

Joseph Robert Kasprzyk

I. Personal Information

Contact Information: Civil, Environmental, and Architectural Engineering Department
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II. Academic and Professional Background

Education

Ph.D., Civil Engineering	Pennsylvania State University	2013
M.S., Civil Engineering	Pennsylvania State University	2009
B.S., Civil Engineering (with Honors)	Pennsylvania State University	2007

Professional Experience

Associate Chair for Graduate Education, CEAE Department 7/2022 – Present

As associate chair, I lead graduate education in the department and oversee graduate policies, admissions, appointments, examinations, and recruitments. I lead the graduate recruitment and admissions committee and serve on the College of Engineering and Applied Science Graduate Education Council. I work directly with the department graduate program advisors, approve requests related to graduate education, and handle issues that arise with graduate students.

Associate Professor, University of Colorado Boulder, Boulder, CO. 8/2020 – Present

Assistant Professor, University of Colorado Boulder, Boulder, CO. 9/2013 – 8/2020

My research uses multiobjective evolutionary algorithms, high performance computing, and interactive visualizations to transform management of environmental problems. Focus areas include (i) water resources planning and management, (ii) decision making under uncertainty, and (iii) improving management of environmental systems. I teach courses including hydrology, water resources engineering, and water resources systems analysis.

Adjunct Assistant Professor, University of Colorado Boulder, Boulder, CO 8/2012 – 9/2013

After being hired at CU, I took an adjunct position in the department before finishing my doctoral degree at Penn State. In this time, I developed research proposals and teaching materials for my transition to the assistant professor position.

Research Assistant, Pennsylvania State University, University Park, PA 5/2006 – 5/2013

My doctoral research developed a set of risk-based planning frameworks for MOEAs in water resources planning and management, focusing on the impacts of uncertainty in optimization problem formulations. The dissertation was funded by an EPA STAR graduate research fellowship. While at Penn State I served as a teaching assistant (for 2 semesters) and an instructor (for 1 semester) of an undergraduate course in water resources engineering. I also performed master's and undergraduate research at Penn State.

I performed technical analysis for a FEMA-supported study on the impact of climate change and population growth on the National Flood Insurance Program. This was a part time position of approximately 5 hours / week

During term breaks, I performed stormwater management calculations, prepared reports, and performed surveying fieldwork for residential and small commercial land development projects.

III. Publications

Statistics as of January 2025: **52** total papers; Google Scholar H-Index: 26; Total Citations: 4222.

Notation: Underline denotes CU graduate student author, italics indicate CU undergraduate student author. The **author order** that is typical in my field is that authors are listed in order of importance, with the authors that have contributed the most to the paper near the front of the author list. Graduate students are the first author when appropriate.

III.A Peer-Reviewed Journal Articles

1. Bonham, N, **JR Kasprzyk**, EA Zagona. 2025. "Taxonomy of purposes, methods, and recommendations for vulnerability analysis" *Environmental Modelling and Software*. vol 183: 106269. <https://doi.org/10.1016/j.envsoft.2024.106269>
2. Shmaya, T, M Housh, F Pecci, K Baker, **JR Kasprzyk**, A Ostfeld. 2024. "Conjunctive optimal operation of water and power networks" *Heliyon*. vol 10(20): e39136. <https://doi.org/10.1016/j.heliyon.2024.e39136>
3. Bonham, N, **JR Kasprzyk**, EA Zagona, B Rajagopalan. 2024. "Subsampling and Space-filling Metrics to Test Ensemble Size for Robustness Analysis with a Demonstration in the Colorado River Basin" *Environmental Modelling and Software*. vol 172: 105933. <https://doi.org/10.1016/j.envsoft.2023.105933>
4. Bonham, N, **JR Kasprzyk**, EA Zagona, R Smith. 2024. "Interactive and Multimetric Robustness Tradeoffs in the Colorado River Basin" *Journal of Water Resources Planning and Management*. vol 150(3). <https://doi.org/10.1061/JWRMD5.WRENG-6199>
5. Kravits, J, **JR Kasprzyk**, K Baker, AS Stillwell. 2023. "Balancing cost, water, emissions, and reliability in power systems operations" *Environmental Research Letters*. <https://doi.org/10.1088/1748-9326/ad0d3a>
6. **Kasprzyk, JR**, M Garcia. 2023. "Guiding Questions for Water Resources Systems Analysis Research" *Journal of Water Resources Planning and Management*. vol 149(8). <https://doi.org/10.1061/JWRMD5.WRENG-6198>
7. Bonham, N, **JR Kasprzyk**, E Zagona. 2022. "post-MORDM: mapping policies to synthesize optimization and robustness results for decision-maker compromise" *Environmental Modelling and Software*. Vol 157: 105491. 2022. <https://doi.org/10.1016/j.envsoft.2022.105491>
8. Modi, PA, EE Small, **JR Kasprzyk**, B Livneh. 2022. "Investigating the role of snow water equivalent on streamflow predictability during drought" *Journal of Hydrometeorology*. Vol 23 (10): 1607-1625. 2022. <https://doi.org/10.1175/JHM-D-21-0229.1>

9. Heldmyer, A, B Livneh, J McCreight, L Read, **JR Kasprzyk**, J Minear. 2022. "Evaluation of a New Observationally Based Channel Parameterization for the National Water Model" *Hydrology and Earth Systems Sciences*. Vol 26: 6121-6136. <https://doi.org/10.5194/hess-26-6121-2022>
10. Kravits, J, **JR Kasprzyk**, K Baker, AS Stillwell. 2022. "Incorporating Thermoelectric Power Plant Water Use into Multi-Objective Optimal Power Flow" *Environmental Research: Infrastructure and Sustainability*. Vol 2: 015005. <https://iopscience.iop.org/article/10.1088/2634-4505/ac4d18>
11. Smith, RM, EA Zagona, **JR Kasprzyk**, N Bonham, E Alexander, RA Butler, J Prairie, C Jerla. 2022. "Decision science can help address the challenges of long-term planning in the Colorado River Basin" *Journal of the American Water Resources Association*. JAWR-21-0043-C <https://doi.org/10.1111/1752-1688.12985>
12. DeRousseau, MA, **JR Kasprzyk**, WV Srubar III. 2021. „Multi-Objective Optimization Methods for Designing Low-Carbon Concrete Mixtures" *Frontiers in Materials*. <https://doi.org/10.3389/fmats.2021.680895>
13. Kravits, JE, **JR Kasprzyk**, KA Baker, K Andreadis. 2021. "Screening Tool for Dam Hazard Potential Classification Using Machine Learning and Multi-Objective Hyperparameter Tuning" *Journal of Water Resources Planning and Management*. Vol 147(10). [https://doi.org/10.1061/\(ASCE\)WR.1943-5452.0001414](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001414). **Selected for Editor's Choice.**
14. Purcell, B, Z Barkjohn, **JR Kasprzyk**, AS Stillwell. 2021. "Linking reclaimed water consumption with quantitative downstream flow impacts" *Journal of Water Resources Planning and Management*. Vol 147(5). [https://doi.org/10.1061/\(ASCE\)WR.1943-5452.0001335](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001335) **Awarded Best Policy-Oriented Paper from Journal of Water Resources Planning and Management.**
15. DeRousseau, MA, JH Arehart, **JR Kasprzyk**, WV Srubar III. 2020. "Statistical Variation in the Embodied Carbon of Carbon Mixtures" *Journal of Cleaner Production*. Vol 275: 123088. <https://doi.org/10.1016/j.jclepro.2020.123088>
16. Raseman, WJ, **JR Kasprzyk**, RS Summers, A Hohner, FL Rosario-Ortiz. 2020. "Multi-objective optimization of water treatment plant operations for disinfection byproduct control" *Environmental Science: Water Research and Technology*. Vol 6: 702-714. <https://doi.org/10.1039/C9EW00850K>
17. Raseman, WJ, R Balaji, **JR Kasprzyk**, W Kleiber. 2020. "Nearest neighbor bootstrap for generating influent time series for water treatment" *Stochastic Environmental Research and Risk Assessment*. Vol 34: 23-31. <https://doi.org/10.1007/s00477-019-01762-3>
18. Rosenberg, DE, Y Filion, RL Teasley, S Sandovol-Solis, JS Hecht, JE van Zyl, GF McMahon, JS Horsburgh, **JR Kasprzyk**, DG Tarboton. 2020. "The Next Frontier: Making Research More Reproducible" *Journal of Water Resources Planning and Management*. Vol 146(6). [https://doi.org/10.1061/\(ASCE\)WR.1943-5452.0001215](https://doi.org/10.1061/(ASCE)WR.1943-5452.0001215)
19. DeRousseau, MA, El Laftchiev, R Balaji, **JR Kasprzyk**, WV Srubar III. 2019. "A comparison of machine learning methods for predicting the compressive strength of field-placed concrete" *Construction and Building Materials*. Vol 228: 116661. <https://doi.org/10.1016/j.conbuildmat.2019.08.042>
20. Smith, RM, **JR Kasprzyk**, R Balaji. 2019. "Combining Multivariate Regression Trees and multiobjective tradeoff sets to reveal fundamental insights about water resources systems" *Environmental Modelling and Software*. Vol 120: 104498. <https://doi.org/10.1016/j.envsoft.2019.104498>

21. Smith, RM, **JR Kasprzyk**, L Dilling. 2019. "Testing the potential of Multiobjective Evolutionary Algorithms (MOEAs) with Colorado water managers" *Environmental Modelling and Software*. vol 117: 149-163. <https://doi.org/10.1016/j.envsoft.2019.03.011>
22. Raseman, WJ, *J Jacobson*, **JR Kasprzyk**. 2019. "Parasol: An open source, interactive parallel coordinates library for multi-objective decision making" *Environmental Modelling and Software*. vol 116: 153-163. <https://doi.org/10.1016/j.envsoft.2019.03.005>
23. Maier, HR, S Razavi, Z Kapelan, LS Mattot, **JR Kasprzyk**, BA Tolson. 2019. "Introductory Overview: Optimization using Evolutionary Algorithms and other Metaheuristics" *Environmental Modelling and Software*. vol 114: 195-213. <https://doi.org/10.1016/j.envsoft.2018.11.018> **Awarded Most Cited Review Paper in 2022**
24. Wheeler, KG, JW Hall, GM Abdo, SJ Dadson, **JR Kasprzyk**, RM Smith, EA Zagona. 2018. "Exploring Cooperative Transboundary River Management Strategies for the Eastern Nile Basin" *Water Resources Research*. vol 54 (11): 9224-9254. <http://dx.doi.org/10.1029/2017WR022149>
25. Barnhart, BL, HE Golden, **JR Kasprzyk**, JJ Pauer, CE Jones, KA Sawicz, N Hoghooghi, M Simon, RB McKane, PM Mayer, AN Piscopo, DL Ficklin, JJ Halama, PB Pettus, B Rashleigh. 2018. "Embedding co-production and addressing uncertainty in watershed modeling decision-support tools: Successes and challenges" *Environmental Modelling and Software*. vol 109: 368-379. <http://dx.doi.org/10.1016/j.envsoft.2018.08.025>
26. **Kasprzyk, JR**, RM Smith, AS Stillwell, K Madani, D Ford, D McKinney, S Sorooshian. 2018. "Defining the role of water resources systems analysis in a changing future" *Journal of Water Resources Planning and Management*. vol 144(12). [http://dx.doi.org/10.1061/\(ASCE\)WR.1943-5452.0001010](http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0001010)
27. DeRousseau, MA, **JR Kasprzyk**, WV Srubar III. 2018. "Computational Design Optimization of Concrete Mixtures: A Review" *Cement and Concrete Research*. vol 109: 42-53. <http://dx.doi.org/10.1016/j.cemconres.2018.04.007>
28. Smith, R, **JR Kasprzyk**, L Basdekas. 2018. "Experimenting with water supply planning objectives using the Eldorado Utility Planning Model multireservoir testbed" *Journal of Water Resources Planning and Management*. vol 144(8). [https://doi.org/10.1061/\(ASCE\)WR.1943-5452.0000962](https://doi.org/10.1061/(ASCE)WR.1943-5452.0000962)
29. Clarkin, TJ, WJ Raseman, **JR Kasprzyk**, JD Herman. 2018. "Diagnostic Assessment of Preference Constraints for Simulation-Optimization in Water Resources" *Journal of Water Resources Planning and Management*. vol 144(8). [https://doi.org/10.1061/\(ASCE\)WR.1943-5452.0000940](https://doi.org/10.1061/(ASCE)WR.1943-5452.0000940)
30. Stewart, JR, B Livneh, **JR Kasprzyk**, B Rajagopalan, JT Minear, WJ Raseman. 2017. "A multi-algorithm approach to land surface modeling of suspended sediment in the Colorado Front Range" *Journal of Advances in Modeling Earth Systems*. vol 9: 2526-2544. <http://dx.doi.org/10.1002/2017MS001120>
31. Rosenberg, DE, M Babbar-Sebens, E Root, JD Herman, A Mirchi, M Giacomoni, **JR Kasprzyk**, K Madani, D Ford, L Basdekas. 2017. "Towards More Integrated Formal Education and Practice in Water Resources Systems Analysis" *Journal of Water Resources Planning and Management*. vol 143(12): 02517001. [http://dx.doi.org/10.1061/\(ASCE\)WR.1943-5452.0000847](http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000847)
32. Smith, R, **JR Kasprzyk**, L Dilling. 2017. "Participatory Framework for Assessment and Improvement of Tools (ParFAIT): Increasing the impact and relevance of water management decision support research" *Environmental Modelling and Software*. vol 95: 432-446. <http://dx.doi.org/10.1016/j.envsoft.2017.05.004>

33. Watson, AA, **JR Kasprzyk**. 2017. "Incorporating deeply uncertain factors into the many objective search process" *Environmental Modelling and Software*. vol 89: 159-171. <http://dx.doi.org/10.1016/j.envsoft.2016.12.001> *Thematic Issue: Innovative Techniques for Quantitative Scenarios in Energy and Environmental Research*.
34. Houle, E, **JR Kasprzyk**, BL Livneh. 2017. "Exploring Snow Model Parameter Sensitivity Using Sobol' Variance Decomposition" *Environmental Modelling and Software*. vol 89: 144-158. <http://dx.doi.org/10.1016/j.envsoft.2016.11.024>
35. Raseman, WJ, **JR Kasprzyk**, FL Rosario-Ortiz, J Stewart, B Livneh. 2017. "Emerging Investigators Series: A critical review of decision support systems for water treatment: Making the case for incorporating climate change and climate extremes" *Environmental Science: Water Research and Technology*. vol 3: 18-36. <http://dx.doi.org/10.1039/c6ew00121a>
36. Yanto, R Balaji, B Livneh, **JR Kasprzyk**. 2017. "Hydrological Model Application Under Data Scarcity for Multiple Watersheds, Java Island, Indonesia" *Journal of Hydrology: Regional Studies*. vol 9: 127-139. <http://dx.doi.org/10.1016/j.ejrh.2016.09.007>
37. Huskova, I, ES Matrosov, JJ Harou, **JR Kasprzyk**, C Lambert. 2016. "Screening robust water infrastructure investments and their trade-offs under global change: A London Example" *Global Environmental Change*. vol 41: 216-217. <http://dx.doi.org/10.1016/j.gloenvcha.2016.10.007>
38. Piscopo, A, R Neupauer, **JR Kasprzyk**. 2016. "Optimal design of active spreading systems to remediate sorbing groundwater contaminants in situ" *Contaminant Hydrology*. vol 190: 29-43. <http://dx.doi.org/10.1016/j.jconhyd.2016.03.005>
39. Smith, R, **JR Kasprzyk**, E Zagona. 2016. "Many Objective Analysis to Optimize Pumping and Releases in a Multi-Reservoir Water Supply Network" *Journal of Water Resources Planning and Management*. vol. 142, no. 2. [http://dx.doi.org/10.1061/\(ASCE\)WR.1943-5452.0000576](http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000576)
40. **Kasprzyk, JR**, PM Reed, D Hadka. 2016. "Battling Arrow's Paradox to Discover Robust Water Management Alternatives" *Journal of Water Resources Planning and Management*. vol 142, no. 2. [http://dx.doi.org/10.1061/\(ASCE\)WR.1943-5452.0000572](http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000572)
41. Matrosov, E, I Huskova, **JR Kasprzyk**, JJ Harou, C Lambert, PM Reed. 2015. "Many-Objective Optimization and Visual Analytics Reveal Key Trade-offs for London's Water Supply" *Journal of Hydrology*, vol 531, part 3: 1040-1053. <http://dx.doi.org/10.1016/j.jhydrol.2015.11.003>
42. Piscopo, AN, **JR Kasprzyk**, RM Neupauer. 2015. "An Iterative Approach to Multi-Objective Engineering Design: Optimization of Engineered Injection and Extraction for Enhanced Groundwater Remediation" *Environmental Modelling and Software*, vol 69: 253-261. <http://dx.doi.org/10.1016/j.envsoft.2014.08.030>
43. Maier, HM, Z Kapelan, **JR Kasprzyk**, JB Kollat, LS Mattot, MC Cunha, GC Dandy, MS Gibbs, E Keedwell, A Marchi, A Ostfeld, D Savic, DP Solomatine, JA Vrugt, AC Zecchin, BS Minsker, EJ Barbour, G Kuczera, F Pasha, A Castelletti, M Giuliani, PM Reed. 2014. "Evolutionary Algorithms and Other Metaheuristics in Water Resources: Current Status, Research Challenges, and Future Directions" *Environmental Modelling and Software*, vol. 62: 271-299. <http://dx.doi.org/10.1016/j.envsoft.2014.09.013>
44. Zeff, HB, **JR Kasprzyk**, JD Herman, PM Reed, GW Characklis. 2014. "Navigating Financial and Supply Reliability Tradeoffs in Regional Drought Management Portfolios." *Water Resources Research*, vol. 50, no. 6: 4906-4923. <http://dx.doi.org/10.1002/2013WR015126>

45. Fu, G, Z Kapelan, **JR Kasprzyk**, PM Reed. 2013. "Optimal design of water distribution systems using many-objective visual analytics." *Journal of Water Resources Planning and Management*, vol. 139, no. 6: 624-633. [http://dx.doi.org/10.1061/\(ASCE\)WR.1943-5452.0000311](http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000311). **Awarded Quentin Martin Best Practice-Oriented Paper from Journal of Water Resources Planning and Management.**
46. **Kasprzyk, JR**, S Nataraj, PM Reed, RJ Lempert. 2013. "Many objective robust decision making for complex environmental systems undergoing change." *Environmental Modelling and Software*, vol. 42: 55-71. <http://dx.doi.org/10.106/j.envsoft.2012.12.007>
47. Reed, PM, D Hadka, JD Herman, **JR Kasprzyk**, JB Kollat. 2013. "Evolutionary Multiobjective Optimization in Water Resources: The Past, Present, and Future." *Advances in Water Resources*. vol. 51: 438-456 <http://dx.doi.org/10.1016/j.advwatres.2012.01.005>. *Invited article for 35th anniversary issue.*
48. Kollat, JB, **JR Kasprzyk**, WO Thomas, AC Miller, and D Divoky. 2012. "Estimating the Impacts of Climate Change and Population Growth on Flood Discharges in the United States." *Journal of Water Resources Planning and Management*, vol. 138, no. 5: 442-452. [http://dx.doi.org/10.1061/\(ASCE\)WR.1943-5452.0000233](http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000233). *Special section on climate change and water resources.*
49. **Kasprzyk, JR**, PM Reed, GW Characklis, BR Kirsch. 2012. "Many-Objective de Novo Water Supply Portfolio Planning Under Deep Uncertainty." *Environmental Modelling and Software*, vol. 34: 87-104. <http://dx.doi.org/10.1016/j.envsoft.2011.04.003>. *Issue: Emulation techniques for the reduction and sensitivity analysis of complex environmental models.*
50. **Kasprzyk, JR**, PM Reed, BR Kirsch, GW Characklis. 2009. "Managing population and drought risks using many-objective water portfolio planning under uncertainty." *Water Resources Research*, vol. 45, W12401. <http://dx.doi.org/10.1029/2009WR008121>
51. Reed, PM, **JR Kasprzyk**. 2009. "Water Resources Management: The Myth, the Wicked, the Future" *Journal of Water Resources Planning and Management*, vol. 135, no. 6: 411-413. [http://dx.doi.org/10.1061/\(ASCE\)WR.1943-5452.0000047](http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000047)
52. Kollat, JB, PM Reed, **JR Kasprzyk**. 2008. "A New Epsilon-Dominance Hierarchical Bayesian Optimization Algorithm for Large Multi-Objective Monitoring Network Design Problems." *Advances in Water Resources* vol. 31: 828-845. <http://dx.doi.org/10.1016/j.advwatres.2008.01.017>

Table 1: Journal impact factors and number of papers published per journal*All impact factors reflect 2023 (most recently updated January 2025)*

Journal Name	Number of Papers	Impact Factor
Journal of Cleaner Production	1	11.900
Cement and Concrete Research	1	11.680
Global Environmental Change	1	10.470
Construction and Building Materials	1	8.200
Journal of Hydrology	1	6.370
Environmental Research Letters	1	5.870
Hydrology and Earth Systems Sciences	1	5.490
Environmental Modelling and Software	15	5.220
Journal of Hydrology: Regional Studies	1	5.070
Water Resources Research	3	4.610
Stochastic Environmental Research and Risk Assessment	1	4.520
Journal of Advances in Modeling Earth Systems	1	4.420
Advances in Water Resources	2	4.260
Journal of Contaminant Hydrology	1	4.020
Heliyon	1	4.000
Environmental Science: Water Research and Technology	2	3.580
Journal of Hydrometeorology	1	3.100
Journal of Water Resources Planning and Management	14	2.890
Environmental Research: Infrastructure and Sustainability	1	2.700
Journal of the American Water Resources Association	1	2.670
Frontiers in Materials	1	2.510

III.B Peer-Reviewed Conference Papers

(in the following sections, * denotes presenter, underline denotes CU graduate student presenter, *italics* denotes undergraduate student)

1. Stroessner, S, R Lucero, J *Kravits, A* *Russell, S* *Johannes, K* Baker, **JR Kasprzyk**, Z Popovic “Power Amplifier Design Using Interactive Multi-Objective Visualization” European Microwave Conference, 2022. <https://doi.org/10.23919/EuMC54642.2022.9924437>
2. Kravits, J, KA Baker, **JR Kasprzyk**, AS Stillwell “Assessing Trade-offs Between Water, Emissions, and Cost in Multi-objective Optimal Power Flow” IEEE Power and Energy Society General Meeting, 2022. <https://doi.org/10.1109/PESGM48719.2022.9917158>
3. Kravits, J, KA Baker, **JR Kasprzyk**, “Multi-Objective Optimal Power Flow Considering Emissions and Voltage Violations” IEEE Power and Energy Society General Meeting, 2021. <https://doi.org/10.1109/PESGM46819.2021.9638044>

4. Kim, SM, KA Baker, **JR Kasprzyk**, “Operational Revenue Insufficiency in Highly Renewable DC and AC-based LMP Markets” North American Power Symposium, June 2021.
<https://doi.org/10.1109/NAPS50074.2021.9449693>
5. **Kasprzyk, JR***, JB Kollat, C Danilo, “Balancing Conflicting Management Objectives Using Interactive, Three-Dimensional Visual Analytics” International Environmental Modelling and Software Society (iEMSs), San Diego, CA, June 2014.
6. Houle, E*, **JR Kasprzyk**, “Investigating Parameter Sensitivity for Management in Snow-Driven Watersheds” iEMSs, San Diego, CA, June 2014.
7. **Kasprzyk, JR**, JHA Guillaume*, JB Kollat, C Danilo, “Hypothesis testing for management: Evolving and answering closed questions using multiobjective visualization” iEMSs, San Diego, CA, June 2014.
8. Reed, PM, D Hadka, JD Herman, **JR Kasprzyk***, JB Kollat, “Evolutionary Multiobjective Optimization in Water Resources: The Past, Present, and Future” iEMSs, Leipzig, Germany. July 2012
9. **Kasprzyk, JR***, S Nataraj, PM Reed, RJ Lempert. “Many-Objective Robust Decision Making for Water Supply Portfolio Planning Under Deep Uncertainty.” iEMSs, Leipzig, Germany. July 2012. **Received Student Presentation Award.**
10. Reed, PM*, **JR Kasprzyk**, BR Kirsch, GW Characklis. “Many-objective Management of Population and Drought Risks: A Case for De Novo Programming.” iEMSs, Ottawa, Canada. 2010.

III.C Journal Articles Submitted

1. Pernat, M, **JR Kasprzyk**, EA Zagona, SD Walker, B Livneh "The Relative Importance of Model Structure and Input Features for Water Supply Forecasting in Snow-Dominated River Basins of the US Southwest" Submitted to Journal of Hydrology Regional Studies, August 2024. Working on first revision as of January 2025
2. Modi, Parthkumar A, KS Jennings, **JR Kasprzyk**, EE Small, CW Wobus, B Livneh "Using Deep Learning in Ensemble Streamflow Forecasting: Exploring the Predictive Value of Explicit Snowpack Information". Submitted to JAMES, July 2024. Available at ESS Open Archive: DOI: 10.22541/essoar.172222576.62134567/v1

IV. Presentations

IV.A Presentations at National and International Meetings

Peer-reviewed conference papers (section III.B) and poster presentations (section IV.B) not included in this section.

1. **Kasprzyk, JR***, EA Zagona, D Neumann, P Lynn “A Multi-Reservoir Testbed in Borg-RiverWare to Aid Multi-Objective Simulation-Based Optimization” RiverWare User Group Meeting, Boulder, CO, January 2025
2. Smith, R*, EA Zagona*, **JR Kasprzyk***, S Martin, C Jerla, J Prairie, RA Butler, N Bonham*, HB Zeff*, N Daniels* “Bringing DMDU into Colorado River Basin Planning: Collaboration, Engagement, and Technology” 90 minute session at the Decision Making Under Deep Uncertainty (DMDU) Annual Meeting, Denver, CO, November 2024
3. Livneh, B*, P Modi, K Jennings, **JR Kasprzyk**, C Wobus, E Small "Snow data do not consistently improve Long Short Term Memory (LSTM) performance: An assessment of LSTM models in an Ensemble

Streamflow Prediction (ESP) framework over western US watersheds" AGU Fall Meeting, Washington DC, December 2024

4. Smith, R*, S Martin, EA Zagona, **JR Kasprzyk**, N Bonham, N Daniels, C Jerla "The Colorado River Basin Post-2026 Operations Exploration Tool: Connecting Policymakers and Stakeholders Through a Web-Based Decision-Support Platform" AGU Water Science Conference (WaterSciCon24), St Paul, MN, June 2024.
5. **JR Kasprzyk***, EA Zagona, N Bonham "Using self organizing maps to facilitate decision-maker compromise under deep uncertainty in the Colorado River Basin" ASCE Environmental Water Resources Institute (EWRI) meeting, Milwaukee, WI, May 2024.
6. Pernat, M*, EA Zagona, **JR Kasprzyk** "Enhancing many objective robust decision making in the Colorado River Basin through robust optimization and comparative analysis" ASCE Environmental Water Resources Institute (EWRI) meeting, Milwaukee, WI, May 2024.
7. Pernat, M*, B Livneh, EA Zagona, **JR Kasprzyk** "The relative importance of model type versus input features for water supply forecasting in snow-dominated river basins of the Southwest US" ASCE Environmental Water Resources Institute (EWRI) meeting, Milwaukee, WI, May 2024.
8. Zeff, HB*, R Smith, **JR Kasprzyk**, EA Zagona, RA Butler, JR Prairie, C Jerla, N Bonham "Using Decision Making under Deep Uncertainty to Support Long-Term Colorado River Basin Policy Exploration" Invited talk at American Geophysical Union (AGU) Fall Meeting, December 2023.
9. Bonham, N*, **JR Kasprzyk**, EA Zagona "post-MORDM: mapping policies to synthesize optimization and robustness results for decision-maker compromise" American Geophysical Union (AGU) Fall Meeting, December 2022.
10. Modi, P, **JR Kasprzyk**, EE Small, B Livneh "Investigating Predictability of Seasonal Streamflow Hindcasts From Physical and Machine Learning Models Using Ensemble Prediction Framework" American Geophysical Union (AGU) Fall Meeting, December 2022.
11. Bonham, N*, **JR Kasprzyk**, EA Zagona "post-MORDM: mapping policies to synthesize optimization and robustness results for decision-maker compromise" Meeting of the Society for Decision Making Under Deep Uncertainty, November 2022.
12. Bonham, N*, JR Kasprzyk, EA Zagona "How robustness should inform decision-making in systems characterized by deep uncertainty" Water Availability Chapman Conference, AGU, Golden, CO, September 2022.
13. Walker, S., B. Ely, P. Modi, B. Duncan, J. Kasprzyk, and **Livneh, B.**, "Towards Machine Learning-Aided Predictions of Water Availability and Droughts in Snow-Dominated Basins." EWRI World Congress Meeting, Atlanta, GA, June, 2022.
14. Modi, P. Walker, S., B. Ely, B. Duncan, J. Kasprzyk, and **Livneh, B.**, "Evaluating the Performance of Ensemble Streamflow Prediction (ESP) in Future Climate Conditions to Advance Drought Predictability." EWRI World Congress Meeting, Atlanta, GA, June, 2022.
15. **Livneh, B.** and J.R. Kasprzyk (Invited), Association of American Universities Data Exchange (AAUDE) Annual Meeting, Boulder, CO., Apr. 2022: Melting snow and water rights: Challenges for Western water management.

16. Bonham, N*, **JR Kasprzyk**, EA Zagona “Retroactive and Future Vulnerability of Lake Mead Operating Policies to Uncertainty in Water Supply, Demand, and Storage” American Geophysical Union (AGU) Fall Meeting, December 2021
17. Livneh, B, P Modi, **JR Kasprzyk**, B Ely, B Duncan “Evaluating seasonal drought prediction in snow-fed systems past, present, and future: towards identifying resilient prediction techniques” European Geophysical Union (EGU), online, April 2021
18. Bonham, N*, **JR Kasprzyk**, EA Zagona “Robust Robustness: A Sensitivity Analysis of MORDM with Competing Assumptions about Future States of the World” AGU Fall Meeting, online, December 2020
19. Kim, SM*, KA Baker, **JR Kasprzyk** “Framework to explore tradeoffs on integrating water into the energy market” AGU Fall Meeting, online, December 2020
20. Alexander, EA, **JR Kasprzyk***, EA Zagona, RM Smith, J Prairie, C Jerla, RA Butler “Using Multiobjective Evolutionary Algorithms and RiverWare for Generating Robust Lake Mead Operating Policies” International Environmental Modelling and Software Society (iEMSs), online, September 2020
21. Bonham, N*, **JR Kasprzyk**, EA Zagona “Evaluation of Scenario Discovery Methods for Multi-Reservoir System Planning” iEMSs, online, September 2020
22. **Kasprzyk, JR***, R Smith, WJ Raseman, J Jacobson, R Balaji “Improving interpretability of multi-objective tradeoff sets for environmental systems” iEMSs, online, September 2020
23. **Kasprzyk, JR***, WJ Raseman, “Multiobjective Optimization to Support Long-term Water Treatment Planning” iEMSs, online, September 2020
24. Kravits, J*, KA Baker, **JR Kasprzyk** “Multi-objective Machine Learning Hyper-parameter Optimization: A Case Study in Dam Hazard Classification” iEMSs, online, September 2020
25. DeRousseau, MA*, **JR Kasprzyk**, WV Srubar III “Low-carbon concrete mixture design via multi-objective optimization” Advanced Materials for Sustainable Infrastructure Development, Gordon Research Seminar, Ventura, CA, February 2020.
26. DeRousseau, MA*, El Laftchiev, **JR Kasprzyk**, R Balaji, WV Srubar III “Predicting Field Concrete Strength Using Machine Learning and Hybridized Datasets” 10th Annual American Ceramics Society (ACerS) Cements Division Advances in Cement-based Materials Conference; Champaign, Illinois, USA. 16 June 2019.
27. O'Donnell, MC*, **JR Kasprzyk**, B Livneh, L Benschling “Exploring Hydrologic Sensitivity Analysis to Improve Reservoir Management” American Society of Civil Engineering (ASCE) Environmental Water Resources Institute (EWRI), June 2019.
28. Alexander, E*, **JR Kasprzyk**, EA Zagona, JR Prairie, C Jerla, A Butler “Generating and Identifying Robust Lake Mead Operating Policies Using Many Objective Robust Decision Making” Fall Meeting of AGU 2018.
29. Wheeler, KG*, JW Hall, G Abdo, SJ Dadson, **JR Kasprzyk**, R Smith, EA Zagona “Negotiating coordination within transboundary rivers: The Nile and Grand Ethiopian Renaissance Dam” Fall Meeting of AGU 2018.
30. **Kasprzyk, JR***. “Using multi-objective optimization to improve water treatment plant operations under extreme events” AWWA ACE, Las Vegas, NV, June 2018.

31. DeRousseau, MA*, **JR Kasprzyk**, WV Srubar III. "Incorporating artificial neural network models into multi-objective optimization: an approach for mixture proportioning of sustainable and durable concrete mixtures" iEMSs meeting, Fort Collins, CO, June 2018.
32. **Kasprzyk, JR***. "Toward Improved Reservoir Management via Hydrologic Uncertainty Quantification" iEMSs, Fort Collins, CO, June 2018.
33. Raseman, WJ*, **JR Kasprzyk**, W Kleiber, R Balaji. "Uncertainty in drinking water supplies: exploring stochastic source water quality generation methods" iEMSs, Fort Collins, CO, June 2018.
34. **Kasprzyk, JR***, AS Stillwell "Tradeoffs of Alternate Water Resources for Thermoelectric Power Plant Cooling" ASCE EWRI, Minneapolis, MN, June 2018.
35. Estep, M*, JD Delorit, P Block, **JR Kasprzyk** "Many-objective analysis of water rights allocation and trading alternatives for the agriculture-dominated Elqui River Basin" ASCE EWRI, Minneapolis, MN, June 2018.
36. Neupauer, RM, *S Waers*, **JR Kasprzyk**, DC Mays "Monitoring Design for Groundwater Remediation Using Engineered Injection and Extraction" ASCE EWRI, Minneapolis, MN, June 2018.
37. Alexander, E*, **JR Kasprzyk**, EA Zagona, J Prairie, C Jerla, A Butler "Using Multi-Objective Optimization to Explore Robust Policies in the Colorado River Basin" ASCE EWRI, Minneapolis, MN, June 2018.
38. Raseman, WJ*, **JR Kasprzyk**, FL Rosario-Ortiz, RS Summers, AK Hohner "Development of a Water Treatment Decision Support System for Utilities Facing Wildfire Risks" American Water Works Association (AWWA) Sustainable Water Management Conference, Seattle, WA, March 2018.
39. Greene, JA*, RM Neupauer, M Ye, **JR Kasprzyk**, DC Mays, GR Curtis "Bioremediation of Uranium-Contained Groundwater using Engineered Injection and Extraction" Fall Meeting of AGU 2017.
40. Smith, R*, **JR Kasprzyk**, R Balaji "Using multiobjective tradeoff sets and Multivariate Regression Trees to identify critical and robust decisions for long term water utility planning" Fall Meeting of AGU 2017.
41. Estep, M*, JD Delorit, P Block, **JR Kasprzyk** "Integrating hydroclimatic prediction and many-objective risk management to foster optimal water allocation" ASCE EWRI, May 2017
42. Greene, J*, RM Neupauer, M Ye, **JR Kasprzyk**, DC Mays "Engineered Injection and Extraction for Remediation of Uranium-Contaminated Groundwater" ASCE EWRI, May, 2017
43. **Kasprzyk, JR***, TJ Clarkin, WJ Raseman, JD Herman "Exploring the Effects of Constraints on Multiobjective Evolutionary Algorithm Performance in Water Resources" ASCE EWRI, May, 2017
44. Srubar, WV*, **JR Kasprzyk** "Design Optimization of Sustainable and Multi-Hazard Resilient Concrete Mixtures" ASCE Structures Congress, April, 2017
45. Srubar, WV*, **JR Kasprzyk** "Multi-Criteria Design Optimization of Sustainable and Resilient Concrete" ASCE Architectural Engineering Institute Conference, April 2017
46. Smith, R*, **JR Kasprzyk**, L Basdekas, L Dilling "Producing regionally-relevant multiobjective tradeoffs to engage with Colorado water managers" Fall Meeting of AGU 2016
47. Srubar, WV*, **JR Kasprzyk** "Multi-objective, Multi-Hazard Design Optimization of Sustainable and Durable Concrete Mixtures" American Concrete Institute (ACI), Philadelphia, PA, October 2016
48. Piscopo, A*, RM Neupauer, **JR Kasprzyk** "Guidelines for active spreading during in situ chemical oxidation to remediate contaminated groundwater" ASCE Environmental Water Resources Institute (EWRI) congress, West Palm Beach, FL, May 2016.

49. Srubar, WV*, **JR Kasprzyk**, “Design of Sustainable and Resilient Concrete Mixtures via Multi-Objective Optimization” International Concrete Sustainability Conference, Washington, DC, May 2016
50. Smith, R*, **JR Kasprzyk**, L Dilling, ES Gordon “Co-Production with Water Managers to Improve Applicability and Adoption of an Emerging Decision Support Tool” Fall Meeting of AGU 2015
51. Piscopo, A, RM Neupauer, **JR Kasprzyk*** “Effects of heterogeneity on active spreading strategies to remediate contaminated groundwater” Fall Meeting of AGU 2015
52. *Greene, J**, A Piscopo, R Neupauer, **JR Kasprzyk** “Optimal well placement for enhanced degradation during in situ groundwater remediation” Fall Meeting of AGU, December 2015
53. Huskova, I*, ES Matrosov, JH Kwakkel, JJ Harou, **JR Kasprzyk**, PM Reed “Adaptive planning for the flexible expansion of London’s water supply system” 3rd annual workshop on decision making under deep uncertainty, Delft, Netherlands, 2015.
54. **Kasprzyk, JR***, JN Ryan, “Tradeoff analysis of setback distance and density for oil and natural gas development” American Water Resources Association (AWRA) 2015 meeting, Denver, CO, November 2015.
55. Smith, R*, **JR Kasprzyk**, L Dilling “Co-Producing a Many Objective Water Supply Optimization Experiment to Support Management on the Front Range,” AWRA 2015 meeting, Denver, CO, November 2015
56. Smith, R*, **JR Kasprzyk**, E Zagona “Many Objective Analysis to Optimize Pumping and Releases in a Multi-Reservoir Water Supply Network”, AWRA 2015 meeting, Denver, CO, November 2015.
57. **Kasprzyk, JR***, R Pence, B Livneh, F Rosario-Ortiz, “Coupling between hydrologic processes and water quality to enhance resilience of potable water systems under extreme events” Association of Environmental Engineering and Science Professors (AEESP) 2015 meeting.
58. Piscopo, AN*, R Neupauer, **JR Kasprzyk**, “Multi-Objective Optimization of Engineered Injection and Extraction with Simultaneous Well Operation for In Situ Groundwater Remediation” MODFLOW and More 2015.
59. Smith, R*, **JR Kasprzyk**, L Dilling, E Gordon, “Co-Producing a Many Objective Problem Formulation to Support Water Management in the Front Range” ASCE EWRI 2015.
60. **Kasprzyk, JR***, E Houle, B Livneh, “Diagnostic analysis of multiple snow models across the Western US” ASCE EWRI 2015.
61. **Kasprzyk, JR***, Watson, A, “Incorporating Deeply Uncertain Factors into the Many Objective Search Process” ASCE EWRI 2015.
62. Piscopo, AN*, R Neupauer, **JR Kasprzyk**, “Developing design guidelines to remediate contaminated groundwater via Engineered Injection and Extraction based on insights from multi-objective optimization” ASCE EWRI 2015.
63. Piscopo, AN*, R Neupauer, **JR Kasprzyk**, “Multi-Objective Optimization of Engineered Injection and Extraction to Remediate Sorbing Contaminants in Homogeneous and Heterogeneous Aquifers” Fall Meeting of AGU, December 2014.
64. **Kasprzyk, JR*** “Many objective water resources planning and management given deep uncertainties, population pressures, and environmental change” Universities Council on Water Resources (UCOWR) meeting, Boston, MA, June 2014.

65. Piscopo, AN*, **JR Kasprzyk**, RM Neupauer, and DC Mays “An Iterative Approach to Many Objective Engineering Design: Balancing Conflicting Objectives for Engineered Injection and Extraction” ASCE EWRI 2014, Portland, OR.
66. Smith, R*, **JR Kasprzyk**, E Zagona, J Carron, and N Mander “Many Objective Analysis to Optimize Energy Costs for Water Pumping and Regional Planning” ASCE EWRI 2014, Portland, OR.
67. **Kasprzyk, JR***, and Guillaume, J “Iterative Closed Question Methodology for Improving the Flexibility of Many Objective Decision Aiding” ASCE EWRI 2014, Portland, OR.
68. Huskova, I*, ES Matrosov, JJ Harou, **JR Kasprzyk**, and PM Reed “Many Objective Robust Optimization of London’s Regional Water Infrastructure Systems Under Climate Change” ASCE EWRI 2014, Portland, OR.
69. **Kasprzyk, JR***, PM Reed, DM Hadka. “Battling Arrow’s Paradox to Discover Robust Water Management Alternatives” Fall Meeting of the American Geophysical Union (AGU), December 2013.
70. Guillaume, J*, **JR Kasprzyk** “Improving the Flexibility of Optimization-Based Decision Aiding Frameworks for Integrated Water Resource Management” Fall Meeting of AGU, December 2013.
71. **Kasprzyk, JR***, S Nataraj, PM Reed, RJ Lempert. “Many-Objective Robust Decision Making for Water Supply Portfolio Planning Under Deep Uncertainty.” Invited minisymposium talk at SIAM Conference on Computational Science and Engineering, Boston, MA. February 2013
72. **Kasprzyk, JR***, D Hadka, P Reed, “Diagnostic Evaluation of Many Objective Search for Water Supply Portfolio Planning” ASCE EWRI. Cincinnati, OH. May 2013.
73. Matrosov, ES, I Huskova, **JR Kasprzyk***, J Harou, P Reed, “A Many-Objective Analysis of Supply and Demand Management Options for the Thames Basin” ASCE EWRI. Cincinnati, OH. May 2013.
74. **Kasprzyk, JR***, S Nataraj, PM Reed, RJ Lempert. “Many objective robust decision making for complex environmental systems undergoing change” Fall Meeting of the American Geophysical Union (AGU). San Francisco, California. December 2012.
75. Reed, PM*, D Hadka, JD Herman, **JR Kasprzyk**, JB Kollat, “Evolutionary Multiobjective Optimization in Water Resources: The Past, Present, and Future” European Geophysical Union. April 2012
76. **Kasprzyk, JR***, S Nataraj, PM Reed, RJ Lempert. “Many-Objective Robust Decision Making for Water Supply Portfolio Planning Under Deep Uncertainty.” ASCE EWRI. Albuquerque, NM. May 2012.
77. Matrosov, ES*, **JR Kasprzyk**, J Harou, PM Reed. “Many-objective infrastructure capacity optimization – Application to the Thames Basin.” Computing and Control for the Water Industry. Exeter, UK. September 2011.
78. **Kasprzyk, JR***, JB Kollat, WO Thomas, AC Miller, D Divoky. “Estimating the Impacts of Climate Change and Population Growth on Flood Discharges in the United States.” ASCE EWRI. Palm Springs, CA. May 2011.
79. **Kasprzyk, JR***, PM Reed, GW Characklis, BR Kirsch. “What is the Nondominated formulation? A Demonstration of de Novo Water Supply Portfolio Planning Under Deep Uncertainty.” ASCE EWRI. Palm Springs, CA. May 2011.
80. **Kasprzyk, JR***, PM Reed, GW Characklis, BR Kirsch. “What is the Nondominated formulation? Demonstration of de Novo Water Supply Portfolio Planning Under Deep Uncertainty.” European Geophysical Union (EGU). April 2011.

81. Reed, PM*, **JR Kasprzyk**, GW Characklis. "Many-objective Risk-based Planning within Complex Engineering Systems: An Urban Water Planning Example." International conference on vulnerability and risk analysis and management (ICVRAM) and Fifth international symposium on uncertainty modelling and analysis (ISUMA). Hyattsville, MD. April 2011.
82. **Kasprzyk, JR***, PM Reed, BR Kirsch, GW Characklis. "Managing population and drought risks using many objective water portfolio under uncertainty." Invited participant to Technology Management and Policy Consortium. Cambridge, UK. 2010.
83. **Kasprzyk, JR***, PM Reed, BR Kirsch, GW Characklis. "Managing population and drought risks using many objective water portfolio under uncertainty." ASCE EWRI. Providence, R.I. 2010.
84. Kollat, JB*, **JR Kasprzyk**, WO Thomas. "Using Uncertain Projections of Extreme Climate Indicators to Quantify the Effects of Climate Change on Extreme Event Flooding in the United States." AWRA, Seattle, Washington. November 2009.
85. Reed, PM*, **JR Kasprzyk**, "Do we understand how to use urban water markets to address population and drought risks?" Invited Conference Paper for the World City Water Forum 2009. Songdo Convensia, Incheon, Korea. August 2009.
86. **Kasprzyk, JR***, Reed, P. M., Kirsch, B. R., Characklis, G. W. "Gaming Change: A Many-Objective Analysis of Water Supply Portfolios under Uncertainty" Fall Meeting of AGU. December 2008.

IV.B Poster Presentations

1. **Kasprzyk, JR***, JS Ramírez Núñez, *J Lee* "Deep Learning Flow Detection in Non-Perennial Streams" American Geophysical Union (AGU) meeting, December 2024, Washington, DC
2. **Kasprzyk, JR***, EA Zagona, D Neumann, P Lynn "A Multi-Reservoir Testbed in Borg-RiverWare to Aid Multi-Objective Simulation-Based Optimization" AGU meeting, December 2024, Washington DC
3. Modi, P*, K Jennings, **J Kasprzyk**, E Small, B Livneh "How does 'hydrologic memory' from water storage in snowpack impact skill in machine-learning based seasonal streamflow forecasts?" American Geophysical Union (AGU) meeting, December 2023, San Francisco, CA
4. Bonham, N*, **JR Kasprzyk**, EA Zagona "Vulnerability in the Colorado River Basin: a critical review of vulnerability analyses to inform the renegotiation of Lake Mead operation policy" AGU Fall Meeting, December 2022.
5. Kravits, J*, **JR Kasprzyk**, K Baker, AS Stillwell "Identifying System and Generator Vulnerabilities Through a Sensitivity Analysis of a Multi-Objective Optimal Power Flow Formulation" AGU Fall Meeting, December 2021.
6. **Kasprzyk, JR***, R Smith, WJ Raseman, J Jacobson, R Balaji "Improving interpretability of multi-objective tradeoff sets for environmental systems" AGU Fall Meeting, December 2019
7. Kravits, J*, **JR Kasprzyk**, K Baker, K Andreadis "A machine-learning approach to dam hazard classification" Fall Meeting of AGU 2019.
8. **Kasprzyk, JR** "Using inductive reasoning to demonstrate principles in water resources engineering classes" Fall Meeting of AGU 2019; with e-lightning presentation
9. Carpenter, C*, K Wickland, DW Clow, M Dornblaser, JC Koch, RG Striegl, **JR Kasprzyk** "Aquatic carbon exports from alpine and boreal wetlands to headwater streams" Submitted to Fall Meeting of AGU 2019

10. Raseman, WJ*, *J Jacobson*, RS Summers, R Balaji, FL Rosario-Ortiz, **JR Kasprzyk** “Multi-objective optimization and visual analytics to support drinking water decision making” AWWA ACE 2019.
11. Raseman, WJ*, **JR Kasprzyk**, RS Summers, R Balaji, FL Rosario-Ortiz, W Kleiber, B Livneh “Advancing Stochastic Water Quality and Simulation-Optimization Techniques for Potable Water Systems Facing Source Water Quality Degradation” Fall Meeting of AGU 2018
12. Purcell, B*, ZA Barker, **JR Kasprzyk**, AS Stillwell “Scenario analysis of downstream flow impacts from reclaimed water consumption in two distinct regions” Fall Meeting of AGU 2018
13. Estep, MA*, JD Delorit, **JR Kasprzyk**, PJ Block “Informing many-objective decision-making for water rights allocations and trading dynamics conditioned on a streamflow prediction regime in the Elqui River Basin” Fall Meeting of AGU 2018
14. Baker, KA, **JR Kasprzyk** “A guide to the use of internet memes in engineering education” American Society for Engineering Education Zone IV Conference, Boulder, CO, 2017
15. **Kasprzyk, JR***, R Smith, WJ Raseman, MA DeRousseau, L Dilling, K Ozekin, RS Summers, R Balaji, B Livneh, FL Rosario-Ortiz, L Sprain, WV Srubar “Collaborative Workshops for Assessment and Creation of Multi-Objective Decision Support for Multiple Sectors” Fall Meeting of AGU 2017.
16. Alexander, E*, **JR Kasprzyk**, EA Zagona, J Prairie, C Jerla, A Butler “Using Multi-Objective Optimization to Explore Robust Policies in the Colorado River Basin” Fall Meeting of AGU 2017.
17. Raseman, WJ*, **JR Kasprzyk**, FL Rosario-Ortiz, RS Summers, AK Hohner “Multiobjective Optimization of Water Treatment Operations for Seasonally Varying Source Water Quality and Extreme Events” Water Quality Technology Conference, November 2017, Portland, OR
18. Smith, R*, **JR Kasprzyk**, “Using multiobjective tradeoffs sets and Multivariate Regression Trees to identify critical and robust decisions for long term water utility planning” Decision Making under Uncertainty Conference, Oxford, UK, November 2017
19. Raseman, WJ*, **JR Kasprzyk**, *JP Vernon*, RS Summers, FL Rosario-Ortiz “Long-Term Planning for Potable Water Systems under Climate Change and Extreme Weather Events: Translating Stakeholder Feedback into Modeling and Optimization” Association of Environmental Engineering and Science Professors meeting, Ann Arbor, MI, June 2017
20. Smith, R*, **JR Kasprzyk**, L Dilling, L Basdekas, L Kaatz “Improving the relevance and impact of decision support research: A co-production framework and water management case study” Fall Meeting of AGU 2016
21. Stewart, JR*, B Livneh, **JR Kasprzyk**, WJ Raseman “Ensemble Modeling of Suspended Sediment in Steep Mountain Catchments” Fall Meeting of AGU 2016
22. Yanto, JR Kasprzyk*, B Rajagopalan, B Livneh “Multi-objective Optimization Based Calibration of Hydrologic Model and Ensemble Hydrologic Forecast for Java Island, Indonesia” Fall Meeting of AGU 2016
23. Alongi, M*, **JR Kasprzyk**, J Milford, JN Ryan, M Estep “Multiobjective Policy Analysis to Evaluate Air Quality Impacts of Oil and Gas Regulations” Fall Meeting of AGU 2016
24. Raseman, WJ*, **JR Kasprzyk**, FL Rosario-Ortiz, RS Summers, JR Stewart, B Livneh “Multi-objective Optimization for the Robust Performance of Drinking Water Treatment Plants under Climate Change and Climate Extremes” Fall Meeting of AGU 2016

25. **Kasprzyk, JR***, WJ Raseman, FL Rosario-Ortiz, JR Stewart, B Livneh “Decision support framework for potable water systems under climate extremes” Decision Making under Uncertainty Conference, Washington, DC, November 2016
26. Smith, R*, **JR Kasprzyk**, L Dilling “How can we improve decision support research and increase its impact on resource management? A co-production framework and water management case study” Decision Making under Uncertainty Conference, Washington, DC, November 2016
27. Smith, R*, **JR Kasprzyk**, EA Zagona “Improving the Performance of Highly Constrained Water Resource Systems using Multiobjective Evolutionary Algorithms and RiverWare” Fall Meeting of AGU, December 2015
28. Yanto*, B Livneh, B Rajagopalan, **JR Kasprzyk** “Hydrologic Modeling and Parameter Estimation Under Data Scarcity for Java Island, Indonesia” Fall Meeting of AGU, December 2015.
29. Alongi, M*, C Howard, **JR Kasprzyk**, JN Ryan “Toward a multi-objective decision support framework to support regulations of unconventional oil and gas development” Fall Meeting of AGU, December 2015.
30. Huskova, I*, ES Matrosov, JJ Harou, **JR Kasprzyk**, and PM Reed “Scheduling interventions within water resource systems under deep uncertainty” Fall Meeting of AGU, December 2015.
31. Clarkin, TJ*, WJ Raseman, **JR Kasprzyk**, JD Herman “How do severe constraints affect the search ability of multiobjective evolutionary algorithms in water resources?” Fall Meeting of AGU, December 2015.
32. Huskova, I*, ES Matrosov, JJ Harou, **JR Kasprzyk**, and PM Reed “Scheduling and adaptation of London’s future water supply and demand schemes under uncertainty” EGU 2015.
33. **Kasprzyk, JR***, AA Watson. “Incorporating Deeply Uncertain Factors into the Many Objective Search Process: Improving Adaptation to Environmental Change” Fall Meeting of AGU, December 2014.
34. Houle, ES*, BL Livneh, **JR Kasprzyk**. “Inter-Model Diagnostics for Two Snow Models Across Multiple Western U.S. Locations and Implications for Management” Fall Meeting of AGU, December 2014.
35. Huskova, I*, ES Matrosov, JJ Harou, **JR Kasprzyk**, PM Reed. “Scheduling Future Water Supply Investments Under Uncertainty” Fall Meeting of AGU, December 2014.
36. Smith, R*, JR Kasprzyk, EA Zagona. “Combining Interactive Infrastructure Modeling and Evolutionary Algorithm Optimization for Sustainable Water Resources Design” Fall Meeting of AGU, December 2013.
37. Piscopo, A*, **JR Kasprzyk**, R Neupauer, D Mays. “Many-Objective Design of Engineered Injection and Extraction Sequences for In Situ Remediation of Contaminated Groundwater” ASCE EWRI, Cincinnati, OH. May 2013.
38. Zeff, HB*, **JR Kasprzyk**, PM Reed, GW Characklis. “A Many-Objective Approach to Developing Adaptive Water Supply Portfolios in the ‘Research Triangle’ Region of North Carolina” Fall Meeting of AGU, 2012.
39. Huskova, I*, ES Matrosov, **JR Kasprzyk**, JJ Harou, PM Reed. “A Many-Objective Analysis of Supply and Demand Management Options for the Thames Basin” Fall Meeting of AGU, 2012.
40. **Kasprzyk, JR***, PM Reed, GW Characklis, BR Kirsch. “What is the Nondominated Formulation? A Demonstration of de Novo Water Supply Portfolio Planning Under Deep Uncertainty” Fall Meeting of AGU, 2010.
41. **Kasprzyk, JR***, PM Reed, BR Kirsch, GW Characklis. “Sensitivity-Informed De Novo Programming for Many-Objective Water Portfolio Planning Under Uncertainty.” Fall Meeting of AGU, 2009.

IV.C Other Presentations

Invited University Seminars

1. Duke University, January 2025
2. Syracuse University, Spring 2021.
3. Indiana University, October 2019.
4. University of California Berkeley, April 2016, Environmental Engineering Seminar Series
5. Tufts University, March 2016
6. Colorado School of Mines, January 2015, Van Tuyl Hydrologic Seminar Series
7. University of Illinois Urbana Champaign, October 2014
8. Imperial College London, March 2014
9. Colorado State University, October 2013, guest lecture in water resources course
10. University of Colorado Boulder, March 2012
11. Oregon State University, March 2012

Local Presentations, Outreach, Panel Discussions, Webinars

12. Pernat, M*, **JR Kasprzyk**, EA Zagona "A 'Map' of Hydrologic and System Condition Scenarios for Evaluating Water Management Policies in the Colorado River Basin" CU Hydrologic Sciences Symposium, 2024
13. **Kasprzyk, JR***, M Garcia "Can water resource systems analysis provide generalized knowledge to help society?" CU Hydrologic Sciences Symposium, 2024
14. "New Insights into the role of snow and machine learning tools in water supply prediction", Western Water Assessment webinar, September 11, 2023. Kasprzyk group graduate student Maddy Pernat presented with Ben Livneh and graduate student Parth Modi
15. Bonham, N*, E Zagona, **JR Kasprzyk** "The Colorado River Basin Robustness Analysis web application: a novel tool for visualizing and filtering candidate Lake Mead operation policies" CU Hydrologic Sciences Symposium, 2021
16. **Kasprzyk, JR*** "Optimization and Machine Learning to Improve Water Resources Sustainability" invited talk for CU Hydrologic Sciences Symposium, 2021
17. Kravits, J, **JR Kasprzyk**, KA Baker "I am once again asking you to use multiple objectives to calibrate your machine learning models" CU Hydrologic Sciences Symposium, 2021
18. Colorado River Hydrology Research Symposium Webinar, online, October 2020
19. EPA Small Systems Monthly Webinar Series, online, September 2020
20. **Kasprzyk, JR***, "Toward Improved Reservoir Management via Hydrologic Uncertainty Quantification" CU Hydrologic Sciences Symposium, 2018.
21. **Kasprzyk, JR***, JR Stewart, B Livneh, B Rajagopalan "Improving the holistic calibration of simulated hydrologic processes using multiple objectives" CU Hydrologic Sciences Symposium, 2017.
22. Estep, M*, **JR Kasprzyk** "Comparison of Water Markets in Multiple Countries and the Potential for Multi-Objective Optimization in the Chilean Elqui Valley" CU Hydrologic Sciences Symposium, 2017.

23. Greene, JA*, RM Neupauer, M Ye, **JR Kasprzyk**, DC Mays “Remediation of Uranium-Contaminated Groundwater Using Engineered Injection and Extraction” CU Hydrologic Sciences Symposium, 2017.
24. Smith, RM*, **JR Kasprzyk** “Connecting Water Managers, Multiobjective Evolutionary Algorithms, and Multivariate Regression Trees to Support Water Utility Planning on the Front Range” CU Hydrologic Sciences Symposium, 2017.
25. Vernon, JP*, WJ Raseman, **JR Kasprzyk**, FL Rosario-Ortiz, AK Hohner, RS Summers “Multi-Objective Optimization Using Water Treatment Plant Simulation Model for Wildfire Conditions” Poster Presentation at CU Hydrologic Sciences Symposium, 2017.
26. **Kasprzyk, JR*** “Many Objective Decision Support for Water and Environmental Problems Under Deep Uncertainty” CU Hydrologic Sciences Symposium, 2016.
27. Clarkin, T*, W Raseman, **JR Kasprzyk**, J Herman “Exploring the effects of constraints on multiobjective evolutionary algorithm optimization efficiency and effectiveness in water resources” CU Hydrologic Sciences Symposium, 2016.
28. Participated in panel discussion at EWRI 2015 on improving systems education in water resources
29. Watson, A*, **JR Kasprzyk** “Incorporating Deeply Uncertain Factors into the Many Objective Search Process” CU Hydrologic Sciences Symposium, 2015.
30. Smith, R*, **JR Kasprzyk**, E Zagona, L Blaylock, J Carron, N Mander “Many Objective Analysis to Optimize Pumping and Releases in a Multi-Reservoir Water Supply Network.” RiverWare User Group Meeting, Boulder, CO, January 2015.
31. Invited presentation, “Introduction to Water Resources Engineering” for University of Colorado International English Center’s Go English! program for international students
32. **Kasprzyk, JR*** and R Smith, “Framing Energy and Environmental Planning Problems Using Many Objective Robust Decision Making,” Presentation at IQ SCENE: Innovative techniques for Quantitative Scenarios in Energy and Environmental Research, a workshop at the University College London Energy Institute, London, UK, March 2014.
33. **Kasprzyk, JR*** “Balancing cost, performance, and efficiency for complex water problems: A many objective approach to sustainability.” Invited presentation to the Center for Science and Technology Policy Research, CIRES, University of Colorado, October 2013
34. CEAE Department Seminar, September 2013.
35. **Kasprzyk, JR*** and R Smith, “What are the tradeoffs? A many objective approach to water resources planning”. RiverWare User Group Meeting, Boulder, CO, August 2013.
36. Invited Panelist at Association of Environmental Engineering and Science Professors (AEESP) Conference Workshop, *Increasing the Role of Economics in Environmental Research*, July 2013, Golden, CO
37. “Improving Water Supply Sustainability Using Many-Objective Water Portfolio Planning,” Invited presentations at Oregon State University, University of Colorado Boulder, March 2012
38. “Many-Objective Visual Analytics: Participatory Decision Support in Water Resources and Beyond”: with Pat Reed and Shanthy Nataraj, RAND National Security Research Division Briefing, February 2012

39. “Many-Objective de Novo Water Supply Portfolio Planning Under Deep Uncertainty”: Penn State (PSU) Environmental Economics seminar Fall 2010; PSU Student chapter of INFORMS Spring 2011; PSU Water Resources Engineering seminar Spring 2011

Mentions and Interviews in Popular Press

1. Hicks, B “Access to Advanced Decision Making Science,” syndicated clip for news outlets on Colorado River web tool with quotes from **JR Kasprzyk**, EA Zagona, and others. [Link to clip from KWWL, an NBC affiliate from Waterloo, IA](#)
2. Partlow, J “Inside the race to grasp the fate of the Colorado River” Article in the *Washington Post* about our work on the Colorado River Basin, February 11, 2024 <https://www.washingtonpost.com/climate-environment/2024/02/11/colorado-river-states-climate-change-future/>
3. **Kasprzyk, JR***, et al “Expert explains how snowy start to 2022 affects Colorado’s drought” Televised video interview conducted by Jennifer Meckles, 7 News Denver, Feb. 2022 <https://www.9news.com/article/weather/colorados-drought-snowy-start/73-368e9626-2d51-4c1c-8a1e-589815d5f8f6>

V. Proposals for Research

V.A Current and Past Funded Grants at CU Boulder

1. Center for Effective Abatement of Nutrients (CLEAN)

Subaward to CU from Colorado State University

CU Investigators: Rajagopalan Balaji, JoAnn Silverstein, Joseph Kasprzyk

Funding Agency: Environmental Protection Agency

Total Award: \$2,220,150

Award Period: 9/1/2013-8/1/2017

Kasprzyk Support: No financial support (project funded in my transition to joining CU)

Description: The CLEAN center sought to create knowledge, build capacity, and forge collaboration to develop sustainable solutions for reduction of nutrient pollution in the nation’s water resources. I helped advise Bihu Suchetana on the last part of her dissertation, on statistical modeling that demonstrated how to reduce nutrients across the different domains within the broader project.

2. Balancing Severe Decision Conflicts Under Climate Extremes in Water Resource Management

Investigators: Lisa Dilling, Joseph Kasprzyk, Kristen Averyt, Eric Gordon, Imtiaz Rangwala (CU Boulder); Leon Basdekas (Colorado Springs Utilities); Lurna Kaatz (Denver Water)

Funding Agency: National Oceanic and Atmospheric Administration

Total Award: \$276,064

Award Period: 8/1/2014-7/1/2016

Kasprzyk Support: Summer salary and support for Rebecca Smith. Total expenditures **\$117,680**.

Description: We focused on water management in the Front Range of Colorado, seeking to gauge the extent to which multiobjective evolutionary algorithm (MOEA) decision support could aid in long-term planning. We (i) held a series of workshops with six Front Range water utilities to understand best practices for using MOEA-based decision support and (ii) co-produced a water management test bed, which combines MOEAs, water system infrastructure models, and plausible climate change projections. **Dr. Rebecca Smith** was supported on the project, and subsequent work with a former water manager at Colorado Springs Utilities has continued to study MOEAs with other real-world planning applications.

3. An integrated modeling and decision framework to evaluate adaptation strategies for sustainable drinking water utility management under drought and climate change

Principal Investigator: Kenan Ozekin (Water Research Foundation)

Investigators: Balaji Rajagopalan, Scott Summers, Fernando Rosario-Ortiz, Ben Livneh, Joseph Kasprzyk

Funding Agency: Environmental Protection Agency

Total Award: \$1,250,000

Award Period: 3/1/2015 – 2/28/2018

Kasprzyk Support: Summer salary and support for William Raseman. Total expenditures **\$256,815**.

Description: We explored how drought due to climate change and other extreme events challenge drinking water utilities' ability to treat water to meet regulatory and public health protection goals, focusing on water quality. Objectives: (i) connect watershed processes with sediment generation and water quality, (ii) understand the mobilization and transport of organic matter, sediments, and nutrients through the watershed and eventually to the water treatment plant, (iii) develop source water quality thresholds at the water treatment plant and use stream water quality information to predict threshold exceedance, and (iv) evaluate a suite of adaptation and operation strategies (e.g., watershed management, wild fire mitigation, treatment plant modifications) along with their economic, societal and policy implications with multi-objective optimization tools. I coordinated project reporting throughout the project. **Dr. William Raseman** was supported throughout this project, creating a multi-objective optimization framework for drinking water treatment. Dr. Raseman and I also collaborated on hydrologic and sediment modeling applications.

4. Routes to Sustainability for Natural Gas Development and Water and Air Resources in the Rocky Mountain Region

Investigators: Joseph Ryan, Mark Williams, and Michael Hannigan, as well as a network of researchers at Colorado State University, Colorado School of Mines, and other institutions.

Funding Agency: National Science Foundation

Total Award: \$11,999,328

Award Period: 10/01/2012 – 9/30/2017

Kasprzyk Support: Summer Salary and support for Matthew Alongi. Total expenditures **\$192,076**.

Description: The project created the AirWaterGas Sustainability Research Network that advanced scientific understanding of unconventional oil and gas development in the Rocky Mountain region. In April 2015, I was added to the project to aid in decision support for the project. Via this support, **Matthew Alongi** was supported for the entirety of his MS degree. He performed air quality simulations that demonstrated how air pollution outcomes change due to different possible setback distances between residences and oil and gas activity. In summer 2019, I leveraged university funding for undergraduate student Max Nyfenegger to help finalize the study, help with a future journal article, and disseminate source code.

5. Collaborative Research: Multi-Model Bayesian Data-Worth Analysis for Groundwater Remediation Design

Investigators: Roseanna Neupauer, Joseph Kasprzyk (CU Boulder); Ming Ye (Florida State)

Funding Agency: National Science Foundation

Amount: \$183,760

Period: 8/2016 – 7/2020

Support: Summer Salary. Expenditures to date: **\$23,998**

Description: The project addresses the challenge that groundwater remediation strategies often fail because they ignore model uncertainty. The proposed research uses a multi-model data-worth analysis to

improve groundwater remediation design. The project also involves creating model surrogates to improve computational efficiency. The project is a collaboration with Roseanna Neupauer's graduate students including MS student Jack Greene.

6. Design Optimization of Sustainable and Resilient Concrete Mixtures

Investigators: Wil Srubar, Joseph Kasprzyk, Leah Sprain

Funding Agency: National Science Foundation

Amount: \$500,000

Period: 7/2016 – 6/2020

Support: Summer Salary and support for Mikaela Derousseau. Expenditures to date: **\$149,470.**

Description: The project addresses the challenge that conventional design of concrete mixtures employs time-intensive, trial-and-error approaches that do not offer optimal performing designs. The project seeks to define, formulate, and link mathematical models that relate concrete mixture proportions to concrete performance, linking the models with multi-objective optimization. The workflow includes industry professionals in the development and testing of the methodology through interactive workshops, taking advantage of a collaboration with a communication sciences professor. **Mikaela DeRousseau** is supported on this project.

7. Colorado River Basin Decision Making Under Deep Uncertainty

Investigators: Joseph Kasprzyk, Edie Zagona

Funding Agency: Bureau of Reclamation

Amount: \$57,557

Period: 9/2017 – 9/2018

Kasprzyk Support: Summer Salary. Total expenditures: **\$57,557.**

Description: The project provided a proof of concept for how decision making under deep uncertainty (DMDU) could guide long-term planning decisions in the Colorado River Basin, in order to expand the Bureau of Reclamation's capabilities with respect to DMDU frameworks. The work had four phases: literature review of DMDU frameworks, synthesis and testing of a new DMDU framework to be used for Colorado River Basin planning, design of the final framework, and demonstration of its capabilities to support decision making in the basin. The funding supported summer salary, for Kasprzyk to advise **Elliot Alexander** whose stipend funding came directly from the Bureau of Reclamation.

8. Water Treatment Plant (WTP) Model Software Development

Investigators: Joseph Kasprzyk, R Scott Summers

Funding Agency: Subcontract to Cadmus, Inc.

Amount: \$88,000

Period: 1/2018 to 4/2018 with extensions to present

Kasprzyk Support: Summer Salary, and support for several months of time for Billy Raseman. Total expenditures **\$88,000**

Description: The project supports modernization of the WTP model to support modern operating systems, including the addition and testing of new prediction algorithms and functionality. It provides partial support for Kasprzyk's salary and **Dr. William Raseman's** degree.

9. Establishing a Framework for Robust Planning in the Colorado River Basin

Investigators: Joseph Kasprzyk, Edith Zagona

Funding Agency: Bureau of Reclamation

Amount: \$230,463

Period: 7/2019 to 9/2021

Kasprzyk Support: Summer Salary, two years of support for Nathan Bonham.

Description: The project seeks to contribute a technical framework to help identify robust interim guidelines for drought planning that include multiple performance objectives and deep uncertainty. The project supported **Nathan Bonham**.

10. Drought-Contingent Regional Coordination of Thermoelectric Power Plants

Investigators: Joseph Kasprzyk, Kyri Baker, Ben Livneh, Ashlynn Stillwell (University of Illinois at Urbana-Champaign)

Funding Agency: University of Colorado Boulder

Amount: \$45,682

Period: 6/2019 to 5/2020

Kasprzyk Support: Summer Salary, one year of support for Jacob Kravits.

Description: This seed grant hypothesizes that electric power generation and water resources sustainability can be improved via coordinated operation of power plants that share water sources, especially during drought conditions. The project will create a modeling and optimization framework that combines drought scenarios with spatially resolved water resources and electricity network data. The project supports **Jacob Kravits** in the first year of his degree.

11. Identifying alternatives to snow-based streamflow predictions to advance future drought predictability

Investigators: Ben Livneh, Joseph Kasprzyk, Benet Duncan

Funding Agency: NOAA

Amount: \$495,000

Period: 9/2020 to 5/2023

Kasprzyk Support: Summer Salary, two years of student support.

Description: For large populations across the western U.S., water supply prediction relies centrally on knowledge of spring snow conditions, where snowpack can provide critical early warning of drought. As future temperatures rise and snowpack dwindles, the relationship between snow and streamflow is expected to shift. Recent research found that in the future, snowpack will be less predictive of drought in snowmelt-dominated systems in the western U.S. In this three-year project, we will develop and evaluate new techniques for drought prediction in the Intermountain West and Pacific Northwest that go beyond exclusively snow-based prediction methods, harnessing alternative datasets to identify better ways to predict and respond to drought. A key innovation will be the use of Machine Learning tools to explore different models to improve current and future drought prediction. This research seeks to incorporate the needs of western U.S. water management entities, considering regional characteristics and shifts to a warmer, less snow-dominated future climate. The team will collect direct input from regional water managers to help shape the modeling and Machine Learning work and assess the feasibility of alternative strategies.

12. Advancing a Robust Planning Framework for the Colorado River Basin

Investigators: Joseph Kasprzyk, Edith Zagona

Funding Agency: Bureau of Reclamation

Amount: \$99,998

Period: 8/2021 to 8/2022

Kasprzyk Support: Summer Salary, support for Elle Stark

Description: In this project, methods for adaptive planning are developed in the Colorado River Basin, including time-varying performance evaluation and sensitivity analysis.

13. Exploring Adaptive Planning in the Colorado River Basin

Investigators: Joseph Kasprzyk, Edith Zagona

Funding Agency: Bureau of Reclamation

Amount: \$120,000

Period: 8/2022 to 8/2024

Kasprzyk Support: Summer Salary, student support

Description: To support the negotiation of Post-2026 reservoir operating policies for the Colorado River Basin (CRB), Reclamation has adopted Decision Making Under Deep Uncertainty (DMDU) analysis techniques, specifically based on the Many Objective Robust Decision Making (MORDM) framework. These methods test policies in large ensembles of States of the World (SOW) that represent broad collections of assumptions about future conditions. MORDM provides tools for generating potential policies, exposing them to a wide range of potential SOW, and analyzing their performance. They have facilitated a platform for stakeholders to engage with this analysis technique by hosting the publicly available Post-2026 webtool to explore, compare, and evaluate possible policies using the MORDM approach. The webtool arose due to a series of grants advancing the use of MORDM in the CRB, and the current research project is part of this effort.

The aim of our “Exploring Adaptive Planning in the Colorado Basin” project is to extend the MORDM framework by developing adaptive policymaking methods, providing Reclamation with the tools to identify when adaptation would be useful and how those measures can be identified. Phase 1 of the project laid the groundwork by reviewing recent literature on a new type of optimization that could add value to MORDM called robust optimization (RO); the report also covered advances in and timeseries analysis. Phase 2 implemented an initial robust optimization experiment for the CRB. Phase 3 created new robust optimization runs that benefited from updated modeling and an expanded set of input hydrology that helped improve the relevance of the research to the ongoing Post-2026 process. Phase 4 presented an integrated framework for policy generation and evaluation. In addition to advancements in RO, Phases 3 and 4 also contribute new methodology using the Self Organizing Map (SOM). The project supported **Maddy Pernat**.

14. Exploring the Use of Vulnerability-Based Analyses in Mid-Term Operational Projections

Investigators: Joseph Kasprzyk, Edith Zagona

Funding Agency: Bureau of Reclamation

Amount: \$267,059

Period: 9/2024 to 12/2026

Kasprzyk Support: Summer Salary, student support

Description: Reclamation provides ensemble-based midterm (2- to 5-year) operational projections for internal and stakeholder use multiple times per year. These projections are based on using a range of hydrologic inputs with our Colorado River Midterm Modeling System, or CRMMS, model to provide important insights into what the potential impacts of different hydrologic futures on system operations. Historically, Reclamation has analyzed these projections using a probabilistic approach that can result in a skewed view of system risks. In this research project, we will be exploring how we may incorporate a different analytical approach based on concepts from Many Objective Robust Decision Making (MORDM), which we have researched and applied in our long-term planning studies. MORDM relies on analyzing the system over a wide range of potential hydrologic futures and uses advanced analytical concepts on the modeling outputs to learn information about the robustness of a policy and the hydrologic conditions under which the system could be vulnerable. This approach has been an important component of the ongoing Post-2026 Process to negotiate successor operations to the 2007 Interim Guidelines, and it could

be beneficial to bring a similar type of information into midterm system projections. Enabling Reclamation and stakeholders to connect specific hydrologic conditions to specific operational outcomes, rather than relying solely on risk-based views, could improve system understanding and preparation. It could also provide a better pathway to incorporating experimental hydrologic forecasts into operations discussions. This project will support **Zach Carpenter**.

V.B Other Support

- Department of Education Graduate Assistantships in Areas of National Need (GAANN) fellowship programs
 - o Led by Ross Corotis, 2016-2019: supported **Melissa Estep**.
 - o Originally led by Abbie Liel, 2019-2024: I took over as project director in 2020. This grant supported **Jacob Kravits, Sung Min Kim, and Nathan Bonham**.
 - o Led by Amy Javernick-Will, 2022-present: partial support for **Maddy Pernet**
- Water-Energy Nexus Interdisciplinary Research Theme Seed Grant, 2018, \$11,177. Partial funding for **Brendan Purcell** to explore how alternative water sources can be used for power plant cooling. See also the funding extension for 2019.

V.C Pending and Declined Proposals

Year	Title	PIs, Co-PIs, and Collaborators	Funding Agency	Funding Level	Status
2025	Collaborative Research: SRS RN: ZECURE: Scaling up Zero-Carbon Transitions in Urban-Rural Regions with Climate-Resilience, Resource-Sustainability and Equity Co-Benefits	PI: Rajagopalan Balaji. Co-PI: Joseph Kasprzyk	NSF	\$6,010,173	Pending
2021	HDR Institute: Data-driven Construction Institute (DCI) Construction Materials and Methods Innovation	PI: Mija Hubler. Senior Personnel Joseph Kasprzyk	NSF	\$10,312,414	Declined
2020	Collaborative Research: Using Reservoir Operations to photolytically degrade wildfire-derived contaminants in drinking water	PI: Diane McKnight. Co-PI: Joseph Kasprzyk	NSF/NIST	\$319,942	Declined
2019	Experimental and Modeling Investigation of Near-Source Bioreactors	PI: Cresten Mansfeldt. Co-PI: Joseph Kasprzyk	EPA	\$999,999	Declined
2016	INFEWS/T1: Water and Energy Resilient Protein (WERP): Developing a Global Framework for Understanding Food System Resilience	PI: Sherri Cook. Co-PIs: Peter Newton, Ben Livneh, Joseph Kasprzyk , Kristen Averyt	NSF EAR	\$1,999,998	Declined
2016	Collaborative Research: Resilient Potable Water Systems: The Role of Public and Decision-maker Core Beliefs, Risk	PI: Katie Dickinson Co-PIs: Joseph Kasprzyk , Deserai Crow	NSF SES	\$497,742	Declined

	Perceptions, and Policy Preferences	Collaborative with Duke University			
2015	CNH-L: Coupling among climate change, water quality, and decision-making to enhance resilience of potable water systems	PI: Joseph Kasprzyk Co-PIs: Fernando Rosario-Ortiz, Katie Dickinson With subawards to Duke University, Columbia University, Water Research Foundation	NSF DEB	\$1,799,931	Declined
2015	Collaborative Research: Resilient Potable Water Systems: The Role of Public and Decision-Maker Risk Perceptions, Beliefs, and Values	PI: Katie Dickinson Co-PIs: Joseph Kasprzyk , Deserai Crow Collaborative with Duke University	NSF SES	\$459,429	Declined
2014	CNH-L: Coupling among climate change, water quality, and decision-making to enhance resilience of potable water systems	PI: Joseph Kasprzyk Co-PIs: Fernando Rosario-Ortiz, Katie Dickinson With subawards to Duke University, Columbia University, Water Research Foundation	NSF AGS	\$1,799,481	Declined
2014	Quantifying the Multiscale Environmental Benefits of Geopolymer-based Pervious Pavement Materials	PI: Wil Srubar, co-PI Joseph Kasprzyk	NSF CBET	\$299,505	Declined
2014	Collaborative Research: Toward Optimal Water Allocation in Drought-prone Regions Through Hydroclimatic Prediction and Many-objective Risk Management	Lead institution University of Wisconsin, PI: Paul Block CU-Boulder collaborative: PI Joseph Kasprzyk	NSF CBET	\$149,996	Declined
2014	RSB: Toward More Sustainable Residential Building Systems: A Multi-Objective Decision-Making Framework for Homeowners and Communities	PI Abbie Liel; Co-PI Joseph Kasprzyk	NSF CMMI	\$1,199,980	Declined
2013	Collaborative Research: WSC-Category 3 Collaborative: Designing Robust Institutions and Adaptation Strategies for Competing Water Uses Given Climate Change Uncertainty	Lead institution University of Colorado Denver, PI: Tanya Heikkela CU-Boulder collaborative: PI Rajagopalan Balaji; Co-PIs Ben Livneh, Joseph Kasprzyk , Roseanna Neupauer	NSF EAR	\$1,124,767	Declined
2013	Quantifying the Environmental Benefits of Resilient Pervious Cement-based Infrastructure Materials	PI Wil Srubar, Co-PI Joseph Kasprzyk	NSF CBET	\$299,976	Declined
2013	Collaborative Research: Quantifying the Depths of Uncertainty in Extreme	CU-Boulder is lead institution. PI Ben Livneh; Co-PIs Joseph Kasprzyk , Rajagopalan Balaji	NSF EAR	\$490,979	Declined

	Atmospheric-Hydrologic Events for Improved Understanding of Flooding Processes	With collaborative institution University of Colorado Denver			
2013	Multi-scale water supply and demand outlooks: Development and application for optimal water allocation in drought-prone regions	Lead institution University of Wisconsin, PI: Paul Block CU-Boulder subaward, lead PI: Joseph Kasprzyk	NASA	\$235,882 (sub award)	Declined

Note: For NSF proposals above, division acronyms are: AGS: Atmospheric and Geospace Sciences, CBET: Chemical, Bioengineering, Environmental, and Transport Systems, CMMI: Civil, Mechanical, and Manufacturing Innovation, DEB: Environmental Biology, EAR: Earth Sciences, SES: Social and Economic Sciences

VI. Distinctions

- Best Policy-Oriented Paper Award from ASCE EWRI for Purcell et al., awarded 2022
- Most Cited Paper for 2021 Review Papers from Environmental Modelling and Software for Maier et al., awarded 2022
- Kasprzyk Research Group students awarded NSF Graduate Research Fellowships: Sung Min Kim, Nathan Bonham, Maddy Pernat
- Goh Faculty Fellow, 2019-2023
- Outstanding Scholar Alumni Award, Penn State Schreyer Honors College, 2019. Press release: <https://www.psu.edu/news/campus-life/story/scholar-alumnus-spurring-conversation-about-sustainability-among-students>
- Young Researcher Award, CEAE Department, 2017
- Early Career Research Excellence Award of the International Environmental Modelling and Software Society (iEMSs). Awarded at iEMSs meeting in Toulouse, France, July 2016.
- University Council on Water Resources (UCOWR) Ph.D. Dissertation Award in Natural Science and Engineering, Awarded at UCOWR Conference, June 2014.
- Quentin Martin Best Practice-Oriented Paper, ASCE Journal of Water Resources Planning and Management, for Fu et al. (2013) "Optimal Design of Water Distribution Systems Using Many-Objective Visual Analytics" Awarded at EWRI 2014 in Portland, OR.
- Reviewing awards: Environmental Modelling and Software (2014); Journal of Water Resources Planning and Management (Best Reviewer, 2014; Outstanding Reviewer; 2011); Water Resources Research (2014, 2019)
- Student Presentation Award, International Environmental Modelling and Software Society Meeting, July 2012
- US Environmental Protection Agency Science to Achieve Results (STAR) Graduate Fellowship, 2010-2013
- NSF Graduate Research Fellowship Program Honorable Mention, 2009

- First Place Technical Paper/Presentation Competition, ASCE Mid-Atlantic regional student competition, 2007
- Member, Chi Epsilon Civil Engineering Honor Society

VII. National and International Service, Professional Affiliations

VIIa. Moderated Sessions at Professional Conferences

- Convener of a sessions at AGU 2018-2020; co-convener of a session at AGU 2017; session organizer and co-convener for 3 sessions at AGU 2016. Moderated sessions as a volunteer for conveners 2013-2015.
- Co-convener of session at iEMSs 2016, Toulouse, France and iEMSs 2014, San Diego, CA.
- Moderator of session at AEESP 2015, New Haven, CT
- Moderated water management sessions for EWRI conferences since 2014
- Served on Planning Committee and moderated “Professional Development” panel discussion at EPA STAR Graduate Fellowship Conference, September 2011

VIIb. External Service

- Associate Editor, Environmental Modelling and Software, 2024-Present
Membership and extensive service with the American Society of Civil Engineers (ASCE) and American Geophysical Union (AGU), as detailed below.

Service to ASCE EWRI:

- Chair of the Planning and Management Council starting in 2023. In the organizational structure of EWRI, the EWRS and other committees are overseen by the Planning and Management council.
- Associate Editor of Journal of Water Resources Planning and Management, 2016 – 2023.
- Member of control group of Environmental Water Resource Systems (EWRS) committee, 2016-2020 (a four year term that includes serving as Secretary, Vice Chair, Chair, and Past Chair). The EWRS committee includes over 100 researchers and practitioners in the field of water resources systems.
- Vice Chair of task committee ECSTATIC: Excellence in Systems Analysis Teaching and Innovative Communication, headed by Prof. David Rosenberg, Utah State. The committee created an interactive website with course materials (<https://digitalcommons.usu.edu/ecstatic/>), prepared a manuscript that reviews the state of systems analysis education which included data from interviews with practitioners (Rosenberg et al. 2017, see Publications above).

Service to AGU:

- Chair, Water and Society technical committee within AGU Hydrology section (2020-2022). In this role I have coordinated sessions across the Fall Meeting and interfaced with the Hydrology section president. I have also worked with other control group members to disseminate information about the committee to other AGU members and the broader public.
- Former member of Hydrologic Uncertainty technical committee within AGU Hydrology section

Other External Service:

- Guest Editor for Thematic Issue “Evolutionary Algorithms and Other Metaheuristics in Water Resources: Research Challenges and Future Directions”, *Environmental Modelling and Software* with Holger R Maier (University of Adelaide), Zoran Kapelan (University of Exeter) and L Shawn Matott (University at Buffalo)
- Journal Reviewer (listed in order of frequency): Journal of Water Resources Planning and Management, Water Resources Research, Environmental Modelling and Software, Advances in Water Resources, Journal of Hydroinformatics, Journal of the American Water Resources Association, Geoscientific Model Development, Water Management, Journal of Environmental Management, IEEE Transactions on Evolutionary Computation.
- Proposal Review Panels: NSF, Bureau of Reclamation, Pakistan-US Science and Technology Cooperation Program
- Student Competition Judging: Pennsylvania Junior Academy of Science (PJAS) competition (science fair for middle school and high school students), summer 2009; Penn State Undergraduate Exhibition, spring 2013; ASCE Regional Conference at CU Boulder, spring 2019
- Performed review of the Bureau of Reclamation’s Upper Red River Basin Study, Oklahoma, 2021

VIIc. Outreach

- From 2014-2021, gave presentations at several sessions within CU’s International English Center (IEC), that seeks to provide English language and college preparation skills to incoming international students. Topics include Introduction to Water Management and Study Skills to Succeed in College. Seeking to build further collaboration on course material and mentorship with IEC faculty.
- Held workshop in 2015 that brought together a set of Front Range water management agencies to discuss multi-objective water resources planning under climate change. As part of our NOAA-funded project, we seek to help improve managers’ ability to cope with supply-demand imbalances as well as improve the sustainability of public water supply.
- Participated in workshops at University of California, Davis that interfaced academics with water utilities to discuss new methods for improving water management
- Disseminating research insights through web publishing. Water Programming, a collaborative blog with researchers at Cornell University and elsewhere, provides tips on simulation, optimization, Linux programming and high performance computing, at <http://waterprogramming.wordpress.com>.
- Presented water management research to state high school science fair competition students, spring 2011

VIII. University Service

VIIIa. Department Service

- Associate Chair for Graduate Education, 7/1/2022-Present
 - o Lead graduate education in CEAE, responsible for overseeing graduate policies, admissions, appointments, examinations, and recruitment
 - o Leads Graduate Recruiting and Admissions Committee
 - o Until 2024, member of the Graduate Programs and Students Committee
 - o Represent CEAE to the College of Engineering and Applied Science Graduate Education Council, as well as the university Division of Graduate Studies

- Organize department visit day, and help supervise the graduate program advisors
- Graduate committee, 2013-2015, 2016-2021. Responsible for coordinating graduate applications for the Hydrology, Water Resources, and Fluid Mechanics group within CEAE, communicating with students, and acting as the de facto advisor for incoming students. As part of my committee work, I was also responsible for updating the CEAE department website with information about groups' research. I have also coordinated group admissions for Civil Systems in several academic years.
- Executive committee, Fall 2022
- Personnel committee, Fall 2020-Present
- Justice, Equity, Diversity, and Inclusion (JEDI) committee, Spring 2021
- Governance and climate committee, 2018-2019, 2019-2020
- Search committee for financial professional, 2019-2020
- Curriculum committee, 2015-2016. Participated in reviewing new course proposals as well as coordinating the undergraduate course offerings for civil and architectural engineering majors in the department.
- Reviewer for technical paper competition, ASCE regional conference at CU Boulder, April 2019
- Reviewer for RIO Innovative Seed Grant competition, 2019

VIIIb. University Service

- Participated in the Faculty Leadership Institute, 2021-2022

VIIIc. Graduate Student Committees

Advisor/Co-Advisor for M.S. and Ph.D. Theses, Completed (total: 13 MS, 6 PhD)

MS: Rebecca Smith (Spring 2014), Liz Houle (MS, Spring 2015), Abigail Watson (MS, Summer 2015), Timothy Clarkin (MS, Spring 2016), Matthew Alongi (MS, Spring 2017), Nathan Stambaugh (MS, Spring 2017), Elliot Alexander (MS, Summer 2018), Leah Bensching (MS, Spring 2019), Melissa Estep (MS, Spring 2019), Brendan Purcell (MS, Spring 2019), Courtlyn Carpenter (MS, Spring 2020), Sung Min Kim (MS, Spring 2021), Sydney Walker (MS, 2022)

PhD: Rebecca Smith (2017), Amy Piscopo (2015), William Raseman (2019), Mikaela DeRousseau (2020), Jacob Kravits (2023), Nathan Bonham (2023)

Advisor/Co-Advisor for M.S. and Ph.D. Theses, In Progress (total: 2 MS, 1 PhD)

MS: Zach Carpenter (expected 2026), Myles Turner (expected 2026)

PhD: Maddy Pernat (expected 2027)

M.S. Report:

Amber Schrum (2018)

Committee Member:

Neil Stewart (*MS, passed oral exam*), Pablo Mendoza (PhD, Spring 2015), Farrokh Shoaie (PhD, Spring 2015), Jeff Walters (PhD, Spring 2015), Todd Bergman (MS, Spring 2015), Antoine Tixier (PhD, Spring 2015), Emily Gill (PhD, Summer 2015), Solomon Erkyihun (PhD, Summer 2015), Mary Jean O'Hair (MS, Summer 2015), Xavier

Alegre (PhD, Fall 2015), Andrew Verdin (PhD, Summer 2016), Cameron Bracken (PhD, Summer 2016), Yanto (PhD, Summer 2017), Sarah Welsh-Huggins (PhD, Spring 2017), Bihu Suchetana (PhD, Summer 2017), Jenna Stewart (MS, Spring 2017), Jack Greene (MS, Fall 2017), Sarah Goldstein (MS, Spring 2018), Eric Roth (PhD, Fall 2018), Peter Van Dusen (MS, Spring 2019), Topher Jones (PhD, Spring 2019), Ronnie Abolafia-Rosenzweig (PhD, Fall 2020), Julia Matton (MS, Spring 2020), Melanie Holland (MS, Spring 2020), Mitchell Frischmeyer (MS, Fall 2020), Ashley Filion (MS, Fall 2020), Britta Bergstrom (MS), Kaylene Kuykendall (MS), Sarah Miller (MS), Eric Waag (MS), Ankita Soni (MS), Kelsey Reeves (PhD), Elsa Culler (PhD), Aaron Heldmyer (PhD), Parth Modi (PhD)

International External Committee Member:

Cameron McPhail (PhD, University of Adelaide, Spring 2020)

IX. Students Mentored

IXa. Current Graduate Student Advising

- **Maddy Pernat.** Doctoral student, started Fall 2022. Ms. Pernat developed machine learning techniques for streamflow prediction, and will also work on Colorado River Basin planning later in her doctoral studies.
- **Fall 2013 – Spring 2015, Fall 2016 – Spring 2021:** As the graduate committee representative for the Hydrology, Water Resources and Environmental Fluid Mechanics and Civil Systems groups, I have served as the initial advisor for all new water students and many civil systems students.

IXb. Former Graduate Student Advising

PhD:

- **Dr. Amy Piscopo (PhD, Fall 2015).** Currently at EPA Research and Development, Rhode Island. Co-advised, with main advisor Prof. Roseanna Neupauer. Dr. Piscopo developed an iterative multi-objective design approach for engineered injection and extraction of contaminated groundwater, advancing techniques for active spreading of groundwater contamination for multiple contamination scenarios.
- **Dr. Rebecca Smith (MS, Spring 2014; PhD, Fall 2017).** Currently at US Bureau of Reclamation. Dr. Smith's masters research advanced large scale water resources infrastructure planning using multiobjective evolutionary algorithms and RiverWare simulations, exploring new management strategies for the Tarrant Regional Water District in Texas. Her doctoral research provided best practices for incorporating MOEA decision support into water management, using a combination of engineering and social science approaches. This was done through co-producing a decision support testbed through a series of workshops with 6 water utilities in the Front Range of Colorado, in collaboration with Western Water Assessment at CU.
- **Dr. William Raseman (PhD, Summer 2019).** Currently at Hazen and Sawyer. Dr. Raseman's dissertation contributed a framework for multi-objective planning and management of water treatment systems, given water quality uncertainty. The dissertation included a published literature review of the state-of-the art of optimization within water treatment systems, new methods for generating plausible timeseries of water quality data, multi-objective optimization of water treatment plant operations, and development of open source interactive tools for visualizing tradeoff sets.
- **Dr. Mikaela DeRousseau (PhD, Summer 2020).** Currently at Building Transparency. Main advisor, co-advised by Prof. Wil Srubar III. Ms. DeRousseau's dissertation is creating a multi-objective optimization framework for sustainable materials design, including improved life cycle assessment and machine learning for predicting concrete compressive strength.

- **Dr. Jacob Kravits (PhD, 2023).** Currently at encooord. Main advisor, co-advised by Prof. Kyri Baker. Started Fall 2019. Mr. Kravits' dissertation developed methods for integrating water resources planning with water withdrawals for thermoelectric power generation.
- **Dr. Nathan Bonham (PhD, 2023).** Currently at US Bureau of Reclamation. Main advisor, co-advised by Prof. Edith Zagona. Started Fall 2019. Awarded NSF GRFP 2021. Mr. Bonham's dissertation advanced approaches for bottom-up decision making for the Colorado River Basin.

MS:

- **Liz Houle (MS, Spring 2015).** Currently at Google. Ms. Houle performed a project investigating model parameter uncertainty for snow and hydrological models, with the ultimate goal of improving water supply planning especially under conditions of environmental change.
- **Abigail Watson (MS, Summer 2015).** Currently at Denver Water. Ms. Watson performed a study that investigated incorporating deeply uncertain factors (e.g., population growth and changes to hydrology) into the many objective search process, to aid water supply portfolio management.
- **Timothy Clarkin (MS, Spring 2016).** Currently with US Bureau of Reclamation. Mr. Clarkin's project explored the effect of constraints on MOEA problem formulations, in order to determine how an analyst's assumptions affect the optimization and decision support process. The project was in collaboration with William Raseman and Prof. Jon Herman (UC Davis).
- **Matthew Alongi (MS, Spring 2017).** Currently at ICEM (International Centre for Environmental Management) in Hanoi, Vietnam. Mr. Alongi worked on the NSF-funded sustainability research network on unconventional oil and gas development, creating a simulation-model based framework to calculate potential air quality outcomes of different setback regulations.
- **Nathan Stambaugh (MS, Spring 2017).** Currently with the US Navy. Co-advised by Prof. Wil Srubar. Mr. Stambaugh improved models of service life for concrete, and using MOEAs to optimize concrete mix design properties.
- **Elliot Alexander (MS, Summer 2018).** Currently at the US Bureau of Reclamation. Co-advised by Prof. Edith Zagona in collaboration with CU's Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) and the Bureau of Reclamation. Mr. Alexander investigated the use of robust decision making techniques for water resources in the context of Colorado River Basin planning.
- **Leah Benschung (MS, Spring 2019).** Currently at Otak. Master's student, advised by Ben Livneh and co-advised by Kasprzyk. Ms. Benschung performed a sensitivity analysis of sediment prediction, to support better methods of predicting reservoir sedimentation.
- **Melissa Estep (MS, Spring 2019).** Currently at the US Bureau of Reclamation. Ms. Estep was funded by a GAANN fellowship and performed research on water marketing and hydrologic forecasting in the Elqui Basin in Chile.
- **Brendan Purcell (MS, Spring 2019).** Currently at Golder Engineering. Master's student, expected graduation Spring 2019. Mr. Purcell is creating a framework for analyzing downstream impacts of reclaimed water consumption. The project was funded by a College of Engineering and Applied Science seed grant from the Water Energy Interdisciplinary Research Theme, and is done in collaboration with Prof. Ashlynn Stillwell from the University of Illinois at Urbana-Champaign.
- **Courtlyn Carpenter (MS, Spring 2020).** Currently at USGS. I served as her Environmental Engineering advisor and research collaborator, and her research was advised at the USGS by Dr. Kimberly Wickland. Ms. Carpenter's thesis explored carbon exports from wetlands.

- **Sung Min Kim (MS, Spring 2021).** Co-advising, with main advisor Prof. Kyri Baker. Awarded NSF GRFP 2021. Ms. Kim's research explored financial and economic implications of power generation under hydrologic constraints, and how to integrate operational optimization with long-term planning optimization for power systems.
- **Sydney Walker.** Master's student, graduated Spring 2022. Ms. Walker developed machine learning models for water supply forecasting under climate change.

X. Educational Activities

Xa. Courses Taught

Colorado

- CVEN 4323/5423: Water Resources Engineering (Fall term: 2013-2019, 2022)
Description: Studies principles and techniques of water resources engineering design. Introduces environmental modeling under uncertainty, stormwater design, precipitation estimation and flow routing. Surveys hydropower, reservoir management and water resources economics.
Average enrollment: 20 (10 undergraduate, 10 graduate students)
 Note: Since Fall 2016, the course was slightly modified to be solely a graduate offering (5423); many advanced undergrads are still enrolled.
- CVEN 4333: Engineering Hydrology (Spring term: 2014-2021; Fall term: 2023, 2024).
Description: Studies engineering applications of principles of hydrology, including hydrologic cycle, rainfall and runoff, groundwater, storm frequency and duration studies, stream hydrography, flood frequency, and flood routing.
Average enrollment: Up to and including Spring 2016: 90-110 students. Prof. Ben Livneh started offering 4333 in the fall term and enrollment fell to ~60 students since Spring 2017. In the Fall term, enrollment is ~20 students.
- CVEN 5393: Water Resource Systems and Management (Spring term: 2015-2017, 2019-2021, 2023-2024).
Description: Introduces water resources planning and management as an integrated systems problem that satisfies multiple competing objectives under constraints and uncertainty. Includes problem formulation and solution using decision support systems, optimization with and without uncertainty, stochastic simulation, and multiobjective optimization. Introduces water resources economics and planning under uncertainties such as climate change and increasing urbanization.
Average enrollment: 15-20 students.

Penn State

- CE 461: Water Resources Engineering, Instructor (Spring 2011), Teaching Assistant (Fall 2008 – Spring 2009)

Xb. Journal Articles and Presentations Relevant to Education

These entries were listed elsewhere but are copied here due to their relevance to education.

1. *Poster/E-Lightning Presentation:* **Kasprzyk, JR** "Using inductive reasoning to demonstrate principles in water resources engineering classes" Fall Meeting of AGU 2019.
2. *Journal Article:* Maier, HR, S Razavi, Z Kapelan, LS Mattot, **JR Kasprzyk**, BA Tolson. 2019. "Introductory Overview: Optimization using Evolutionary Algorithms and other Metaheuristics" *Environmental Modelling and Software*. vol 114: 195-213. <https://doi.org/10.1016/j.envsoft.2018.11.018>

3. *Journal Article*: Rosenberg, DE, M Babbar-Sebens, E Root, JD Herman, A Mirchi, M Giacomoni, **JR Kasprzyk**, K Madani, D Ford, L Basdekas. 2017. "Towards More Integrated Formal Education and Practice in Water Resources Systems Analysis" *Journal of Water Resources Planning and Management*. vol 143(12): 02517001. [http://dx.doi.org/10.1061/\(ASCE\)WR.1943-5452.0000847](http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000847)
4. *Poster Presentation*: Baker, KA, JR Kasprzyk "A guide to the use of internet memes in engineering education" American Society for Engineering Education Zone IV Conference, Boulder, CO, 2017

Xc. Educational Development Activities

- Contributed to "Excellence in Systems Analysis Teaching and Innovative Communication" repository of teaching materials for water resources systems education, <https://digitalcommons.usu.edu/ecstatic/>
- Participated in CU Boulder Faculty Teaching Excellence Program workshops and Classroom Learning Interview Program
- Solicited course visits from CEAE colleagues and met to discuss teaching styles
- Mentored several undergraduate students in research through the Discovery Learning Apprenticeship and Summer Program for Undergraduate Research
- Attended American Society for Engineering Education regional conference, 2017