

# KEVIN G. WHEELER PhD, P.E.

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## EDUCATION

PhD Geography and Environment – University of Oxford - July 2018  
MSc Water Science, Management and Policy – University of Oxford - August 2012  
MSc Civil/Water Resource Engineering – University of Colorado - May 2000  
BSc Civil/Environmental Engineering – University of Colorado - December 1997

## ACADEMIC EXPERIENCE AND RESEARCH CONSULTING

**Environmental Change Institute, University of Oxford, Senior Research Fellow**  
Oct 2013 to Present

My research focuses on developing and analyzing potential coordinated management strategies with the purpose of both understanding and facilitating multi-national negotiations through Track I and Track II diplomacy. I developed the Eastern Nile RiverWare Model to simulate water management within Ethiopia, Sudan, South Sudan, and Egypt, and have conducted numerous co-development sessions with governmental ministries, dam operators, academic staff, students, and consultants across the region. My approach focuses on combining political processes with simulation-optimization techniques to identify multi-dimensional decision spaces for viable agreements.

**Futures of the Colorado River, Utah State University, Research Consultant**  
Jul 2018 to present

My research on the Colorado River focuses on exploratory modeling using the Colorado River Simulation System (CRSS) to examine the benefits re-operation of major reservoirs to manage pressures from drought, climate change, and overallocation. The objective is to develop and examine alternative management paradigms to improve water supply reliability, hydropower, and protect or enhance environmental and habitat conditions in the Upper Colorado River, Green River, Grand Canyon, and Colorado River Delta. This research informs policy makers and stakeholder across the seven basin-states and throughout multiple levels of federal and state governments, broadening the conversation of how future needs can be met.

**Kennedy School of Government, Harvard University, Visiting Research Fellow**  
Jan 2017 to July 2017

To advance theoretical frameworks developed in the field of Science and Technology for Sustainability (STS), I conducted interview-based research to evaluate the utility of analytical modeling tools to support negotiations in multi-stakeholder and transboundary river contexts.

**Center for Advanced Decision Support for Water and Environmental Systems (CADSWES)**  
**University of Colorado, Professional Research Assistant** Jan 2000 to Aug 2002

I conducted numerous modeling analyses on impacts of alternative management policies for the Colorado River for the development of the Interim Surplus Guidelines, Secretarial Implementation Agreement and Multi-Species Conservation Programs. I conducted an analysis of alternative management of Flaming Gorge Dam operations to improve peak flood flows for habitat conditions of endangered species and developed management proposals for the restoration of the Colorado River Delta. Central to these efforts was the development of the Graphical Policy Analysis Tools (GPAT) for analyzing results of the CRSS model and allowing greater stakeholder involvement.

**Institute for Arctic and Alpine Research (INSTAAR) – University of Colorado, Professional Research Assistant**  
Jan 2001 to Aug 2002

I participated in fieldwork at the Long-Term Ecological Research (LTER) in Station of Dry Valleys, Antarctica and Station Toolik Lake, Alaska. The work included water collection and laboratory analysis, hydrologic measurements, land surveying to map and analyze remote seasonal streams, and logistical coordination.

**International Institute for Applied Systems Analysis (IIASA) – Laxenburg, Austria**  
Sept 1999 to Dec 2000

I developed a model of basin-scale surface water pollution in China based on socio-economic conditions to study the impacts of various climate change scenarios and management/mitigation policies. This work won the Mikhalevich Award for innovation of the science-policy interface

## CONSULTING EXPERIENCE

### **Water Balance Consulting, *Principal***

June 2010 to Present

I provide modeling analyses for river basin management, support stakeholder engagement in the policy development process, and support educational outreach efforts. Major clients include the Nile Basin Initiative (NBI), World Bank, United Nations Environment Program (UNEP), U.S. Bureau of Reclamation (USBR), Environmental Defense Fund (EDF), The Nature Conservancy (TNC), Pacific Institute (PI), American Rivers, Tarrant Regional Water District (TRWD), University of Colorado Climate and Civil Systems Group (CLICS), Stockholm International Water Institute (SIWI) and the American Museum of Natural History (AMNH).

#### **River Basin Analysis and Stakeholder Support**

- United Nations Environment Program Modeling Support: Provided technical support for the analysis of proposed management strategies for the Nile River and the Grand Ethiopian Renaissance Dam
- World Bank – Modeling Support: Provided technical support for formal negotiations over the management of the Nile and the Grand Ethiopian Renaissance Dam
- Stockholm International Water Institute (SIWI): Provided training for media outlets across the Nile Basin to facilitate balanced reporting.
- Nile Basin Initiative: Designed and developed a RiverWare model of water management in the Eastern Nile Region. Working with stakeholders from Ethiopia, Sudan, South Sudan and Egypt, this long-range planning model simulates the reservoir operations and river management across the region.
- U.S. Bureau of Reclamation – Bi-National Negotiations with Mexico: The focus of this work was to amend the bi-national treaty between the United States and Mexico to reduce consumptive water use of the Colorado River during extended drought conditions, allocate water during surplus conditions, establish a transboundary water banking mechanism, and introduce a test flow to restore the Colorado River Delta.
- Environmental Defense Fund – Colorado River Policy Analysis: Provided technical support and policy analysis for a coalition of non-governmental organizations including Environmental Defense Fund, The Nature Conservancy, Trout Unlimited and Western Resource Advocates. I provided modeling expertise for the analysis of existing and proposed water management policies, implementation of improved reservoir operation guidelines, and evaluation of the impacts of climate change.
- Tarrant Regional Water District – Policy Development: Developed alternative water management policies for the Fort Worth Texas area under potential climate change scenarios and improved forecasting capabilities. Policies were evaluated to improve system efficiency by reducing pumping costs, evaporation losses, and reservoir spills while minimizing shortages to water users and maximizing strategic in-stream flows and maintaining reservoir elevations.
- American Museum of Natural History – Center for Biodiversity and Conservation Education: Co-author of an interactive teaching tool for understanding the complexities of the Colorado River. Components include six modules: geographic, hydrologic, economic, climate change, water conservation, and native ecosystems which interact with a central reservoir simulation to evaluate trade-offs of different scenarios.  
[http://ncep.amnh.org/colorado\\_simulation/](http://ncep.amnh.org/colorado_simulation/)

### **Hydrosphere Resource Consultants – AMEC Earth and Environmental, *Staff Engineer***

Jan 2005 to May 2010

#### **River Basin Analysis and Stakeholder Support**

- State of Colorado – Colorado River Water Availability Study: Conducted a basin-wide stochastic analysis of the impacts of climate change on the Colorado River Basin to determine the future amount of water available to the State. This work included the representation of a historical interstate compact agreement within a modeling framework and an analysis of the impacts of this agreement during future drought conditions.
- Upper Colorado River Basin Coalition: Supported a partnership of Upper Basin water users during the development of 2007 Interim Shortage Guidelines to evaluate and respond to proposals regarding coordinated reservoir operations.

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- U.S. Bureau of Reclamation – Model Development and Support: Provided technical assistance for the development and enhancement of the CRSS modeling tool. Examples of work include the implementation of paleo-reconstructed hydrologic scenarios, simulation of reservoir operations during extreme drought events and evaluating potential management strategies.
- Windy Gap Firming EIS: Developed the analysis tools to conduct an impact evaluation of development in the Fraser River Basin and provided an expansion of the three-lakes water quality model for the Windy Gap Firming Environmental Impact Statement. The work included enhancement of a Q2K water quality model for the Upper Colorado River to assess potential water quality concerns from the project.
- Lower Colorado River Lower Colorado River Authority (Texas) – Daily Operations Model Development: Collaborated with dam managers to develop three models for the LCRA River Operation Center including: 1) a daily release model based on multi-objective water rights allocation, 2) a river routing model to evaluate flooding potential from hydropower releases, and 3) a post-accounting model to evaluate and charge water delivered to LCRA customers. These three models are currently used to help LCRA staff operate and manage six reservoirs on the Colorado River System.
- Lower Colorado River Authority (Texas) – Planning Model Development: Provided hydrologic policy modeling expertise with RiverWare to simulate existing models and management criteria in a water rights model for long-term planning. This project emphasized modeling of prior appropriations allocation and the evaluation of impacts of future development on those water rights.

### Stakeholder Support and Education

- Colorado River Upper Basin Water User Coalition: Provided support for a coalition of upper basin water users during interstate negotiations for the Colorado River Interim Guidelines for Lower Basin Shortages EIS. Consultation included analysis of proposals set forth by stakeholders through implementation and simulation of these potential policies within the CRSS modeling tool.
- Unites States of Mexico: Conducted a five-day stakeholder training session of the RiverWare software at the National Water Commission of Mexico (CONAGUA). Participants included staff from CONAGUA, Mexico Technical Water Institute (IMTA), University of Zacatecas, and the International Boundary and Water Commission (Mexico water managers).

### Infrastructure Design and Development

- Eagle River Water and Sanitation District: Conducted a hydrologic and hydraulic analysis of flood flows for a dam design and rehabilitation using HEC-HMS and HEC-RAS modeling tools and coordinated the construction design for a new spillway and rehabilitation of the outlet.
- Eagle River Water and Sanitation District: Designed and installed various hydraulic structures for accurate flow measurements and installed automated flow and reservoir volume data collection systems to improve water resource management practices.
- City of Northglenn: Conducted a preliminary design study for a stream flow monitoring station on Big Dry Creek. This project included providing numerous alternatives ranging from temporary to permanent structures in a highly erosive region.
- City of Boulder Flow Monitoring Station: Designed, implemented and operated a flow measurement station for Elmer's Two Mile Creek including an automated data collection system on behalf of the City of Boulder. The data was used to determine annual baseflow and storm flow runoff contributions.
- Piceance Basin Lateral Pipeline Scour Analysis: Conducted a channel scour analysis for three stream crossings of the Piceance Basin Natural Gas Liquids (NGL) pipeline to determine proper burial depth to avoid damage of the pipeline due to long-term degradation and localized storm event scour.

### TEACHING EXPERIENCE

I have led courses on River System Modeling (many locations), Climate Change Impacts and Adaptations (Oxford), Transboundary River Management (Oxford), GIS applications in Water Resources (Colorado), and Land Surveying (Colorado). I have delivered lectures on various topics of water science, management and water diplomacy at Harvard University, Massachusetts Institute of Technology, University of Colorado, University of Oxford, University of Khartoum, Addis Ababa University and Cairo University. I have been a Teaching Assistant for classes

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on Engineering Hydrology, Hydraulic Engineering Systems, and Engineering Economics. I have supervised or co-supervised eight MSc students (University of Oxford and TH Koln) and one DPhil student (University of Oxford).

## VOLUNTEER EXPERIENCE

### Peace Corps - Dominican Republic and Haiti

Sept 2002 to Nov 2004

I designed and directed the construction of two rural water systems in the Dominican Republic that provide potable water to 850 individuals. I designed a potable water system in Tiroli, Haiti to provide water to 3,500 individuals. I implemented a community-wide sanitation education project including household peer-education of hygiene practices and latrine improvements with an outreach included 180 households.

## PROFESSIONAL ASSOCIATIONS AND CERTIFICATIONS

- Associate Editor - *Water International* - International Water Resources Association
- Journal referee – *Conflict Resolution Quarterly*, *Development Studies Research*, *Environmental Software and Modeling*, *Geosciences*, *International Journal of Water Resource Development*, *Journal of Water Resources Planning and Management*, *Journal of Hydrology*, *Journal of Hydrology: Regional Studies*, *Journal of Contemporary African Studies*, *Journal of Renewable and Sustainable Energy*, *Journal of Contemporary African Studies*, *Nature Communications*, *Nature Sustainability*, *Nature Science Reports*, *River Research and Applications*, *Water*, *Water International*, *Water Resources Research*, *Water Supply*, *WIREs Water*, *World Water Policy*
- Professional Engineer – Registered in the State of Colorado, PE-43389
- Mountain Rescue Association Member, Incident Command System (IS100, IS200, IS300, IS700, IS800)

**LANGUAGES** - Native Fluency in English, Written and Conversational Fluency in Spanish

## PEER-REVIEWED JOURNAL ARTICLES

2022

**Wheeler, K.**, Udall, B., Wang, J., Kuhn, E., Saleh, S., & Schmidt, J. C. (2022). What will it take to stabilize the Colorado River? *Science* 377: 373-375. doi: 10.1126/science.abo4452

**Wheeler, K.**, Jeuland, M., Strzepek, K., Hall, J., Zagona, E., Abdo, G., . . . Whittington, D. (2022). Comment on ‘Egypt’s water budget deficit and suggested mitigation policies for the Grand Ethiopian Renaissance Dam filling scenarios’. *Environmental Research Letters*, 17(8), 088003. doi:10.1088/1748-9326/ac7e5e

Bruckerhoff, L. A., **Wheeler, K.**, Dibble, K. L., Mihalevich, B. A., Neilson, B. T., Wang, J., . . . Schmidt, J. C. (2022). Water Storage Decisions and Consumptive Use May Constrain Ecosystem Management under Severe Sustained Drought. *JAWRA Journal of the American Water Resources Association*. doi: 10.1111/1752-1688.13020

Salehabadi, H., Tarboton, D., Udall, B., **Wheeler, K.**, & Schmidt, J. C. (2022). An assessment of potential severe droughts in the Colorado River Basin. *JAWRA Journal of the American Water Resources Association*, accepted. doi:10.1111/1752-1688.13061

2021

**Wheeler, K. G.**, & Hussein, H. (2021). Water research and nationalism in the post-truth era. *Water International*, 46(7-8), 1216-1223. doi: 10.1080/02508060.2021.1986942

de Boer, T., Paltan, H., Sternberg, T., & **Wheeler, K.** (2021). Evaluating Vulnerability of Central Asian Water Resources under Uncertain Climate and Development Conditions: The Case of the Ili-Balkhash Basin. *Water*, 13(5), 615. doi: 10.3390/w13050615

2020

**Wheeler, K. G.**, Jeuland, M., Hall, J. W., Zagona, E., & Whittington, D. (2020). Understanding and managing new risks on the Nile with the Grand Ethiopian Renaissance Dam. *Nature Communications*, 11(1), 5222. doi: 10.1038/s41467-020-19089-x

**Wheeler, K.**, & Caplan, R. (2020). How natural resource (mis-) management in the Nile River Basin may threaten stability. *Georgetown Journal of International Affairs*

Basheer, M., **Wheeler, K. G.**, Elagib, N. A., Etichia, M., Zagona, E. A., Abdo, G. M., & Harou, J. J. (2020). Filling Africa’s Largest Hydropower Dam Should Consider Engineering Realities Comment. *One Earth*, 3(3), 277-281. doi: 10.1016/j.oneear.2020.08.015

Mordos, M. A., Sharfi, E. S. A., Mohammed, B. A., & **Wheeler, K.** (2020). Hydrological Impacts of the Grand Ethiopian Renaissance Dam (GERD) on River Nile Hydrology Within Sudan. *Hydrology*, 8(3), 41. doi: 10.11648/j.hyd.20200803.12

2018

**Wheeler, K. G.**, Hall, J. W., Abdo, G. M., Dadson, S. J., Kasprzyk, J. R., Smith, R., & Zagona, E. A. (2018). Exploring Cooperative Transboundary River Management Strategies for the Eastern Nile Basin. *Water Resources Research*, 54(11), 9224-9254. doi: 10.1029/2017WR022149

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**Wheeler, K. G.**, Robinson, C. J., & Bark, R. H. (2018). Modelling to bridge many boundaries: the Colorado and Murray-Darling River basins. *Regional Environmental Change*, 18(6), 1607-1619. doi: 10.1007/s10113-018-1304-z

Basheer, M., **Wheeler, K. G.**, Ribbe, L., Majdalawi, M., Abdo, G., & Zagona, E. A. (2018). Quantifying and evaluating the impacts of cooperation in transboundary river basins on the Water-Energy-Food nexus: The Blue Nile Basin. *Sci Total Environ*, 630, 1309-1323. doi: 10.1016/j.scitotenv.2018.02.249

## 2016

**Wheeler, K. G.**, Basheer, M., Mekonnen, Z. T., Eltoun, S. O., Mersha, A., Abdo, G. M., . . . Dadson, S. J. (2016). Cooperative filling approaches for the Grand Ethiopian Renaissance Dam. *Water International*, 41(4), 611-634. doi:10.1080/02508060.2016.1177698

Grafton, R. Q., McLindin, M., Hussey, K., Wyrwoll, P., Wichelns, D., Ringler, C., **Wheeler, K.** . . . Williams, J. (2016). Responding to Global Challenges in Food, Energy, Environment and Water: Risks and Options Assessment for Decision-Making. *Asia & the Pacific Policy Studies*, 3(2), 275-299. doi: 10.1002/app5.128

## Before 2016

**Wheeler, K. G.**, Pitt, J., Magee, T. M., & Luecke, D. F. (2007). Alternatives for restoring the Colorado river delta. *Natural Resources Journal*, 47, 917. doi: <http://www.jstor.org/stable/24889540>

## PEER REVIEWED BOOKS AND BOOK CHAPTERS

**Wheeler, K.** (2019). Reflections on the Colorado River. In E. Choudhury & S. Islam (eds.), *Complexity of Transboundary Water Conflicts: Enabling Conditions for Negotiating Contingent Resolutions*. London: Antham Press.

Hall, J. W., Borgomeo, E., Mortazavi-Naeini, M., & **Wheeler, K.** (2019). Water Resource System Modelling and Decision Analysis. In *Water Science, Policy, and Management* (pp. 257-273).

**Wheeler K.** (2018) Managing risks while filling the Grand Ethiopian Renaissance Dam. In: Yihdego Z, Rieu-Clarke A, Cascão AE (eds.), *The Grand Ethiopian Renaissance Dam and the Nile Basin: Implications for Transboundary Water Cooperation*. Abingdon: Routledge.

## POLICY-DIRECTED WHITE PAPERS

**Wheeler, K.**, Kuhn, E., Bruckerhoff, L., Udall, B., Wang, J., Gilbert, L., . . . Schmidt, J. C. (2021). Alternative Management Paradigms for the Future of the Colorado and Green Rivers. *The Future of the Colorado River Project*.

Salehabadi, H., Tarboton, D., Kuhn, E., Udall, B., **Wheeler, K.**, Rosenberg, D., . . . Schmidt, J. C. (2020). The Future Hydrology of the Colorado River Basin. *The Future of the Colorado River Project*.

Wang, J., **Wheeler, K.**, Rosenberg, D., & Schmidt, J. C. (2020). Managing the Colorado River for an Uncertain Future. *The Future of the Colorado River Project*.

**Wheeler, K.**, Rosenberg, D., & Schmidt, J. C. (2019). Water Resource Modeling of the Colorado River: Present and Future Strategies. *The Future of the Colorado River Project*.

## GRANTS

2022 Catena Foundation - Principal-investigator - \$45,000

2021-2023 United States Bureau of Reclamation – Co-investigator -\$100,000

2021 EPSRC Global Challenge Research Fund Institutional Sponsorship - Principal Investigator - £67,390

2019-2022 Oxford Martin School - PDRA - £945,803

2018-2022 GIZ and the German Federal Foreign Office - Principal Investigator - €149,803

2018-2019 Catena Foundation - Co-investigator - \$149,999

2017 EPSRC Global Challenge Research Fund Institutional Sponsorship - Principal Investigator - £29,609

2017 Economic Modeling for Climate-Energy Policy - €12,600

## MEDIA EXPOSURE

Numerous interviews and quotes in international and local press including the BBC, CNN, Associated Press, Reuters, Washington Post, New York Times, Foreign Policy, Financial Times, Nature News, The Telegraph, Geographical, The Economist, World Politics Review, Ethiopia Observer, The National, Anadolu Agency, the Reporter Ethiopia, Ahram Online, France 24, Deutsche Welle, Arizona Star

## AWARDS

2020 – Nature Communications Top 50 Earth, Environmental, and Planetary Sciences Articles

2016 - International Water Resource Association Best paper and all-time most downloaded paper of Water International (20k+)

2013 - Best dissertation – MSc in Water Science, Management and Policy, University of Oxford

1999 - IIASA Mikhalevich Award