

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

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Senior Professor
Zachry Department of Civil and Environmental Engineering
Texas A&M University
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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.

He completed a M.S. degree at the University of Texas at Arlington while working full-time for the Fort Worth District. He was also a full-time salaried employee while completing the Ph.D. program at Colorado State University under a USACE fellowship. Other 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 (18 semesters, 2002-2021, 367 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 (23 semesters, 1984-2024, 308 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 Taught 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

43 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 series of five courses containing 21 recorded lectures (32 hours) sponsored by the Texas Commission on Environmental Quality, last updated June 2021. Audio/video recordings and written materials are accessible at the TAMU WRAP website.

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, Recordings 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, Sept. 2007, March 2008, Sept. 2008, April 2009, October 2009, April 2010, February 2012, July 2015, January 2016, September 2022.
- 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 the principal) investigator for the 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, 2005-2024
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, research on various topics, 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. Water availability models (WAMs) maintained by the TCEQ consist WRAP input datasets for all of river basins of Texas. 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

Texas Water Lifetime Achievement Award presented in 2024 by the Board of Directors of the Texas Water Journal, an affiliate of the Texas Water Resources Institute at Texas A&M University and other statewide water agencies and institutions.

Ralph A. Wurbs Fellowship in Water Resources created in 2024 as an endowed TAMU graduate student fellowship established by a group of former students and named in Wurbs honor.

Fellow and Life Member, American Society of Civil Engineers (ASCE).

Founding Diplomat, American Academy of Water Resources Engineers (AAWRE).
(Inducted at ASCE 2005 World Water Congress in Anchorage, Alaska in May 2005.)

Distinction of Honorary Diplomat 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 2009 to 2018.

Arthur McFarland Endowed Professorship, 2012-2017.

Freese and Nichols Endowed Faculty Fellow, 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.

Outstanding Reviewer Designation by ASCE Journal of Hydrologic Engineering, 2019.

Texas Section ASCE John B. Hawley Award for Best Paper, 1996 and 2005.

U.S. Army Corps of Engineers Water Resources Planning Fellowship, 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

- R.A. Wurbs, *Managing Water in River and Reservoir Systems: Water Resources, Institutional Practices, and Constructed Infrastructure in Texas*, 425 pages, ASCE Press, American Society of Civil Engineers, 2024.
- R.A. Wurbs and W.P. James, *Water Resources Engineering*, 838 pages, Prentice-Hall Division of Pearson Publishing Corporation, 2002.
- 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 Division of Pearson, 1995.

Technical Reports Published by the Texas Water Resources Institute

<http://twri.tamu.edu/publications/reports/>

- R.A. Wurbs, *Water Rights Analysis Package Modeling System Reference Manual*, Texas Water Resources Institute (TWRI) Technical Report (TR) 255, 14th Edition, 464 pages, July 2022.
- R.A. Wurbs, *Water Rights Analysis Package Modeling System Users Manual*, TWRI TR-256, 14th Edition, 274 pages, July 2022.
- R.A. Wurbs, *Fundamentals of Water Availability Modeling with WRAP*, TWRI TR-283, 10th Edition, 116 pages, July 2022.
- R.A. Wurbs and R.J. Hoffpauir, *Water Rights Analysis Package Daily Modeling System*, TWRI TR-430, 4th Edition, 346 pages, July 2022.
- R.A. Wurbs and R.J. Hoffpauir, *Water Rights Analysis Package Modeling System Programming Manual*, TWRI TR-388, 7th Edition, 215 pages, July 2022.
- R.A. Wurbs, *Water Rights Analysis Package River System Hydrology*, TWRI TR-431, 3rd Edition, 241 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

<http://www.hec.usace.army.mil/publications/> ; <http://www.ntis.gov/>
<http://www.iwr.usace.army.mil/Library/IWRLibrary.aspx>

- 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, "Institutional Framework for Modeling Water Availability and Allocation", *Feature Papers on Water Resources Management, Policy, and Governance*, (A. Loukas and L. Garrotte, Editors), MDPI, Basel, Switzerland, 2022.
- 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

Duncan Kikoyo, R.A. Wurbs, Srinivasulu Ale, and Patricia Smith, "Alternative Reservoir Operating Policies for Lake Victoria in East Africa: A Framework for Balancing Transboundary and Local Water Demands", *Journal of Lakes & Reservoirs: Science, Policy, and Management for Sustainable Use*, Vol. 28, Issue 1, John Wiley & Sons, January 2023.

<https://onlinelibrary.wiley.com/journal/14401770>

Cemil Arslan and R.A. Wurbs, "Modeling Interactions between Reservoir System Operating Objectives", *International Journal of River Basin Management*, International Association for Hydro-Environmental Engineering and Research, Taylor & Francis Publishing, April 2022.

<https://www.tandfonline.com/doi/full/10.1080/15715124.2022.2060244>

R.A. Wurbs and Mingyue Yang, "Statistical Assessments of River Flow Alterations and Environmental Flow Standards", *Journal of Water Management Modeling*, Computational Hydraulics International, February 2022. <https://doi.org/10.14796/JWMM.C481>

R.A. Wurbs, "Water Rights Analysis Package Modeling System", *Texas Water Journal*, TWRI, Vol. 12, No. 1, pages 68-90, July 2021.

<https://twj-ojs-tdl.tdl.org/twj/index.php/twj/issue/view/375/53>

R.A. Wurbs, "Storage and Regulation of River Flows by Dams and Reservoirs", *Texas Water Journal*, TWRI, Vol. 12, No. 1, pages 10-39, February 2021.

<https://twj-ojs-tdl.tdl.org/twj/index.php/twj/issue/view/375/53>

R.A. Wurbs, "Monthly River Flows in Texas for Natural and Developed Conditions", *Water Cycle* 2(2021):1-14, Elsevier, 2021. <https://www.sciencedirect.com/journal/water-cycle/vol/2/suppl/C>

R.A. Wurbs, "Institutional Framework for Modeling Water Availability and Allocation", *Journal of Water*, MDPI, Vol. 12, Issue 10, October 2020.

<https://www.mdpi.com/2073-4441/12/10/2767>

Yiwen Zhang and R.A. Wurbs, "Long-Term Changes in River System Hydrology in Texas", *Proceedings of International Association of Hydrological Sciences*, Copernicus Publications, Vol. 379, pages 255-261, 2018. <https://piahs.copernicus.org/articles/379/255/2018/>

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, pages 18-33, 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.

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