

Ralph A. Wurbs, Ph.D., P.E., Hon.D.WRE

December 2020

Senior Professor
Zachry Department of Civil Engineering
Texas A&M University
College Station, Texas 77843-3136
(979)845-3079, r-wurbs@tamu.edu

Registered Professional Engineer in Texas since 1975 (PE 38959, Firm Registration F-4546).
Founding (2005) and Honorary (2014) Diplomat, American Academy of Water Resources Engineers.

Date of Birth: August 17, 1949

EDUCATION

B.S. Degree, Civil Engineering, Texas A&M University, May 1971.

M.S. Degree, Civil Engineering Department, Water Resources Engineering Program,
University of Texas at Arlington, May 1974.

Thesis: *Determination of Reservoir Areas to be Cleared of Timber*

Ph.D. Degree, Civil Engineering Department, Water Resources Systems Planning and
Management Program, Colorado State University, December 1978.

Dissertation: *Flood Damage Reduction System Optimization*

PROFESSIONAL EXPERIENCE

Texas Department of Transportation (1969-1970)

While a student at Texas A&M University, Wurbs worked under the cooperative work-study program for the Texas Highway Department as a surveyor and construction inspector.

U.S. Army Corps of Engineers Fort Worth District (May 10, 1971 to August 24, 1980)

Experience as a civil engineer in the water resources development program of the USACE included 3.5 years in civil and hydraulic design, 4.5 years as a program and project manager, and 16 months as a Ph.D. student studying at Colorado State University under a Corps of Engineers fellowship. He worked primarily on planning and design studies for comprehensive river basin development, multiple-purpose reservoir projects, and local flood protection projects. He managed and provided technical input for a number of feasibility studies and design projects, involving in most cases multiple-year efforts with budgets of several hundred thousand dollars per year, at 1970's price levels. Construction costs for the projects implemented based on these studies ranged from several million dollars for urban flood protection projects to over a hundred million dollars for multiple-purpose reservoir projects. Although working primarily in the civil works program, he also had minor involvement with the military design and construction program.

A M.S. Degree was completed at the University of Texas at Arlington while working full-time for the Corps of Engineers. He was a full-time salaried USACE employee while completing the Ph.D. program at Colorado State University. Internal USACE professional development activities included the rotational engineer-in-training program and several short courses.

Texas A&M University (August 25, 1980 to Present)

Senior Professor (September 2017–Present), Professor (September 1997–August 2017), Associate Professor (September 1987–August 1997), Assistant Professor (August 1980–August 1987)
Arthur McFarland Endowed Professorship (March 2012–August 2017)
Executive and Admissions Committee Member, Interdepartmental Graduate Program in Water Management and Hydrologic Science (from creation of program in 2005 to September 2017)
Associate Director for Engineering, Texas Water Resources Institute (August 2007 to August 2012)
Division Head, Environmental and Water Resources Engineering Division of Civil Engineering Department (August 1999 to August 2007)

Off-Campus Visiting Assignments Since Joining Texas A&M University Faculty in 1980

Research Engineer, U.S. Army Corps of Engineers (USACE) Engineering Research and Development Center, Waterways Experiment Station, Military Hydrology Research Program, Vicksburg, Mississippi, June-August 1983 and June-August 1985.
Research Engineer and Visiting Scholar, USACE Hydrologic Engineering Center, Research Programs in Reservoir System Modeling, Storage Reallocation, and Flood Control Risk and Uncertainty Analysis, Davis, California, June-August of 1989, 1990, 1994, and 1995.
Research Engineer and Visiting Scholar, USACE Institute for Water Resources, National Study of Water Management During Drought, Alexandria, Virginia, June-August 1992 and July 1993.
Consultant, United Nations Development Program, National Institute of Hydrology of India, Indian Institute of Technology, Roorkee, India, July-August 1996.
Visiting Professor, Catholic University of Leuven (Institute for Land and Water Management) and Vrije University of Brussels (Department of Hydrology and Hydraulic Engineering), Leuven and Brussels, Belgium. Taught a graduate course in Belgium in 1998, 2001, 2002, and 2003.

Courses Taught at Texas A&M University

Undergraduate Courses

ENGR 109 Engineering Problem Solving and Computations (1 semester, 1989, 122 students)
ENGR 111 Foundations of Engineering (2 semesters, 2005, 2006, 195 students)
CVEN 302 Computer Applications in Engineering (4 semesters, 1990-1993, 151 students)
CVEN 311 Fluid Dynamics (2 semesters, 1982, 1984, 54 students)
CVEN 336 Fluid Dynamics Laboratory (coordinator, 4 semesters, 1982-1983)
CVEN 339 Water Resources Engineering (35 semesters, 1981-2016, 1,364 students)
CVEN 348 Engineering Economics (2 semesters, 1980-1981, 179 students)
CVEN 383 Civil Engineering Systems I (3 semesters, 1980-1981, 96 students)
CVEN 384 Civil Engineering Systems II (2 semesters, 1981, 67 students)
CVEN 422 Civil Engineering Systems (1 semester, 1997, 60 students)
CVEN 455 Urban Stormwater Management (7 semesters, 1988-2004, 2009, 190 students)
CVEN 458 Hydraulic Engineering of Water Distribution Systems (3 sem, 1997-2003, 39 students)
CVEN 463 Engineering Hydrology (6 semesters, 1984, 1985, 1995, 2010, 2011, 2018, 204 students)

Graduate Courses

CVEN 627 Surface Water Hydrology (11 semesters, 1985-1996, 148 students)
CVEN 628 Advanced Hydraulic Engineering (17 semesters, 2002-2020, 347 students)
CVEN 629 Hydraulics of Open Channels (4 semesters, 1986-1990, 38 students)

CVEN 664 Water Resources Planning and Management (14 semesters, 1982-2001, 159 students)
CVEN 665 Water Resources Systems Engineering (20 semesters, 1984-2020, 265 students)
CVEN 674 Groundwater Engineering (2 semesters, 2008-2009, 29 students)
CVEN 681 Environmental and Water Resources Seminar (coordinator, 7 semesters, 1987-2002)
OCEN 681 Ocean and Hydraulic Engineering Seminar (coordinator, 1 semester, 1982)
WMHS 601 Problems and Applications in Hydrologic Science (lecture team, 8 semesters, 2005-2014)

Graduate Course at Catholic University of Leuven and Vrije University of Brussels

Systems Approach to Water Management (4 semesters, 1998, 2001, 2002, 2003, 94 students)

Chair of Graduate Student Advisory Committees and Research Supervisor

42 M.S. with thesis, 48 M.E. (38 with CVEN 685 projects), 3 D.E., and 21 Ph.D. advisees have graduated. Forty-four graduate student advisees were funded by research assistantships on projects Wurbs supervised; other advisees were funded directly by NSF, USACE, or their employing agencies; and others held teaching assistantships, worked for engineering firms, and/or had fellowships. Several post-doctoral research associates and visiting scholars and a number of undergraduate students have also worked under his supervision on research projects.

Instructor for Continuing Education Courses for Practicing Engineers

Water Rights Analysis Package (WRAP) Modeling System Courses

Online Course on Water Availability Modeling with WRAP sponsored by Texas Commission on Environmental Quality, November 2020. Audio/video recordings and written materials are accessible at the TAMU WRAP website (<https://wrap.engr.tamu.edu/>).

Texas Commission on Environmental Quality, Austin, one day June 1999, March 2001, July 2010, two days, December 2011 and April 2015, and one day, June 2016 and August 2019.

Texas A&M University AgriLife Urban Solutions Center, Dallas, 2.5 days, July 2010.

Texas Water Resources Institute, College Station, 2.5 days, August 2008 and July 2009.

Texas Water Development Board, Austin, 2 days, May 2009.

USAID and Armenian Government, Yerevan, Armenia, 5 days, August 2003.

U.S. Agency for International Development (USAID), Austin, Texas, 2 days, March 2003.

National Institute of Development of Peru, Lima, Peru, 5 days, March 2002.

River Basin and River/Reservoir System Analysis with Hydrologic Engineering Center (HEC) Simulation Models, National Institute of Hydrology of India, Roorkee, 10 days, July 1996.

Water Distribution System Analysis, Universidad Autonoma de Coahuilla, Saltillo, Mexico, 5 days, August 1993.

Review for Fundamentals of Engineering Exam (fluid mechanics) originally presented via video for Fort Hood, Spring 1998, available at TAMU Civil Engineering Department website.

Review for Professional Engineering Registration Exam (fluid mechanics, hydraulics, hydrology), video for Fort Hood, Spring 1995, Fall 1996, available at TAMU Civil Engineering website.

Stream Hydrology and Hydraulics, Texas A&M University, 5 days, annually 1986-1992.

Flood and Flood Plain Analysis, Texas A&M University, 5 days, annually 1985-1991.

Water Distribution System Analysis, Texas A&M University, 5 days, annually 1982-1991.

Analysis of Unsteady Flow in Pipelines, Texas A&M University, 3 days, 1986.

Invited Speaker for Major Conferences and Workshops

- Water Rights Analysis Package (WRAP) Modeling System Users Group Conferences*, Austin and other cities, September 2006, March 2007, September 2007, March 2008, September 2008, April 2009, October 2009, April 2010, February 2012, July 2015, and January 2016.
- Panel Session on Advancing New Methods for Treatment of Climate Change and Extreme Events*, 20th World Environmental and Water Resources Congress, ASCE Environmental and Water Resources Institute, Pittsburgh, Pennsylvania, May 2019.
- Conference on Rethinking Texas Water Policy*, Bush School of Government and Public Service, Texas A&M University, College Station, April 2018.
- Water Resources Panel*, CECON2015 Conference, American Society of Civil Engineers (ASCE) Texas Section, San Marcos, Texas, October 2015.
- Panel Session on Accelerating Innovation* sponsored by Royal HaskoningDHV at the World Water Congress XV, International Water Resources Association, Edinburgh, Scotland, May 2015.
- Water Without Boundaries Seminar Series*, TAMU Water Management and Hydrologic Science Program, University of Pernambuco, and Brazilian Agricultural Research Corporation, College Station, Texas, November 2012.
- Gulf of Mexico Regional Climate Modeling Workshop*, Texas Center for Climate Studies, College Station, Texas, May 2012.
- Binational Border Sanitation and Water Quality Summit*, International Boundary and Water Commission, San Antonio, Texas, March 2011.
- Workshop on Reservoir Evaporation Reduction*, More Aqua, Inc., Massachusetts Institute of Technology, Cambridge, Massachusetts, December 2010. Also presented a seminar at Tufts University, Medford, Massachusetts, December 2010.
- Binational Water Congress*, Consejo Estatal de Ciencia y Tecnologia (COECYT) and Comision Estatal de Aguas y Saneamiento (CEAS), Saltillo, Mexico, November 2007.
- Ven Te Chow Hydrosystems Seminar Series*, Department of Civil and Environmental Engineering, University of Illinois, Urbana, Illinois, April 2007.
- Annual Congress of Korea Water Resources Association*, Jeju, Korea, May 2006. Also lectured at Korea Institute of Construction Technology, Ilsan, and Water Resources Corporation, Daejeon.
- River Systems Management Workshop*, U.S. Bureau of Reclamation, Las Vegas, Nevada, November 2005.
- California Water and Environmental Modeling Forum Annual Conference*, Monterrey, California, March 2005.
- National Conference on Hydrologic Modeling*, U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, and U.S. Geological Survey, Las Vegas, Nevada, March 1998.
- Water Availability Modeling Workshop*, Texas Natural Resource Conservation Commission and Texas Water Development Board, Austin, Texas, May 1997.
- Conference on Integrated Resource Management for Reclamation's River Managers*, U.S. Bureau of Reclamation, Denver, Colorado, April 1996.
- Drought Management Workshop*, USACE Institute for Water Resources, University of Washington, Seattle, Washington, June 1992.
- Reservoir and River System Management Workshop*, U.S. Bureau of Reclamation, Billings, Montana, March 1992.
- Interagency Workshop on Managing Bottomland Hardwoods*, U.S. Fish & Wildlife Service, U.S. Forest Service, Texas Parks & Wildlife Department, Nacogdoches, Texas, May 1986.

Research

Wurbs was the principal investigator for research projects funded by the following sponsors, with the exception of being a co-principal (rather than principal) investigator for National Science Foundation grants. All research was administered through either the Texas Engineering Experiment Station or the Texas Water Resources Institute of the Texas A&M University System.

Texas Commission on Environmental Quality, 1996, 1997-2003, 2005-2021
Texas Water Development Board, 1992-1994, 1997-1998, 2007-2008, 2014-2016
National Science Foundation, 2010-2017
Texas A&M AgriLife Research and Extension Water Initiative Program, 2014-2015
U.S. Department of the Interior and Texas Water Resources Institute
Cooperative University Research Program, 1983-1988, 1992-1994, 2001-2004, 2007-2008
U.S. Department of Energy through Baylor University, 2007-2008
U.S. Department of Energy, National Institute for Global Environmental Change, 1998-2003
U.S. Army Corps of Engineers (USACE) Fort Worth District, 1988-1989, 2001-2005
USACE Hydrologic Engineering Center, 1989, 1990, 1994, 1995
USACE Institute for Water Resources, 1992-1993
USACE Engineering Research and Development Center, 1983-1987
Brazos River Authority, 1986-1988, 2008-2010
Lower Rio Grande Development Council, 1997-1998
City of Corpus Christi, 1997
Texas Advanced Technology Program, 1990-1992
Center for Mineral and Energy Resources, 1983-1986
KTM and WKM Industries, 1982-1983

Consulting

Consulting assignments performed by Wurbs independently of TAMU were sponsored by the clients listed below. The majority of the consulting projects involved associations with clients extending over several years. Consulting projects have dealt with flood control, stormwater management, water right permits, interstate water allocation, environmental issues, multiple-purpose reservoir system operations, and associated computer modeling and analyses.

Engineering consulting firms including HDR, Freese and Nichols, Half Associates, CivilTech, R.J. Brandes Company, and others, and also several law firms.
Water agencies including the Texas Water Development Board, Brazos River Authority, Canyon Regional Water Authority, and Harris County Flood Control District.
USACE Memphis District through the Battelle Institute.
USACE Tulsa District through Mangi Environmental, Inc.
Crown Law, Department of Justice and Attorney General, State of Queensland, Australia.
U.S. Agency for International Development, ARD, Inc., and Government of Armenia.
National Institute of Hydrology of India through United Nations Development Program.
National Institute of Development of Peru.
Nebraska Department of Natural Resources and Office of the Attorney General.
Lake Lewisville Association.
City of College Station.
City of Austin.

Water Rights Analysis Package (WRAP) Modeling System

The WRAP modeling system was developed and has been continually expanded and improved by Wurbs and his graduate students at TAMU during 1988 through the present, sponsored by the TCEQ and other state and federal agencies. The modeling system has been extensively applied by the Texas Commission on Environmental Quality (TCEQ), Texas Water Development Board (TWDB), river authorities, other water management agencies, engineering consulting firms, and university researchers in regional and statewide planning, administration of the water rights permit system, operational planning studies, and other water management activities in Texas since 2002 and has significantly contributed to improved water management throughout the state. WRAP has also been applied by researchers and practitioners in other states and countries, both with and without assistance from Wurbs, but not to the extent as in Texas. Research and development at TAMU that begin with the initial creation of the modeling system has evolved to continuing expansion of modeling capabilities and exploration of priority water management issues.

The Texas Water Availability (WAM) System maintained by the TCEQ consists of the generalized WRAP, input datasets for all of the river basins of Texas, and related databases. WRAP software and documentation are available at <https://wrap.engr.tamu.edu/> with linkages with the TCEQ WAM website which provides WRAP input datasets and other information.

HONORS AND AWARDS

Fellow and Life Member, American Society of Civil Engineers (ASCE).
Founding Diplomate, American Academy of Water Resources Engineers (AAWRE).
(Inducted at ASCE 2005 World Water Congress in Anchorage, Alaska in May 2005.)
Distinction of Honorary Diplomate of AAWRE awarded at the ASCE 2014 World Environmental and Water Resources Congress in Portland, Oregon in June 2014.
Inaugural AAWRE Outstanding Research and Innovation Award presented at ASCE 20th World Environmental and Water Resources Congress in Pittsburgh, PA in May 2019.
TAMU Delegate, Universities Council on Water Resources, 1988-2018.
Editorial Board Member, Texas Water Journal, from creation of journal in 2010 to 2018.
Arthur McFarland Endowed Professorship, 2012-2017.
Freese and Nichols Faculty Endowed Fellowship, 2009-2012.
Truman R. Jones Excellence in Graduate Teaching Award, 2008 and 2014.
National J. M. Robbins Teaching Excellence Award from Chi Epsilon Honor Society, 2000.
Southwest Region Teaching Excellence Award from Chi Epsilon Honor Society, 1999.
Association of Former Students Distinguished Teaching Award, 1993.
Zachry Award for Excellence in Teaching, 1991/1992.
Texas Section ASCE John B. Hawley Award for Best Paper, 1996 and 2005.
Outstanding Reviewer Designation by ASCE Journal of Hydrologic Engineering, 2019.
U.S. Army Corps of Engineers Water Resources Planning Fellow, Colorado State University, 1976-1977.
Phi Kappa Phi Honor Society, Colorado State University, 1978.
Tau Beta Pi Engineering Honor Society, Texas A&M University, 1971.
Chi Epsilon National Civil Engineering Honor Society, Texas A&M University, 1970.

PUBLICATIONS

Books Published by Prentice-Hall Division of the Pearson Education Publishing Corporation

R.A. Wurbs and W.P. James, *Water Resources Engineering*, 838 pages, Prentice-Hall, 2002.
(Textbook for CVEN 339 for 41 semesters, reference/textbook for CVEN 455, CVEN 463,
and CVEN 665 for many semesters, and textbook for courses at many other universities.)

R.A. Wurbs, *Modeling and Analysis of Reservoir System Operations*, 372 p., Prentice-Hall, 1996.

R.A. Wurbs, *Water Management Models*, 245 pages, Prentice-Hall, 1995.

Technical Reports Published by the Texas Water Resources Institute (TWRI)

<https://twri.tamu.edu/publications/>

R.A. Wurbs, *Water Rights Analysis Package Modeling System Reference Manual*, Texas Water Resources Institute (TWRI) Technical Report (TR) 255, 12th Edition, 462 pages, May 2019.

R.A. Wurbs, *Water Rights Analysis Package Modeling System Users Manual*, TWRI TR-256, 12th Edition, 272 pages, May 2019.

R.A. Wurbs, *Fundamentals of Water Availability Modeling with WRAP*, TWRI TR-283, 9th Edition, 114 pages, May 2019.

R.A. Wurbs and R.J. Hoffpauir, *Water Rights Analysis Package Daily Modeling System*, TWRI TR-430, 3rd Edition, 342 pages, May 2019.

R.A. Wurbs and R.J. Hoffpauir, *Water Rights Analysis Package Modeling System Programming Manual*, TWRI TR-388, 6th Edition, 215 pages, May 2019.

R.A. Wurbs, *Water Rights Analysis Package River System Hydrology*, TWRI TR-431, 3rd Edition, 215 pages, May 2019.

R.A. Wurbs, *Daily Water Availability Model for the Brazos River Basin and San Jacinto-Brazos Coastal Basin*, TWRI TR-513, 238 pages, May 2019.

R.A. Wurbs and Yiwen Zhang, *River System Hydrology in Texas*, TWRI TR-461, 442 pages, August 2014.

R.A. Wurbs and Richard J. Hoffpauir, *Environmental Flows in Water Availability Modeling*, TWRI TR-440, 285 pages, May 2013.

R.A. Wurbs, R.J. Hoffpauir, and S.T. Schnier, *Application of Expanded WRAP Modeling Capabilities to the Brazos WAM*, TWRI TR-389, 2nd Edition, 356 pages, August 2012.

R.A. Wurbs and R.J. Hoffpauir, *WRAP Daily Simulation, Flood Control, and Short-Term Reliability Modeling Capabilities*, TWRI TR-403, 296 pages, December 2011.

R.A. Wurbs, *Salinity Simulation with WRAP*, TWRI TR-317, 87 pages, July 2009.

R.A. Wurbs and C.H. Lee, *Salinity Budget and WRAP Salinity Simulation Studies of the Brazos River/Reservoir System*, TWRI TR-352, 324 pages, July 2009.

R.A. Wurbs and T.J. Kim, *Extending and Condensing the Brazos River Basin Water Availability Model*, TWRI TR-340, 491 pages, December 2008.

R.A. Wurbs, R.J. Hoffpauir, H.E. Olmos, and A.A. Salazar, *Conditional Reliability, Sub-Monthly Time Step, Flood Control, and Salinity Features of WRAP*, TWRI TR-284, 263 pages, September 2006.

R.A. Wurbs, *Comparative Evaluation of Generalized River/Reservoir System Models*, TWRI TR-282, 203 pages, April 2005.

- R.A. Wurbs, *Reference and Users Manual for the Water Rights Analysis Package*, TWRI TR-180, 343 pages, July 2001.
- R.A. Wurbs and E.D. Sisson, *Comparative Evaluation of Methods for Distributing Naturalized Streamflows from Gaged to Ungaged Sites*, TWRI TR-179, 185 pages, August 1999.
- R.A. Wurbs, G. Sanchez-Torres, and D.D. Dunn, *Reservoir/River System Reliability Considering Water Rights and Water Quality*, TWRI TR-165, 201 pages, March 1994.
- R.A. Wurbs, A.S. Karama, I. Saleh, and C.K. Ganze, *Natural Salt Pollution and Water Supply Reliability in the Brazos River Basin*, TWRI TR-160, 178 pages, August 1993.
- R.A. Wurbs, D.D. Dunn, and W.B. Walls, *Water Rights Analysis Package, Model Description and Users Manual*, TWRI TR-146, 172 pages, March 1993.
- R.A. Wurbs and P.E. Carriere, *Evaluation of Storage Reallocation and Related Strategies for Optimizing Reservoir System Operations*, TWRI TR-145, 237 pages, August 1988.
- R.A. Wurbs, C.E. Bergman, P.E. Carriere, and W.B. Walls, *Hydrologic and Institutional Water Availability in the Brazos River Basin*, TWRI TR-144, 246 pages, August 1988.
- R.A. Wurbs, L.M. Cabezas, and M.N. Tibbets, *Optimum Reservoir Operation for Flood Control and Conservation Purposes*, TWRI TR-137, 130 pages, November 1985.
- R.A. Wurbs, M.N. Tibbets, L.M. Cabezas, and L.C. Roy, *State-of-the-Art Review and Annotated Bibliography of Systems Analysis Techniques Applied to Reservoir Operations*, TWRI TR-136, 353 pages, June 1985.
- R.A. Wurbs, *Reservoir Operation in Texas*, Texas Water Resources Institute Technical Report 135, 165 pages, June 1985.

Research Reports Published by the U.S. Army Corps of Engineers (USACE)

Engineering Research and Development Center: <https://www.ercd.usace.army.mil/Library/>

Institute for Water Resources: <http://www.iwr.usace.army.mil/Library/TWRLibrary.aspx>

Hydrologic Engineering Center: <https://www.hec.usace.army.mil/publications/>

- R.A. Wurbs, *Closures and Interior Facilities for Levee Projects: Principles, Case Examples, and Risk-Based Analysis Concepts*, Research Document 44, NTIS-AD-A315781/5INZ, USACE Hydrologic Engineering Center, Davis, California, 92 pages, September 1996.
- R.A. Wurbs, *Computer Models in Water Resources Planning and Management*, Report 94-NDS-7, NTIS-AD-A295807/2INZ, USACE Institute for Water Resources, Alexandria, Virginia, 227 pages, July 1994.
- R.A. Wurbs, *Military Hydrology Report 21: Regulation of Streamflow by Dams and Associated Modeling Capabilities*, MP EL-79-6, NTIS-AD-A260690/3INZ, USACE Waterways Experiment Station, Vicksburg, Mississippi, 119 pages, October 1992.
- R.A. Wurbs and S.T. Purvis, *Military Hydrology Report 20: Reservoir Outflow (RESOUT) Model*, MP EL-79-6, NTIS-AD-A237372/8INZ, USACE Waterways Experiment Station, Vicksburg, Mississippi, 182 pages, April 1991.
- R.A. Wurbs, *Optimization of Multiple-Purpose Reservoir System Operations: A Review of Modeling and Analysis Approaches*, Research Document 34, NTIS-AD-A236080/8INZ, USACE Hydrologic Engineering Center, Davis, California, 87 pages, January 1991.
- R.A. Wurbs, *Modifying Reservoir Operations to Improve Capabilities for Meeting Water Supply Needs During Droughts*, Research Document 31, NTIS-AD-A236078/2INZ, USACE Hydrologic Engineering Center, Davis, California, 70 pages, December 1990.

- R.A. Wurbs, *Military Hydrology Report 13: Comparative Evaluation of Dam-Breach Flood Forecasting Methods*, MP EL-79-6, USACE Waterways Experiment Station, Vicksburg, Mississippi, 117 pages, June 1986.
- R.A. Wurbs, *Military Hydrology Report 12: Case Study Evaluation of Alternative Dam-Breach Flood Wave Models*, MP EL-79-6, 4 Volumes, USACE Waterways Experiment Station, Vicksburg, Mississippi, 665 pages, November 1986.
- R.A. Wurbs, *Military Hydrology Report 9: State-of-the-Art Review and Annotated Bibliography of Dam-Breach Flood Forecasting*, MP EL-79-6, USACE Waterways Experiment Station, Vicksburg, Mississippi, 157 pages, February 1985.

Chapters in Books

- R.A. Wurbs, "Chapter 4 Impacts of Development on River Flows", *Water Resources Systems, Management and Investigations*, (R.A. Lambert, Editor), Nova Science, 2017.
- R.A. Wurbs, "Chapter 137 Institutional Framework for Water Management", *Handbook of Applied Hydrology* (V.P. Singh, Editor-in-Chief), McGraw-Hill, Second Edition, 2016.
- R.A. Wurbs, "Chapter 5 Reservoir System Management", *Sustainable Water Management and Technologies, Volume I Sustainable Water Management*, (D.H. Chen, Editor), Taylor & Francis/CRC Press, 2016.
- R.A. Wurbs, "Chapter 1 Metrics of River/Reservoir System Water Availability and Supply Reliability," *Drinking Water and Water Management: New Research* (M. Giannino, Editor), Nova Science Publishers, 2014.
- R.A. Wurbs, "Chapter 8 Water Allocation Systems," *Water Resources Planning, Development and Management* (R.A. Wurbs, Editor), InTech Publishers, 2013.
- R.A. Wurbs, "Chapter 1 Generalized Models of River System Development and Management," *Current Issues in Water Management* (U. Uhlig, Editor), InTech Publishers, 2011.
- R.A. Wurbs, "Chapter 24 Water Rights Analysis Package (WRAP) Modeling System", *Watershed Models* (V.P. Singh and D.K. Frevert, Editors), Taylor & Francis/CRC Press, 2006.
- R.A. Wurbs, "Natural Salt Pollution Control in the Southwest," *Desalination of Seawater and Brackish Water* (W.C. Lauer, Editor), American Water Works Association, 2006.
- R.A. Wurbs, "Chapter 3 Administration and Modeling of the Texas Water Rights System," *Water for Texas*, (J. Norwine, J.R. Giardino, and S. Krishnamurthy, Editors), Texas A&M University Press, 2005.
- R.S. Muttiah and R.A. Wurbs, "Chapter 6 Climate Change Effects on the Water Supply in Some Major River Basins", *Climate Change and Global Food Security* (R. Lal, N. Uphoff, B.A. Stewart, and D.O. Hansen, Editors), Taylor & Francis/CRC Press, 2005.
- R.A. Wurbs, "Chapter 4 Enhancement of Operational Efficiencies of Federal Reservoir Projects," *Public Works Administration* (L. Brewer, Editor), Sage Publications, 1996.
- R.A. Wurbs, "Application of Network Flow Programming Models in Managing Reservoir/River Systems," *Applications of Management Science: Volume 9 Engineering Applications* (K.D. Lawrence and G.R. Reeves, Editors), JAI Press, 1996.
- R.A. Wurbs, "Modeling and Analysis of Reservoir/River System Reliability," *Trends in Hydrology* (S.G. Pandalai, Editor), Council of Scientific Research Integration, India, 1994.
- R.A. Wurbs, "Chapter 13 Economic Evaluation of Urban Flood Damage Reduction Plans," *Civil Engineering Practice: Water Resources/Environmental* (P.N. Cheremisinoff and S.L. Cheng, Editors), Technomic Publishing, 1988.

Journal Papers

- R.A. Wurbs, "Institutional Framework for Modeling Water Availability and Allocation", *Journal of Water, Special Issue of Featured Papers on Water Resources Management, Policy, and Governance*, MDPI, Vol. 12, Issue 10, 2767, 26 pp, doi:10.3390/w12102767, <https://www.mdpi.com/2073-4441/12/10/2767>, October 2020.
- R.A. Wurbs, "Monthly River Flows in Texas for Natural and Developed Conditions", *Water Cycle Journal*, Elsevier, <https://doi.org/10.1016/j.watcyc.2020.10.10.001>, November 2020.
- Yiwen Zhang and R.A. Wurbs, "Long-Term Changes in River System Hydrology in Texas", *Proceedings of International Association of Hydrological Sciences*, Copernicus Publications, <https://doi.org/10.5194/piahs-95-1>, Vol. 379, 255-261, 2018.
- R.A. Wurbs, "Incorporation of Environmental Flows in Water Allocation in Texas", *Water International*, Journal of the International Water Resources Association, Taylor & Francis, Vol. 42, Issue 1, January 2017.
- Mustafa Demirel and R.A. Wurbs, "Assessment of Flood Control Capabilities for Alternative Reservoir Storage Allocations", *Turkish Journal of Water Science & Management*, Republic of Turkey Ministry of Forestry and Water Affairs, 6777(1):108-136, January 2017.
- Mark A. Pauls and R.A. Wurbs, "Environmental Flow Attainment Metrics for Water Allocation Modeling", *Journal of Water Resources Planning and Management*, American Society of Civil Engineers (ASCE), Vol. 142, Issue 8, August 2016.
- R.A. Wurbs and Richard J. Hoffpauir, "Environmental Flow Requirements in a Water Availability Modeling System", *Journal of Sustainability of Water Quality and Ecology*, International Water Association, Elsevier, [dx.doi.org/10.1016/j.swape.2016.05.003](https://doi.org/10.1016/j.swape.2016.05.003), May 2016.
- R.A. Wurbs, "Sustainable Statewide Water Resources Management in Texas", *Journal of Water Resources Planning and Management*, ASCE, Vol. 141, Issue 12, December 2015.
- R.A. Wurbs, "Institutional and Hydrologic Water Availability", *Journal of Water Resources Management*, European Water Resources Association, Springer, Vol. 29, Issue 2, 2015.
- R.A. Wurbs and Rolando A. Ayala, "Reservoir Evaporation in Texas, USA", *Journal of Hydrology*, Elsevier Science, Vol. 510, No.1, January 2014.
- R.A. Wurbs, "Impacts of Climate Variability on Water Management", *Journal of Academic Perspectives*, Vol. 2014, No. 2, 2014. (Expanded version of paper presented at *London Symposium on Climate Change*, Oxford and Cambridge University Club, June 2013.)
- R.A. Wurbs, S.T. Schnier, and H.E. Olmos, "Short-Term Reservoir Storage Frequency Relationships," *Journal of Water Resources Planning and Management*, American Society of Civil Engineers, Vol. 138, No. 6, November 2012.
- R.A. Wurbs, "Reservoir/River System Management Models," *Journal of Texas Water*, Texas Water Resources Institute, 3(2):26-41, August 2012.
- R.A. Wurbs and C.H. Lee, "Salinity in Water Availability Modeling," *Journal of Hydrology*, Elsevier Science, Vol. 407, No. 2, November 2011.
- T.J. Kim and R.A. Wurbs, "Modeling River/Reservoir System Management with the Expanded WRAP," *Journal of Civil Engineering*, Korean Society of Civil Engineers, Springer Publishers, Vol. 15, No. 8, November 2011.
- T.J. Kim and R.A. Wurbs, "Development of Monthly Naturalized Flow Using Water Rights Analysis Package (WRAP)-Based Methods," *Journal of Civil Engineering*, Korean Society of Civil Engineers, Springer Publishers, Vol. 15, No. 7, September 2011.
- R.A. Wurbs and T.J. Kim, "River Flows for Alternative Conditions of Water Resources Development," *Journal of Hydrologic Engineering*, ASCE, Vol. 16, No. 2, February 2011.

- T.J. Kim and R.A. Wurbs, "Development of a Condensed Model for Managing a River/Reservoir System Based on Texas Water Availability Modeling System," *Journal of Civil Engineering*, Korean Society of Civil Engineers, Springer Publishers, Vol. 15, No. 1, January 2011.
- R.A. Wurbs and T.J. Kim, "Condensing Water Availability Models to Focus on Specific Water Management Systems," *Journal of Texas Water*, TWRI, 1(1):20-32, September 2010.
- R.A. Wurbs, "Methods for Developing Naturalized Monthly Flows at Gaged and Ungaged Sites," *Journal of Hydrologic Engineering*, ASCE, Vol. 11, No. 1, January 2006.
- R.A. Wurbs, R.S. Muttiah, and F. Felden, "Incorporation of Climate Change in Water Availability Modeling," *Journal of Hydrologic Engineering*, ASCE, Vol. 10, No. 3, September 2005.
- R.A. Wurbs, "Texas Water Availability Modeling System," *Journal of Water Resources Planning and Management*, American Society of Civil Engineers, Vol. 131, No. 4, July 2005.
- R.A. Wurbs, "Modeling River/Reservoir System Management, Water Allocation, and Supply Reliability," *Journal of Hydrology*, Elsevier Science, Vol. 103, No. 1-4, 2005.
- A.A. Salazar and R.A. Wurbs, "Conditional Reliability Modeling of Short Term River Basin Management," *Journal of Water Resources Planning and Management*, American Society of Civil Engineers, Vol. 130, No. 6, November 2004.
- R.A. Wurbs, "Water Allocation Systems in Texas," *International Journal of Water Resources Development*, Taylor & Francis: Routledge Publishing, Vol. 20, No. 2, June 2004.
- R.A. Wurbs, "Modeling River Basin Management: An Institutional Perspective," *International Journal of Water Resources Development*, Routledge, Vol. 19, No. 4, December 2003.
- R.A. Wurbs, "Future Water Availability in the U.S.," *The World and I Journal*, Washington Times Corporation, Vol. 16, No. 7, July 2003.
- R.A. Wurbs, "Natural Salt Pollution Control in the Southwest," *Journal of the American Water Works Association*, Vol. 94, No. 12, December 2002.
- R.S. Muttiah and R.A. Wurbs, "Modeling the Impacts of Climate Change on Water Supply Reliabilities," *Water International*, Journal of the International Water Resources Association, Vol. 27, No. 3, September 2002.
- R.A. Wurbs, "Stage-Frequency Analyses for Urban Flood Control Reservoirs," *Journal of Hydrologic Engineering*, American Society of Civil Engineers, Vol. 128, No. 1, January 2002.
- R.S. Muttiah and R.A. Wurbs, "Scale-Dependent Soil and Climate Variability Effects on Watershed Water Balance of the SWAT Model," *Journal of Hydrology*, Elsevier Science, Vol. 256, January 2002.
- R.A. Wurbs, S.V. Toneatti, and J.M. Sherwin, "Modeling Uncertainties in Flood Studies," *International Journal of Water Resources Development*, Routledge, Vol. 17, No. 3, 2001.
- R.A. Wurbs, "Assessing Water Availability under a Water Rights Priority System," *Journal of Water Resources Planning and Management*, ASCE, Vol. 127, No. 4, July/August 2001.
- R.A. Wurbs, "Managing Our Precious Liquid Asset," *The World and I*, Washington Times Corporation, Vol. 15, No. 10, October 2000.
- R.A. Wurbs, "Dissemination of Generalized Water Resources Models in the United States," *Water International*, International Water Resources Association, Vol. 23, No. 3, September 1998.
- R.A. Wurbs, "Water Supply Reliability as Influenced by Natural Salt Pollution," *Journal of Contemporary Water Resources Education and Research*, Universities Council on Water Resources, No. 108, 1997.
- R.A. Wurbs, "Reservoir System Management," *Journal of Contemporary Water Resources Education and Research*, Universities Council on Water Resources, No. 106, 1997.

- R.A. Wurbs, "Water Rights Considerations in Reservoir System Management," *Journal of Contemporary Water Resources Education and Research*, Universities Council on Water Resources, No. 106, 1997.
- R.A. Wurbs, "Issues in Evaluating Water Availability Under the Texas Water Rights System," *Journal of the American Water Works Association*, Vol. 89, No. 5, May 1997.
- R.A. Wurbs and G. Sanchez-Torres, "Simulation of a Surface Water Allocation System," *Water International*, Journal of the International Water Resources Association, Vol. 21, No. 2, 1996.
- R.A. Wurbs, "Optimal Sizing of Flood Damage Reduction Measures Based on Economic Efficiency," *International Journal of Water Resources Development*, Taylor & Francis: Routledge Publishing, Vol. 12, No. 1, March 1996.
- A.R. Yerramreddy and R.A. Wurbs, "Water Resources Allocation Based on Network Flow Programming," *Journal of Civil Engineering Systems*, Gordon and Breach Publishers, Vol. 13, No. 1, 1996.
- R.A. Wurbs, "Water Rights in Texas," *Journal of Water Resources Planning and Management*, American Society of Civil Engineers, Vol. 121, No. 6, November 1995.
- R.A. Wurbs and A.S. Karama, "Salinity and Water Supply Reliability," *Journal of Water Resources Planning and Management*, ASCE, Vol. 121, No. 4, September 1995.
- R.A. Wurbs, I. Saleh, and A.S. Karama, "Reservoir System Reliability Constrained by Salinity," *International Journal of Water Resources Development*, Vol. 11, No. 3, September 1995.
- R.A. Wurbs, "Supply Storage in Federal Reservoirs," *Journal of the American Water Works Association*, Vol. 86, No. 4, April 1994.
- R.A. Wurbs and A.K. Yerramreddy, "Reservoir/River System Analysis Models: Conventional Simulation versus Network Flow Programming," *International Journal of Water Resources Development*, Taylor & Francis: Routledge Publishing, Vol. 10, No. 2, 1994.
- R.A. Wurbs, "Reservoir System Simulation and Optimization Models," *Journal of Water Resources Planning and Management*, ASCE, Vol. 119, No. 4, July/August 1993.
- R.A. Wurbs and P.E. Carriere, "Hydrologic Simulation of Reservoir Storage Reallocations," *International Journal of Water Resources Development*, Routledge, Vol. 9, No. 1, 1993.
- R.A. Wurbs, "Evolution of Water Law in Texas," *Journal of Hydrological Science and Technology*, American Institute of Hydrology, Vol. 6, October 1991.
- R.A. Wurbs, P.E. Carriere, and W.K. Johnson, "Management Strategies for Increasing Reservoir Yields," *Water International*, Journal of the International Water Resources Association, Vol. 15, No. 3, September 1990.
- W.K. Johnson, R.A. Wurbs, and J.E. Beegle, "Opportunities for Reservoir Storage Reallocation," *Journal of Water Resources Planning and Management*, ASCE, Vol. 116, No. 4, July 1990.
- R.A. Wurbs and C.E. Bergman, "Evaluation of Factors Affecting Reservoir Yield Estimates," *Journal of Hydrology*, Elsevier Science Publishers, Vol. 112, 1990.
- R.A. Wurbs and W.B. Walls, "Water Rights Modeling and Analysis," *Journal of Water Resources Planning and Management*, American Society of Civil Engineers, Vol. 115, No. 4, July 1989.
- R.A. Wurbs and L.M. Cabezas, "Analysis of Reservoir Storage Reallocations," *Journal of Hydrology*, Elsevier Science Publishers, Vol. 92, June 1987.
- R.A. Wurbs, "Dam-Breach Flood Wave Models," *Journal of Hydraulic Engineering*, American Society of Civil Engineers, Vol. 113, No. 1, January 1987.
- R.A. Wurbs, "Reservoir Management in Texas," *Journal of Water Resources Planning and Management*, American Society of Civil Engineers, Vol. 113, No. 1, January 1987.
- L.M. Cabezas and R.A. Wurbs, "Economic Evaluation of Water Supply Systems," *Journal of Urban Planning and Development*, ASCE, Vol. 112, No. 2, December 1986.

- R.A. Wurbs, "Flood Damage Reduction System Optimization," *Journal of Civil Engineering*, Pergamon Press, Vol. 3, No. 4, 1984.
- R.A. Wurbs, "Economic Feasibility of Flood Control Improvements," *Journal of Water Resources Planning and Management*, American Society of Civil Engineers, Vol. 109, No. 1, Jan. 1983.

Papers Published in Conference Proceedings

- R.A. Wurbs, "Simulation Modeling of River/Reservoir System Water Allocation and Management", *World Water Congress XV*, International Water Resources Association, Edinburgh, Scotland, May 2015.
- R.A. Wurbs and Y. Zhang, "Changing Surface Water Availability in Texas", *World Environmental and Water Resources Congress 2015* (K. Karvazy and V. Webster, Editors), Environmental & Water Resources Institute, American Society of Civil Engineers, Austin, Texas, May 2015.
- R.A. Wurbs, "Long-Term Changes in River System Water Budgets in Texas", *Conference on Water Systems, Science, and Society Under Global Change*, Universities Council on Water Resources, National Institutes for Water Resources, and University Consortium for Advancement of Hydrologic Science, Medford, Massachusetts, June 2014.
- R.A. Wurbs, "Modeling Institutional and Hydrologic Water Availability: Lessons from the Texas Experience", *8th International Conference of the European Water Resources Association*, Porto, Portugal, June 2013.
- R.A. Wurbs and R.J. Hoffpauir, "Incorporation of Environmental Flows in Water Availability Modeling", *2013 Annual Conference of the Universities Council on Water Resources and National Institutes for Water Resources*, Lake Tahoe, California, June 2013.
- C.H. Lee and R.A. Wurbs, "Development of Salinity Budget for the Brazos River Basin," *18th Congress of the Asia and Pacific Division of the International Association for Hydro-Environment Engineering and Research*, Jeju, Korea, August 2012.
- R.J. Hoffpauir and R.A. Wurbs, "Modeling Environmental Instream Flow Requirements," *Spring 2012 Conference*, Texas Section, American Society of Civil Engineers, April 2012.
- R.A. Wurbs, "Modeling Reservoirs from a Water Allocation Perspective," *Universities Council on Water Resources Annual Conference, Planning for Tomorrow's Water: Snowpack, Aquifers, and Reservoirs*, Boulder, Colorado, July 2011.
- R.J. Hoffpauir and R.A. Wurbs, "Daily Version of Water Rights Analysis Package Modeling System," *Proceedings of Spring 2011 Conference*, ASCE Texas Section, April 2011.
- R.A. Wurbs, "Institutional Dimensions of River/Reservoir System Modeling: Lessons from Implementation of the Texas Water Availability Modeling System," *World Water and Environmental Resources Congress*, ASCE EWRI, Providence, Rhode Island, May 2010.
- R.A. Wurbs and C.H. Lee, "Natural Salt Pollution in the Brazos River Basin," *Proceedings of Spring 2010 Conference*, Texas Section, American Society of Civil Engineers, April 2010.
- R.A. Wurbs, "New and Expanded WRAP Modeling Capabilities," *Proceedings of Fall 2009 Conference*, Texas Section, American Society of Civil Engineers, October 2009.
- S.T. Schnier and R.A. Wurbs, "Using Conditional Reliability Modeling to Assess Short-Term Water Supply Capabilities," *Proceedings of Conference on Adaptive Water Management*, Snowbird, Utah, American Water Resources Association, June 2009.
- R.A. Wurbs, "Extensions to the Water Rights Analysis Package Modeling System," *World Water and Environmental Resources Congress 2005*, Anchorage, Alaska, Environmental and Water Resources Institute, American Society of Civil Engineers, May 2005.

- H.D. Rivera and R.A. Wurbs, "Flood Control Reservoir Operations for Conditions of Limited Storage Capacity," *Proceedings of Fall 2004 Conference*, Texas Section ASCE, Sept 2004.
- D.M. Khan and R.A. Wurbs, "Flood Frequency Analysis with Multiple Discrete Event Simulation," *Proceedings of Spring 2004 Conference*, Texas Section ASCE, April 2004.
- R.A. Wurbs, "Implementation of a Water Allocation Modeling System for Texas," *World Water and Environmental Resources Congress 2003* (P. Bizier and P. DeBarry, Editors), Philadelphia, PA, Environmental and Water Resources Institute, ASCE, June 2003.
- A.A. Salazar and R.W. Wurbs, "Conditional Reliability Modeling of Short-Term River Basin Management," *Proceedings of Spring 2003 Conference*, Texas Section, ASCE, March 2003.
- R.A. Wurbs, "Water Rights Analysis Package (WRAP) Model," *Proceedings of Spring 2001 Conference*, Texas Section, American Society of Civil Engineers, March 2001.
- R.A. Wurbs, "Impacts of Urban Development on Reservoir Stage Frequency Relationships," *ASCE 2000 Joint Conference on Water Resources Engineering and Water Resources Planning and Management* (H. Hotchkiss and M. Glade, Ed.), ASCE, July 2000.
- R.A. Wurbs, "Water Availability Modeling in Texas," *ASCE Joint Conference on Water Resources Engineering and Water Resources Planning and Management* (H. Hotchkiss and M. Glade, Editors), Minneapolis, Minnesota, ASCE, July 2000.
- R.S. Muttiah, R.A. Wurbs, and J.A. Bowman, "Soil and Climate Variability Effects on Water Balance of Climate Change Watershed Models," *Specialty Conference on Potential Consequences of Climate Variability and Change to Water Resources*, Atlanta, Georgia, American Water Resources Association, May 1999.
- R.A. Wurbs, "Water Rights Analysis Package," *Proceedings of 25th Water for Texas Conference* (R. Jensen, Editor), Texas Water Resources Institute, December 1998.
- R.A. Wurbs and S.V. Toneatti, "Flood Damage Analysis Methods," *Proceedings of Annual Meeting of Texas Section of the American Society of Civil Engineers*, September 1996.
- S.V. Toneatti and R.A. Wurbs, "Risk-Based Versus Conventional Approaches for Estimating Expected Annual Flood Damages," *Rivertech '96 Proceedings*, Chicago, Illinois, International Water Resources Association, September 1996.
- R.A. Wurbs, "Natural Salt Pollution in the Southwest," *UCOWR96 Proceedings*, Universities Council on Water Resources, San Antonio, Texas, July 1996.
- G. Sanchez-Torres and R.A. Wurbs, "Mathematical Model for Management of a Water Rights System," *Proceedings of 8th Regional Conference of Scientific and Technological Research*, Tamaulipas Academy of Scientific and Technologic Research, Mexico, May 1996.
- J.B. Valdes, J.B. Marco, R.A. Wurbs, and A. Mejia, "Water Resources Extremes and Sustainable Development," *Proceedings of 1995 International Symposium on Sustainable Development*, Industrial Research Institute of Taiwan and Texas A&M University, Taipei, Taiwan, 1995.
- R.A. Wurbs, "Considerations in Simulating the Texas Water Rights System," *Water for Texas Conference: Research Leads the Way* (R. Jensen, Editor), Texas Water Resources Institute, January 1995.
- R.A. Wurbs, "Issues in Water Rights Modeling," *Integrated Water Resources Planning for the 21st Century* (M.F. Domenica, Editor), American Society of Civil Engineers, 1995.
- W.K. Johnson, D.R. Ford, and R.A. Wurbs, "Opportunities, Constraints, and Change in Reservoir Management," *Water Policy and Management: Solving the Problems* (D.G. Fontane and H.N. Tuvel, Editors), Denver, Colorado, American Society of Civil Engineers, 1994.
- R.A. Wurbs, "Integration of Water Rights and Salinity Considerations in Comprehensive River Basin Management," *Water Policy and Management: Solving the Problems* (D.G. Fontane and H.N. Tuvel, Editors), American Society of Civil Engineers, 1994.

- A.R. Yerramreddy and R.A. Wurbs, "Water Rights Analysis Program: Conventional Simulation Versus Network Flow Programming," *Proceedings of Conference on Man's Effects on Hydrologic Systems*, American Water Resources Association, December 1993.
- A.R. Yerramreddy and R.A. Wurbs, "Network Flow Programming for Water Rights Analysis," *Proceedings of American Institute of Hydrology Conference*, April 1994.
- R.A. Wurbs and A.S. Karama, "Modeling and Analysis of the Brazos River Salinity Problem," *Proceedings of Conference on Texas Water Issues*, Texas Sections of American Water Resources Institute and American Institute of Hydrology, April 1993.
- R.A. Wurbs, "Hydraulics of Dams from a Military Perspective," *Hydraulic Engineering* (M.E. Jennings and N.G. Bhowmik, Editors), American Society of Civil Engineers, 1992.
- R.A. Wurbs and A.S. Karama, "Reservoir System Reliability Constrained by Natural Salt Pollution," *Water Resources Planning and Management* (M. Karamouz, Editor), ASCE, 1992.
- D.D. Dunn and R.A. Wurbs, "System Operating Strategies in Water Rights Modeling and Analysis," *Water Resources Planning and Management* (M. Karamouz, Editor), ASCE, 1992.
- P.E. Carriere and R.A. Wurbs, "Seasonal Rule Curve Reservoir Operation in Texas," *Proceedings of the Conference on Hydrology of Floods and Watershed Systems*, AWRA, May 1992.
- R.A. Wurbs, "Natural Salt Pollution in the Brazos River Basin," *Hydraulic Engineering* (R.M. Shane, Editor), Nashville, Tennessee, American Society of Civil Engineers, 1991.
- R.A. Wurbs, "A Review of Modeling and Analysis Approaches for Optimization of Reservoir System Operations," *Hydraulic Engineering* (R.M. Shane, Editor), ASCE, 1991.
- P.E. Carriere and R.A. Wurbs, "Storage Reallocation Evaluation for Reservoir Systems," *Optimizing the Resources for Water Management* (R.M. Khanbilvardi and T.C. Gooch, Editors), American Society of Civil Engineers, 1990.
- W.B. Walls and R.A. Wurbs, "Simulation of a Surface Water Allocation System," *Optimizing the Resources for Water Management* (R.M. Khanbilvardi & T.C. Gooch, Editors), ASCE, 1990.
- P.E. Carriere and R.A. Wurbs, "Storage Reallocation of Hydropower Projects in North Georgia", *Hydropower '89 International Conference on Hydropower*, Niagara Falls, NY, ASCE, 1989.
- R.A. Wurbs, "Hydrologic and Institutional Water Availability," *Computerized Decision Support Systems for Water Managers* (Labadie, Brazil, Corbu, and Johnson, Editors), ASCE, 1988.
- R.A. Wurbs, "Management Strategies for Increasing Reservoir Yields," *22nd Water for Texas Conference* (R. Jensen and C. Dunagan, Editors), TWRI, 1988.
- R.A. Wurbs, C.E. Bergman, and P.E. Carriere, "Brazos River Basin Reservoir System Simulation," *Sixth World Congress on Water Resources*, Montreal, Canada, International Water Resources Association, 1988.
- L.M. Cabezas and R.A. Wurbs, "Economic Analysis of Multipurpose Reservoirs," *Water Planning and Financing for the 21st Century* (M.A. Collins, Editor), Center for Urban Water Studies, Southern Methodist University, September 1987.
- R.A. Wurbs and M.N. Tibbets, "Seasonal Rule Curve Reservoir Operation," *Engineering Hydrology* (A.D. Feldman, Editor), Williamsburg, Virginia, ASCE, August 1987.
- R.A. Wurbs, "Effects of Dams on Hydrology in Bottomland Hardwoods," *Bottomland Hardwoods in Texas* (C.A. McMahan and R.G. Frye, Editors), Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, and U.S. Forest Service, May 1986.
- R.A. Wurbs, "Comparative Evaluation of Dam-Breach Flood Wave Models," *Texas Civil Engineer*, American Society of Civil Engineers, May 1986.
- W.P. James, K.M. Strzepek, and R.A. Wurbs, "Microcomputers in Hydraulics-Hydrology Education," *Hydraulics and Hydrology in the Small Computer Age* (W.R. Waldrop, Editor), American Society of Civil Engineers, August 1985.

UNPUBLISHED REPORTS FOR RESEARCH AND CONSULTING SPONSORS

- R.A. Wurbs, *Daily Water Availability Model for the Neches River Basin*, Texas Commission on Environmental Quality, Contract 582-18-80410, 199 pages, June 2020.
<https://wrap.engr.tamu.edu/>
- R.A. Wurbs, *Daily Water Availability Model for the Trinity River Basin*, Texas Commission on Environmental Quality, Contract 582--18-80410, 193 pages, December 2019.
<https://wrap.engr.tamu.edu/>
- R.A. Wurbs, *WRAP Additions and Revisions*, Texas Commission on Environmental Quality, Contract 582-15-50298, 86 pages, Sep 2019. <https://wrap.engr.tamu.edu/>
- R.A. Wurbs, *Pre-Flood Releases of Reservoir Water Supply Storage to Reduce Flood Damages Based on River Flow Forecasts*, Crown Law, Department of Justice and Attorney General, State of Queensland, Australia, 24 pages, February 2018.
- R.A. Wurbs, *Hydrology Update and Refinement for the Brazos River Basin Daily Water Availability Model*, Texas Commission on Environmental Quality (TCEQ), Contract 582-15-50298, 64 pages, April 2017.
- R.A. Wurbs, *Hydrology Update and Refinement for the Trinity River Basin Daily Water Availability Model*, TCEQ, Contract 582-15-50298, 55 pages, July 2016.
- R.A. Wurbs and Y. Zhang, *Analyses of Flows in the Brazos and Trinity Rivers and Tributaries*, Texas Water Development Board, Contract 1348311643, 406 pages, June 2016.
- R.A. Wurbs, *Daily Water Availability Models*, TCEQ, Contract 582-15-50298, 20 p, August 2015.
- R.A. Wurbs, M. Ryu, M.A. Pauls, and R.J. Hoffpauir, *Daily Water Availability Model for the Guadalupe and San Antonio River Basins*, TCEQ, Contract 582-12-10220, 171 pages, August 2014.
- R.A. Wurbs and A. Bista, *Comparative Analysis of Naturalized Stream Flows in the Colorado River Basin*, TCEQ, Contract 582-12-10220, 159 pages, October 2014.
- R.A. Wurbs, R.J. Hoffpauir, M.A. Pauls, M. Ryu, and A. Bista, *Daily Water Availability Model for the Sabine River Basin*, Texas Commission on Environmental Quality, Contract 582-12-10220, 182 pages, July 2014.
- R.A. Wurbs, R.J. Hoffpauir, M.A. Pauls, M. Ryu, and A. Bista, *Daily Water Availability Model for the Neches River Basin*, Texas Commission on Environmental Quality, Contract 582-12-10220, 117 pages, July 2014.
- R.J. Hoffpauir, M.A. Pauls, and R.A. Wurbs, *Daily Water Availability Model for the Trinity River Basin*, TCEQ, Contract 582-12-10220, 109 pages, April 2014.
- M.A. Pauls and R.A. Wurbs, *Hydrologic Period-of-Analysis Extension for the Guadalupe and San Antonio River Basins Water Availability Model*, TCEQ, Contract 582-12-10220, 317 pages, April 2014.
- M.A. Pauls and R.A. Wurbs, *Hydrologic Period-of-Analysis Extension for the Neches River Basin Water Availability Model*, TCEQ, Contract 582-12-10220, 103 pages, March 2014.
- M.A. Pauls and R.A. Wurbs, *Hydrologic Period-of-Analysis Extension for the Sabine River Basin Water Availability Model*, TCEQ, Contract 582-12-10220, 109 pages, March 2014.
- M.A. Pauls, R.J. Hoffpauir, and R.A. Wurbs, *Comparison of Stream Flows in Trinity River Basin*, TCEQ, Contract 582-12-10220, 65 pages, September 2013.
- R.J. Hoffpauir, M.A. Pauls, and R.A. Wurbs, *Application of Expanded WRAP Modeling Capabilities to the Colorado WAM*, TCEQ, Contract 582-12-10220, 153 pages, Sept. 2013.
- M.A. Pauls, R.J. Hoffpauir, and R.A. Wurbs, *Comparison of Stream Flow in Trinity River Basin*, Texas Commission on Environmental Quality, Contract 582-12-10220, 67 pages, Sept 2013.

- M.A. Pauls, R.J. Hoffpauir, and R.A. Wurbs, *Hydrologic Period-of-Analysis Extension for the Trinity River Basin Water Availability Model*, TCEQ, Contract 582-12-10220, 219 pages, August 2013.
- M.A. Pauls, R.J. Hoffpauir, and R.A. Wurbs, *Hydrologic Period-of-Analysis Extension for the Colorado River Basin and Brazos-Colorado Coastal Basin Water Availability Model*, TCEQ, Contract 582-12-10220, 455 pages, August 2013.
- R.A. Wurbs and G. Chun, *Hydrologic Period-of-Analysis Extension for the Brazos River Basin and San Jacinto-Brazos Coastal Basin Water Availability Model*, TCEQ, Contract 582-12-10220, 359 pages, October 2012.
- Battelle Memorial Institute, *Independent External Peer Review Reports, St. Johns Bayou and New Madrid Floodway Project, Missouri, Environmental Impact Statement*, U.S. Army Corps of Engineers, Memphis District, Phase 1 Report, October 2009, Phase 2 Report, April 2010, Phase 3 Report, December 2011, and Phase 4 Report, October 2015.
- R.A. Wurbs, *Extending TCEQ WAM System Hydrologic Periods-of-Analysis Based on TWDB Precipitation and Evaporation Datasets*, Texas Commission on Environmental Quality, Contract 582-12-10220, 101 pages, August 2012.
- R.J. Hoffpauir and R.A. Wurbs, *WRAP/WAM Daily Simulation of the Neches River Basin*, TCEQ, Contract 582-12-10220, 62 pages, August 2012.
- R.J. Hoffpauir and R.A. Wurbs, *Developmental Version of the Daily WRAP with Brazos Case Study*, TCEQ, Contract 582-9-89809, December 2010.
- R.J. Hoffpauir, J. Islam, and R.A. Wurbs, *Neches River Basin Case Study with the Developmental Daily WRAP*, TCEQ, Contract 582-9-89809, December 2010.
- R.A. Wurbs, *Reservoir Evaporation in Texas*, More Aqua, Inc., October 2010.
- R.A. Wurbs and T.J. Kim, *Procedure for Extending the Hydrologic Simulation Periods of the Water Availability Modeling System Datasets, Brazos River Basin Case Study*, Texas Commission on Environmental Quality, Contract 582-9-89809, August 2008.
- R.A. Wurbs, *Development of Tools to Improve the State's Water Availability Models*, Texas Water Development Board, April 2008.
- R.A. Wurbs and C.H. Lee, *Salinity Budget Study for the Brazos River/Reservoir System From Above Lake Possum Kingdom to Below Lake Whitney*, U.S. Department of Energy through Baylor University, March 2008.
- R.A. Wurbs and T.J. Kim, *WRAP-SIM Modifications and Comparisons of Simulation Results*, Texas Commission on Environmental Quality, TCEQ, Contract 582-6-77422, February 2007.
- R.A. Wurbs, *Water Availability Modeling Assessment for a Proposed Water Supply Diversion at Lake Dunlap on the Guadalupe River*, Canyon Regional Water Authority, August 2006.
- R.A. Wurbs, *Simulation Modeling Analysis of Reallocation of Flood Control Storage in Lake Ray Roberts as a Strategy for Reducing Storage Fluctuations in Lake Lewisville*, Lake Lewisville Association, Dallas Water Utilities, and USACE Fort Worth District, May 2006.
- R.A. Wurbs, *Sensitivity of Water Supply Reliabilities and Reservoir Storage Levels to Alternative Operating Strategies for the Lakes Lewisville and Ray Roberts System*, Lake Lewisville Association, January 2006.
- R.A. Wurbs, *Reservoir/River System Models Project Summary Report*, Fort Worth District, U.S. Army Corps of Engineers, December 2005.
- R.A. Wurbs, *Water Availability Analysis for Proposed Diversion at Lake Dunlap on the Guadalupe River*, Canyon Regional Water Authority, December 2005.
- R.A. Wurbs, *Comparison of Yield Analyses of Lakes Lewisville and Ray Roberts Based on the Dallas Water Utility Model and TCEQ WAM*, Lake Lewisville Association, October 2005.

- G. Garg and R.A. Wurbs, *Long-Term Streamflow Changes on the Rio Grande*, Texas Water Resources Institute, September 2004.
- R.A. Wurbs, *Water Availability Assessment for the Proposed CRWA Water Supply Diversion at Lake Dunlap on the Guadalupe River*, Canyon Regional Water Authority, July 2004.
- R.A. Wurbs, *Simulation of Operations of the Lewisville and Lake Ray Roberts Reservoir System*, Lake Lewisville Association, June 2004.
- R.A. Wurbs, *Water Availability Analysis for the Milligan Permit Application*, Hohn & Janssen, Attorneys at Law, June 2004.
- R.A. Wurbs, *Water Availability from the San Marcos River near Martindale*, Hohn & Janssen, Attorneys at Law, January 2004.
- R.A. Wurbs, *Sensitivity of Water Supply Reliabilities and Reservoir Storage Levels to Allocating Diversions and Storage between Lake Lewisville and Lake Ray Roberts*, Lake Lewisville Association, February 2004.
- R.A. Wurbs, *Comparison of the WAM System Simulation Results Using the January 2003 and December 2003 Versions of WRAP-SIM*, Texas Commission on Environmental Quality, December 2003.
- R.A. Wurbs, *Modifications to the Water Rights Analysis Package*, Texas Commission on Environmental Quality and U.S Army Corps of Engineers, September 2003.
- R.A. Wurbs, *Water Availability Modeling Analysis for the Lake Dunlap Site on the Guadalupe River*, Canyon Regional Water Authority, December 2002.
- R.A. Wurbs, *Water Rights Analysis Package (WRAP) Modeling of the Canyon Regional Water Authority Cibolo Creek Permit Application*, Canyon Regional Water Authority, October 2002.
- A.A. Salazar and R.A. Wurbs, *Conditional Reliability Modeling of Short-Term River Basin Management*, SR-2002-023, Texas Water Resources Institute, 2002.
- R.A. Wurbs, *Reservoir/River System Operations in the Republican River Basin of Colorado, Nebraska, and Kansas*, Nebraska Department of Natural Resources and Office of the Attorney General, August 2001.
- A.A. Salazar and R.A. Wurbs, *Comparison of the Generic and Basin-Specific Versions of WRAP for the Guadalupe-San Antonio and Nueces River Basins*, Texas Natural Resource Conservation Commission, July 2001.
- R.A. Wurbs, *Summary Report: Operation of Addicks and Barker Reservoirs*, Harris County Flood Control District, January 2000.
- R.A. Wurbs, *Effects of Urban Development on Inflows and Reservoir Stages in the Buffalo Bayou Watershed*, Harris County Flood Control District, June 1999.
- R.A. Wurbs, *New Features in the November 1998 and April 1999 Versions of the Water Rights Analysis Package*, Texas Natural Resource Conservation Commission, April 1999.
- R.A. Wurbs, *Stage-Frequency Analyses for Addicks and Barker Reservoirs*, Harris County Flood Control District, September 1998.
- R.A. Wurbs, *Procedure Manual for Distributing Naturalized Streamflows from Gaged Watersheds to Ungaged Subwatersheds*, Texas Natural Resource Conservation Commission, August 1998.
- R.A. Wurbs, *Operation of Amistad and Falcon Reservoirs and Associated Modeling Capabilities*, Lower Rio Grande Development Council and Texas Water Development Board, July 1998.
- R.A. Wurbs and E.D. Sisson, *Relationships between Naturalized Streamflows at Gaging Stations in the San Jacinto and Brazos River Basins*, Texas Natural Resource Conservation Commission, June 1998.
- R.A. Wurbs, *Desalination and Its Role in Meeting the Future Water Supply Needs of the Corpus Christi Region*, City of Corpus Christi, August 1997.

- R.A. Wurbs, *Water Availability Model for the San Jacinto River Basin*, Texas Natural Resource Conservation Commission, September 1996.
- R.A. Wurbs, *Developing Capabilities for Hydrologic Studies, Consultant Report*, United Nations Development Program Project IND/90/003, National Institute of Hydrology of India, August 1996.
- C.K. Ganze and R.A. Wurbs, *Compilation and Analysis of Monthly Salt Loads and Concentrations in the Brazos River Basin*, Fort Worth District, U.S. Army Corps of Engineers, January 1989.
- R.A. Wurbs, C.E. Bergman, and P.A. Carriere, *Simulation of the Water Supply Yield of the Brazos River Authority Reservoir System*, Brazos River Authority, September 1987.