenhoe, Somerset and North Pine Dams. South East Queensland Water Board
- Chair, Expert Review Panel for Investigation of Safety Issues and Remedial Works Design for Hope Valley Dam. South Australian Water Corporation
- Member, Expert Review Panel for Portfolio Dam Safety Risk Assessment of 54 large dams. Hydro Tasmania
- Member, Technical Review Panel for the Watershed and River System Management Program (WaRSMP) and RiverWare, U.S. Bureau of Reclamation.
- Reviewer for Hume Dam Initial Phase Risk Assessment and emergency draw down decision. Murray-Darling Basin Commission and Department of Land & Water Conservation, New South Wales
- Reviewer, Prospect Dam Risk Assessment, Sydney Water.
- Expert Reviewer, Snowmelt Aspects of the Reevaluation of Spillway Evaluation Floods for the Snowy Mountains Hydro-Electric Authority dams.
- Reviewer, Probable Maximum Flood determinations for six reservoirs. Lower Colorado River Authority, Austin, Texas, USA
- Review and evaluation of spillway design flood for Mancos River Reservoir, Bureau of Indian Affairs. New Mexico, USA
- Review of Probable Maximum Precipitation Study. Harza Engineering Company, Chicago, Illinois
- Reviewer, ANCOLD Guidelines on Design Floods for Dams, Australia.
- Reviewer, Canadian Electricity Association Risk Assessment Guidelines and Commentary
- Reviewer, Risk Assessment Methods for Dam Safety Decision Making, U.S. Bureau of Reclamation
- Peer Reviewer, Risk Assessment of Dams and Hydroelectric Facilities: Guidance for Practical Application, American Society of Civil Engineers
- Corresponding Member, Review Panel for “*A Guide to Risk Management for UK Reservoirs*” by the Construction Industry Research Information Association (CIRIA), London, England
- Reviewer, Draft Engineering and Design Guideline: Risk Analysis for Dam Safety Assurance. U.S. Army Corps of Engineers
- Reviewer, risk analysis aspects of Interim Guide to Quantitative Risk Assessment for UK Reservoirs, Department for Environment, Food and Rural Affairs (defra), UK
- Reviewer, Draft Engineering and Design Guideline: Risk Analysis for Dam Safety Assurance. USACE
- Reviewer, ANCOLD Guidelines on Risk Assessment, Australia
- Member and Spokesperson, Peer Review Team for the Dam Safety Program of the U.S. Bureau of Reclamation, Bureau of Land Management, U.S. Fish and Wildlife Service, Office

of Surface Mining, Bureau of Indian Affairs, National Park Service, 1996 - 1997.

Flood Hydrology, Reservoir Operation and Spillway Gate Reliability

- Advisor for development of a Mid-Term River Operations Model of the Lower Colorado River With Uncertainty Analysis for River Operations, Lower Colorado Region, US Bureau of Reclamation, Boulder City, Nevada.
- Yuba-Feather Forecast-Coordinated Reservoir Operations Feasibility Study: Development of an approach for coordinating the operation of Lake Oroville and New Bullards Bar Reservoirs, California using real-time and planning modes of a Reservoir Release Forecast Model. Yuba County Water Agency and California Department of Water Resources.
- Emergency Action Inundation Mapping and dam break analyses for Success dam, Sacramento District of the U.S. Army Corps of Engineers.
- Emergency Action Inundation Mapping and dam break analyses for 25 dams in Fort Worth District of the U.S. Army Corps of Engineers. (2003-2004)
- PMF determination and dam break modeling for the Hills Creek Dam of Portland District of the US Army Corps of Engineers using HEC-1 and DAMBRK models.
- Assessment of the reliability of 13 spillway gate systems for the U.S. Army Corps of Engineers Portland, Huntington and Fort Worth Districts with Professor Jack Lewin and Dr. Geoff Ballard and integration in dam safety risk assessments. (2001)
- Folsom Real-time Reservoir Operations Software: Development and application of real-time and planning modes of Folsom Dam Reservoir Release Forecast Model for U.S. Bureau of Reclamation in collaboration with National Weather Service CA/NV River Forecast Center, Sacramento Area Flood Control Agency (SAFCA), State of California Division of Water Resources, and U.S. Army Corps of Engineers. (1995 - 2003).
- Hydraulic and hydrologic analyses of urban flooding in Los Angeles, California. Expert testimony and hydraulic and hydrologic analyses of urban drainage facilities and urban flooding using HEC-2, HEC-RAS, and proprietary models. Keller, Price & Moorhead, Redondo Beach, California; Tomaryn and O'Reilly, Torrance, California; and Breidenbach, Buckley, Huchting, Halm & Hamblet, Los Angeles, California. (1995-2002)
- Estimation of Spillway Evaluation Floods for Two Logan River Dams, Utah. PMF determinations and dam break flood inundation studies for Emergency Action Plans for Logan River First and Third Dams for CH2M Hill, Salt Lake City, Utah and Utah State University Physical Plant, Logan, Utah. (1991)
- Engineering hydrology and hydraulics including dam break analyses. Dam-break analyses for 15 dams in Baltimore District of the U.S. Army Corps of Engineers.
- Estimation of Spillway Evaluation Floods for seven Sevier River Basin dams based on the "most likely" outcome of hydrometeorologic variables that would be expected to occur in combination with the PMP Franson-Noble & Associates, Inc., American Fork, Utah (1997)
- Reevaluation of Spillway Evaluation Floods for the Snowy Mountains Hydro-Electric Authority dams, NSW, Australia. Specialized Snowmelt Consultant for the Reevaluation of Spillway Evaluation Floods for all 15 dams of the Snowy Mountains Hydro-Electric Scheme for Sinclair, Knight, and Merz (formerly HydroTechnology), Armadale, Victoria, Australia. (1995-1996)
- PMF and spillway evaluation flood determinations and incremental damage assessments for seven Sevier River Basin dams including site-specific PMP. Otter Creek, Piute, Rocky Ford, Gunnison, Sevier Bridge, DMAD, and Gunnison Bend dams of Sevier River Basin in Utah. Utah State Engineer's Office, Salt Lake City, Utah. (1994-1995)
- Estimation of PMFs for six dams for Lower Colorado River Authority, Texas. Determination of Probable Maximum Floods on a 30,000 square mile area of the Lower Colorado River Authority and dam break studies. (1989-1991)

Selected Papers for Downloading

To view these papers you need [Acrobat Reader](#)



Applications of Dam Safety Risk Assessment

- [Alamo dam demonstration risk assessment](#). ANCOLD Bulletin 114:113-128, April 2000. (D.S. Bowles, L.R. Anderson, J.B. Evelyn, T.F. Glover, and D.M. Van Dorpe).
- [Dam Safety Evaluation for a Series of Utah Power and Light Hydropower Dams, Including Risk Assessment](#). In Proceedings from the *6th ASDSO Annual Conference*, October 1-5, 1989, Albuquerque, New Mexico. (Various Authors).
- [Dam Safety Risk Assessment with Uncertainty Analysis](#). ANCOLD Bulletin 127:73-88. August 2004. (Chauhan, S.S. and D.S. Bowles).
- [Incorporating Uncertainty into Dam Safety Risk Assessment](#). *Proceedings on Risk Analysis in Dam Safety*, at Third International Conference on Dam Safety Evaluation. Goa, India. December 2001. (S.S. Chauhan and D.S. Bowles).
- [Portfolio risk assessment of SA water's large dams](#). ANCOLD (Australian Committee on Large Dams) Bulletin 112:27-39. August 1999. (D.S. Bowles, A.M. Parsons, L.R. Anderson, and T.F. Glover).
- [Risk-based evaluation of operating restrictions to reduce the risk of earthquake-induced dam failure](#). In *Proceedings of the 2005 USSD Annual Lecture*. Salt Lake City, UT, June 2005. (D.S. Bowles, L.R. Anderson, T.F. Glover, S.S. Chauhan, and R.S. Rose).
- [Understanding and managing the risks of aging dams: Principles and case studies](#). Nineteenth USCOLD Annual Meeting and Lecture, Atlanta, Georgia. May 16-21, 1999. (D.S. Bowles, L.R. Anderson, T.F. Glover, and S.S. Chauhan).

Dam Breach Modeling

- A Numerical Method for Simulating One-Dimensional Headcut Migration and Overtopping Breaching in Cohesive and Zoned Embankments. *Water Resources Research*. Vol. 43(5), W05411, 2007. (Z. Wang and D.S. Bowles).
- [Do Current Breach Parameter Estimation Techniques Provide Reasonable Estimates for Use in Breach Modeling?](#) Proceedings of Dam Safety 2004, ASDSO 2004 Annual Conference, Phoenix, AZ. September 2004. (S.S. Chauhan, D.S. Bowles, and L.R. Anderson).
- Dam Breach Simulations with Multiple Breach Locations under wind and Wave Actions. *Advances in Water Resources*, Vol. 29(8):1222-1237, 2006. (Z. Wang and D.S. Bowles).
- [Overtopping Breaches for a Long Dam Estimated Using a Three-Dimensional Model](#). *Proceedings of the 2006 USSD Annual Lecture*, San Antonio, TX. June 2006. (Z. Wang, and D.S. Bowles). ([For PDF copy of Poster click here](#)).
- Three-Dimensional Non-Cohesive Earthen Dam Breach Model. Part 1. Theory and Methodology. *Advances in Water Resources*. Vol. 29(10):1528-1545, 2006. (Z. Wang and D.S. Bowles).
- Three-Dimensional Non-Cohesive Earthen Dam Breach Model. Part 2. Validation and applications. *Advances in Water Resources*. Vol. 29(10):1490-1503, 2006. (Z. Wang and D.S. Bowles).

Dam Safety Risk Assessment and Management

- ICOLD Bulletin on Dam Safety Management. Keynote paper in Proceedings of the NZSOLD/ANCOLD Workshop on "Promoting and Ensuring the Culture of Dam Safety",

- Queenstown, New Zealand. November 2007. (D. S. Bowles, F. L. Giuliani, D.N.D. Hartford, J.P.F.M. Janssen, S. McGrath, M. Poupart, D. Stewart, P.A. Zielinski)
- [ASDSO/FEMA Specialty Workshop on Risk Assessment for Dams](#). Invited paper in the Proceedings of the *2001 ASDSO 21st Annual Conference*, Snowbird, Utah, September. (D.S. Bowles and D.L. Johnson).
 - [Dam Safety Decision-Making: Combining Engineering Assessments with Risk Information](#). In Proceedings of the *2003 USSD Annual Lecture*, Charleston, SC, April 2003. (D.S. Bowles, L.R. Anderson, T.F. Glover, and S.S. Chauhan).
 - [Reservoir Safety: A Risk Management Approach](#). *International Conference on Aspects of Conflicts in Reservoir Development and Management*, September 1996. The City University, London, England. (D.S. Bowles).
 - [The Practice of Dam Safety Risk Assessment and Management: Its Roots, Its Branches, and Its Fruit](#). Presented at the *Eighteenth USCOLD Annual Meeting and Lecture*, Buffalo, New York. August 8-14, 1998. (D.S. Bowles, L.R. Anderson, and T.F. Glover).
 - [Summary of USSD Emerging Issues White Paper on Dam Safety Risk Assessment: What Is It? Who's Using it and Why? Where Should We Be Going With It?](#) Invited Plenary Session Presentation and Paper in Proceedings of the 2003 USSD Annual Lecture, Charleston, South Carolina. April 2003. (D.S. Bowles).
 - [Understanding and Managing the Risks of Aging Dams: Principles and Case Studies](#). Nineteenth USCOLD Annual Meeting and Lecture, Atlanta, Georgia. May 16-21, 1999. (D.S. Bowles, L.R. Anderson, T.F. Glover, and S.S. Chauhan).

Extreme Flood Estimation

- [A Framework for Characterization of Extreme Floods for Dam Safety Risk Assessments](#). Proceedings of the *1998 USCOLD Annual Lecture*, Buffalo, New York. August 1998. (R. Swain, D.S. Bowles, and D. Ostenaar).
- [A Probability-Neutral Approach to the Estimation of Design Snowmelt Floods](#). Referred paper in Proceedings of the *International Hydrology and Water Resources Symposium*, November 1997. Auckland, New Zealand. (R.J. Nathan and D.S. Bowles).

Life-Loss Estimation and Evacuation Modeling

- [A Model for Estimating Dam Failure Life Loss](#). ANCOLD Bulletin 127:43-62. August 2004. (Aboelata, M., D.S. Bowles, and D.M. McClelland).
- [Evacuation and Life Loss Estimation Model for Natural and Dam-Break Floods](#). Invited poster presentation. *Innovation and Technology Showcase, FEMA FY 2003 Risk Management in a Multi-Hazard World Workshop*, Emergency Management Institute, Emmitsburg, Maryland. June 2003. (Aboelata, M. and D.S. Bowles).
- Estimating Life Loss for Dam Safety Risk Assessment: A Review and New Approach. Institute for Water Resources Report, 02R-3. U.S. Army Corps of Engineers, 2002. (D.M. McClelland and D.S. Bowles) (<http://www.iwr.usace.army.mil/inside/products/pub/pubsearchAll.cfm?alpha=E>).
- [GIS Model for Estimating Dam Failure Life Loss](#). Invited paper in: Risk-Based Decision Making in Water Resources (Y.Y. Haimes and D.A. Moser Eds). American Society of Civil Engineers and presented at the *Tenth Engineering Foundation Conference on Risk-Based Decisionmaking in Water Resources: Protection of the Homeland's Water Resources Systems*, Santa Barbara, California. November 2002. (M. Aboelata, D.S. Bowles, and D.M. McClelland).
- [Life-loss estimation: What can we learn from case histories?](#) ANCOLD Bulletin 113:75-91, December 1999. (D.M. McClelland and D.S. Bowles).
- [LIFESim: A Model for Estimating Dam Failure Life Loss](#). Report to Institute for Water

Resources, US Army Corps of Engineers and Australian National Committee on Large Dams by Institute for Dam Safety Risk Management, Utah State University, Logan, Utah. 2005. (M.A. Aboelata and D.S. Bowles).

- [Transportation model for evacuation in estimating dam failure life loss.](#) ANCOLD Bulletin 128. 2005. (M Aboelata, D.S. Bowles, and A. Chen).

Reservoir Operating Restrictions

- [Risk-based evaluation of operating restrictions to reduce the risk of earthquake-induced dam failure.](#) In *Proceedings of the 2005 USSD Annual Lecture*. Salt Lake City, UT, June 2005. (D.S. Bowles, L.R. Anderson, T.F. Glover, S.S. Chauhan, and R.S. Rose).

Portfolio Risk Assessment and Management

- [Advances in the Practice and Use of Portfolio Risk Assessment.](#) ANCOLD Bulletin 117:21-32, April 2001. (D.S. Bowles).
- [From Portfolio Risk Assessment to Portfolio Risk Management.](#) ANCOLD Bulletin 117:21-32, April 2001. (D.S. Bowles).
- [Portfolio risk assessment: A tool for managing dam safety in the context of the owner's business.](#) ICOLD 20th Congress. Invited contribution to Q 76: The Use of Risk Analysis to Support Dam Safety Decisions and Management. (D.S. Bowles).
- [Portfolio risk assessment: A Tool for dam safety risk management.](#) *Proceedings of the 1998 USCOLD Annual Lecture*, Buffalo, New York. August 1998. (D.S. Bowles, L.R. Anderson, T.F. Glover, and S.S. Chauhan).
- [Portfolio risk assessment of SA Water's large dams.](#) ANCOLD (Australian Committee on Large Dams) Bulletin 112:27-39. August 1999. (D.S. Bowles, A.M. Parsons, L.R. Anderson, and T.F. Glover).

Forecast-Based Real-Time Reservoir Flood Operation

- [Reservoir Release Forecast Model for Flood Operation of the Folsom Project Including Pre-Releases.](#) *Proceedings of the 2004 USSD Annual Lecture*, St. Louis, MO, March 2004. (D.S. Bowles, J.D. Mathias, S.S. Chauhan, and J.D. Countryman).

Tolerable Risk Evaluation and Decision Making

- Dam safety, economic regulation and society's need to prioritise health and safety expenditures. In *Proceedings of the NZSOLD/ANCOLD Workshop on "Promoting and Ensuring the Culture of Dam Safety"*, Queenstown, New Zealand. November 2007. (J. Marsden, L. McDonald, D.S. Bowles, R. Davidson and R. Nathan)
- [A Role for Risk Assessment in Dam Safety Management.](#) In Broch, Lysne, Flatabo and Helland-Hansen (Eds.). Balkema, Rotterdam. *Proceedings of the 3rd International Conference HYDROPOWER 97*, Trondheim, Norway, June 1997. (D.S. Bowles, L.R. Anderson, and T.F. Glover).
- [ALARP Evaluation: Using Cost Effectiveness and Disproportionality to Justify Risk Reduction.](#) ANCOLD Bulletin 127:89-106. August 2004. (D.S. Bowles).
- [Comparison of Hazard Criteria with Acceptable Risk Criteria.](#) *Dam Safety '95*. Proceedings of the 1995 Annual Conference of the Association of State Dam Safety Officials, Inc. Atlanta, GA, September 17-20, 1995. (D.S. Bowles, L.R. Anderson, and T.F. Glover).
- [Dam Safety Decision-Making: Combining Engineering Assessments with Risk Information.](#) In *Proceedings of the 2003 USSD Annual Lecture*, Charleston, SC, April 2003. (D.S. Bowles, L.R. Anderson, T.F. Glover, and S.S. Chauhan).
- [Evaluation and Use of Risk Estimates in Dam Safety Decisionmaking](#) Invited paper in the

Proceedings of the United Engineering Foundation Conference on Risk-Based Decision-Making in Water Resources IX, 20-Year Retrospective and Prospective of Risk-Based Decision-Making, Santa Barbara, California. American Society of Civil Engineers. August 2001.

- [Risk Assessment in Dam Safety Decisionmaking](#). In *Proceedings of 4th Conference/EF/WR Div./ASCE*, Santa Barbara, CA, October 15-20, 1989. (D.S. Bowles).
- [Tolerable Risk for Dams: How Safe is Safe Enough?](#) Proceedings of the 2007 USSD Annual Lecture, Philadelphia, Pennsylvania. March. (Bowles, D.S.)

Spillway Gate Reliability

- [Gate Reliability: An Important Part of Dam Safety](#). Presented at the *2003 USSD Annual Lecture*, Charleston, South Carolina. April 2003. (Lewin, J., G. Ballard, and D.S. Bowles).
- [Gate Reliability Assessment for a Spillway Upgrade Design in Queensland, Australia](#). Invited paper at the Workshop on Spillway Reliability, USSD 2005 Annual Conference, San Antonio, Texas. (M. Barker, B. Vivian, and D.S. Bowles).

Risk Analysis and Probability Estimation

- Generalized event tree algorithm and software for dam safety risk assessment (DAMRAE). In Proceedings of the NZSOLD/ANCOLD Conference on Dams, Queenstown, New Zealand. November 2007. (A. Srivastava, D.S. Bowles and S.S. Chauhan)
- [Estimating Overall Risk of Dam Failure: Practical Considerations in Combining Failure Probabilities](#). ANCOLD Bulletin 127:63-72. August 2004. (P.I. Hill, D.S. Bowles, P. Jordan, and R.J. Nathan).
- On The Art of Event Tree Modeling for Portfolio Risk Analyses. ANCOLD Bulletin 121: 99-108, August 2002. (P.I. Hill, D.S. Bowles, R.J. Nathan, and R. Herweynen)
- [The Status of Methods for Estimation of the Probability of Failure of Dams for Use in Quantitative Risk Assessment](#) (French version of title). Q76-R. International Commission on Large Dams, 20th Congress, Beijing, China. (R. Fell, D.S. Bowles, L.R. Anderson, and G. Bell).

Uncertainty Analysis

- [Dam Safety Risk Assessment with Uncertainty Analysis](#). ANCOLD Bulletin 127:73-88. August 2004. (Chauhan, S.S. and D.S. Bowles).
- [Incorporating Uncertainty into Dam Safety Risk Assessment](#). *Proceedings on Risk Analysis in Dam Safety*, at Third International Conference on Dam Safety Evaluation. Goa, India. December 2001. (S.S. Chauhan and D.S. Bowles).

Selected Professional Activities

- Chair, Working Group for preparation of International Commission on Large Dams (ICOLD) Bulletin on Dam Safety Management to replace Bulletin 59: Dam Safety
- Elected to Board of Directors, U.S. Society on Dams, 2003 – 2009.
- Member of the U.S. Society on Dams (USSD) Committee on Dam Safety and Dam Security (CODSDS).
- Chair of a Working Group that prepared the USSD Emerging Issues White Paper *Dam Safety Risk Assessment: What is it? Who's using it and why? Where should we be going with it?* Published in 2003. .
- One of five co-authors of the International Commission on Large Dams (ICOLD) Bulletin 130: *Risk Assessment in Dam Safety Management: A Reconnaissance of Benefits, Methods and Current Applications*. Published in 2005.
- Peer Reviewer, ASCE publication, "Risk Assessment of dams and Hydroelectric Facilities: Guidance for Practical Application."

- Member of the Task Committee on Hazard Potential Classification Guideline (*FEMA 333*) for the Subcommittee on Federal and Non-Federal Coordination of the Interagency Committee on Dam Safety (ICODS).
- Former Control Member of the ASCE Geotechnical Safety and Reliability Committee.
- Former Chairman of the AWRA National Technical Working Group on Modeling and Statistics.
- Former President of the Utah and Colorado/Wyoming AWRA State Sections.

Other Experience

Some of Dr. Bowles' professional experience in other areas includes:

- Co-Director of a five-year USU/Harza project for transferring river basin planning and management technology to India including the establishment of a national training center.
- Extensive work for the mining industry including: permit preparation; water supply evaluation; diversion, control, storage, and treatment of surface water; hydrologic impact analysis of surface and subsurface mining; reclamation plans for a major strip mine in Wyoming; and the design of dewatering, depressurization, and injection well systems.
- Evaluation of flood mitigation alternatives including dikes and West Desert pumping for Great Salt Lake flooding for the State of Utah during the years of high lake levels.
- Benefit-cost, cost allocation, and pricing studies for a large water resources development project involving three West African nations on the Senegal River.
- Stream channelization and land development engineering for several Denver developers including presentations to Planning and Zoning Commission and Urban Flood Control District.
- Evaluation of flow and storage water rights aspects of mining developments and the ownership of new water from weather modification.
- Hydrologic, water quality, and rainfall modeling through the development of state-of-the-art models and the application and review of existing statistical and simulation procedures for various agencies including: U.S. Bureau of Reclamation, U.S. Geological Survey, Office of Technology Assessment, National Science Foundation, and National Weather Service.
- Extensive experience as an expert witness in major lawsuits covering mining impacts, water resources management, hydropower generation, toxic tort, urban flooding, canal break flooding, reservoir operation, potential hazard classification, dam failure and downstream impacts.
- Development and presentation of many graduate classes and professional development training programs for all levels and audiences including: general public, professional groups, engineering firm board of directors, international development bank, legislative committees, etc.
- Site engineering and supervision for drainage, highway, and industrial housing construction; design of mooring structures; and development of computerized management information, cost control, and cost estimating systems for an international civil engineering contractor based in London, England.

Education

- Ph.D. Civil and Environmental Engineering (Water Resources and Hydrology), Utah State University, Logan, Utah, U.S.A., 1977.
- B.Sc. Civil Engineering, The City University, London, England, 1972 (1st class honors).

Experience Record

1976 – 1981 and 1983 – Present:

Professor of Civil and Environmental Engineering and Director, Institute for Dam Safety

Risk Management Utah Water Research Laboratory, Utah State University. Formerly Director, Associate Director and Head of the Water and International Divisions, Utah Water Research Laboratory and Utah Center for Water Resources Research, Utah State University.

1986 – Present:

Managing Principal, RAC Engineers & Economists, 1520 Canyon Road, Providence, Utah 84332-9431, U.S.A.

1981-1983:

Branch Manager, Engineering Department Manager and Senior Hydrologist/Engineer, Law Engineering Testing Company, Denver, Colorado, U.S.A. (Management of hydrologic, hydraulic, and civil engineering design projects; and branch and department management functions including administration, personnel, hiring, business development, planning, cost control, client relations, etc.)

1972-1976:

Graduate Research Assistant, Utah Water Research Laboratory, Utah State University.

1967-1972:

Junior Civil Engineer (aggregate of 3 years) George Wimpey & Co. Ltd., Hammersmith, London, England (Site engineering and supervision of earthworks, drainage, highway, and industrial housing construction; design of mooring structures; and development of computerized management information, cost control, and cost estimating systems).

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