

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

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Senior Professor
Zachry Department of Civil 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) Diplomate, 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), Zachry Department of Civil Engineering

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 (3 semesters, 1997, 1999, 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 (15 semesters, 2002-2018, 317 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 (18 semesters, 1984-2018, 247 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, 2005-14)

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

41 M.S., 48 M.E. (38 with CVEN 685 projects), 3 D.E., and 20 Ph.D. advisees have graduated. Others are currently enrolled. 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

Texas Commission on Environmental Quality, Austin, one day, July 2010,
two days, December 2011, two days April 2015, and one day, June 2016.
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.
Texas Natural Resource Conservation Commission and Texas Water Development Board,
Austin, one day, June 1999 and March 2001.

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.

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.

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

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

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.

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 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

The principal investigator for research projects funded by the following sponsors, except the National Science Foundation (NSF). Co-principal investigator and steering committee member for NSF grants. All of the research was administered through TEES or TWRI of the TAMU System.

Texas Commission on Environmental Quality, 1996, 1997-2003, 2005-2019

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 have dealt with flood control, stormwater management, water right permits, interstate water allocation, environmental impact analysis, multiple-purpose reservoir system operations, and associated computer modeling. The majority of the consulting projects have involved associations with clients extending over several years. Clients include the following.

Engineering consulting firms including HDR, Freese and Nichols, Halff Associates, CivilTech, R.J. Brandes Company, and others, and also 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 and 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. WRAP has been extensively applied by the TCEQ, TWDB, other water management agencies, engineering consulting firms, and university researchers in regional and statewide planning, administration of the water rights permit system, and other water management activities in Texas since 2002. Recently developed additional WRAP capabilities are currently being implemented and further expanded. The WRAP modeling system 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. WRAP software and documentation are available at <https://ceprofs.civil.tamu.edu/rwurbs/wrap.htm> which links to the TCEQ WAM website which provides WRAP input datasets for all of the river basins of Texas.

HONORS AND AWARDS

Fellow and Life Member, American Society of Civil Engineers (ASCE)
Founding Diplomate, American Academy of Water Resources Engineers, ASCE, 2005
Honorary Diplomate, American Academy of Water Resources Engineers, ASCE, 2014
TAMU Delegate, Universities Council on Water Resources, 1988-present
Arthur McFarland Endowed Professorship, 2012-2017
Freese and Nichols 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
Texas Section ASCE John B. Hawley Award for Best Paper, 1996 and 2005
U.S. Army Corps of Engineers Water Resources Planning Fellowship, CSU, 1976-1977
Chi Epsilon National Civil Engineering Honor Society
Tau Beta Pi Engineering Honor Society
Phi Kappa Phi Honor Society

PUBLICATIONS

Books

- R.A. Wurbs and W.P. James, *Water Resources Engineering*, 838 pages, Prentice-Hall, 2002.
(Textbook for CVEN 339 for 35 semesters (2,300 students), CVEN 455, CVEN 463, and
CVEN 665 for many semesters, and 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

<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) 455, 12th Edition, 458 pages, July 2018.
- R.A. Wurbs, *Water Rights Analysis Package Modeling System Users Manual*, TWRI TR-256, 12th Edition, 266 pages, July 2018.
- R.A. Wurbs, *Fundamentals of Water Availability Modeling with WRAP*, TWRI TR-283, 7th Edition, 116 pages, July 2018.
- R.A. Wurbs and R.J. Hoffpauir, *Water Rights Analysis Package Daily Modeling System*, TWRI TR-430, 3rd Edition, 324 pages, July 2018.
- R.A. Wurbs and R.J. Hoffpauir, *Water Rights Analysis Package Modeling System Programming Manual*, TWRI TR-388, 6th Edition, 216 pages, July 2018.
- R.A. Wurbs and Y. Zhang, *River System Hydrology in Texas*, Texas Water Resources Institute (TWRI) Technical Report (TR) 461, 442 pages, August 2014.
- R.A. Wurbs, *Water Rights Analysis Package River System Hydrology*, TWRI TR-431, 2nd Edition, 195 pages, August 2013.

- R.A. Wurbs and R.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, "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), pages 1-44, 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

- Y. 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 (IWRA), Taylor & Francis, Vol. 42, Issue 1, January 2017.
- M. Demirel and R.A. Wurbs, "Assessment of Flood Control Capabilities for Alternative Reservoir Storage Allocations", *Turkish Journal of Water Science & Management*, January 2017.
- M.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 R.J. Hoffpaur, "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 R.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.
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