

# Kevin Wallington

kwallin2@illinois.edu • (205) 807-6377

## CURRENT POSITION

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**Postdoctoral researcher, Automatic Control Laboratory (IfA), ETH Zurich**

November 2023 - present

Supervisor: John Lygeros

## EDUCATION

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**Ph.D., Civil Engineering, University of Illinois at Urbana-Champaign**

August 2023

Advisor: Ximing Cai

Thesis: “Improving phosphorus management through coordinated watershed modelling and systems analysis”

**M.S., Civil Engineering, UIUC**

December 2018

Advisor: Ximing Cai

Thesis: “Implications of floodplain dynamics for reservoir operation”

**B.S., Mechanical Engineering, UIUC**

May 2011

## RESEARCH EXPERIENCE AND DIRECTION

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I borrow approaches from systems dynamics and control theory to analyze connected human-natural systems and improve water resources management. This research focus builds upon past experience in watershed modelling and analysis of connected food-energy-water systems. My research efforts to date have included:

1. **Safety verification for environmental and water resources systems:** applying verification techniques from control theory to characterize and improve management policies for water resources systems subject to uncertainty, such as agricultural nutrient management
2. **Optimal reservoir control within coevolving socio-economic systems:** coupling socio-economic models with reservoir operation models to expose myopia in status quo operation strategies and propose corrective approaches
3. **Food-energy-water systems analysis:** analyzing interconnected systems that have previously been treated as siloed sectors to identify synergies and Pareto-optimal outcomes
4. **Modelling watershed-scale phosphorus (P) dynamics:** developing new simple models, updating existing complex models, and using them in tandem to generate hypotheses and challenge assumptions about watershed-scale P processing

## TEACHING AND MENTORING EXPERIENCE

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**Undergraduate Mentor**

Spring 2020 - Present

- Designed research plans and supervised 4 students performing 5-10 hours/week research
- Trained mentees in data science methods, programming, geographic information systems, and science communication
- Mentees presented 3 posters at UIUC Undergraduate Research Symposium
- Coached and resourced mentees through scholarship and graduate school applications

**Teaching Assistant, Environmental Systems I (CEE 434)**

Fall 2017, '18, '20, '21, '22

- Designed active-learning lecture demonstrating water quality regulations and markets
- Helped plan, administer, and debrief multi-lecture “game-based learning” exercise illustrating non-cooperative game theory
- Taught weekly hybrid online/in-person discussions during COVID pandemic
- Lectured 19 times, co-wrote one final exam, hosted office hours, and graded assignments/exams

**Teaching Assistant, Systems Engineering and Economics (CEE 201)**

Spring 2017

- Trained and coordinated 3 grading assistants for class of 90 students

- Taught weekly review sessions for 10-25 students
- Campus Director, InterVarsity Christian Fellowship** 2011-2015
- Coached student leaders to cast vision, set SMART goals, conduct outreach, and lead discussion groups

## NON-ACADEMIC PROFESSIONAL EXPERIENCE

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**Design Engineer, EN Engineering** 2015 – 2016  
Warrenville, IL

- Designed natural gas regulation stations (layout, materials, and instrumentation), supervised CAD drafters, and communicated designs and project updates to clients

**Campus Director, InterVarsity Christian Fellowship** 2011-2015  
Illinois Wesleyan University, Bloomington, IL

- Raised \$160,000 through grants and individual donations
- Started new chapter and grew to 50 members; directed all programs, outreach, and leadership development

## HONORS AND AWARDS

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**Mavis Future Faculty Fellowship**, University of Illinois 2020-2021  
“Facilitates training of next generation of great engineering faculty.”

**Olive Chacey Kuehn & Alfred L Kuehn Fellowship**, University of Illinois 2016-2017  
**Bronze Tablet Scholar** 2011

Awarded to top 3% GPA earners

**ExxonMobil Corporation Scholarship**, University of Illinois 2010-2011

**CJ Gauthier Mechanical Science and Engineering Scholarship**, University of Illinois 2009-2010

**Thomas Lain Scholarship**, University of Illinois 2009-2010

**International Programs in Engineering Travel Fellowship**, University of Illinois 2008

## JOURNAL PUBLICATIONS

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- 11) **Wallington, Kevin**, Ximing Cai, and Margaret Kalcic. 2023. “Evaluating the longevity of in-stream phosphorus legacies: a downstream cascade of recovery following point source remediation.” *Science of the Total Environment*. Under Revision.
- 10) Li, Shaobin, Ximing Cai, Sundar Niroula, **Kevin Wallington**, et al. 2023 “Integrated agricultural practices and engineering technologies enhance synergies of food-energy-water systems in Corn Belt Watersheds.” *Environmental Science & Technology*. In Press.
- 9) **Wallington, Kevin**, and Ximing Cai. 2023. “Updating SWAT+ to Clarify Understanding of In-Stream Phosphorus Retention and Remobilization: SWAT+P.R&R.” *Water Resources Research* 59 (3): e2022WR033283. <https://doi.org/10.1029/2022WR033283>.
- 8) Niroula, Sundar, **Kevin Wallington**, and Ximing Cai. 2023. “Addressing Data Challenges in Riverine Nutrient Load Modeling of an Intensively Managed Agro-Industrial Watershed.” *JAWRA Journal of the American Water Resources Association*. <https://doi.org/10.1111/1752-1688.13097>.
- 7) Li, Shaobin, \***Kevin Wallington**, Sundar Niroula, and Ximing Cai. 2021. “A Modified Response Matrix Method to Approximate SWAT for Computationally Intense Applications.” *Environmental Modelling & Software*, December, 105269. <https://doi.org/10.1016/j.envsoft.2021.105269>.
- 6) Li, Shaobin, Ximing Cai, Seyed Aryan Emaminejad, Ankita Juneja, Sundar Niroula, Seojeong Oh, **Kevin Wallington**, et al. 2021. “Developing an Integrated Technology-Environment-Economics Model to

Simulate Food-Energy-Water Systems in Corn Belt Watersheds.” *Environmental Modelling & Software* 143 (September): 105083. <https://doi.org/10.1016/j.envsoft.2021.105083>.

- 5) Xu, Bo, Yu Li, Feng Han, Yi Zheng, Wei Ding, Chi Zhang, **Kevin Wallington**, and Zhe Zhang. "The transborder flux of phosphorus in the Lancang-Mekong River Basin: Magnitude, patterns and impacts from the cascade hydropower dams in China." *Journal of Hydrology* 590 (2020): 125201.
- 4) **Wallington, Kevin**, and Ximing Cai. 2020. "Feedback Between Reservoir Operation and Floodplain Development: Implications for Reservoir Benefits and Beneficiaries." *Water Resources Research* 56 (4): e24524. <https://doi.org/10.1029/2019WR026610>.
- 3) Feng, Maoyuan, Pan Liu, Ximing Cai, **Kevin Wallington**, Liangsheng Shi, and Yu Li. 2019. "Understanding the Resilience of Soil Moisture Regimes." *Water Resources Research* 55 (9): 7541–63. <https://doi.org/10.1029/2018WR024495>.
- 2) Cai, Ximing, \***Kevin Wallington**, Majid Shafiee-Jood, and Landon Marston. 2018. "Understanding and Managing the Food-Energy-Water Nexus – Opportunities for Water Resources Research." *Advances in Water Resources* 111 (Supplement C): 259–73. <https://doi.org/10.1016/j.advwatres.2017.11.014>.
- 1) **Wallington, Kevin**, and Ximing Cai. 2017. "The Food–Energy–Water Nexus: A Framework to Address Sustainable Development in the Tropics." *Tropical Conservation Science* 10 (January): 1940082917720665. <https://doi.org/10.1177/1940082917720665>.

\* Senior authorship shared.

## GENERAL INTEREST PUBLICATIONS

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- 2) **Wallington, Kevin** and Ximing Cai. 2023. "Water conservation suffers as reservoir operation and floodplain development become entrenched in a vicious cycle." *Global Water Forum*. <https://globalwaterforum.org/>
- 1) **Wallington, Kevin**, and Majid Shafiee-Jood. 2019. "Reforming a Phosphorus Cycle and the Pursuit of Sustainability." In *Illinois 150: The 21st Century Research University and the Public Good*. Windsor & Downs Press. <https://iopn.library.illinois.edu/pressbooks/research150/chapter/re-forming-a-phosphorus-cycle/>.

## INVITED SEMINARS

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- 1) Water Resources Engineering and Science seminar, University of Illinois. "Feedback between reservoir operation and floodplain development: implications for reservoir benefits (who and how much?)." October 1, 2021.

## CONFERENCE PRESENTATIONS

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- 9) **Wallington, K.** X. Cai, and D. Stipanovic. "Reachability of water quality targets while avoiding adverse impacts on agricultural productivity." Oral presentation. EWRI Congress 2023. May 21-25, Henderson, NV.
- 8) **Wallington, K.** and X. Cai. "Reevaluating assumptions regarding in-stream phosphorus retention and remobilization at the watershed scales." Poster. AGU Fall Meeting 2022. December 12-16, Chicago.
- 7) **Wallington, K.** and X. Cai. "Reattributing Phosphorus Load Variability Using a Revised SWAT Model." Oral presentation. EWRI Congress 2021. June 7-11, virtual.

- 6) **Wallington, K.** and X. Cai. “Feedback Between Reservoir Operation and Floodplain Development: Implications for Economically Efficient use of Reservoirs and Floodplains.” Oral presentation. AGU Fall Meeting 2020. December 7-16, virtual.
- 5) **Wallington, K.**, X. Cai, G. McIsaac, and M. Feng. “Generating Intuition and Hypotheses with a Simplified, Watershed-Scale Phosphorus Model.” Poster. AGU Fall Meeting 2019. December 9-13, San Francisco, CA.
- 4) Li, Yu, Bo Xu, Feng Han, Yi Zheng, Wei Ding, Zhe Zhang, Chi Zhang, and **Kevin Wallington**. “The Transborder Flux of Phosphorus in the Lancang-Mekong River Basin: Magnitude, Patterns and Impacts from the Cascade Hydropower Dams in China.” Poster. AGU Fall Meeting 2019. December 9-13, San Francisco, CA.
- 3) Niroula, S., **K. Wallington**, G. McIsaac, and X. Cai. “Spatiotemporal Variability of Stream Phosphorus in an Agroindustrial Watershed.” Poster. AGU Fall Meeting 2019. December 9-13, San Francisco.
- 2) **Wallington, K.**, X. Cai, and G. McIsaac. “Modelling In-Stream Phosphorus Processes to Generate Insights on Point-Source Phosphorus Removal.” Poster. AGU Fall Meeting 2018,. December 10-14, Washington D.C.
- 1) **Wallington, K.**, and X. Cai. “Feedbacks between Reservoir Operation and Floodplain Development.” Poster. AGU Fall Meeting 2017. December 11-15, New Orleans, LA.

## SERVICE

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### Journal Reviewer 2020-2023

- Water Resources Research (2x), Journal of Hydrology (2x), Hydrology and Earth System Sciences (2x), Environmental Science and Policy

### Mentoring Programs 2020-2023

- MentorSHPE (Society of Hispanic Professional Engineers), Undergraduate Research Apprenticeship Program, Building Confidence and Engagement through Undergraduate Research, Research Experience for Undergraduates, Clean Water Science Network

### Illinois Water Day 2017 - Present

- Directed Illinois Water Day (IWD) 2018, which included “lightning talks”, poster presentations, art exhibits and a reception. Led or supported content sub-committee other years.
- Built interdisciplinary planning team for IWD 2018, with representatives from geography, fish and wildlife, agricultural and biological engineering, civil and environmental engineering, and atmospheric sciences
- Collaborated with faculty and students in School of Information Sciences to provide storytelling coaching for “lightning talk” presenters

### Engineering Open House 2017 - Present

- Engaged children ages 4-18 with physical and technological demonstrations of hydrology, hydraulics, and water resources
- Organized and trained volunteers for exhibit demonstrating water and carbon footprints of foods we eat, designed by collaborators in College of Education
- Won 1<sup>st</sup> place exhibit (among over 250) for “Sustainable Solutions” and “Innovation in Energy” in 2019

## CERTIFICATIONS

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Graduate Mentoring Certificate, UIUC Graduate College 2021

Graduate Teaching Certificate, UIUC Center for Innovation in Teaching and Learning  
Engineer-in-Training, NCEES

2021  
2015

**MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS**

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American Society of Civil Engineers  
American Geophysical Union

2019- Present  
2017- Present