

# **Future of water quality modelling in the face of climate change and mega urbanization**

**Steven C. Chapra, PhD, F.ASCE, F.AEESP**

Louis Berger Chair in Civil and Environmental Engineering  
Tufts University  
Medford, MA, USA

This talk traces the origin, evolution, and current state of the art of river and stream water-quality modeling and management. The historical roots of both environmental engineering and water-quality management are traced to mid-19th century London when engineers and public health workers worked to control and manage the major water-quality problems derived from urban wastewater. This is followed by a brief review of the field's subsequent century-plus evolution. The talk then turns to the current state of the art and a delineation of key research issues and frontiers. These include the modeling of floating plants, "black water", and harmful algal blooms as well as the impact of improved observational technology such as drones and sensors on water quality modeling. The last part of the talk focuses on the special problems of the developing world. In particular, parallels are observed between the 19th-century slums of Europe and North America and the current water-quality crises in the burgeoning squatter settlements and favelas ringed 21st century mega-cities. The talk stresses that measures beyond conventional wastewater treatment such as model-based environmental modifications and real-time control will be necessary to effectively manage global water quality in a rational and cost-effective manner. In addition, the application of hydroepidemiological models to simulate and combat waterborne epidemics is described.

**STEVEN C. CHAPRA, Ph.D., F.ASCE, F.AEESP**  
**Professor and Louis Berger Chair**

Civil and Environmental Engineering Department  
Tufts University  
Medford, MA 02155, USA

office: (617) 627-3654; FAX: (617) 627-3994

Email: [steven.chapra@tufts.edu](mailto:steven.chapra@tufts.edu)

Home page: <http://engineering.tufts.edu/cee/people/chapra/index.asp>



**BIOSKETCH:**

Steve Chapra presently holds the Louis Berger Chair for Computing and Engineering in the Civil and Environmental Engineering Department at Tufts University. Professor Chapra received engineering degrees from Manhattan College and the University of Michigan and is a Fellow of the American Society of Civil Engineers (ASCE). In 2013, he was also chosen as one of the 5 inaugural Fellows of the Association of Environmental Engineering & Science Professors (AEESP). He has published over 150 papers, reports and software packages, and has authored seven textbooks including *Numerical Methods for Engineers*, which has been adopted at over 150 universities throughout the world. He has also authored the book *Surface Water-Quality Modeling*, the standard text in that area.

Before joining the faculty at Tufts, Dr. Chapra worked for EPA, NOAA, Texas A&M University and the University of Colorado. He has also served as the Associate Director of the Center for Advanced Decision Support in Water and Environmental Systems (CADSWES), and has been a visiting professor at Duke University, the University of Michigan, Imperial College London, the University of Reading, and the University of Washington.

His general research interests focus on water-quality modeling and advanced computer applications in environmental engineering. His research has been used in a number of decision-making contexts including the 1978 Great Lakes Water Quality Agreement. He is the recipient of 4 international best paper awards including the 1993 *Rudolph Hering Medal*, the 2009 *Chandler-Misener Award* and the 2015 *Wesley W. Horner Award*. He has developed several environmentally-oriented software packages, including QUAL2K and LAKE2K, which are widely used for river and lake water-quality modeling.

Aside from his activities in environmental engineering, he has written several texts on computing and engineering for which he was awarded the 1987 Meriam-Wiley Distinguished Author Award by the American Society for Engineering Education. He has also taught 72 workshops on water-quality modeling in North and South America, Europe, Asia, Africa, and Oceania.

He has been recognized as the outstanding teacher at Texas A&M University (1986 Tenneco Award), the University of Colorado (1992 Hutchinson Award), and Tufts University (2011 Professor of the Year Award). He is also the first recipient of the AEESP Wiley Award for Outstanding Contributions to Environmental Engineering and Science Education (2000). Finally, he was originally drawn to environmental engineering because of his love of the outdoors. He is an avid fly fisherman and hiker. His primary professional goal is to apply engineering, mathematics and computing to maintain a high-quality environment in a wise and cost-efficient fashion and to share this knowledge with others through his teaching and publications.

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**Professor and Louis Berger Chair**  
Civil and Environmental Engineering Department  
Tufts University  
Medford, MA 02155  
USA

office: (617) 627-3654

FAX: (617) 627-3994

Email: [steven.chapra@tufts.edu](mailto:steven.chapra@tufts.edu)

Home page: <http://engineering.tufts.edu/cee/people/chapra/index.asp>

## PERSONAL INFORMATION:

Born: 8/5/48

Birthplace: Bronx, NY

## EDUCATION:

- University of Michigan, Ph.D., Water Resources and Environmental Engineering, 1982.
- Manhattan College, M.E., Environmental Engineering, 1972.
- Manhattan College, B.E., Civil Engineering, 1970.

## EMPLOYMENT:

### Full-time Academic

- **Tufts University**, Professor and Berger Chair in Computing and Engineering, Civil and Environmental Engineering Department, August, 1999 to present.
- **University of Colorado**, Boulder, Professor, Civil, Environmental, and Architectural Engineering Department. September 1991 to July, 1999.
  - Associate Professor, Civil, Environmental, and Architectural Engineering Department. September 1986 to September 1991.
  - Associate Director, CADSWES (Center for Advanced Decision Support for Water and Environmental Systems). September 1987 to June, 1992.
- **Texas A&M University**, Associate Professor, Civil Engineering Department, Environmental Engineering Division. September 1982 to August 1986.

### Visiting Academic Appointments

- **University of Washington**, Steve and Sylvia Burges Endowed Visiting Professorship in Civil and Environmental Engineering, Civil and Environmental Engineering Dept., Seattle, Washington, August 2006 to December 2006.
- **Imperial College of Science, Technology and Medicine**, Visiting Professor, Civil and Environmental Engineering Dept., London, England, September, 1997 to present.
- **University of Reading**, Visiting Professor, Geography Dept., University of Reading, Reading, England, September, 1997 to August, 1999.

- **University of Michigan**, Visiting Professor, Environmental and Water Resources Engineering and Fellow, Environmental Institute, January, 1996 to May 1996.
- **Duke University**, Visiting Professor, School of the Environment. 1985 to 1990.

## **Research Institutions**

- **National Institute of Water and Atmospheric Research**, Visiting Scientist, Hamilton, New Zealand, May, 1997 to August, 1997, February 1999 to March 1999, January 2002 to March 2002, January 2007 to March 2007.

## **Governmental**

- **National Oceanic and Atmospheric Administration**. Great Lakes Environmental Research Laboratory, Ann Arbor, Michigan, Physical Scientist, 1974 to 1981.
- **U.S. Environmental Protection Agency**, Region II, New York, New York, Environmental Engineer. 1971 to 1974.

## **PROFESSIONAL AND EDITORIAL COMMITTEES:**

- Member, Science Advisory Committee (SAC), Center for the Study of Metals in the Environment, University of Delaware and Penn State University, 2006
- Committee on Adaptive Management for the Total Maximum Daily Load Approach for Water Pollution Reduction, Member, National Research Council, 2004 to 2006.
- Peer review of the Lake Tahoe clarity analysis. University of California, Davis. 2004.
- Lower Charles River Nutrient TMDL Advisory Committee, Charles River Watershed Association, Waltham, MA, 2002 to 2006.
- PCB TMDL Advisory Committee, Delaware River Basin Commission; 2000 to 2005.
- Peer Review Committee, San Joaquin River Deep Water Ship Channel Dissolved Oxygen TMDL, 2002.
- Toxics Advisory Committee, Delaware River Basin Commission; 2000 to present.
- Lower Fox River Peer Review Panel; American Geological Society; 1999 to 2000.
- Water Quality and Ecosystem Modeling, Editorial Board, 1998 to 2002.
- Urban Water, Editorial Board, 1998 to present.
- Progress in Environmental Science, Editorial Advisory Board, 1998 to 2003.
- Peer review of report on "Standley Lake Eutrophication Model". City of Westminster, CO, 1998.
- North American Lake Management Society, Research Advisory Board, 1993 to 1995.
- Water Pollution Control Federation, Research Committee, 1987 to 1993.
- Association of Environmental Engineering Professors/The American Academy of Environmental Engineers, Member, Computer Committee. 1985 to 1992.
- Environmental Protection Agency Exploratory Research Program, Member, Environmental Chemistry and Physics Panel--Water. 1983 to 1997.
- American Water Works Association, Member, Quality Control in Reservoirs. 1979 to 1983.
- American Geophysical Union, Member, Water Quality Committee. 1982 to 1984.
- Environmental Protection Agency, Advisor, Great Lakes Phosphorus Task Group, 1979 to 1980.
- International Joint Commission, Advisor, Nutrient Objectives Work Group. 1978 to 1980.

## AWARDS:

- **The Wesley W. Horner Award, 2015.** Awarded by the American Society of Civil Engineers (ASCE) to the author of the paper that makes the most valuable contribution to the environmental engineering profession, with preference given to those authors who are in the private practice of engineering.”
- **Journal of Great Lakes Research Highly Cited Paper Award of 2014.** Awarded by Elsevier Publishers for “Great Lakes chloride trends: long-term mass balance and loading analysis,” co-authored with Alice Dove and David C. Rockwell.
- **Life Member, ASCE, 2013**
- **Fellow, AEESP, 2013.** One of the 5 inaugural Fellows of the Association of Environmental Engineering & Science Professors (AEESP).
- **Tufts Teaching with Technology Award, Honorable Mention, 2013.**
- **Tufts Teaching with Technology Award, Honorable Mention, 2012.** Annual award nominated by students for teachers using technology to positively impact learning and engagement in their course.
- **Professor of the Year Award. Department of Civil and Environmental Engineering, Tufts University, 2011.** Annual award voted by students for outstanding professor in the Civil and Environmental Engineering Department at Tufts University.
- **Fellow, ASCE, 2011.**
- **Chandler-Misener Award. Outstanding Article, Journal of Great Lakes Research, 2009.** Awarded by the International Association for Great Lakes Research for “Great Lakes chloride trends: long-term mass balance and loading analysis,” co-authored with Alice Dove and David C. Rockwell.
- **Steve and Sylvia Burges Endowed Visiting Professorship in Civil and Environmental Engineering, 2004.** Awarded by the University of Washington for sabbatical support.
- **Journal of Water Resources Planning and Management Best Practice-Oriented Paper Award, 2004.** Awarded by the American Society of Civil Engineers for “Decision Support System for Adaptive Water Supply Management,” co-authored with Kirk S. Westphal, Richard M. Vogel and Paul Kirshen and published in May/June 2003.
- **AEESP/Wiley Interscience Award for Outstanding Contributions to Environmental Engineering and Science Education, 2000.** Awarded by the Association of Environmental Engineering and Science Professors.
- **The Rudolph Hering Medal, 1993.** Awarded by the American Society of Civil Engineers to “the author of the paper which contains the most valuable contribution to the increase of knowledge in, and the advancement of, the environmental branch of the engineering profession.”
- **Hutchinson Award for Excellence in Teaching of Engineering, 1992.** Annual award for outstanding teacher in the College of Engineering at the University of Colorado.
- **Best Paper Award, ASEE, Rocky Mountain Section, 1988.** Awarded for paper entitled "A Course to Introduce Freshman Engineers to Computing at the University of Colorado."
- **Meriam-Wiley Distinguished Author Award, 1987.** Annual award of the American Society for Engineering Education for outstanding textbook in engineering. Award received for "Numerical Methods for Engineers" and "Introduction to Computing for Engineers."
- **McGraw-Hill Engineering and Computer Science First Edition of the Year, 1985.** Awarded for "Numerical Methods for Engineers"

- **Tenneco Award for Excellence in Teaching of Engineering, 1985.** Annual award for outstanding teacher in the College of Engineering at Texas A&M.
- **Outstanding Civil Engineering Professor, Texas A & M, 1983.** Annual award for outstanding teacher in the Civil Engineering Department at Texas A&M.
- **Department of Commerce Special Achievement Award, 1978.** Received for research and publications on Great Lakes eutrophication.

## **SOCIETY MEMBERSHIPS:**

- American Society of Civil Engineers (Fellow)
- Chi Epsilon
- North American Lake Management Society (Lifetime Member)
- Association of Environmental Engineering And Science Professors
- International Association for Great Lakes Research
- International Society of Limnology
- American Public Health Association
- American Society of Limnology and Oceanography

## **RESEARCH INTERESTS:**

- Surface water-quality modeling
- Simulation of chemical, biological and physical processes in aquatic environments
- Advanced decision support for water and environmental systems.
- Computer programming and numerical methods.
- Personal computer and workstation applications in engineering.

## **PUBLICATIONS:**

### **Dissertation**

1. Chapra, S.C. 1982. Long-term models of interactions between solids and contaminants in lakes, thesis presented to the University of Michigan at Ann Arbor, Mich., in partial fulfillment of the requirements of the degree of Doctor of Philosophy.

### **Books**

1. Chapra, S.C. and Canale, R.P., 2015. Numerical Methods for Engineers with software applications and programming, 7th ed., WCB/McGraw-Hill, New York, N.Y. (Available in Spanish, Chinese, Korean, and International editions).
2. Chapra, S.C. 2011. Applied Numerical Methods with MATLAB for Engineering and Science, 3<sup>rd</sup> Ed., WCB/McGraw-Hill, New York, N.Y. (Available in Chinese, Indonesian, Italian, Korean, Portuguese, Spanish, Thai, Turkish, and International editions)
3. Chapra, S.C. 2010. Introduction to VBA for Excel. Pearson, Upper Saddle River, NJ, 189 pp.
4. Chapra, S.C., Surface Water-Quality Modeling, Waveland Press, Long Grove, IL, 1997. (Available in Korean and International editions)
5. Chapra, S.C. and Canale, R.P., Introduction to Computing for Engineers, 2nd Ed., McGraw-Hill, New York, N.Y., 1993. (Available in Greek and International editions.)

6. Chapra, S.C. and Reckhow, K.H., Engineering Approaches for Lake Management Vol. 2, Mechanistic Modeling, Ann Arbor Science Publications, Inc., Ann Arbor, Michigan, 1983.
7. Reckhow, K.H., and Chapra, S.C., Engineering Approaches for Lake Management Vol. 1, Data Analysis and Empirical Modeling, Ann Arbor Science Publications, Inc., Ann Arbor, Michigan, 1983.

## **Contributions to Books**

1. Limbrunner, J.F., Vogel, R.M., and Chapra, S.C. 2005. A Parsimonious Watershed Model. Chapter 27 in "Watershed Models." edited by Singh, V.P. and Frevert, D.K., CRC Press LLC, Boca Raton, FL.
2. Chapra, S.C. and Auer, M.T. 1999. Management Models to Evaluate Phosphorus Loads in Lakes. "Phosphorus Biochemistry in Subtropical Ecosystems." edited by Reddy, K.R. et al. Lewis Publishers, Boca Raton, FL.
3. Reitsma, R., Zagona, E., Chapra, S.C., and Strzepek, K.M. Decision support systems (DSS) for Water-Resources Management, in Handbook of Water Resources, Mays, L.W., Ed. McGraw-Hill, N.Y., N.Y., 1996.
4. Chapra, S.C., Rivers and Streams, in Handbook of Water Resources, Mays, L.W., Ed. McGraw-Hill, N.Y., N.Y., 1996.
5. Reckhow, K.H. and Chapra, S.C., The need for simple approaches for the estimation of lake model uncertainty, in Uncertainty and Forecasting of Water Quality, Beck, M.B., van Straten, G., eds., Springer-Verlag, Berlin, 1983.
6. Chapra, S.C., Applications of phosphorus loading models to river-run lakes and other incompletely mixed systems, in Restoration of Lakes and Inland Waters, Environmental Protection Agency (USGPO), Washington, D.C., 1981.
7. Chapra, S.C., Application of the phosphorus loading concept to the Great Lakes, in Phosphorus Management Strategies for Lakes, R.C. Loehr et al., eds., Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1980.

## **Contributions to Proceedings**

1. Chapra, S.C., Simulation of Water Quality: Long-term models of the Great Lakes. in Proceedings of Workshop on priority Great Lakes environmental research initiatives, E. Aubert and A.P. Pinsak, eds., GLERL, NOAA, Ann Arbor, April, 1975.
2. Clough, D.E., S.C. Chapra, and G.S. Huvard. 2001. A Change in Approach to Engineering Computing for Freshman – Similar Directions at Three Dissimilar Institutions. Proceedings of the 2001 American Society for Engineering Education. Washington, D.C.: American Society for Engineering Education.
3. Limbrunner, J.F., Chapra, S.C., Vogel, R.M., and Kirshen, P.H. Tufts Watershed Loading Function: best management practice model for decision support, Proceedings of the American Society of Civil Engineers, 2005 World Water & Environmental Resources Congress, Anchorage, Alaska, May 15-19, 2005.
4. Limbrunner, J., Kirshen, P., and Chapra, S., (2007) Optimization of BMP selection using linear programming, Proceedings of ASCE EWRI World Environmental and Water Resources Congress, Tampa FL, 15-19 May 2007.
5. Limbrunner, J.F., Vogel, R.M., Chapra, S.C., and Kirshen, P.H. (2007) Comparison of linear and non-linear optimization models for stormwater and non-point source pollution best management practice decision support. Proceedings of the American Society of Civil

Engineers, 2007 World Water and Environmental Resources Congress, Tampa, Florida, May 15-19 2007.

6. McKnight, D.M., Miller, M.P., Chapra, S.C. and Williams, M.W. 2009. A model of degradation and production of three pools of dissolved organic matter in an alpine lake. *Geophysical Research Abstracts*, Vol. 11, EGU2009-13374, 2009.
7. Rutherford, J.C., Chapra, S.C., and Matheson, F. 2011. Can a simple model quantify stream nutrient dynamics? *Modsim 2007: International Congress on Modelling and Simulation*. p. 2104-2108.

## Refereed Journal Articles, Notes, and Comments

### Current Citation Metrics: (2/15/15)

	ResearcherID	GoogleScholar	
		All	Since 2010
Times cited	2304	10906	4148
Citations per article	27.76		
<i>h</i> -index*	24	37	23
<i>g</i> -index**	48		
<i>i</i> 10-index†	46	70	44

\*The *h*-index indicates that *h* of *N* papers have at least *h* citations each, and the other (*N* – *h*) papers have no more than *h* citations each.

\*\*The *g*-index is the largest rank (where papers are arranged in decreasing order of the number of citations they received) such that the first *g* papers have (together) at least *g*<sup>2</sup> citations. The *g* index gives more weight to authors with more highly cited papers.

†The *i*10-index indicates the number of academic publications an author has written that have at least ten citations from others.

In following list, *h*-publications (the 24 publications cited more than 24 times from ResearcherID) are displayed in **bold face**.

### Published

1. **Chapra, S.C. 1975. An empirical method of estimating the retention of phosphorus in lakes - Reply, *Water Resour. Res.*, 11:1033–1034**
2. **Chapra, S.C. & Tarapchak, S.J. 1976. A chlorophyll *a* model and its relationship to phosphorus loading plots for lakes, *Water Resour. Res.*, 12:1260–1264.**
3. **Chapra, S.C. 1977. Total phosphorus model for the Great Lakes, *J. Environ. Engin. Div., ASCE*, 103:147–161.**
4. **Chapra, S.C. & Robertson, A. 1977. Great Lakes eutrophication: The effect of point source control of total phosphorus. *Science*, 196(4297):1448–1450.**
5. Scavia, D. & Chapra, S.C. 1977. Comparison of an ecological model of Lake Ontario and phosphorus loading models, *J. Fish. Res. Board Can.* 34:286–290.
6. Chapra, S.C. 1978. Total phosphorus model for the Great Lakes (Closure). *J. of the Environ. Engin. Div.*, 104:1309–1310.



7. Chapra, S.C. 1979. Applying phosphorus loading models to embayments. *Limnol. Oceanogr.*, 24:163–168, 1979.
8. **Chapra, S.C. & Reckhow, K.H. 1979. Expressing the phosphorus loading concept in probabilistic terms, *J. Fish. Res. Board Can.*, 36:225–229.**
9. **Chapra, S.C. & Sonzogni, W.C., 1979. Great Lakes total phosphorus budget for the mid-1970's, *J. Water Poll. Control Fed.*, 51(10):2524–2533.**
10. Reckhow, K.H & Chapra, S.C. 1979. Error analysis for a phosphorus retention model, *Water Resour. Res.*, 15:1643–1646.
11. Chapra, S.C. 1980. Simulation of recent and projected total phosphorus trends in Lake Ontario, *J. Great Lakes Res.*, 6:101–112.
12. Chapra, S.C. & Dobson, H.F.H. 1981. Quantification of the lake trophic typologies of Naumann (surface quality) and Thienemann (oxygen) with special reference to the Great Lakes, *J. Great Lakes Res.*, 7:182–193.
13. Chapra, S.C., 1982. A budget accounting for the positional availability of phosphorus in lakes, *Water Res.*, 16:205–209.
14. **Sonzogni, W.C., Chapra, S.C., Armstrong, D. & Logan, T., 1982. Bioavailability of phosphorus inputs to lakes--significance to management, *J. Environ. Qual.*, 11:555–563.**
15. Chapra, S.C., Wicke, H.D. & Heidtke, T.M. 1983. Cost effectiveness of treatment to meet phosphorus objectives in the Great Lakes, *J. Water Poll. Control Fed.*, 55:83–91.
16. **Reckhow, K.H. & Chapra, S.C. 1983. Confirmation of water quality models. *Ecol. Model.* 20:113–133.**
17. Chapra, S.C. & Reckhow, K.H. 1983. Comment on “The effect of changes in the nutrient income on the condition of Lake Washington” (Edmondson and Lehman). *Limnol. Oceanogr.* 28(4):792–795.
18. Martin, J.L., Batchelor, B. & Chapra, S.C. 1985. Modification of a metal adsorption model to describe the effect of pH, *J. Water Poll. Control Fed.* 25:427.
19. Chapra, S.C. & Canale, R.P., Personal computers and environmental engineering, Part I—Trends and perspectives, *Environ. Sci. Technol.* 21(9):832–837.
20. Chapra, S.C. & Canale, R.P. 1989. Breaking through conceptual roadblocks, *Academic Computing*, March:32.
21. Chapra, S.C. & Canale, R.P. 1989. The minimal toxic substance budget model for lakes, *Lakelines*, 41–43.
22. Chapra, S.C. & Boyer, J.M. 1989. Fate of pollutants, *J. Water Poll. Control Fed.*, 61(6):992–998.
23. Strzepek, K.M. & Chapra, S.C. 1990. Do the right thing, *Civil Engineering*, 60(11):54–56.
24. Chapra, S.C. & Boyer, J.M., Fate of pollutants. 1990. *J. Water Poll. Control Fed.*, 62(4):569–577.
25. **Chapra, S.C. & Canale, R.P. 1991. Long-term phenomenological model of phosphorus and oxygen in stratified lakes, *Water Research.* 25(6):707–715.**
26. **Chapra, S.C. & Di Toro, D.M. 1991. The delta method for estimating community production, respiration and reaeration in streams, *J. Environ. Engr.* 117(5):640–655.**
27. Chapra, S.C. 1991. A toxicant loading concept for organic contaminants in lakes, *J. Environ. Engr.* 117(5):656–677.
28. Boyer, J.M. & Chapra, S.C. 1991. Fate of pollutants, *Res. J. WPCF*, 63(4):607–619.
29. Chapra, S.C. & Boyer, J.M. 1992. Fate of environmental pollutants, *Water Environ. Res.* 64(4):581–593.
30. Chapra, S.C. & Canale, R.P. 1992. Authors reply to comments by Barbiero on “Long-term phenomenological model of phosphorus and oxygen in stratified lakes”, *Water Research* 26(5):709–710.

31. Chapra, S.C. & Di Toro, D.M. 1992. The delta method for estimating community production, respiration and reaeration in streams – closure, *J. Environ. Engr.* 118(6):1007–1008.
32. **Runkel, R.L. & Chapra, S.C., 1993. An efficient numerical solution of the transient storage equations for solute transport in small streams, *Water Resour. Res.* 29(1):211–215.**
33. **Sharpley, A.N., Chapra, S.C., Wedepohl, R., Sims, J.T., Daniel, T.C., & Reddy, K.R. 1994. Managing agricultural phosphorus for protection of surface waters: issues and opinions. *J. Environ. Quality*, 23(3):437–451.**
34. Runkel, R.L., & Chapra, S.C. 1994. Reply to comments on ‘An efficient numerical solution of the transient storage equations for solute transport in small streams.’ *Water Resour. Res.* 30(10):2863–2865.
35. **Writer, J., Leenheer, J. Barber, L., Amy, G., & Chapra, S.C., 1995. "Sewage contamination in the upper Mississippi River," *Water Res.* 29(6):1427–1436.**
36. Johnson, W., Amy, G. & Chapra, S.C. 1995. "Model simulation of facilitated groundwater transport and enhanced desorption of polycyclic aromatic hydrocarbons (PAH) in natural organic matter," *J. Environ. Engr.* 121(6):438–446.
37. **Runkel, R.L., Bencala, K.E., Broshears, R.E., & Chapra, S.C. 1996. Reactive solute transport in small streams: I. Development of an equilibrium-based simulation model. *Water Resour. Res.* 32(2):409–418.**
38. **Runkel, R.L., McKnight, D.M., Bencala, K.E., & Chapra, S.C. 1996. Reactive solute transport in small streams: II. Simulation of a pH-modification experiment. *Water Resour. Res.* 32(2):419–430.**
39. Gelda, R.K., Auer, M.T., Effler, S.W., Chapra, S.C., & Storey, M.L. 1996. “Determination of reaeration coefficients: a whole-lake approach” *J. Environ. Engr.* 122(4):269–275.
40. **Kim, K.S. & Chapra, S.C. 1997. A temperature model for highly transient shallow streams *J. Hydraulics, ASCE*, 23(1):30–40.**
41. Canale, R.P., Chapra, S.C., Amy, G.L. & Edwards, M.A. 1997. Trihalomethane precursor models for lakes and reservoirs. *J. Water Resources Planning & Management, ASCE*, 123(5):259–265.
42. Chapra, S.C., Canale, R.P., & Amy, G.L. 1997. Empirical models for disinfection by-product management of water-supply reservoirs. *J. Environ. Engr. ASCE*, 123(7):714–715.
43. Chapra, S.C. Organic carbon and surface water quality modelling. 1999. *Progress in Environmental Science*. 1(1):49–70.
44. Chapra, S.C. & Runkel, R.L. 1999. Impact of storage zones on stream water quality. *J. Environ. Engr.* 125(5):415–419.
45. **Reckhow, K.H., & S.C. Chapra. 1999. Modeling excessive nutrient loading in the environment. *Environ. Pollution*. 100:197–207.**
46. Wilcock, R.J. & S.C. Chapra 1999. Predicting stream water pH from changes in dissolved oxygen produced by aquatic plants. *Water & Atmosphere* 7(3):25–27.
47. **Lees, M., Camacho, L. & Chapra, S.C. 2000. On the relationship of transient storage and aggregated dead zone models of longitudinal solute transport in small streams. *Water Resour. Res.* 36(1):213–224.**
48. Chapra, S.C. & Wilcock, R.J. 2000. Transient storage and gas transfer in a lowland stream. *J. Environ. Engr.* 126(8):708–712.
49. Stoianov, I., Chapra, S.C., & Maksimovic, C. 2000. A framework linking urban park land use with pond water quality. *Urban Water*. 2(2000):47–62.
50. Daldorph, P.W.G., Lees, M., Wheater, H. & Chapra, S.C. 2001. Integrated lake and catchment phosphorus model: A eutrophication management tool. I. Model theory. *J. Chart. Inst. Water E.* 15(3):174–181.

51. Daldorph, P.W.G., Spraggs, G.E., Lees, M., Wheeler, H. & Chapra, S.C. 2001. Integrated lake and catchment phosphorus model: A eutrophication management tool. II, Application to Rutland Water. *J. Chart. Inst. Water E.* 15(3):182–189.
52. Canale, R.P. & Chapra, S.C., 2002. Modeling zebra mussel impacts on water quality of Seneca River, New York, *J. Environ. Engr.* 128(12):1158–1168.
53. Neilson, B.T. & Chapra, S.C. 2003. Integration of water quality monitoring and modeling for TMDL development. *Water Resources Impact*, 5(1):9–11.
54. McIntyre, N., Wagener, T., Wheeler, H.S., & Chapra, S.C. 2003. **Risk-based Modelling of Surface Water Quality: a Case Study of the Charles River, Massachusetts.** *J. Hydrology*, 274(2003):225–247
55. Westphal, K., Vogel, R.M., Kirshen, P., & Chapra, S.C. 2003. **Decision Support System for Adaptive Water Supply Management,** *J. Water Resources Planning & Management*, 129(3):165–177.
56. Chapra, S.C. 2003. **Engineering Water Quality Models and TMDLs,** *J. Water Resources Planning & Management*, 129(4):247–256.
57. Anderson, P.D., D'Aco, V.J., Shanahan, P., Chapra, S.C., Buzby, M.E., Cunningham, V.L., DuPlessie, B.M., Hayes, E.P., Mastrocco, F., Parke, N.J., Rader, J.C., Samuelian, J.H., & Schwab, B.W. 2004. **Screening Analysis of Human Pharmaceutical Compounds in U.S. Surface Waters.** *Environ. Sci. Technol.* 38(3):838–849.
58. McIntyre, N., Jackson, B., Wheeler, H., & Chapra, S.C. 2004. Numerical efficiency in Monte Carlo simulations – Case Study of a River Thermodynamic Model. *J. Environ. Engr.* 130(4):456–464.
59. Westphal, K. & Chapra, S.C. 2004. Modeling TOC and UV-254 absorbance for reservoir planning and operations, *J. American Water Resour. Assoc.*, 40(3):795–809.
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## In Review

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2. Strzepek, K., Fant, C., Gebretsadik, Y., Lickley, M., Boehlert, B., Chapra, S. Adams, E.E., Martinich, J., Sullivan, P., McFarland, J., Strzepek, A., Schlosser, C.A. 2015. Climate change effect on thermal power cooling in the U.S. *Earth's Future* (in review).
3. Effler, S.W., Prestigiacomo, A.R., O'Donnell, S.M., Matthews, D.A., Perkins, M., Hairston, N.G., Auer, M.T., Kuczynski, A., Chapra, S.C. 2015. Systematic Differences in Dissolved Phosphorus Concentrations Measured by Two Analytical Protocols: Implications. *J. Amer. Wat. Resour. Assoc. (JAWRA)* (in review).

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12. Chapra, S.C., TOXMOD 1.0: Software to Model Long-Term Trends of Toxic Organics in Lakes, CADSWES Working Paper No. 14, 1991.
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14. Chapra, S.C., 1993. CARBMOD: Model of Organic Carbon Cycling in Lakes, Seattle Water Dept. Seattle, WA (190K written in QuickBASIC)
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## Reports

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3. Chapra, S.C. and Nossa, G.A., HAR03: 2nd edition. U.S. EPA Report, New York, New York, 1974.
4. Rooney, J.P. and Chapra, S.C., Water Quality Analysis of the Raritan-Lower Bay System. U.S. EPA Report, New York, New York, 1974.
5. Chapra, S.C. 1978. Effect of phosphorus load reductions in the Great Lakes. Report prepared for the Large Lakes Research Station, U.S. Environmental Protection Agency, Grosse Ile, Michigan.
6. Lang, G.A. and Chapra, S.C., SED: A Sediment/Water Column Contaminant Model. NOAA Technical Memorandum ERL GLERL-41, Ann Arbor, MI, 1982.
7. Chapra, S.C. and Strzepek, K.M., CADSWES: The Center for Advanced Decision Support for Water and Environmental Systems, 1989.
8. Chapra, S.C., A Simple Model to Assess Ammonia Toxicity Controls for Boulder Creek, A Report to the City of Boulder and EPA Region VIII, CADSWES Working Paper No. 1, 1989.

9. Boyer, J.M. and Chapra, S.C., 1989. RECOVERY: A Mathematical Model to Predict Temporal Response of Surface Water to Contaminated Sediments, CADSWES Working Paper No. 2, 1989.
10. Chapra, S.C., Water-quality Modeling of Toxic Organics in Natural Waters, CADSWES Working Paper No. 4, 1989.
11. Chapra, S.C., The Effect of Bottom Sediments on Temperature Variations of Vertically-Mixed Waters, CADSWES Working Paper No. 5.
12. Chapra, S.C., 1991. PHOSMOD 1.0: Software to Implement a Long-Term Total Phosphorus Model for Lake/Sediment Interactions, CADSWES Working Paper No. 14.
13. Chapra, S.C., Byars, M.S. and Brandao, M. 1994. Stream Water Quality Modeling with QUAL2E, prepared for U.S. Environmental Protection Agency.
14. Boyer, J.M., Chapra, S.C., Ruiz, C.E., and Dortch, M.S. 1994. "RECOVERY: A Mathematical Model to Predict the Temporal Response of Surface Water to Contaminated Sediments," Technical Report W-94-4, US Army Engineer Waterways Experiment Station: Vicksburg, MS.
15. Chapra, S.C. and Church, C.R. 1996. Water-quality model of Cascade Reservoir, Idaho. Report to Idaho Department of Health and Welfare Division of Environmental Quality. Cascade, ID.
16. Chapra, S.C. and Davidson, W.J. 1996. Simulation of temperature, and conservative and non-conservative tracers in the Tolt Reservoir, Washington with the CE-QUAL-W2 model. Report to the Seattle Water Department, Seattle, WA.
17. Chapra, S.C. 1997. Simulation of Stream pH Based on Diurnal Oxygen Curves, NIWA Working Paper, National Institute of Water and Atmospheric Research, Hamilton, New Zealand.
18. Chapra, S.C. 1997. Integrating SOD into Numerical Water-Quality Models, NIWA Working Paper, National Institute of Water and Atmospheric Research, Hamilton, New Zealand.
19. Chapra, S.C. 1997. Simple Stream Eutrophication Model, NIWA Working Paper, National Institute of Water and Atmospheric Research, Hamilton, New Zealand.
20. Gibson, G., Carlson, R., Simpson, J., Smeltzer, E., Gerritson, J., Chapra, S.C., Heiskary, S., Jones, J. and Kennedy, R. 2000. Eutrophication TMDL Technical Guidance Manual. United States Environmental Protection Agency, Office of Science and Technology, Office of Water, EPA-822-B00-001, Washington, DC.
21. Shabman, L. Reckhow, K.H., Beck, M.B., Benaman, J., Chapra, S.C., Freedman, P., Nellor, M., Rudek, J., Schwer, D., Stiles, T., and Stow, C. 2007. Adaptive Implementation of Water Quality Improvement Plans: Opportunities and Challenges, Nicholas School of the Environment and Earth Sciences, Duke University.
22. DePinto, J.V., Lam, D., Auer, M.T., Burns, N., Chapra, S.C., Charlton, M., Dolan, D.M., Kreis, R., Howell, T., and Scavia, D. 2007. Examination of the status of the goals of Annex 3 of the Great Lakes Water Quality Agreement. Annex 3 Technical Sub-group of the RWG D.
23. Chapra, S.C. 2008. Why TP Concentration Standards are Inappropriate for Managing Phytoplankton Biomass in Rivers. Testimony submitted to EPA Science Advisory Board, July 8, 2008.
24. Chapra, S.C. 2012. Technical Review of Regulation 31 and 85 Proposals Regarding Nutrient Regulation. Report submitted as expert testimony to the Colorado Water Quality Control Commission, January 20, 2012.
25. Chapra, S.C. 2012. Assessment of Whether the Division's Approach to Stream Criteria Derivation Uses Reliable Methods Accepted Within the Scientific Community. Report submitted as expert testimony to the Colorado Water Quality Control Commission, March 2, 2012.

26. Bierman, V.J., DePinto, J.V., Jr., Dilks, D.W., Moskus, P.E., Slawewski, T.A.D., Bell, C.F., Chapra, W.C., Flynn, K.F. 2013. Modeling Guidance for Developing Site-Specific Nutrient Goals. Final Technical Report of Project #LINK1T11 prepared for Water Environment Research Foundation (WERF), Alexandria, VA.



## **PRESENTATIONS AND SHORT COURSES:**

### **Keynote and Plenary Presentations**

1. Keynote: Computing and Civil Engineering: Past, Present and Future, Fifth Symposium, Internacional de Ingenieria Civil y Arquitectura, Instituto de Estudios Superiores de Monterrey, Monterrey, Mexico, March 1, 1991.
2. Keynote: Water Quality Modeling in Developing Countries, Seventh Symposium, Internacional de Ingenieria Civil y Arquitectura, Instituto de Estudios Superiores de Monterrey, Monterrey, Mexico, March 10, 1993.
3. Keynote: Water Quality Modeling of Drinking-Water Reservoirs, Eleventh Symposium, Internacional de Ingenieria Civil y Arquitectura, Instituto de Estudios Superiores de Monterrey, Monterrey, Mexico, February 28, 1997.
4. Keynote: "Engineering approaches to algal modelling & management." Second International Conference on Algal Modelling: Processes and Management, Aquatic Environments Research Centre, Department of Geography, University of Reading, Reading, UK, July 6, 1998
5. Keynote Address: "My Excellent Adventure: Water Quality Modelling Across the Waters and into the Next Century," AWRA Annual Conference, Point Clear, Alabama, Nov. 16, 1998.
6. Plenary talk: Chapra, S.C. 2001. 21st Century Surface Water Quality Modeling (and Monitoring), American Water Resources Association (AWRA), TMDL San Antonio, TX, April 30, 2001.
7. Plenary talk: Chapra, S.C. 2005. Ecosystem Forecasting in the Great Lakes: A Modeler's Perspective. Conference on Great Lakes Research. International Association for Great Lakes Research, Ann Arbor, MI, May 24, 2005.
8. Keynote: Chapra, S.C. 2006. Building Environmental Consensus with Data, Science and Modeling, Lake Tahoe Science Plan Special Workshop and Symposium, University of California Davis, Incline Village, NV, October 19, 2006.
9. Keynote: Chapra, S.C. 2008. Basura, Apesta y Nocivo: How Civil Engineers Invented Rational Environmental Modeling and Management. Twenty Second Symposium, Internacional de Ingenieria Civil y Arquitectura, Tecnológico de Monterrey, Monterrey, Mexico, February 29, 2008.
10. Keynote: Chapra, S.C. 2008. The Roots, Evolution and Future of Water-Quality Modeling. Twelfth Workshop on Physical Processes. Tahoe Environmental Research Center, University of California Davis, Incline Village, NV, September 2, 2008.
11. Invited Lecture: Chapra, S.C. 2010. Rubbish, Stink and Death: The Historical Evolution, Present State and Future Direction of Water-Quality Management and Modeling. 2010 John R. Freeman Lecture. Co-sponsored by the Environmental and Water Resources Group of the Boston Society of Civil Engineers Section, the ASCE, and the MIT Department of Civil and Environmental Engineering. MIT, Cambridge, MA, April 26, 2010.
12. Keynote: Chapra, S.C. 2011. Building Environmental Consensus with Data, Science and Modeling: The Great Lakes Case Study. 2011 University of Washington Water Symposium. Center for Urban Waters, University of Washington, Tacoma, WA, April 18, 2011.
13. Keynote: Chapra, S.C. 2011. Rubbish, Stink and Death: The Historical Evolution, Present State and Future Direction of Water-Quality Management and Modeling. 2011 KEI International Water Symposium: Water Security and Cities of the Future. Hosted by The Korean Environment Institute, and The Korean National Research Council for Economics, Humanities and Social Sciences. Seoul, Republic of Korea, July 19, 2011.

14. Keynote: Chapra, S.C. 2011. Rubbish, Stink and Death: The Historical Evolution, Present State and Future Direction of Water-Quality Management and Modeling. 13<sup>th</sup> Annual Onondaga Lake Scientific Formula. Hosted by Upstate Freshwater Institute and State University of New York College of Environmental Science and Forestry, Syracuse, NY, November 18, 2011.

## **Conference and Invited Presentations**

1. Chapra, S.C., Simulation of Water Quality: Long-Term Models of the Great Lakes. in Proceedings of Workshop on Priority Great Lakes Environmental Research Initiatives, E. Aubert and A.P. Pinsak, eds., GLERL, NOAA, Ann Arbor, April, 1975.
2. Phosphorus Budget Model of the Great Lakes, 19th Conference on Great Lakes Research, International Association for Great Lakes Research, University of Guelph, Guelph, Ontario, May 5, 1976.
3. Total Phosphorus Model for the Great Lakes, Great Lakes Research Division Seminar Series, University of Michigan, Ann Arbor, MI, March 2, 1976.
4. Research Needs and Applications of a Total Phosphorus Budget Model for the Great Lakes, 20th Conference on Great Lakes Research, International Association for Great Lakes Research, University of Michigan, Ann Arbor, MI, May, 11, 1977.
5. Application of the Phosphorus Loading Concept to the Great Lakes, Annual Meeting of American Society of Limnology and Oceanography, Victoria, British Columbia, June 20, 1978
6. Phosphorus Loading Design for the Lower Great Lakes, 21th Conference on Great Lakes Research, International Association for Great Lakes Research, University of Windsor, Windsor, Ontario, May 10, 1978.
7. Application of the Phosphorus Loading Concept to the Great Lakes. The Cornell Conference. Phosphorus Management Strategies for the Great Lakes, Rochester, NY, April 18, 1979.
8. The Use (and Misuse) of the Phosphorus Loading Concept in Lake Water Quality Management. North American Lake Management Conference, Michigan State University, East Lansing, MI. April 16, 1979.
9. The Need for Simple Approaches for the Estimation of Lake Model Prediction Uncertainty. International Institute for Applied Systems Analysis: Task Force Meeting on Uncertainty and Forecasting of Water Quality, Laxenburg, Austria. 1979; with K.H. Reckhow.
10. Application of Phosphorus Loading Models to River-run Lakes and Other Incompletely Mixed Systems. International Symposium on Inland Waters and Lake Restoration, Portland, Maine. September 1980.
11. Management and Analysis of Great Lakes Eutrophication. 13th Argonne Universities Association-Argonne National Laboratory Biology Symposium: Biological Aspects of Ecosystem Restoration, Argonne, Illinois. April 1980.
12. Lake Ontario is Changing: A Progress Report on Evidence of Eutrophication Trends. Second Winter Meeting of the American Society of Limnology and Oceanography, University of Southern California, Los Angeles, California. January-February 1980; with H.F.H. Dobson.
13. Monte Carlo Simulation for the Estimation of Lake Modeling Errors. Second Winter Meeting of the American Society of Limnology and Oceanography, University of Southern California, Los Angeles, California. January-February 1980; with K.H. Reckhow.

14. Systems Approach for Phosphorus Management in the Great Lakes. American Society of Civil Engineers, Planning and Management Division Annual Meeting, Green Bay, Wisconsin. July-August 1980; with H.D. Wicke.
15. Lake Ontario Phosphorus Management: Assessment of Within-Lake Trends, 1966-79, 23rd Conference on Great Lakes Research, Queen's University, Kingston, Ontario. May 1980; with H.F.H. Dobson.
16. Phosphorus Availability: Significance to Modeling and Management. 23rd Conference on Great Lakes Research, Queen's University, Kingston, Ontario. May 1980; with W.C. Sonzogni.
17. The Prediction of Long-Term Trends of Eutrophication and Toxic Substance Pollution in Large Lakes. Princeton University Water Resources Seminar Series, Princeton, New Jersey. 1980.
18. Risk Assessment and Great Lakes Eutrophication Management. Resource Policy Center, Dartmouth College, Hanover, New Hampshire. May 1982; with H.D. Wicke.
19. Marketing and Implementation of Large System Models for Resource Planning and Management. UNESCO Conference on Sustainability of the Global Resource Base, Lake Balaton, Hungary. September 1982.
20. The Use of Mathematical Models for International Water Resources Management. Center for the Investigation of Applied Chemistry (CIQA), Saltillo, Mexico. November 1982.
21. Application of Large System Models for Management of Mexican-United States Water Problems. Center for International Studies, Duke University, Durham, North Carolina. October, 1983.
22. Heidtke, TM; Sonzogni, WC; Chapra, SC. Optimizing phosphorus control strategies for the Great Lakes Basin: A linear programming approach. 5. Proceedings of the 26th Conference on Great Lakes Research. May 23-27, 1983, State University of New York at Oswego., 1983, p. 42
23. Integration of Microcomputers into Undergraduate Engineering Education. Engineering Seminar Series, Clarkston College, Potsdam, New York. January 1984.
24. The Integration of Personal Computers and Numerical Methods into the Undergraduate Engineering Curriculum, State University of New York at Buffalo, April 10, 1987.
25. Advanced Decision Support: User Interfaces for the TOXIWASP/FGETS Models, All Investigators Meeting, Athens EPA Lab, Calloway Gardens, GA, January 26, 1988; with Jim Waterman.
26. The Role of Personal Computers in Engineering Education, Penn State University, State College, PA, March 22, 1988.
27. The Integration of Personal Computers in the Undergraduate Engineering Curriculum, U.S. Naval Academy, Annapolis, MD, March 31, 1988.
28. A Course to Introduce Freshman Engineers to Computing at the University of Colorado, Rocky Mountain Section ASEE, Fort Collins, CO, April 8, 1988.
29. The Minimal Toxicant Loading Model for Lakes, NALMS/Rocky Mountain Regional Meeting, Denver, CO, June 9, 1988.
30. CADSWES: The Center for Advanced Decision Support for Water and Environmental Systems, ASCE Conference on Engineering Education, Las Vegas, NV, April 19, 1990.
31. Water Quality Impact of Fish Hatcheries, North American Lake Management Society Meeting, Shanty Creek, MI, June 12, 1990; with R.P. Canale and W.J. Swiecki.
32. Long-Term Phenomenological Model of Phosphorus and Oxygen in Stratified Lakes, North American Lake Management Society Meeting, Shanty Creek, MI, June 12, 1990; with R.P. Canale.
33. Modeling Sediment Phosphorus and Oxygen in Lakes, Slovakian Water Resource Institute, Bratislava, Czechoslovakia, July 9, 1990.

34. A Toxicant Loading Concept for Lakes, Environmental Engineering Seminar Series, Texas A&M University, College Station, Texas, September, 21, 1990.
35. Advanced Decision Support for Management of the Upper Platte River, Interim Water Committee, Colorado State Legislature, State Capitol, Denver, Colorado, October 3, 1990.
36. A Toxicant Loading Concept for Lakes, Mechanical and Environmental Engineering Seminar Series, University of California at Santa Barbara, Santa Barbara, California, October 22, 1990.
37. Models of the World, Seminar Series: The Interdisciplinary Nature of Decision Support Systems, CADSWES, The University of Colorado, Boulder, Colorado, April 16, 1991.
38. Modeling Long-Term Response of Lakes to Phosphorus Load Reductions, NALMS 11th International Symposium, Denver, Colorado, November 14, 1991.
39. (with Johnson, D.P., and Amy, G.L.) Natural Organic Matter Interactions with Polynuclear Hydrocarbons: Facilitated Transport and Enhanced Desorption Under Saturated Groundwater Conditions, 205th American Chemical Society Meeting, Denver, CO, March 31, 1993.
40. Water Quality Modeling of Boulder Creek CU Summer Speaker Series on Water Quality of Natural Systems, July 12, 1993.
41. Technology Transfer in Advanced Decision Support. Second International Conference on Integrating Geographical Information Systems and Environmental Modeling, Sept. 26, 1993, Breckenridge, CO.
42. Session Chair, Reactive Solute Transport in Contaminated Surface Waters II, AGU National Conf., San Francisco, CA, Dec. 8, 1993.
43. Advanced Decision Support Systems for Environmental Simulation Modeling, published in *Water Management in the '90s*, Proceedings of the 20th Annual Conference of the ASCE Water Resources Planning and Management Division, Seattle, WA.
44. Session Chair, Advanced Decision Support Systems, 20th Annual Conference of the ASCE Water Resources Planning and Management Division, Seattle, WA. Dec. 13, 1993.
45. Toxicant Loading Concept for Lakes, Chemical Engineering Dept. Seminar Series, University of Colorado, Boulder, Oct. 19, 1993.
46. Numerical Methods for Engineering Problem Solving, ITESM, Monterrey, Mexico, Aug. 12, 1993.
47. Writer, J., Leenheer, J. Barber, L., Amy, G., Chapra, S.C., and Tabor, C., 1993. "Sewage Contamination in the Upper Mississippi River," a paper presented at the Joint CSCE-ASCE National Conference on Environmental Engineering and published in Proceedings.
48. Evolution of an introductory computing course responsive to the needs of freshman students. ASEE Rocky Mountain Section Annual Meeting, University of Colorado, Boulder, CO, April 8, 1994.
49. Oppenheimer, J., Anderson, D., Chapra, S.C., and Donner, R., The development and application of a water quality model to simulate TOC in a drinking water reservoir, AWWA National Conference.
50. Water-Quality Modeling of Non-point Source Pollution: The Need for a New Perspective, University of Michigan Environmental Engineering Seminar Series, Ann Arbor, MI, Sept. 23, 1994.
51. Water-Quality Modeling of Non-point Source Pollution, University of California at Santa Barbara, Department of Mechanical and Environmental Engineering Seminar Series, Santa Barbara, CA, October 10, 1994.
52. Water-Quality Modeling of Non-point Source Pollution, State University of New York at Buffalo Environmental Engineering and Science Seminar Series, Buffalo, NY, October 19, 1994.

53. Modeling Long-Term Response of Lakes to Phosphorus Load Reductions, NALMS 14th International Symposium, Orlando, FL, November 15, 1994.
54. Application of water-quality models for management and planning, NALMS 14th International Symposium, Orlando, FL, December, 1994.
55. Modeling of flow-contributing pollutant sources to streams. Dept. of Civil and Environmental Engineering, University of New Orleans, New Orleans, Louisiana, February 2, 1995.
56. Modeling of flow-contributing pollutant sources to streams. Dept. of Civil and Environmental Engineering, Purdue University, West Lafayette, Indiana, April 20, 1995.
57. Modeling of THM Formation Potential in Lake Youngs, Washington, Dept. of Civil and Environmental Engineering, University of Wisconsin, Madison, WI, Sept. 1995.
58. Areal hypolimnetic oxygen model for lakes, NALMS 15th International Symposium, Toronto, Ontario, Canada, December, 1995.
59. DrinkQUAL: A Water-Quality Modeling System to Evaluate Disinfection Byproducts in Drinking Water Reservoirs. American Water-Works Company, Philadelphia, PA, Dec. 1995.
60. Organic Carbon and the Next Generation of Surface Water Quality Models. Institute for Environmental Science, Engineering and Technology Seminar Series, University of Michigan, Ann Arbor, MI, Feb. 20, 1996.
61. Organic Carbon and the Next Generation of Surface Water Quality Models. Dept. of Civil and Environmental Engineering Seminar Series, Michigan Technological University, Houghton, MI, April 25, 1996.
62. Career Paths in Environmental Engineering, Society of Environmental Engineering Students, Michigan Technological University, Houghton, MI, April 25, 1996.
63. Computing and Engineering, Dept. of Civil and Environmental Engineering Faculty Seminar, Michigan Technological University, Houghton, MI, April 26, 1996.
64. Water-Quality Modeling of Reservoir and Lake Eutrophication, Conference on Environmetrics in Brazil, 7th International Conference on Quantitative Methods for the Environmental Sciences, Sao Paulo, Brazil, July 23, 1996.
65. Eutrophication-based Models for Management of Drinking-water Lakes and Reservoirs, Water-Resources Engineering Seminar Series, University of Colorado, Boulder, CO, September 12, 1996.
66. Eutrophication-based Models for Management of Drinking-water Lakes and Reservoirs, Environmental and Water-Resources Engineering Seminar Series, Texas A&M University, College Station, TX, September 20, 1996.
67. Applications of Numerical Methods in Environmental Engineering, Guest Lecture, Video course on Numerical Methods in Environmental Engineering, Instituto de Estudios Superiores de Monterrey, Monterrey, Mexico, February 26, 1997.
68. Water Quality Problems in Developing Countries, Televised Interview, Instituto de Estudios Superiores de Monterrey, Monterrey, Mexico, February 27, 1997.
69. The History of Surface Water-Quality Modeling, Environmental Engineering Seminar, Instituto de Estudios Superiores de Monterrey, Monterrey, Mexico, February 27, 1997.
70. Numerical Methods: The Use of Packages and Programming Language, Joint Mechanical and Civil Engineering Seminar, Instituto de Estudios Superiores de Monterrey, Monterrey, Mexico, February 28, 1997.
71. Water Quality Modeling of Drinking-Water Reservoirs, Eleventh Symposium, Internacional de Ingenieria Civil y Arquitectura, Instituto de Estudios Superiores de Monterrey, Monterrey, Mexico, February 28, 1997.
72. Eutrophication-based Models for Management of Drinking-water Lakes and Reservoirs, Water-Resources Engineering Seminar Series, Colorado State University, Fort Collins, CO, Mar. 27, 1997.

73. (with David E. Clough) Let Them Eat C !! Why C is Poorly Suited for Scientific Computation and as an Introductory Programming Language for Engineering Students, American Society for Engineering Education, Rocky Mountain Section, 1997 Annual Meeting, Logan, Utah, April 11, 1997.
74. Eutrophication-based Models for Management of Drinking-water Lakes and Reservoirs, NIWA Seminar Series, National Institute of Water and Atmospheric Research, Hamilton, New Zealand, May 30, 1997.
75. Chapra, S.C. and Auer, M.T. Management Models to Evaluate Phosphorus Loads in Lakes. Symposium on Phosphorus Biochemistry in Florida Ecosystems, July 16, 1997, Clearwater, Florida.
76. Eutrophication-based Models for Management of Drinking-water Lakes and Reservoirs, Geography Seminar Series, University of Reading, Reading, UK, October 14, 1997.
77. Eutrophication-based Models for Management of Drinking-water Lakes and Reservoirs, Environmental and Water-Resource Engineering Seminar Series, Imperial College of Science, Technology and Medicine, London, UK, Nov. 4, 1997.
78. Stream Water-Quality Modeling for the Year 2000: What's Missing? British Hydrological Society, London, UK, Dec. 10, 1997.
79. Advances in Stream Water-Quality Modeling, Hydrology Seminar Series, University of Bristol, Bristol, UK, March 3, 1998.
80. Computing and Engineering Education, Civil Engineering Seminar, Tufts University, Medford, MA, May 11, 1998.
81. A New Generation of Stream Water-Quality Models, Civil Engineering Seminar, Tufts University, Medford, MA, July 21, 1998.
82. Advances in Sediment-Water Modelling of Oxygen and Nutrient Fluxes. Civil and Environmental Engineering Seminar, University of Sheffield, Sheffield, U.K., July 29, 1998.
83. Reckhow, K.H. and Chapra, S.C. Excess Nutrient Loading In The Environment, Proceedings, First International Symposium, Issues in Environmental Pollution. The State and Use of Science and Predictive Modeling, Denver, CO, Aug. 26, 1998.
84. Strzepek, K.M., Gooseff, M., and Chapra, S.C. 2001. Climate Change Impacts on Water Temperatures in Rocky Mountain Salmonoid Habitats. 1998 American Fisheries Society Annual Meeting: Challenges for the New Millennium: Shaping the Future of Fisheries Science, and the Fisheries Profession, August 27, 1998.
85. Incorporating Sediment Oxygen Demand and Nutrient Fluxes into Receiving Water Quality Models. UDM '98: Developments in Urban Drainage Modelling, Imperial College, London, Sept.23, 1998.
86. Eutrophication-based Models for Management of Drinking-water Lakes and Reservoirs, Civil and Environmental Engineering Seminar Series, Imperial College of Science, University of Alabama, Tuscaloosa, AL, Nov. 20, 1998.
87. Process-Based Modelling of Sediment-Water Interactions, Workshop on New Techniques in Environmental Modelling, Dec. 7, 1998, London, UK
88. Water Quality Modelling Abroad and Into the Next Century, Environmental Engineering Research Centre, Nanyang Technological University, Mar. 31, 1999, Singapore.
89. A New Water Quality Modeling Framework for Simulating Pollutant Transport and Fate in Rivers, HydroQual, Inc., Oct. 29, 1999, Mahwah, NJ.
90. A Tale of Three Rivers: the Hun, the Thames and the Mystic. Appalachian Mountain Club, Mar. 28, 2000, Newton Highlands, MA.
91. Campos, L.C., Chu, R.K.Y., Chapra, S.C. and Graham, N.J.D. 2000. Developments in Slow Sand Filters Modelling. Proceedings Vol. 2, World Filtration Congress 8, Brighton, UK, April 6, 2000.

92. A Year ("Almost") On The Mystic: Tufts Water Quality Monitoring And Modeling on the Aberjona/Mystic Watershed. Civil and Environmental Engineering Seminar Series, Tufts University, Medford, MA, Sept. 22, 2000.
93. QUAL2K: A Modern Water Quality Modeling Framework for Rivers and Streams, University of Michigan Environmental Engineering Seminar Series, Ann Arbor, MI, Sept. 28, 2000.
94. Software Advances and River Water Quality Modeling, LimnoTech, Inc., Ann Arbor, MI, Sept. 29, 2000.
95. Freshmen Computing at Tufts College of Engineering. Tufts Engineering Overseers, Medford, MA, Oct. 12, 2000.
96. Boyer, J.M., S.C. Chapra, and C. Brady. 2000. "Dynamic Eutrophication Modeling of Aurora Reservoir Using CE-QUAL-W2." Presented at the North American Lake Management Society 20th International Symposium, Miami, Florida. November 8-10, 2000.
97. Boyer, J.M., S.C. Chapra, K. DiNatale, T.J. Settle. 2000. "An EXCEL-Based, Mechanistic Water-Quality Model for Standley Lake, Colorado." Presented at the North American Lake Management Society 20th International Symposium, Miami, Florida. November 8-10, 2000.
98. Chapra, S.C. 2001. The Tufts Approach for Empowering Engineering Students to Use Computers and Mathematics, Smith College, February 9, 2001
99. Chapra, S.C. 2001. Tufts Watershed Center's Monitoring And Modeling Studies on the Aberjona/Mystic /Alewife Watershed. Mystic River Watershed Association Speaker Series. Winchester Town Hall, Winchester, MA, Feb. 21, 2001.
100. Chapra, S.C. 2001. Seneca river water quality model: Steady-state water quality and zebra mussel model. Onondaga Lake Technical Advisory Committee Meeting, Syracuse, NY, Mar. 2, 2001.
101. Chapra, S.C. 2001. Modeling and Monitoring to Achieve Credible TMDLs, Water Environment Federation, St. Louis, MO.
102. Chapra, S.C. 2001. Incorporating Sediment Oxygen Demand and Nutrient Fluxes into Receiving Water Quality Models. Utah State Environmental and Water Resource Engineering Seminar Series, Logan, Utah, Nov. 26, 2001.
103. Chapra, S.C. 2002. Effective PowerPoint Presentations. 15th University wide Conference, On the Road to Internet 2, Tufts University Fletcher School of Law and Diplomacy, Tufts University, Medford, MA, May 10, 2002
104. Chapra, S.C. 2002. Global Climate Change and Water Quality. Conference on Climate Change Impacts And Integrated Assessment, Snowmass, CO, August 5, 2002
105. Chapra, S.C. 2002. Instream Calibration Issues for TMDLs, National TMDL Science And Policy 2002 Specialty Conference, Water Environment Federation and the Association of State and Interstate Water Pollution Control Administrators, Phoenix, AZ, November 14, 2002.
106. Chapra, S.C. 2003. Lake Eutrophication Modeling for TMDLs, NALMS 23rd International Symposium, North American Lake Management Society, Mashantucket, CT, November 6, 2003.
107. Limbrunner, J. and S. Chapra, 2004. Simulation Model of BMP Application in the Upper Mystic River Watershed, Mystic 2010: Research Supporting Watershed Goals, Medford, Massachusetts, 3 April 2004.
108. Chapra, S.C. 2004. Lake Eutrophication Modeling for TMDLs, U.S. Environmental Protection Agency, Athens, GA, September 16, 2004.
109. Chapra, S.C. 2004. Water-Quality Modeling: New Software Tools, Video Conferenced Lecture broadcast from Tufts to ITESM, Monterrey, Mexico, Oct. 1, 2004.
110. Chapra, S.C. 2004. Water-Quality Modeling for TMDLs, Environmental Engineering Seminar Series, Cornell University, Ithaca, NY, December 2, 2004.

111. Vogel, R., Limbrunner, J. , Chapra, S.C., and Kirshen, P. 2005. A Distributed Decision Support System for Watershed Quality Management, EWRI Watershed Management 2005, Williamsburg, VA July 19-22, 2005.
112. Limbrunner, J. , Chapra, S.C., Vogel, R., and Kirshen, P. 2005. Decision Support System for Optimal Watershed Nutrient Management, EWRI Watershed Management 2005, Williamsburg, VA, July 19-22, 2005.
113. Limbrunner, J.F., Chapra, S.C., Vogel, R.M. and Kirshen, P.H. 2005. Tufts Watershed Loading Function: Best Management Practice Model for Decision Support, EWRI World Water and Environmental Resources Congress 2005, Anchorage, AK, May 15-19, 2005.
114. Limbrunner, J. , Chapra, S.C., Vogel, R.M., Kirshen, P.H. and Perez-Pedini, C. , 2005. Connections Between Land Management and Water Quality, Friends of Winter Pond, Winchester, MA, October 12, 2005
115. Limbrunner, J. , Perez-Pedini, C. , Vogel, R.M., Chapra, S.C., and Kirshen, P.H., 2005. Distributed Watershed Best Management Practice Solution Structure for Storm Water and Sediment Management, Tufts University Engineering Graduate Research Expo, October 19, 2005.
116. Chapra, S.C. 2006. Overview of Water-Quality Modeling Research, Civil and Environmental Engineering Dept. University of Washington, Seattle, WA, March 21, 2006.
117. Chapra, S.C. 2006. Water Quality and International Conflict, Tufts University Research Day: Shining a Light on Environmental Scholarship, Tufts University, Medford, MA, April 18, 2006.
118. Chapra, S.C. 2006. Great Lakes Eutrophication Redux: Success and Surprise. Interdisciplinary Water Seminar. USU Water Initiative, Utah State University, Logan, UT, September 21, 2006.
119. Chapra, S.C. 2006. Better Modeling through Chemistry. Interdisciplinary Water Seminar. Michigan Tech University, Houghton, MI, October 2, 2006.
120. Chapra, S.C. 2006. Great Lakes Eutrophication Redux: Success and Surprise. Environmental Engineering Seminar. Michigan Tech University, Michigan Tech University, Houghton, MI, October 2, 2006.
121. Chapra, S.C. 2006. Great Lakes Eutrophication Revisited: Some Successes and Several Surprises, Civil and Environmental Engineering Dept. University of Washington, Seattle, WA, October 12, 2006.
122. Chapra, S.C. 2006. Phosphorus Standards in Freshwaters, Water Environment Federation Conference, Dallas, TX, October 23, 2006.
123. Chapra, S.C. 2006. Better Water-Quality Modeling through Chemistry. Chemical Oceanography Seminar Series. University of Washington, Seattle, WA, November 3, 2006.
124. Chapra, S.C. 2006. Water Quality Modeling and Management: Lessons Learned on the Great Lakes. Oceanography Seminar Series. University of Washington, Seattle, WA, November 8, 2006.
125. Neilson, B., C. Bandaragoda, D. K. Stevens, S. C. Chapra, T. Hardy, and M. McKee. 2006. Multiobjective Dynamic Stream Temperature Model Calibration: Understanding the Causes and Effects of Temperature Impairments and Uncertainty in Predictions. 42nd Annual Water Resources Conference of the American Water Resources Association (AWRA 2006), Baltimore, Maryland (USA), 6-9 Nov 2006
126. Neilson, B. T., S. C. Chapra, and D. K. Stevens. 2006. Two-Zone Solute and Temperature Transport Model Formulation, Data Collection, and Calibration for Quantifying Hyporheic Interaction. 2006 Fall Meeting of the American Geophysical Union, San Francisco, California (USA), 11-15 Dec 2006.
127. Neilson, B. T., Stevens, D. K., Chapra, S. C., Bandaragoda, C. J., Hardy, T. B. (2006). Model Development for Mass and Energy Transfer between Main Channel Flows, Dead



- Zones, and the Hyporheic Zones in High Gradient Systems, American Geophysical Union, 2000 Florida Ave., N.W. Washington DC 20009 USA, [URL:<http://www.agu.org>].
128. Chapra, S.C. 2007. Great Lakes Eutrophication Revisited: Some Successes and Several Surprises, NIWA Seminar Series, National Institute of Water and Atmospheric Research, Hamilton, New Zealand, Feb. 14, 2007.
  129. Chapra, S.C. 2007. Great Lakes Eutrophication Revisited: Some Successes and Several Surprises, NIWA Seminar Series, National Institute of Water and Atmospheric Research, Christchurch, New Zealand, Mar. 26, 2007.
  130. Chapra, S.C. 2007. Total Phosphorus Model for the Great Lakes Revisited: Success and Surprise. 50th Conference on Great Lakes Research, International Association for Great Lakes Research, Pennsylvania State University, State College, PA, June 1, 2007.
  131. Chapra, S.C. and Dolan, D.M. June 1, 2007. Historical Great Lakes Total Phosphorus Loadings. 50th Conference on Great Lakes Research, International Association for Great Lakes Research, Pennsylvania State University, State College, PA, June 1, 2007.
  132. DePinto, J.V., S. Chapra, D.C.L. Lam, D. Rockwell. "Eutrophication Management in the Great Lakes: Summary of Status and Recommendations." Paper presented at the 50th Annual Conference on Great Lakes Research, Pennsylvania State University. May 28-June 1, 2007.
  133. DePinto, J.V., S. Chapra, V.J. Bierman, Jr. "Eutrophication Management in the Great Lakes: Models Were Successful in Establishing Target Phosphorus Loads." Paper presented at the 50th Annual Conference on Great Lakes Research, Pennsylvania State. May 28-June 1, 2007.
  134. Chapra, S.C. and Homa, E. 2007. Long-term Simulation of the Seasonal Carbon Budget for Lake Ontario. SIL 2007: 30th Congress of the International Association of Theoretical and Applied Limnology, Montreal, Quebec, Canada, August 16, 2007.
  135. Homa, E. and Chapra, S.C. 2007. Modeling Calcite Precipitation in Torch Lake. SIL 2007: 30th Congress of the International Association of Theoretical and Applied Limnology, Montreal, Quebec, Canada, August 16, 2007.
  136. Chapra, S.C. 2007. Total Phosphorus Model for the Great Lakes Revisited: Success and Surprise. Environmental and Water-Resource Engineering Seminar Series, Imperial College London, London, UK, August 24, 2007.
  137. Chapra, S.C. 2007. A Funny Thing Happened on the Way to My Sabbatical: Modeling Long-Term Trends in Great Lakes Water Quality. Civil and Environmental Engineering Seminar Series, Tufts University, Medford, MA, October 17, 2007.
  138. Chapra, S.C. 2007. Improved Science and Decision Support for Managing Watershed Nutrient Loads. Environmental Research Seminar, US EPA New England and US EPA Office of Research and Development, Boston, MA, October 24, 2007.
  139. Auer, M.T., Lewis, G.N., and Chapra, S.C. 2007. Mercury Sequestration via Nitrate Addition: A Modeling Analysis of Management Alternatives. Eight Annual Onondaga Lake Scientific Forum, Syracuse, NY, November 16, 2007.
  140. Chapra, S.C. 2008. Water Quality Modelling and Management: from London to Lake Ontario to Cape Town, Sponsored by SA Dept. of Water Affairs and Forestry, Cape Town, SA, February 1, 2008.
  141. Branson, D., Bretz, N., Endicott, D., Homa, E. (g), and Chapra, S.C. 2008. Predictive Water Quality Models for Torch, Bellaire, and Clam Lakes. The 2008 Borchardt Conference, University of Michigan, Ann Arbor, MI, February 27, 2008.
  142. Chapra, S.C. 2008. Basura, Apesta y Nocivo: How Civil Engineers Invented Rational Environmental Modeling and Management. Tecnológico de Monterrey, Monterrey, Mexico, February 29, 2008.
  143. McKnight, D.M., Miller, M.P., Chapra, S.C. and Williams, M.W. 2008. Quantifying fluxes, production and reactivity of dissolved organic material in aquatic ecosystems using

- spectroscopic characterization of humic substances. Humic Science & Technology Conference Eleven. Northeastern University, Boston, Massachusetts, USA, April 2, 2008.
144. Chapra, S.C. 2008. Rubbish, Stink, and Death: How Engineers Invented Water Quality Modeling and How It Might Inform Climate Change. WSSS Seminar Series, Tufts University, Medford, MA, April 4, 2008.
  145. Chapra, S.C. 2008. Rubbish, Stink, and Death: How Engineers Invented Water Quality Modeling and How It Kept Me in Engineering. Computer Science, Engineering, and Mathematics Students (CSEMS) Seminar Series, Tufts University, Medford, MA, April 9, 2008.
  146. Limbrunner, J. and Chapra, S.C. 2008. Snapshots on Some Current WSSS Research Activities: Watershed Management. Presentation to WSSS External Advisory Committee. Water: Systems, Science, and Society Interdisciplinary PhD, MA/MS Program, Tufts University, Medford, Massachusetts, April 10, 2008.
  147. Chapra, S.C., Rockwell, D. and Dove, A. 2008. Long-term trends of Great Lakes chlorides. 51<sup>st</sup> Conference on Great Lakes Research, International Association for Great Lakes Research, May 20, 2008, Peterborough, Ontario.
  148. McKnight, D.M., M.P. Miller, S. Chapra, M. Williams, and E.L. Borgnis. 2008. Photochemical transformation of humic DOM quality in an alpine lake. American Society of Limnology and Oceanography (ASLO) Summer Meeting. St. John's, Newfoundland.
  149. Chapra, S.C. 2008. Lixo, Fedor e Morte: How Civil Engineers Invented Rational Environmental Modeling and Management. University of Sao Paulo, Sao Paulo, Brazil, August 15, 2008.
  150. Chapra, S.C. 2008. A Funny Thing Happened on the Way to My Sabbatical: Modeling Long-Term Trends in Great Lakes Water Quality. Graduate Program of Hydrologic Sciences Fall 2008 Colloquium Series; University of Nevada, Reno, Oct. 10, 2008.
  151. Chapra, S.C. 2008. Environmental Engineering and Water Quality Modeling at Tufts. Tapas High-Table Lecture, Tufts University, Medford, MA, Oct. 22, 2008.
  152. M.P. Miller, D.M. McKnight, and S. Chapra. 2008. Modeling DOM transport in an alpine ecosystem. Invited Seminar Series. University of Lancaster, UK.
  153. M.P. Miller, D.M. McKnight, and S. Chapra. 2008. Reactive transport modeling of DOM in an alpine lake. AGU Chapman Conference on organic matter fluorescence. University of Birmingham, UK.
  154. Chapra, S.C. and Auer, M.T. 2008. Predicting the transport and fate of a contaminated sediment layer in a lake. The 10th Annual Onondaga Lake Scientific Forum. Upstate Freshwater Institute. Syracuse, NY, November 21, 2008.
  155. Chapra, S.C. 2009. Long-Term Trends of Great Lakes Chloride: The Canary in the Coal Mine? Environmental and Water Resources Engineering Seminar Series, Tufts University, Medford, MA, January 27, 2009.
  156. Chapra, S.C. 2009. A Funny Thing Happened on the Way to My Sabbatical: Modeling Long-Term Trends in Great Lakes Water Quality. Environmental Engineering Seminar Series, University of Wisconsin, Green Bay, Green Bay, WI, February 20, 2009.
  157. Chapra, S.C. 2009. Rubbish, Stink, and Death: How Civil Engineers Invented Water Quality Modeling and How It Changed My Life, Public Health Engineering Seminar, Tufts University, Medford, MA, February 23, 2009.
  158. Chapra, S.C. 2009. Rubbish, Stink, and Death: How Civil Engineers Invented Water Quality Modeling and How It Changed My Life, Civil and Environmental Engineering Seminar, Tufts University, Medford, MA, March 11, 2009.
  159. Chapra, S.C. 2009. Rubbish, Stink, and Death: How Civil Engineers Invented Water Quality Modeling and How It Changed My Life, Tufts ASCE Student Chapter Seminar

- Series on Civil and Environmental Engineering, Tufts University, Medford, MA, April 15, 2009.
160. Chapra, S.C. and Dolan, D.M. 2009. Updating Great Lakes Total Phosphorus Mass Balances. 52<sup>nd</sup> Conference on Great Lakes Research, International Association for Great Lakes Research, May 19, 2009, Toledo, OH.
  161. Chapra, S.C., Dove, A. and Warren, G. 2009. Long-Term Trends in the Major-Ion Chemistry of the Lower Great Lakes. 52<sup>nd</sup> Conference on Great Lakes Research, International Association for Great Lakes Research, May 21, 2009, Toledo, OH.
  162. Chapra, S.C. 2009. Overview of Water-Quality Modeling Research at Tufts. Environmental and Water Resources Engineering Seminar Series, Tufts University, Medford, MA, September 15, 2009.
  163. Dolan, D.M. and Chapra, S.C. 2009. Updating Lake Michigan Total Phosphorus and Nitrate Mass Balances.
  164. Chapra, S.C. 2009. Rubbish, Stink, and Death: How Engineers Invented Water Quality Modeling and How It Kept Me in Engineering. Computer Science, Engineering, and Mathematics Students (CSEMS) Seminar Series, Tufts University, Medford, MA, October 28, 2009.
  165. Chapra, S.C., Gute, D. and McBride, G. 2009. Analytical models of zoonotic pathogens in agricultural watersheds. APHA 137<sup>th</sup> Annual Meeting, Philadelphia, PA, November 9, 2009.
  166. Chapra, S.C., Gute, D. and McBride, G. 2009. Dynamic Model of the Evolution of an Epidemic Down an Urbanized River System. APHA 137<sup>th</sup> Annual Meeting, Philadelphia, PA, November 11, 2009.
  167. Auer, M.T., DePetro, P.A., Bierlein, K.A., and Chapra, S.C. 2009. Unto How Many Generations—Legacy Organic Carbon in the Sediments of Onondaga Lake. The 11th Annual Onondaga Lake Scientific Forum. Upstate Freshwater Institute. Syracuse, NY, November 20, 2009.
  168. Chapra, S.C. and Auer, M.T. 2009. An Organic Carbon/Redox Model for the Sediments of Onondaga Lake. The 11th Annual Onondaga Lake Scientific Forum. Upstate Freshwater Institute. Syracuse, NY, November 20, 2009.
  169. Chapra, S.C. 2010. Back to the Future: Engineering Approaches to Controlling and Simulating Waterborne Diseases in River Systems. Public Seminar: Water and Health, 2010 National Academy of Engineering. New England Regional Meeting, Tufts University, Medford, MA, March 4, 2010.
  170. Dolan, D.M. and Chapra, S.C. 2011. Updating Great Lakes Total Phosphorus Loadings. 54th Conference on Great Lakes Research, Duluth, MN, June 1, 2011.
  171. Chapra, S.C. and Dolan, D.M. 2011. Great Lakes Total Phosphorus Model: Post-Audit. 54th Conference on Great Lakes Research, Duluth, MN, June 1, 2011.
  172. Schmitt Marquez, H.S., Chapra, S.C. and Dolan, D.M. 2011. Chloride and Total Phosphorus Interlake Load Estimates in the Upper Great Lakes System, 1994 – 2008. 54th Conference on Great Lakes Research, Duluth, MN, June 1, 2011.
  173. Maccoux, M.J., Dolan, D.M. and Chapra, S.C. 2011. Chloride and Total Phosphorus Loadings (1994-2008) and a Mass Balance Model for Green Bay and Lake Michigan. 54th Conference on Great Lakes Research, Duluth, MN, June 1, 2011.
  174. Chapra, S.C. 2011. Rubbish, Stink and Death: The Historical Evolution, Present State and Future Direction of Water-Quality Management and Modeling. KWater Research Seminar. Korean Water. Seoul, Republic of Korea, July 20, 2011.
  175. Chapra, S.C. 2012. Technical Review of Regulation 31 and 85 Proposals Regarding Nutrient Regulation. Expert testimony to the Colorado Water Quality Control Commission, March 12, 2012.

176. Chapra, S.C. 2012. Panel discussion: The value of clean water; Challenges of clean water in the developed and developing world. Moderator. 3rd Annual Interdisciplinary Water Symposium. Tufts University. Medford, MA. Mar. 27, 2012.
177. Chapra, S.C. 2011. Rubbish, Stink and Death: The Historical Evolution, Present State and Future Direction of Water-Quality Management and Modeling. Water Research Seminar. University of Saskatchewan, Saskatoon, SA, Canada. May 4, 2012.
178. Chapra, S.C., Dove, A., Dolan, D.M., and Hill, B. 2012. Analysis of Interlake Mass Loading Trends of Major Ions and Nutrients Via Great Lakes Interconnecting Channels. 55th Conference on Great Lakes Research, Cornwall, ON, Canada. May 17, 2012.
179. Chapra, S.C., Dove, A., Dolan, D.M., and Hill, B. 2012. GL2K: A Mass-Balance Modeling Framework for Simulating Long-Term Trends of Great Lakes Water Quality. 55th Conference on Great Lakes Research, Cornwall, ON, Canada. May 17, 2012.
180. Chapra, S.C., Walker, J., Matthews, D., and Effler, S. 2013. Simulation of long-term seasonal water quality for Onondaga Lake. The 13th Annual Onondaga Lake Scientific Forum. Upstate Freshwater Institute. Syracuse, NY, March 22, 2013.
181. Chapra, S.C., Dove, A., Dolan, D.M., and Hill, B. 2013. Long-term Nutrient Trends for Lake Ontario. 56th Conference on Great Lakes Research, West Lafayette, IN, June 4, 2013.
182. Chapra, S.C., Tanimoto, Y., Gute, D., Lantagne, D., and McBride, G. 2013. Model of the evolution of a waterborne epidemic down a river system. APHA 141<sup>st</sup> Annual Meeting, Boston, MA, November 6, 2013.
183. Chapra, S.C., Tanimoto, Y., Gute, D., Lantagne, D., and McBride, G. 2014. Model of the evolution of a waterborne epidemic down a river system. Environmental and Water Resources Engineering Seminar Series, Tufts University, Medford, MA, January 21, 2014.
184. Chapra, S.C., Tanimoto, Y. 2014. Modeling the evolution of waterborne epidemics down an urban river system. Tufts SOE Development Seminar Series. Tufts University, Medford, MA, April 25, 2014.
185. Dove, A. and Chapra, S.C. 2014. Long-term trends of nutrients and trophic response variables for the Great Lakes. 57th Conference on Great Lakes Research, Hamilton, ON, Canada, May 28, 2014.
186. Chapra, S.C. 2014. Rubbish, stink and death in the developing world: déjà vu all over again. UCOWR/NIWR/CUAHSI 2014 Annual Conference, Tufts University, Medford, MA, June 18, 2014.
187. Chapra, S.C. 2014. Session 17 Hydroinformatics. UCOWR/NIWR/CUAHSI 2014 Annual Conference, Tufts University, Medford, MA, June 18, 2014.
189. Chapra, S.C. 2014. Rubbish, stink and death in the developing world: déjà vu all over again. University of Michigan. Ann Arbor, MI. October 1, 2014.
188. Chapra, S.C. 2014. Rubbish, stink and death in the developing world: déjà vu all over again. University of Saskatchewan. Saskatoon, Saskatchewan. October 10, 2014.
189. Chapra, S.C. 2014. Rubbish, stink and death in the developing world: déjà vu all over again. Michigan Technological University, Houghton, MI. October 20, 2014.
190. Chapra, S.C. 2014. Basura, Peste y Muerte en el mundo en desarrollo: Déjà Vu all over again. Instituto Nacional de Preinversión, Quito, Ecuador.
191. Chapra, S.C. 2015. A funny thing happened on the way to my sabbatical: modeling long-term trends in Great Lakes water quality. HDR, Inc., Mahwah, NJ, February 11, 2015.
192. Chapra, S.C., Tanimoto, Y., Gute, D., Lantagne, D., and McBride, G. 2015. Rubbish, stink and death in the developing world: déjà vu all over again. HDR, Inc., Mahwah, NJ, February 11, 2015.
193. Chapra, S.C. 2015. Rubbish, stink & death in the developing world: *Déjà vu* all over again. Civil and Environmental Engineering Seminar Series. University of Massachusetts. Amherst, MA. February 20, 2015.

## Short Courses and Workshops

1. Mathematical Modeling of Lake and Reservoir Water Quality. School of Forestry and Environmental Studies Intensive Course Program, Duke University, Durham, North Carolina. November 10-14, 1985.
2. Mathematical Modeling of Lake and Reservoir Water Quality. School of Forestry and Environmental Studies Intensive Course Program, Duke University, Durham, North Carolina. March 25-29, 1985.
3. Mathematical Modeling of Lake and Reservoir Water Quality. School of Forestry and Environmental Studies Intensive Course Program, Duke University, Durham, North Carolina. November 17-21, 1986.
4. Modeling of Toxic Substances in Surface and Groundwater, CATECS, University of Colorado, May, 1987.
5. Mathematical Modeling of Lake and Reservoir Water Quality. School of Forestry and Environmental Studies Intensive Course Program, Duke University, Durham, North Carolina. November, 1987.
6. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Kansas City, KS, May 15, 1988.
7. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Philadelphia, PA, July 20, 1988.
8. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Boulder, CO, August 15-18, 1988.
9. Mathematical Modeling of Lake and Reservoir Water Quality. School of Forestry and Environmental Studies Intensive Course Program, Duke University, Durham, North Carolina. November, 1988.
10. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Chicago, IL, July 18, 1989.
11. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, San Francisco, CA, August 8, 1989.
12. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Boulder, CO, September 13, 1989.
13. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, New York, NY, September 19, 1989.
14. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Atlanta, GA, October 29, 1989.
15. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, Dupont, Newark, DE, November 5, 1989.
16. Modeling of Toxicants in Lakes, North American Lake Management Society, Austin, TX, November 11, 1989.
17. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Seattle, WA, January 9, 1990.
18. Water Quality Modeling, IRTCUD Intensive Course, Dubrovnik, Yugoslavia, June 25 to 29, 1990.
19. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Atlanta, GA, October 11, 1990.
20. Modeling of Toxicants in Lakes, North American Lake Management Society, Springfield, MA, November, 1990.

21. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Atlanta, GA, December 4, 1991.
22. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Ithaca, NY, 1991.
23. Modeling of Exposure and Bioaccumulation of Toxicants in Surface Waters, U.S. EPA, Portland, OR, 1991.
24. Modeling of Toxicants in Lakes, North American Lake Management Society, Denver, CO, November, 16, 1991.
25. Toxicant Modeling in Lakes and Reservoirs, Workshop, NALMS 12th International Symposium, Cincinnati, OH, December 1992.
26. Water-Quality Modeling of Natural Waters, ITESM, Monterrey, Mexico, August 15-19, 1993.
27. Toxicant Modeling in Lakes and Reservoirs, Workshop, NALMS 13th International Symposium, Seattle, WA, December 4, 1993.
28. Stream Water-Quality Modeling with QUAL2E, University of Colorado, Boulder, CO, sponsored by the U.S. Environmental Protection Agency, May 25-27, 1994.
29. Stream Water-Quality Modeling with QUAL2E, University of Sao Paulo, Brasil, June 20-24, 1994.
30. Water-Quality Modeling of Lakes and Reservoirs, Student Workshop, NALMS 14th International Symposium, Orlando, FL, December 1994.
31. Water-Quality Modeling of Lakes and Reservoirs, Professionals Workshop, NALMS 14th International Symposium, Orlando, FL, December 1994.
32. Introduction to Water Quality Modeling, USGS, National Training Center, Denver, CO, February 15, 1995.
33. CE-QUAL-W2 Workshop, U.S. Army Corps of Engineers, Boulder, CO, June 12-15, 1995.
34. QUAL2E Short course, U.S. EPA, San Francisco, CA
35. Water-Quality Modeling of Lakes and Reservoirs, Beginners Workshop, NALMS 15th International Symposium, Toronto, Ontario, December 1995.
36. Water-Quality Modeling of Lakes and Reservoirs, Advanced Topics, NALMS 15th International Symposium, Toronto, Ontario, December 1995.
37. Workshop on CE-QUAL-W2, Seattle Water Dept., Seattle, WA, March 11, 1996.
38. Introduction to Water Quality Modeling, USGS, National Training Center, Denver, CO, April 15-16, 1996.
39. Introduction to Water Quality Modeling, Agricultural University of Tirana, NATO sponsored, Tirana, Albania, May 14-15, 1996.
40. Modeling of Eutrophication in Impoundments, University of Sao Paulo, Sao Paulo, Brazil, July 29-August 2, 1996.
41. Water-Quality Modeling of Lakes and Reservoirs, Beginners Workshop, NALMS 16th International Symposium, Minneapolis, Minn, November 13, 1996.
42. Water-Quality Modeling of Lakes and Reservoirs, Advanced Topics, NALMS 16th International Symposium, Minneapolis, Minn, November 13, 1996.
43. Workshop on Water Quality Modelling of Lakes, Rivers and Catchments, Imperial College of Science, Technology and Medicine, London, UK, June 10-12, 1998.
44. Water-Quality Modeling of Lakes and Reservoirs, Beginners Workshop, NALMS 18th International Symposium, Banff, Alberta, Canada, November 10, 1998.
45. Water-Quality Modeling of Lakes and Reservoirs, Advanced Topics, NALMS 18th International Symposium, Banff, Alberta, Canada, November 10, 1998.
46. Water-Quality Modelling, National Institute of Water and Atmospheric Research, NIWA, Hamilton, NZ, March 11-12, 1999.

47. TMDL San Diego “TMDLs: Modeling, Monitoring and Advanced Decision Support” at the Western TMDL Practitioner’s Meeting in San Diego, Nov. 16, 2000.
48. Water-Quality Modeling of River and Lake Eutrophication. EPA-Region X, Kansas City, MO, May 9-11, 2001.
49. Water Quality Modeling For TMDLs. Tufts University, CEE Workshop, Tufts University, Medford, MA, June 11-15, 2001.
50. Water-Quality Modeling of Lakes and Reservoirs Workshop, Washington State Department of Ecology, Olympia, WA, June 25-28, 2001.
51. Surface water-quality modeling. Environmental and Water Resource Engineering Dept., Utah State University. Logan, Utah, Nov. 26, 2001.
52. Workshop on River Modeling using the QUAL2K, U.S. EPA, Region 8, Denver, CO, June 2-3, 2003.
53. Workshop on River Modeling using the QUAL2K, U.S. EPA, Region 3, Philadelphia, PA, July 22-24, 2003.
54. Workshop on River Modeling using the QUAL2K, U.S. EPA, Region 7, Kansas City, KS, August 12-14, 2003.
55. Workshop on TMDL Modeling, NALMS 23rd International Symposium, North American Lake Management Society, Mashantucket, CT, November 4, 2003.
56. Workshop on Applying LAKE2K for Lake Eutrophication TMDLs, New England Interstate Water Pollution Control Commission (NEIWPCC), Lowell, MA, February 10-11, 2004.
57. Workshop on Applying QUAL2E and QUAL2K for TMDL Development, New England Interstate Water Pollution Control Commission (NEIWPCC), Lowell, MA, June 14-16, 2004.
58. Application of QUAL2K and LAKE2K for River and Lake Eutrophication TMDLs, Washington Dept. of Ecology, Olympia, WA, July 27-30, 2004.
59. Application of QUAL2K for River Eutrophication TMDLs, Louisiana Department of Environmental Quality, Baton Rouge, LA, November 18-19, 2004.
60. Application of QUAL2K for River Eutrophication TMDLs, Ohio Environmental Protection Agency, Columbus, OH, May 3-5, 2005.
61. Application of QUAL2K for River Eutrophication TMDLs, EPA Region III Workshop, Penn State University, State College, PA, Sept. 14-16, 2005.
62. Application of QUAL2K for River Eutrophication TMDLs, U.S. Environmental Protection Agency, Columbia, MO, February 22-24, 2006.
63. Phosphorus in the Environment. Workshop on Removal of Phosphorus from Publicly Owned Treatment Works, New England Interstate Water Pollution Control Commission (NEIWPCC) and Massachusetts Dept. of Environmental Protection, Publick House, Sturbridge, MA, April 28, 2006.
64. Application of QUAL2K for River Eutrophication TMDLs, U.S. Environmental Protection Agency, South Dakota School of Mines and Technology, Rapid City, SD, July 10-13, 2007.
65. Introduction to Water Quality Issues and Modelling, SA Water Research Commission and SA Dept. of Water Affairs and Forestry, Pretoria, South Africa, January 21-22, 2008.
66. Water Quality Modelling Training Workshop, SA Water Research Commission and SA Dept. of Water Affairs and Forestry, Pretoria, South Africa, January 23-25, 2008.
67. Water Quality Modelling Training Workshop, SA Water Research Commission and SA Dept. of Water Affairs and Forestry, Pretoria, South Africa, January 28-30, 2008.
68. 2011 QUAL2K Hands-One Water Quality Workshop. Department of Environmental Engineering; Institute of Environment and BioSystem Research; Chungnam National University, Daejeon, Republic of Korea, July 21, 2011.
69. Introduction to Water Quality Workshop. Sponsored by Ministerio del Medio Ambiente, Santiago, Chile, March, 19-20, 2012.

70. Advanced Water Quality Workshop with Qual2K. Santiago, Chile, Ministerio del Medio Ambiente, March, 21-22, 2012.
71. Lake Water Quality Modeling with Lake2K. University of Brescia, Department of Civil Engineering, Architecture, Land and Environment, Brescia, Italy, May 29-June 1, 2012.
72. Seminario Internacional: Modelación de la calidad del agua superficial. Universidad de los Andes, Bogota, Columbia, June 19-22, 2012.
73. Lake Water Quality Modeling Workshop. Montana Dept. of Environmental Quality, Helena, MT, June 3-5, 2013.  
Water-Quality Modeling of River and Lake Eutrophication. LimnoTech, Inc., Ann Arbor, I, March 18-20, 2014.
74. Water-Quality Modeling of River Dissolved Oxygen. School of Environment and Sustainability, University of Saskatchewan, Saskatoon, Saskatchewan. LimnoTech, Inc., Ann Arbor, MI, October 9-10, 2014.
75. Curso de Modelación de Calidad de Aguas Superficiales. Instituto Nacional de Preinversión, Quito, Ecuador. October 28-29, 2014.