

# David Hanigan, PhD, PE

Associate Professor  
Program Director, Environmental Engineering  
Department of Civil and Environmental Engineering  
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University of Nevada, Reno

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## EDUCATION

### Arizona State University

Ph.D. Environmental Engineering August 2015  
Dissertation Title: Identification of *N*-nitrosodimethylamine Precursors to Improve Their Control  
Committee Members: Paul Westerhoff, Pierre Herckes, Bruce Rittmann

### University of Missouri – Columbia

M.S. Civil Engineering July 2011  
Thesis Title: Removal of Disinfection By-product Precursors by Activated Carbon and MIEX®  
Committee Members: Thomas Clevenger, Enos Inniss, Allen Thompson

B.S. Civil Engineering with Honors December 2009

## PRINCIPAL AREAS OF TEACHING AND RESEARCH EXPERTISE

Environmental chemistry, drinking water treatment, wastewater treatment, water quality, water reuse, analytical chemistry, emerging contaminants, per- and polyfluoroalkyl substances (PFAS), disinfection byproducts (DBPs), oxidation, natural organic matter, pollutant remediation, groundwater, agricultural reuse of wastewater, thermal treatment, thermal decomposition chemistry, combustion, pyrolysis, incineration, stack emissions.

## EXPERIENCE

### University of Nevada, Reno, NV

Associate Professor July 2022-present  
Program Director, Environmental Engineering January 2023-present  
Assistant Professor July 2016-June 2022

### Arizona State University, Tempe, AZ

Postdoctoral Research Associate August 2015-July 2016  
Assessing the lifecycle impacts of engineered nanomaterials (EPA - LCNano). Development of a method to assess reactive oxygen species production of nanomaterials in environmental matrices and correlation with zebrafish embryo morphology and mortality.

Graduate Research Assistant August 2011-August 2015  
Removal and characterization of NDMA precursors at bench- (RSSCTs, bottle point) and full-scale using novel sorbents. Development of an isolation/TOF/MS method for NDMA precursor identification.

Teaching Assistant January 2013-May 2013  
Teaching assistant (full semester) and lecturer of record (4 lectures) for graduate level *Physical and Chemical Treatment of Water and Wastewater*. Greater than 10 other guest lecturers in other environmental engineering graduate level courses during PhD and post-doc.

### University of Missouri, Columbia, MO

Graduate Research Assistant January 2010-July 2011  
Mitigation of disinfection by-product (trihalomethanes, haloacetic acids) formation in source waters containing elevated hydrophilic organic matter fractions.

Undergraduate Research Assistant August 2009-December 2009  
 Investigated the effect of UV fluence on photoreactivation/photo repair of wastewater microorganisms.

**Osage Constructors Inc. Fulton, MO**

On-Site Engineer in Training (Matagorda, TX) May 2009-August 2009  
 Site surveying, preliminary design/bid, safety officer.

On-Site Engineer in Training (Rosenberg, TX) May 2008-August 2008  
 Site surveying, heavy construction.

**HONORS AND AWARDS**

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Environmental Science & Technology Best Papers 2022 Award for “Critical Review of Thermal Decomposition of Per- and Polyfluoroalkyl Substances: Mechanisms and Implications for Thermal Treatment Processes”.	2024
American Academy of Environmental Engineers and Scientists, 40 under 40	2023
Featured in Environmental Science: Water Research & Technology Emerging Investigator Series	2021
Environmental Science: Water Research & Technology Best Paper Award for “Degradation and removal of poly- and per-fluoroalkyl substances from aqueous Systems by nano-enabled water treatment strategies”.	2020
Nevada IDEa Network of Biomedical Research Excellence, Scientific Service Award (\$2k)	2019
American Water Works Association, Abel Wolman Fellow (\$30k/yr)	2014-2016
Water Environment Federation, Canham Graduate Studies Scholar (\$25K)	2014
ACS, Graduate Student Award in Environmental Chemistry (\$100)	2014
Arizona State Sustainable Engineering and the Built Environment, Lab Safety Award	2014
Arizona State University Engineering, Dean’s Fellowship (\$30k/yr)	2011-2013
Arizona Water Association, Scholarship (\$1,000)	2012
Arizona State University, Ira A. Fulton Fellowship (\$5k)	2011-2012
University of Missouri, Paul Kufirin Memorial Scholarship (\$5k)	2010

**Awards to Students in Hanigan’s Group**

Lauren Edwards – Nevada Water Reuse Graduate Student Research Grant (\$2k)	2024
Jordyn Dashiell– Nevada Water Reuse Undergraduate Student Research Grant (\$800)	2024
Haley Grable – Best Poster Competition, Third Place, RemTEC Summit	2023
Kenny Hickenbottom – Whittell Forest Graduate Research Fellowship (\$5k)	2023
Kenny Hickenbottom – US Dept. of Ed. GAANN Fellowship (~32k/yr)	2021-2023
Mingrui Song – Nevada Water Resources Association Scholarship (\$500)	2021
Mingrui Song – UNR Graduate Student’s Association Travel Grant (\$500)	2021
Mingrui Song – Nevada Water Reuse Association Scholarship (\$1k)	2021
Junli Wang – Nevada Water Reuse Association Scholarship (\$1k)	2021
Elizabeth McKenna – AEESP Master’s Thesis Award (\$500)	2021
Junli Wang – Nevada Water Resource Association Scholarship (\$400)	2021
Junli Wang – Air & Waste Management Association Scholarship (\$2k)	2021
Kevin Stewart – US Dept. of Ed. GAANN Fellowship (~32k/yr)	2021
Ibrahim Abusallout – NV INBRE Core Services Award (\$2k)	2020
Mingrui Song – Air & Waste Management Association Scholarship (\$2k)	2020
Priyamvada Sharma – UNR Graduate Student’s Association Travel Grant (\$500)	2020
Elizabeth McKenna – Nevada Water Reuse Association Scholarship (\$1k)	2020
Ibrahim Abusallout – UNR Postdoctoral Professional Development Award (\$500)	2019
Elizabeth McKenna – First Place, AWWA WQTC Student Poster Competition	2019
Elizabeth McKenna – UNR Graduate Dean’s Merit Scholarship (\$5k)	2019
Saeed Arabi – UNR College of Engineering Differential Fees Assistantship (\$13k)	2019
Elizabeth McKenna – 3 <sup>rd</sup> Place NWEA Conference Poster Competition	2018
Chelsea Cluff – NSF Graduate Research Fellowship (\$138k)	2017
Chelsea Cluff – AWWA Henry “Bud” Benjes/HDR Scholarship (\$5k)	2017

## SPONSORED RESEARCH

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### As PI

1. Understanding Wildfire Risks to Drinking Water Source Waters: Pyrogenic Changes to Organic Matter and Disinfection By-product Formation  
*National Science Foundation OIA*  
\$248k 2022-2025
2. Gas Phase PFAS and Organofluorine Release from AFFF: Measurement, Identification, and Exposure Mitigation  
*National Science Foundation CBET Environmental Engineering*  
\$330k 2021-2025
3. Rapid Site Profiling of Organofluorine: Quantification of PFASs by Combustion Gas Analysis  
*Strategic Environmental Research and Development Program*  
\$784k 2019-2024
4. Securing the Future of Direct and Indirect Potable Reuse – *N*-nitrosodimethylamine (NDMA) Formation Pathways and Precursors  
*National Science Foundation CBET Environmental Engineering*  
\$330k 2018-2022
5. Co-Funding - Securing the Future of Direct and Indirect Potable Reuse  
*Water Research Foundation*  
\$50k 2018-2021
6. Understanding Formation of a Critical Disinfection Byproduct: NDMA and Previously Unidentified NDMA Precursors in Advanced Potable Reuse Treatment Plants  
*Subcontracted from Orange County Water District, funding from United States Bureau of Reclamation*  
\$25k 2018-2020
7. Atmospheric CO<sub>2</sub> Capture Through Wastewater  
*University of Nevada, Reno New Scholarly Endeavor Grant*  
\$2.5k 2017-2018
8. Mass spectrometry to identify NDMA forming amines isolated from Orange County Advanced Water Purification Facility – Phase 2  
*Orange County Water District*  
\$15k 2017

### As Co-PI

9. Empowering Community Resilience with Sustainable Energy and Water Reuse Systems  
*National Science Foundation OIA*  
\$6m (\$1.2m to Hanigan) 2024-2028
10. Real-time Analysis of Gas-phase Products of Incomplete Destruction During the Thermal Treatment of PFAS  
*Strategic Environmental Research and Development Program*  
\$1.4m (\$347k to Hanigan) 2024-2027
11. Water Reuse Consortium for Water Resiliency and Self Sufficiency: Advanced Technologies and Systems for Water Reuse  
*Federal Appropriation via US Army Engineer Research and Development Center*  
\$7.2m (\$442k to Hanigan) 2023-2027
12. A Complete Strategy for Pavements Impacted with PFAS: Rapid Quantification, Leaching Kinetics, In Situ Stabilization, Thermal Treatment, and Reusability  
*Strategic Environmental Research and Development Program*  
\$1.4m (\$625k to Hanigan) 2023-2026
13. Compost Filter Sock and Straw Wattle Efficacy for Capturing Waterborne Pollutants Following Urban Wildfire  
*CalRecycle* 2022-2024

- \$125k (\$54k to Hanigan)
14. Collaborative Research: ERASE-PFAS: Thermal Regeneration of PFAS-laden Granular Activated Carbon Presents an Opportunity to Break the Forever PFAS Cycle  
*National Science Foundation CBET Environmental Engineering*  
\$500k (\$250k to Hanigan) 2022-2025
15. Investigation of Disinfection Byproduct Formation and Mitigation in Aquifer Storage and Recovery Operations  
*Truckee Meadows Water Authority*  
\$396k to UNR 2020-2023
16. Addressing Human Health Impacts from Emerging Contaminants in Reclaimed Water to Enhance its Use for Urban and Peri-urban Agriculture  
*USDA AFRI Water for Agriculture*  
\$500k to UNR 2017-2020
- Significant Contribution as Author**
17. Identifying NDMA Forming Amines from the Orange County Water Purification Facility  
*Orange County Water District*  
Co-author with Paul Westerhoff (PI)  
\$18.5k 2016-2017
18. Understanding the Source and Fate of Polymer-Derived Nitrosamine Precursors  
*Water Research Foundation #4622*  
Co-author with Paul Westerhoff (PI)  
\$350k 2016-2018
19. Determining the Relative Importance and Contribution of Anthropogenic and Natural Sources of Nitrosamine Precursors  
*Water Research Foundation #4499*  
Co-author with Paul Westerhoff (PI)  
\$400k 2014-2016

## PROFESSIONAL MEMBERSHIP AND DEVELOPMENT

Registered Professional Engineer in the State of Arizona	2016-present
Association of Environmental Engineering & Science Professors Member	2015-present
International Humic Substances Society Member	2015-present
American Chemical Society Member	2013-present
Water Environment Federation Member	2013-present
American Water Works Association Member	2012-present
UNR Teaching with Technology Certificate	2019
Association of College and University Educators: Effective Teaching Practices Certificate	2017
Preparing Future Faculty ASU Course Completed	2012-2013
DavidsonX EdX Course, 001X Medicinal Chemistry	2014
DelftX EdX Course, CTB3365x Introduction to Water Treatment	2013
HarvardX EdX Course, PH278x Human Health and Global Environmental Change	2013
BerkeleyX EdX Course, Stat2.1x Introduction to Statistics, Descriptive Statistics	2013
BerkeleyX EdX Course, Stat2.2x Introduction to Statistics, Probability	2013
BerkeleyX EdX course, Stat 2.3x Introduction to Statistics, Inference	2013

## PUBLICATIONS AND PRESENTATIONS

**Refereed Journal Publications** (Corresponding author underlined, **UNR students and postdocs directly supervised by Hanigan in blue**)

*H index = 22 to 26 (Scopus, Web of Science, Google Scholar)*

*Times Cited = 1802 to 2415*

- Hayes, H., Lutes, C., Watson, N., Benton, N., Hanigan, D., **McCoy, S.**, Holton, C., Bronstein, K., Schumacher, B., Zimmerman, J., Williams, A. Laboratory Development and Validation of

- Vapor Phase PFAS Methods for Soil Gas, Sewer Gas, and Indoor Air. *Environmental Science: Atmospheres*, in press.
2. **Song, M., Wang, J., DeNicola, M., and Hanigan, D.** Natural Vs. Anthropogenic Sources of *N*-Nitrosodimethylamine Precursors in Surface Water. *Water Research*, 2024. p. 122313.
  3. Lacroix, A., Goli, T., Hanigan, D., and Pagilla, K. Formation, Speciation, and Temporal Variability of DBPs in Drinking Water Distribution Systems in the Context of ASR Operations and Extended Storage Periods. *Chemosphere*, 2024: p. 143154.
  4. Lacroix, A., Goli, T., Hanigan, D., Pagilla, K. Full-scale Granular Activated Carbon and Chloramine Pretreatment of Drinking Water for Aquifer Storage and Recovery. *ACS ES&T Water*, 2024. 4(5): p. 2159-2169.
  5. **Abusallout, I., Song, M., Chan, A., McKenna, E.,** Van Buren, J., **McCoy, S.,** Ledvina, Z., Jeffrey, C., McCurry, D., Hanigan, D. Bacterial dealkylation of benzalkonium chlorides in wastewater produces benzyldimethylamine, a potent *N*-nitrosodimethylamine precursor. *Water Research*, 2024. 260: p. 121945
  6. **Stewart, K.,** An, D., Hanigan, D. Reduction of Haloacetonitrile-associated Risk by Adjustment of Distribution System pH. *Environmental Science: Water Research & Technology*, 2023. 9: p. 2725-2732.
  7. **DeNicola, M.,** Lin, Z., Quiñones, O., Vanderford, B., **Song, M.,** Westerhoff, P., Dickenson, E., Hanigan, D. Per- and Polyfluoroalkyl Substances and Organofluorine in Lakes and Waterways of the Northwestern Great Basin and Sierra Nevada. *Science of the Total Environment*, 2023. 905: p. 166971.
  8. **Hickenbottom, K.,** Pagilla, K., and Hanigan, D. Wildfire Impact on Disinfection Byproduct Precursor Loading in Mountain Streams and Rivers. *Water Research*, 2023. 244: p. 120474.
  9. Shi, Y., Ma, J., Hanigan, D., Chen, Y., Qian, Y., Guo, J., An, D. Magnetically recoverable Fe<sub>3</sub>O<sub>4</sub>/MoS<sub>2</sub>/BiOI microspheres for visible light water disinfection: molecular mechanism and transcriptomic insights. *Separation and Purification Technology*, 2023. 320: p. 124140.
  10. **Wang, J., Song, M., Abusallout, I., Hanigan, D.** Thermal Decomposition of Two Gaseous Perfluorocarboxylic Acids: Products and Mechanisms. *Environmental Science & Technology*, 2023. 57(15): p. 6179-6187.
  11. **Song, M., McKenna, E.,** Thurman, E.M., Ferrer, I., Taylor-Edmonds, L., Hofmann, R., Ishida, K., Roback, S., Plumlee, M., Hanigan, D. Comparison of Oxidants Used in Advanced Oxidation for Potable Reuse: Non-Target Analysis and Bioassays. *ACS ES&T Water*, 2023. 3: p. 690-700.
  12. Qian, Y., Shi, Y., Guo, J., Chen, Y., Hanigan, D., An, D. Molecular Characterization of Disinfection Byproduct Precursors in Filter Backwash Water from 10 Drinking Water Treatment Plants. *Science of the Total Environment*, 2023. 856(Pt 1): p.159027
  13. **Song, M.,** Roback, S., Ishida, K., Wang, J., Plumlee, M., Hanigan, D. Contribution of Dimethylamine to *N*-nitrosodimethylamine Formation at Reverse Osmosis Water Reclamation Facilities. *Environmental Science & Technology Letters*, 2022. 10(1): p. 66
  14. **Abusallout, I.,** Holton, C., **Wang, J., Hanigan, D.** Henry's Law Constants of 15 Per- and Polyfluoroalkyl Substances Determined by Static Headspace Analysis. *Journal of Hazardous Materials Letters*, 2022. 3: p. 100070
  15. Shahriar, A., Hanigan, D., Verburg, P., Pagilla, K., Yang, Y. Modeling the fate of ionizable pharmaceutical and personal care products (iPPCPs) in soil-plant systems: pH and speciation. *Environmental Pollution*, 2022. 315: p. 120367
  16. **Wang, J.,** Lin, Z., He, X., Song, M., Westerhoff, P., Doudrick, K., Hanigan, D. Critical Review of Thermal Decomposition of Per- and Polyfluoroalkyl Substances: Mechanisms, and Implications for Thermal Treatment Processes. *Environmental Science & Technology*, 2022. 56(9): p. 5355. **(Second joint runner up in the category 'Critical Review' in the 2022 Environmental Science & Technology Best Paper Awards)**
  17. Qian, Y., Chen, Y., Hanigan, D., Shi, Y., Sun, S., Hu, Y., An, D. pH Adjustment Improves the Removal of Disinfection Byproduct Precursors from Sedimentation Sludge Water. *Resources, Conservation & Recycling*, 2022. 179: p. 106135
  18. **Arabi, S. M., Alicata, J.,** Hanigan, D., Hiibel, S. R. Capturing Atmospheric Carbon Dioxide by Depleting Inorganic Carbon in Municipal Wastewater. *International Journal of Greenhouse Gas Control*, 2021. 111: p. 103472

19. **Wang, J., Abusallout, I., Song, M.,** Marfil-Vega, R., Hanigan, D. Quantification of Per- and Polyfluoroalkyl Substances with a Modified Total Organic Carbon Analyzer and Ion Chromatography. *AWWA Water Science*, 2021. 3(4): p. e1235
20. **Sharma, P., Hanigan, D.** Evidence of Low Levels of Trace Organic Contaminants in Terminal Lakes. *Chemosphere*, 2021. 285: p. 131408
21. **Abusallout, I., Wang, J., Hanigan, D.** Emerging investigator series: Rapid Defluorination of 22 Per- and Polyfluoroalkyl Substances in Water Using Sulfite Irradiated by Medium-Pressure UV. *Environmental Science: Water Research and Technology*, 2021. 7(9): p. 1552
22. **Thapa, U., Sharma, P., Hanigan, D.** Quantification of Pharmaceuticals in the Sealant Fluids of Actively Used Waterless Urinals. *Water Environment Research*, 2021. 93: pg. 1837
23. **Shahriar, A., Tan, J., Sharma, P., Hanigan, D., Verburg, P., Pagilla, K., Yang, Y.** Modeling the Fate and Human Health Impacts of Pharmaceuticals and Personal Care Products in Reclaimed Wastewater Irrigation for Agriculture. *Environmental Pollution*, 2021. 276: pg. 116532
24. **Qian, Y., Chen, Y., Hu, Y., Hanigan, D., Westerhoff, P., An, D.** Formation and Control of C- and N-DBPs during Disinfection of Filter Backwash and Sedimentation Sludge Water in Drinking Water Treatment. *Water Research*, 2021. 194: p. 116964.
25. **Qian, Y., Hu, Y., Chen, Y., An, D., Westerhoff, P., Hanigan, D., Chu, W.** Haloacetonitrile and Haloacetamide Precursors in Filter Backwash and Sedimentation Sludge Water during Drinking Water Treatment. *Water Research*, 2020. 186: p. 116346.
26. **Rand, L., Poustie, A.,** Bednar, A. J., Hanigan, D., Westerhoff, P., Ranville, J. F. Quantifying Temporal and Geographic Variation in Sunscreen and Mineralogic Titanium-containing Nanoparticles in Three Recreational Rivers. *Science of the Total Environment*, 2020. 743: p. 140845.
27. **Sharma, P., Poustie, A.,** Verburg, P., Pagilla, K., Yang, Y., Hanigan, D. Trace Organic Contaminants in Field-scale Cultivated Alfalfa, Soil, and Pore Water after 10 Years of Irrigation with Reclaimed Wastewater. *Science of the Total Environment*, 2020. 744: p. 140698.
28. **Liu, S., Liu, J., Wang, H., Yang, Y., Liu, S., Hanigan, D., Zhao, H.** A New Antifouling and Antibacterial Membrane Material for Highly Selective Removal of Nitrate and Phosphate. *Industrial & Engineering Chemistry Research*, 2020. 59(26): p. 12114-12122.
29. **Poustie, A.,** Yang, Y., Verburg, P., Pagilla, P., Hanigan, D. Reclaimed Wastewater as a Viable Water Source for Agricultural Irrigation: A Review of Food Crop Growth Inhibition and Promotion in the Context of Environmental Change. *Science of the Total Environment*, 2020. 739: p. 139756.
30. **Thapa, U., Hanigan, D.** Waterless Urinals Remove Select Pharmaceuticals from Urine by Phase Partitioning. *Environmental Science & Technology*, 2020. 54(10): p. 6344-6352.
31. **Roth, J., Abusallout, I., Hill, T., Holton, C., Thapa, U., Hanigan, D.** Release of Volatile Per- and Polyfluoroalkyl Substances from Aqueous Film-Forming Foam. *Environmental Science & Technology Letters*, 2020. 7(3): p. 164-170. (Roth and Abusallout contributed equally).
32. **McKenna, E.,** Thompson, K., Taylor-Edmonds, L., McCurry, D., Hanigan, D. Summation of Disinfection By-product CHO Cell Relative Toxicity Indices: Sampling Bias, Uncertainty, and a Path Forward. *Environmental Science: Processes and Impacts*, 2020. 22: p. 708-718.
33. **Kidd, J., Bi, Y., Hanigan, D., Herckes, P., Westerhoff, P.** Yttrium Residues in MWCNT Enable Assessment of MWCNT Removal During Wastewater Treatment. *Nanomaterials*, 2019. 9(5): p. 670.
34. **Saleh, N., Khalid, A., Tian, Y., Ayres, C., Sabaraya, I., Pietari, J., Hanigan, D., Chowdhury, I., Apul, O.** Degradation and removal of poly- and per-fluoroalkyl substances from aqueous systems by nano-enabled water treatment strategies. *Environmental Science: Water Research and Technology*, 2019. 5(2): p. 198-208. **(Cover Article, Best Papers 2019 collection)**
35. **An, D.,** Chen, Y., Gu, B., Westerhoff, P., Hanigan, D., Herckes, P., Fischer, N., Donovan, S., Croué, J. P., Atkinson, A. Lower Molecular Weight Fractions of PolyDADMAC Coagulants Disproportionately Contribute to N-nitrosodimethylamine Formation During Water Treatment. *Water Research*, 2019. 150: p. 466-472.
36. **Gao, Q., Wang, C.-Z., Liu, S., Hanigan, D., Liu, S.-T., Zhao, H.-Z.** Ultrafiltration Membrane Microreactor (MMR) for Simultaneous Removal of Nitrate and Phosphate from Water. *Chemical Engineering Journal*, 2019. 355: p. 238-246

37. Roback, S., Ferrer, I., Thurman, E. M., Ishida, K., Plumlee, M. H., **Poustie, A.**, Westerhoff, P., Hanigan, D. Non-Target Mass Spectroscopy Analysis of NDMA Precursors in Advanced Treatment for Potable Reuse. *Environmental Science: Water Research and Technology*, 2018. 4(12): p. 1944-1955.
38. Krasner, S. W., Westerhoff, P., Mitch, W. A., Hanigan, D., McCurry, D. L., von Gunten, U. Behavior of NDMA Precursors at 21 Full-Scale Water Treatment Facilities. *Environmental Science: Water Research & Technology*, 2018. 4(12): p. 1966-1978.
39. Hanigan, D., Truong, L., Schoepf, J., Nosaka, T., Mulchandani, A., Tanguay, R. L., Westerhoff, P. Trade-offs in Ecosystem Impacts from Nanomaterial versus Organic Chemical Ultraviolet Filters in Sunscreens. *Water Research*, 2018. 139: p. 281-290.
40. Kidd, J., Hanigan, D., Truong, L., Hristovski, K., Tanguay, R., Westerhoff, P. Developing and Interpreting Aqueous Functional Assays for Comparative Property-Risk Relationships of Different Nanoparticles. *Science of the Total Environment*, 2018. 628-629: p. 1609-1616.
41. Chen, S., Yuan, Z., Hanigan, D., Westerhoff, P., Zhao, H., Ni, J. Coagulation Behaviors of New Covalently Bound Hybrid Coagulants (CBHyC) in Surface Water Treatment. *Separation and Purification Technology*, 2018. 192(Supplement C): p. 322-328
42. Venkatesan, A. K., Reed, R. B., Lee, S., Bi, X., Hanigan, D., Yang, Y., Ranville, J. F., Herckes, P., Westerhoff, P. Detection and Sizing of Ti-containing Particles in Recreational Waters Using Single Particle ICP-MS. *Bulletin of Environmental Contamination and Toxicology*, 2018. 100(1): p. 120-126.
43. Lankone, R., Challis, K., Bi, Y., Hanigan, D., Reed, R., Zaikova, T., Hutchison, J., Westerhoff, P., Ranville, J. F., Fairbrother, F., Gilbertson, L. Methodology for Quantifying Engineered Nanomaterial Release from Diverse Product Matrices Under Outdoor Weathering Conditions and Implications for Life Cycle Assessment. *Environmental Science: Nano*, 2017. 4(9): p. 1784-1797 **(Cover article and selected by editorial team as top 10% published in ES: Nano)**
44. Hanigan, D., Truong, L., Simonich, M., Tanguay, R., Westerhoff, P. Zebrafish Embryo Toxicity of 15 Chlorinated, Brominated, and Iodinated Disinfection By-products. *Journal of Environmental Sciences*, 2017. 58: p. 302-310.
45. Hanigan, D., Ferrer, I., Thurman, E. M., Herckes, P., Westerhoff, P. LC/QTOF-MS Fragmentation of *N*-nitrosodimethylamine Precursors in Drinking Water Supplies is Predictable and Aids Their Identification. *Journal of Hazardous Materials*, 2017. 323(Part A): p. 18-25.
46. Krasner, S. W., Lee, T.F.L., Westerhoff, P., Fischer, N., Hanigan, D., Karanfil, T., Beita-Sandi, W., Taylor-Edmonds, L., Andrews, R.C. Granular Activated Carbon Treatment May Result in Higher Predicted Genotoxicity in the Presence of Bromide. *Environmental Science & Technology*, 2016. 50(17): p. 9583-9591.
47. Hicks, A. L., Reed, R., Theis, T. L., Hanigan, D., Huling, H., Zaikova, T., Hutchinson, J. E., Miller, J. Environmental Impacts of Reusable Nanoscale Silver-coated Hospital Gowns Compared to Single-use, Disposable Gowns. *Environmental Science: Nano*, 2016. 3(5): p.1124-1132.
48. Hanigan, D., Liao, X., Zhang, J., Herckes, P., Westerhoff, P. Sorption and Desorption of Organic Matter on Solid-phase Extraction Media to Isolate and Identify *N*-nitrosodimethylamine Precursors. *Journal of Separation Science*, 2016. 39(14): p. 2661-2884.
49. Zhao, H., Wang, L., Hanigan, D., Westerhoff, P., Ni, J. Novel Ion-exchange Coagulants Remove More Low Molecular Weight Organics than Traditional Coagulants. *Environmental Science & Technology*, 2016. 50(7): p. 3897-3904.
50. Zhang, J. Hanigan, D., Westerhoff, P., Herckes, P. *N*-Nitrosamine Formation Kinetics in Wastewater Effluents and Surface Waters. *Environmental Science: Water Research & Technology*, 2016. 2(2): p. 312-319. **(Editor's Choice - 2016)**
51. Liao, X., Chen, C., Xie, S., Hanigan, D., Wang, J., Zhang, X., Westerhoff, P., Krasner, S.W. Nitrosamine Precursor Removal by BAC: Adsorption versus Biotreatment Case Study. *Journal American Water Works Association*, 2015. 107(9): p. E454-E463.
52. Hanigan, D., Thurman, E. M., Ferrer, I., Zhao, Y., Andrews, S., Zhang, J., Herckes, P., and Westerhoff, P. Methadone Contributes to *N*-nitrosodimethylamine Formation in Surface Waters and Wastewaters during Chloramination. *Environmental Science & Technology Letters*, 2015. 2(6): p. 151-157. **(2<sup>nd</sup> most read article ES&TL March 2015, Highly cited article published in ES&TL, 2018)**

53. Hanigan, D., Krasner, S. W., Zhu, E., Zhang, J., Herckes, P., Westerhoff, P. Contribution and Removal of Watershed and Cationic Polymer N-nitrosodimethylamine Precursors. *Journal American Water Works Association*, 2015. 107(3): p. E152-E163. **(Listed under Most Read Articles consecutively from April 2015 to Jan 2016)**
54. Krasner, S. W., Mitch, W. A., McCurry, D. L., Hanigan, D., Westerhoff, P. Formation, Precursors, Control, and Occurrence of Nitrosamines in Drinking Water: A Review. *Water Research*, 2013. 47(13): p.4433-4450 **(Web of Science Highly Cited in Field)**
55. Hanigan, D., Inniss, E., Clevenger, T. E. Removal of Natural Organic Matter Fractions by MIEX® and Activated Carbon with Regard to Disinfection By-product Formation. *Journal American Water Works Association*, 2013. 105(3): p. E84-E92.
56. Hanigan, D., Zhang, J., Herckes, P., Krasner, S. W., Chen, C., and Westerhoff, P. Adsorption of N-Nitrosodimethylamine Precursors by Powdered and Granular Activated Carbon. *Environmental Science & Technology*, 2012. 46(22): p.12630-12639.

#### Refereed Book Chapters and Other Refereed Publications

1. Busse, G., Hanigan, D., **Sharma, P.**, Yang, Y., Singletary, L., Verburg, P. The Fate of Pharmaceuticals and Personal Care Products in Reclaimed Water Used for Irrigation of Agricultural Crops in Nevada. *University of Nevada Cooperative Extension Fact Sheet*, 2021. SP-21-07.
2. **Sharma, P.**, Pagilla, K., Singletary, L., Hanigan, D. Pharmaceuticals and Personal Care Products (PPCPs) in Alfalfa Irrigated with Reclaimed Water. *University of Nevada Cooperative Extension Fact Sheet*, 2020. FS-20-05
3. Sterle, K., Ormerod, K. J., Singletary, L., Pagilla, K., Hanigan D., Verburg, P., Yang, Y. Reclaiming Water for Urban Foodsheds: State of Nevada Regulations and Permitting. *University of Nevada Cooperative Extension Fact Sheet*, 2020. FS-20-11
4. Pagilla, K., Hanigan, D., Yang, Y., Verburg, P., Sterle, L., Singletary, L. Reclaiming Water for Urban Foodsheds: Program Overview. *University of Nevada Cooperative Extension Fact Sheet*, 2020. FS-19-08
5. Chen, C., Hanigan, D., Liao, X., Wang, J., Zhang, X., Suffet, I. H., Krasner, S. W., Westerhoff, P. pH Effect on Nitrosamine Precursor Removal by Activated Carbon Adsorption, in *Recent Advances in Disinfection By-Products*, pp. 173-185, 2015, American Chemical Society.
6. Zhang, J., Hanigan, D., Shen, E., Andrews, S., Westerhoff, P., Herckes, P. Modeling NDMA Formation Kinetics During Chloramination of Model Compounds and Surface Waters Impacted by Wastewater Discharges, in *Recent Advances in Disinfection By-Products*, pp. 79-95, 2015, American Chemical Society.

#### Other Publications and Reports

1. Adams, H., Hanigan, D., Marfil-Vega, R., Ryan, D., McCurry, D., Keen, O., Ash, S., Southard, M. Operators Need to Know About Organic Contaminants. *Opflow*, 2023. 49(6): p.10-17.
2. Hanigan, D., McKenna, E., Song, M., Thurman, E. M., Ferrer, I., Roback, S., Plumlee, M. Nitrosamine Precursors in Direct and Indirect Potable Reuse Water. *Water Research Foundation Final Report*, 2022. Water Research Foundation: Denver, CO.
3. Roback, S., Plumlee, S., Hanigan, D. Understanding the Formation of a Critical Disinfection Byproduct: NDMA and NDMA Precursors in Advanced Potable Reuse Treatment Plants. *Bureau of Reclamation Final Report*, 2022. U.S. Department of the Interior: Denver, CO
4. **McKenna, E.**, Sharma, P., McCurry, D., Hanigan, D. A Layman's Guide to High-resolution Mass Spectrometry. *Journal American Water Works Association*, 2020. 112(4): p. 40-49.
5. Ferrer, I., Thurman, E. M., Hanigan, D., Westerhoff, P. Finding NDMA Precursors Using Accurate Mass Tools with an Agilent 6540 Q-TOF LC/MS. *Agilent Application Note*, 2017. Agilent Technologies.
6. Westerhoff, P., Hanigan, D., Herckes, P., Thurman, E. M., Ferrer, I., Andrews, S., Zhao, V., Bukhari, Z. Relative Importance and Contribution of Anthropogenic and Natural Sources of Nitrosamine Precursors. *Water Research Foundation Final Report*, 2017. Water Research Foundation: Denver, CO.



7. Hanigan, D., Westerhoff, P. Recovery and Mass Spectrometry Aimed at Identifying NDMA Forming Amines Isolated from the Orange County Advanced Water Purification Facility. *Orange County Water District Final Report*, 2016.
8. Hanigan, D. Identification of *N*-nitrosodimethylamine Precursors to Improve Their Control. Arizona State University, 2015. (PhD Dissertation)
9. Krasner, S. W., Shirkhani, R., Westerhoff, P., Hanigan, D., Mitch, W. A., McCurry, D. L., Chen, C., Skadsen, J., von Gunten, U. Controlling the Formation of Nitrosamines During Water Treatment. *Water Research Foundation Final Report*, 2015. Water Research Foundation: Denver, CO.
10. Hanigan, D. Removal of Disinfection By-product Precursors by Activated Carbon and MIEEX®. University of Missouri, 2011. (Masters Thesis)

### Invited Presentations

1. Hanigan, D. Finding Needles in a Haystack: *N*-nitrosodimethylamine Precursors in Potable Reuse and Treated Wastewater. Hong Kong University of Science and Technology Forum 2024 on Novel Advanced Oxidation, (Chemical/Photo/Electro-)Disinfection, and Their Byproducts. Online. December 6<sup>th</sup>, 2024
2. Hanigan, D. Anthropogenic Small Molecules in the Environment and Engineered Solutions. University of Colorado Environmental Engineering Seminar. Boulder, CO. April 5<sup>th</sup>, 2024.
3. Hanigan, D. Anthropogenic Small Molecules in the Environment and Engineered Solutions. Colorado State University Seminar. Fort Collins, CO. March 28<sup>th</sup>, 2024.
4. Hanigan, D. Anthropogenic Impacts on Water Quality: Everybody is Downstream from Somebody. Kiwanis Club of Montgomery County. March 7<sup>th</sup>, 2024
5. Hanigan, D. PFAS Occurrence in Waterways of the Great Basin and Northern Sierra Nevada, and Challenges to Remediation. Desert Research Institute DHS Colloquium. Reno, NV. November 13<sup>th</sup>, 2023.
6. Hanigan, D., DeNicola, M, Dickenson, E. PFAS in the Great Basin and Sierra Nevada Alpine Lakes. American Chemical Society Western Regional Meeting. Las Vegas, NV. October 20<sup>th</sup>, 2022.
7. Hanigan, D. Rapid Site Profiling of Organofluorine: Quantification of PFASs by Combustion Gas Analysis. SERDP PFAS Summer Meeting. Long Beach, CA. July 18<sup>th</sup>, 2022.
8. Hanigan, D. Anthropogenic Small Molecules in the Environment and Engineered Solutions. University of Arizona Chemical and Environmental Engineering Symposium. Tucson, AZ. March 25<sup>th</sup>, 2022
9. Hanigan, D. Anthropogenic Small Molecules in the Environment and Engineered Solutions. Washington State University. Pullman, WA. March 23<sup>rd</sup>, 2022.
10. Hanigan, D. Anthropogenic Small Molecules in the Environment and Engineered Solutions. WaterReuse Nevada Symposium. Las Vegas, NV. February 1<sup>st</sup>, 2022.
11. Hanigan, D. Tapping into the Future: Potable Reuse in Tomorrow's World. Water UCI Colloquium. May 7<sup>th</sup>, 2021.
12. Hanigan, D. Anthropogenic Small Molecules in the Environment, How They Are Measured, and Engineered Solutions. Arizona State University Environmental Engineering Seminar. April 13<sup>th</sup>, 2021
13. Hanigan, D. Rapid Site Profiling of Organofluorine: Quantification of PFASs by Combustion Gas Analysis. SERDP PFAS Summer Meeting. July 28<sup>th</sup>, 2020.
14. Hanigan, D. Advances in Engineering Impact Public Policy. Engineering Club at Davidson Academy. Reno, NV. Jan 14, 2020.
15. Hanigan, D. Past, Present, and Future of Per- and Polyfluoroalkyl Substances Analysis in the Field. SERDP Symposium. Washington D.C., November 28<sup>th</sup>, 2018.
16. Hanigan, D. Advances in Mass Spectrometry Identify a New Wave of Ultra-low Concentration Hazards. University of Nevada Geography Colloquium Series, Reno NV. Feb 15, 2017.  
**(selected as the semester student favorite)**
17. Hanigan, D., Zhang, J., Herckes, P., Westerhoff, P. Removal and Control of Watershed and Cationic Polymer *N*-nitrosodimethylamine Precursors During Drinking Water Treatment. Arizona State University, School of Sustainable Engineering and the Built Environment, Tempe, AZ. 2013.

18. Hanigan, D., Clevenger, T. E., and Inniss, E. Removal of DBP Precursors by Activated Carbon and MIEX. Arizona State University, School of Sustainable Engineering and the Built Environment, Tempe, AZ. 2011.

**Conference Presentations** (Presenter underlined, UNR students in blue)

1. Hatinoglu, D., **Edwards, L.**, Hanigan, D., Apul, O. Granular Activated Carbon Catalyzes PFOS Mineralization During Thermal Regeneration. American Chemical Society National Meeting, Denver, CO. August 2024.
2. **Dashiell, J.**, **Hickenbottom, K.**, **Castellano, D.**, Hanigan, D. Disinfection By-Product Formation from Point of Use Water "Purifying" Tablets. Nevada WaterReuse Symposium. Las Vegas, NV. January 2024.
3. **Edwards, L.**, Hanigan, D. Thermal Combustion Byproducts of C3, C4, C5 chain PFCAs Adsorbed to Granular Activated Carbon. Nevada WaterReuse Symposium. Las Vegas, NV. January 2024.
4. Hatinoglu, D., Alulema, P., Hanigan, D., Apul, O. Thermal regeneration of PFAS-laden granular activated carbon: An opportunity to break the forever PFAS cycle. American Water Works Association Water Quality and Technology Conference. Dallas, TX. November 2023.
5. **Hickenbottom, K.**, Pagilla, K., Hanigan, D. Wildfire Impact on Disinfection Byproduct Precursor Loading in Mountain Streams and Rivers. American Water Works Association Water Quality and Technology Conference. Dallas, TX. November 2023.
6. **DeNicola, M.** Lin, Z., Westerhoff, P., Dickenson, E., Hanigan, D. Per- and Polyfluoroalkyl Substances in Lakes and Waterways of the Northwestern Great Basin. Nevada Water Environment Association Annual Conference. Reno, NV. March 2023.
7. **Hickenbottom, K.**, Pagilla, K., Hanigan, D. Effects of Wildfire on the Formation of Haloacetonitriles, Haloacetamides, and Regulated Disinfection By-products. American Water Works Association Water Quality Technology Conference. Cincinnati, OH. November, 2022.
8. **Stewart, K.**, Dong, A., Hanigan, D. Reduction of Disinfection Byproduct-associated Toxicity by Adjustment of Distribution System pH. American Water Works Association Water Quality Technology Conference. Cincinnati, OH. November, 2022.
9. Hanigan, D., **Song, M.**, Roback, S., Plumlee, M. Dimethylamine is an important NDMA precursor in full advanced treated water from potable reuse facilities. American Chemical Society National Meeting, Chicago, IL. August 2022.
10. **He, X.**, Hanigan, D. Operation and Species Dependent Carbon Recovery Rates for Per- and polyfluoroalkyl Substances as Measured by a Total Organic Carbon Analyzer. American Chemical Society National Meeting, Chicago, IL. August 2022.
11. **Abusallout, I.**, Holton, C., Hanigan, D. Are PFAS a Vapor Intrusion Threat? Association of Environmental Engineering Scientists and Professors Conference, St. Louis, MO. June 2022.
12. Hanigan, D., **Song, M.**, **Abusallout, I.** Benzyl dimethylamine and dimethylamine are key N-nitrosodimethylamine precursors in wastewater and potable reuse waters. 3<sup>rd</sup> International Water Association Disinfection and Disinfection By-products Conference, Milan, Italy. June 2022.
13. **Song, M.**, Roback, S., Plumlee, S., Hanigan, D. Comparison of Oxidants Used in Advanced Oxidation Processes with Non-target Analysis and Bioassays. International Water Association Leading Edge Technology Conference, Reno, NV. March 2022.
14. **He, X.**, Hanigan, D. Adsorptive separation of fluoride and per- and polyfluoroalkyl substances (PFAS) for direct total organic fluorine (TOF) measurement. American Chemical Society National Meeting, San Diego, CA. March 2022.
15. **Wang, J.**, Marfil-Vega, R., Hanigan, D. Quantification of Per- and Polyfluoroalkyl Substances with a Modified Total Organic Carbon Analyzer and Ion Chromatography. American Water Works Association Water Quality Technology Conference, Tacoma, WA. November 2021.
16. **Song, M.**, Roback, S., Plumlee, M., Hanigan, D. Dimethylamine is an Important NDMA Precursor in Full Advanced Treated Water from Potable Reuse Facilities. American Water Works Association Water Quality Technology Conference, Tacoma, WA. November 2021.
17. Hanigan, D., **Abusallout, I.**, **Chan, A.**, **Song, M.** Benzalkonium chloride is present in wastewater and is biotransformed to the potent N-nitrosodimethylamine precursor

- benzylidimethylamine during secondary treatment. American Chemical Society National Meeting, Atlanta, GA. August 2021.
18. [Wang, J.](#), Marfil-Vega, R., Hanigan, D. PFAS Analysis With a Total Organic Carbon Instrument. Society of Environmental Toxicology and Chemistry North America 41<sup>st</sup> Annual Meeting. November 2020
  19. [Hanigan, D.](#), [Abusallout, I.](#), [Wang, J.](#), Marfil-Vega, R. Quantification of PFASs via total organofluorine measurements with a TOC instrument. American Chemical Society National Meeting. August 2020
  20. [Sharma, P.](#), Hanigan, D. Pharmaceutical and Personal Care Product Accumulation in Terminal Lakes Receiving Reclaimed Wastewater. American Chemical Society National Meeting, Philadelphia, PA. March 2020.
  21. [Abusallout, I.](#), Roth, J., Hill, T., Holton, C., Hanigan, D. Volatile Per- and Polyfluoroalkyl Substances Released from Aqueous Film-Forming Foam. American Chemical Society National Meeting, Philadelphia, PA. March 2020.
  22. [Abusallout, I.](#), [Wang, J.](#), Hanigan, D. Rapid Quantification of Per- and Polyfluoroalkyl Substances by Combustion Gas Analysis. National Environmental Monitoring Conference, Jacksonville, FL. August 2019.
  23. [Roth, J.](#), Holton, C., Hill, T., [Thapa, U.](#), Hanigan, D. Are Per- and Polyfluoroalkyl Substances (PFAS) a Vapor Intrusion Concern? RemTEC Summit, Denver, CO. February 2019.
  24. [Sharma, P.](#), [Poustie, A.](#), Hanigan, D. Pharmaceuticals and Personal Care Products Accumulation in Plants at the Field-scale and in Terminal Lakes. Nevada Water Environment Association Annual Conference, Sparks, NV. January 2019.
  25. [Thapa, U.](#), Hanigan, D. Using Waterless Urinal Sealant to Remove Pharmaceuticals from the Urine. Nevada Water Environment Association Annual Conference, Sparks, NV. January 2019.
  26. [Thapa, U.](#), [Cluff, C.](#), Hanigan, D. Waterless Urinal 2.0: Removing Pharmaceuticals at the Source. American Water Works Association Water Quality Technology Conference, Toronto, ON. November 13, 2018.
  27. [Hanigan, D.](#), Truong, L., Simonich, M., Tanguay, R., Westerhoff, P. Evaluating Toxicity Using Zebrafish Embryo Development: Sunscreens and Disinfection By-products. American Water Works Association Annual Conference and Exposition, Las Vegas, NV. June 13, 2018.
  28. [Hanigan, D.](#), [Poustie, A.](#), Thurman, E. M., Ferrer, I., Westerhoff, P., Roback, S. L., Ishida, K. P., Plumlee, M. H. Identifying NDMA Precursors in Advanced Treated Water for Potable Reuse. International Water Association 2<sup>nd</sup> Disinfection and Disinfection By-products Conference, Beijing, PRC. May 16, 2018.
  29. [Poustie, A.](#), Hanigan, D. Pharmaceutical Uptake in Crops Irrigated with Treated Wastewater. Nevada Water Environment Association Annual Conference, Sparks, NV. April 2018
  30. [Pagilla, K.](#), Verburg, P., Hanigan, D., Yang, Y. Water Reuse Project at University of Nevada-Reno: Addressing Human Health Impacts from Emerging Contaminants in Reclaimed Water to Enhance Its Use for Urban and Peri-Urban Agriculture. American Chemical Society National Meeting, New Orleans, LA. March 2018.
  31. [Lankone, R.](#), Wang, J., Challis, K., Bi, Y., Hanigan, D., Wang, Y., Garland, M., Reed, R., Zaikova, T., Westerhoff, P. K., Gilbertson, L. M., Ranville, J. F., Fairbrother, H. Characterization of Engineered Nanomaterial Release from Nanoenabled Products Following Accelerated and Natural Weathering. American Chemical Society National Meeting, New Orleans, LA. March 2018.
  32. [Hanigan, D.](#), Ferrer, I., Thurman, E. M., Roback, S., Ishida, K., Plumlee, M., Westerhoff, P. NDMA Precursor Transformation and Identification during Reverse Osmosis and UV/Peroxide Water Treatment for Indirect Potable Reuse. American Chemical Society National Meeting, San Francisco, CA. April 3, 2017.
  33. [Thurman, E. M.](#), Ferrer, I., Hanigan, D., Westerhoff, P. Using Dark Matter Accurate Mass to Discover NDMA Precursors in Wastewater. American Chemical Society National Meeting, San Francisco, CA. April 3, 2017.
  34. [Westerhoff, P.](#), Rice, J., Hanigan, D., Dotson, A. Reactivity Towards N-Nitrosamines of bulk and Trace Organics of Wastewater Origin. American Chemical Society National Meeting, San Francisco, CA. April 3, 2017.

35. Lee, C. F. T., Krasner, S. W., Westerhoff, P., Fischer, N. L., Hanigan, D., Karanfil, T., Beita-Sandi, W., Taylor-Edmonds, L. Unintended Consequences of GAC on Emerging DBPs. American Chemical Society National Meeting, San Diego, CA. March 2016.
36. Hanigan, D., Herckes, P., Westerhoff, P. Total Nitrosamines in Wastewaters, Surface Waters, and Foodstuffs by TONO and TONO-HPLC. AWWA Water Quality and Technology Conference, Salt Lake City, UT. Nov 15-19, 2015.
37. Hanigan, D., Herckes, P., Andrews, S., Ferrer, I., Thurman, E. M., Westerhoff, P. Identification of Nitrosamine Precursors in Waste and Surface Waters. AWWA Water Quality and Technology Conference, New Orleans, LA. Nov 17-20, 2014.
38. Hanigan, D., Krasner, S., Herckes, P., Westerhoff, P. Removal of Polymer-Derived N-nitrosamine Precursors by Activated Carbon. AWWA Water Quality and Technology Conference, Long Beach, CA. Nov 3-7, 2013.
39. Hanigan, D., Westerhoff, P., Zhang, J., Herckes, P., and Krasner, S. W. Reduction of NDMA Formation by Granular and Powdered Activated Carbon. AWWA Water Quality Technology Conference, Toronto, Canada. Nov 5, 2012.
40. Hanigan, D., Herckes, P., and Westerhoff, P. Activated Carbon for N-Nitrosodimethylamine (NDMA) Precursor Removal from Drinking Water Treatment Plant Influent. AZ Water Annual Conference, Glendale, AZ. May 3-5, 2012.

**Poster Presentations (Presenter underlined, UNR students in blue)**

1. Hatinoglu, D., **Edwards, L.**, Hanigan, D., Apul, O. Mechanistic Insights into Thermal Regeneration of PFAS-laden Granular Activated Carbons. RemTEC Emerging Contaminants Summit. Westminster, CO. October 2024.
2. **Hickenbottom, K.**, Pagilla, K., Hanigan, D. Wildfire Impact on Disinfection Byproduct Precursor Loading in Mountain Streams and Rivers. Gordon Research Conference: Water Disinfection, Byproducts, and Health. South Hadley, MA. July 2023.
3. **Hickenbottom, K.**, Pagilla, K., Hanigan, D. Wildfire Impact on Disinfection Byproduct Precursor Loading in Mountain Streams and Rivers. Nevada Water Environment Association Conference. Reno, NV. March 2023
4. **Grale, H.**, Syed, A., Matiasek, S., Webster, J., Hanigan, D. PFAS in Camp Fire (Paradise, CA) Sediment Control Devices. Nevada Water Environment Association Conference. Reno, NV. March 2023.
5. **Wang, J.**, Marfil-Vega, R., Hanigan, D. Thermal Decomposition of Gas-Phase Perfluorocarboxylic Acids: Formation of Gaseous Products and Mechanisms. International Water Association Leading Edge Technology Conference. Reno, NV. March 2022.
6. **Abusallout, I.**, Holton, C., Hanigan, D. Determination of Experimental Henry's Law Constants for 15 Poly- and Per-fluoroalkyl Substances (PFAS) Using Static Headspace Analysis. 12th International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Battelle). Palm Springs, CA. May 2022.
7. **Abusallout, I.**, Hanigan, D. Defluorination of Per- and Polyfluoroalkyl Substances (PFASs) by Medium-pressure UV Irradiated Sulfite. SERDP & ESTCP Symposium. December 2020.
8. **Wang, J.**, Hanigan, D. Quantification of PFASs via Total organofluorine measurements with a TOC instrument. SERDP & ESTCP Symposium. December 2020.
9. **Abusallout, I.**, **Wang, J.**, Schlessel, A., Marfil-Vega, R., Hanigan, D. Rapid Quantification of Per- and Polyfluoroalkyl Substances by Combustion Gas Analysis. SERDP & ESTCP Symposium, Washington D.C. December 2019.
10. **McKenna, E.**, Thompson, K., Taylor-Edmonds, L., McCurry, D. L., Hanigan, D. Summation of Disinfection By-product Relative Toxicity Indices: Sampling Bias, Uncertainty, and a Path Forward. American Water Works Association Water Quality Technology Conference, Dallas, TX. November 3, 2019.
11. **McKenna, E.**, Thompson, K., Taylor-Edmonds, L., McCurry, D. L., Hanigan, D. Summation of Disinfection By-product Relative Toxicity Indices: Sampling Bias, Uncertainty, and a Path Forward. University of Nevada, Reno Graduate Student Association Symposium, Reno, NV. October 22, 2019.

12. [Arabi, S.](#), Alicata, J., Hanigan, D., Hiibel, S.R. Capturing Atmospheric Carbon Dioxide by Depleting Wastewater Inorganic Carbon with Polymeric Membranes. UNR Global Climate Change Summit, Reno, NV. September 2019.
13. [Wang, J.](#), [Abusallout, I.](#), [Song, M.](#), Hanigan, D. Rapid Site Profiling of Organofluorine: Quantification of PFASs by Combustion Gas Analysis (ER19-C2-1214). SERDP & ESTCP PFAS Project Meeting, San Diego, Ca. July 2019.
14. [Hanigan, D.](#), [Poustie, A.](#), [McKenna, E.](#), Roback, S., Thurman, E. M., Ferrer, I., Plumlee, M. Identifying Nitrosamine Precursors in the Effluent of a Full Advanced Treatment Facility. Gordon Research Conference: Water Disinfection, Byproducts, and Health, South Hadley, MA. July 2019.
15. [Roback, S.](#), Ishida, K., Plumlee, M., Mitch, W., Chuang, Y. H., Zhang, Z., Taylor-Edmonds, L., Hofmann, R., Hanigan, D., Ferrer, I., Thurman, E. M., Hoh, E. UV/monochloramine, UV/free chlorine, UV/hydrogen peroxide and UV Alone for the Removal of NDMA, NDMA Precursors, Non-target Analytes and Bioassay-indicated Toxicity. Gordon Research Conference: Water Disinfection, Byproducts, and Health, South Hadley, MA. July 2019.
16. [Hanigan, D.](#), [Sharma, P.](#), [Thapa, U.](#) Rethinking Toilet Design to Reduce Environmental Pharmaceutical Loading. Association of Environmental Engineering Science Professors Biannual Conference, Tempe, AZ. May 2019.
17. [McKenna, E.](#), Roback, S., Poustie, A., Thurman, E. M., Ferrer, I., Westerhoff, P., Plumlee, M., Hanigan, D. Identifying NDMA Precursors in Reuse Water Using Non-target Mass Spectrometry. Nevada Water Environment Association Annual Conference, Sparks, NV. January 2019.
18. [Sharma, P.](#), Pagilla, K., Hanigan, D. Pharmaceuticals and Personal Care Product Accumulation in Plants at the Field Scale and in a Terminal Lake. American Water Works Association Water Quality Technology Conference, Toronto, ON. November 13, 2018.
19. [Rand, L.](#), Bi, Y., [Poustie, A.](#), Bednar, A., Hanigan, D., Westerhoff, P., Ranville, J. Daily Cycling of Sunscreen and Mineralogic Ti-containing Nanoparticles in Three Rivers During Recreational Water Use. International Conference on the Environmental Effects of Nanoparticles and Nanomaterials, Durham, NC. September 2018
20. [Thapa, U.](#), [Cluff, C.](#), Hanigan, D. Waterless Urinals: A Potential Extraction Media for Wastewater Pharmaceuticals. Nevada Water Environment Association Annual Conference, Sparks, NV. April 2018. **(2<sup>nd</sup> Place – Best Poster)**
21. [Poustie, A.](#), Roback, S., Ishida, K., Thurman, E. M., Ferrer, I., Plumlee, M. H., Westerhoff, P., [Hanigan, D.](#) NDMA Precursor Transformation During RO/UV/AOP for Indirect Potable Reuse. Gordon Research Conference: Drinking Water Disinfection By-products, South Hadley, MA. July 2017.
22. [Taylor-Edmonds, L.](#), Chih Fen Lee, T., Fischer, N., Hanigan, D., Beita-Sandi, W., Westerhoff, P., Karanfil, T., Krasner, S. W., Andrews, R. C. Genotoxicity and DBP Breakthrough Study: Granular Activated Carbon. Gordon Research Conference: Drinking Water Disinfection By-products, South Hadley, MA. 2017.
23. [Cluff, C.](#), [Hanigan, D.](#) Taking Advantage of Waterless Urinal Design to Removal Pharmaceuticals at the Source. Association of Environmental Engineering and Science Professors Biannual Conference, Ann Arbor, MI. June 22, 2017.
24. [Hanigan, D.](#), Truong, L., Tanguay, R., Westerhoff, P. Comparing Human- and Eco-toxicity of Nanomaterial and Organic Chemical Active Ingredients in Sunscreens. 13<sup>th</sup> International Water Association Leading Edge Conference on Water and Wastewater Technologies, Jerez de la Frontera, Spain. June 14, 2016.
25. [Hanigan, D.](#), Reed, R., Yang, Y., Lee, S., Westerhoff, P. Measuring Nanoparticulate and Dissolved Titanium in Urban Recreational Waterways near Phoenix, AZ. Central Arizona-Phoenix Long-Term Ecological Research Project Annual Symposium, Scottsdale, AZ. Jan 15, 2016.
26. [Hanigan, D.](#), Thurman, M., Ferrer, I., Westerhoff, P. Matlab Enabled Trawling of QqTOF Spectra for NDMA Specific Diagnostic Neutral Ion Fragments. Gordon Research Conference: Drinking Water Disinfection By-products, South Hadley, MA. 2015.

27. Hanigan, D., Thurman, M., Ferrer, I., Herckes, P., Andrews, S., Westerhoff, P. Methadone Contributes to *N*-nitrosodimethylamine Formation in Surface and Wastewater. AZ Water Annual Conference, Glendale AZ. May 6-8, 2015.
28. Hanigan, D., Herckes, P., Krasner, S. W., Westerhoff, P. Contribution and Sources of NDMA in Drinking Water. AZ Water Annual Conference, Glendale, AZ. May 7-9, 2014. **(Best Poster)**
29. Hanigan, D., Zhu, E., Herckes, P., Krasner, S. W., Westerhoff, P. Physical Removal and Control of Cationic Polymer NDMA Precursors During Drinking Water Treatment. AZ Water Annual Conference, Glendale, AZ. May 1-3, 2013.
30. Hanigan, D., Herckes, P., Krasner, S., Westerhoff, P. Adsorption of N-Nitrosodimethylamine Precursors by Powdered and Granular Activated Carbon. Gordon Research Conference: Drinking Water Disinfection By-products, South Hadley, MA. 2012.
31. Hanigan, D., Westerhoff, P. and Herckes, P. Reduction of N-Nitrosodimethylamine Formation during Chloramination by Activated Carbon Precursor Adsorption. Arizona State University Graduate Research Symposium, Tempe, AZ. Mar 15, 2012.
32. Hanigan, D. and T. E. Clevenger. Understanding MIEX® and Activated Carbon NOM Removal Mechanisms in Relation to Disinfection By-product Formation Potential. Mid America Environmental Engineering Conference, Rolla, MO. 2010.

## **MENTORSHIP** (affiliation after graduating in parentheses, when known)

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### **Research Scientists at UNR**

- |                             |              |
|-----------------------------|--------------|
| 1. Sivachandiran Loganathan | 2024-present |
| 2. Srinidhi Lokesh          | 2024-present |

### **Post Docs at UNR**

- |                                   |           |
|-----------------------------------|-----------|
| 1. Xuexiang He                    | 2021-2022 |
| 2. Ibrahim Abusallout (CDM-Smith) | 2019-2021 |

### **Chair for UNR PhD Students**

- |                                            |              |
|--------------------------------------------|--------------|
| 1. Plabon Turzo                            | 2024-present |
| 2. Samiul Ahsan                            | 2024-present |
| 3. Shaik Mohammed Joarder                  | 2024-present |
| 4. Seth McCoy                              | 2022-present |
| 5. Kenny Hickenbottom                      | 2023         |
| 6. Mingrui Song (post-doc at UC-Riverside) | 2022         |
| 7. Junli Wang (post-doc at UC-Riverside)   | 2022         |
| 8. Priyamvada Sharma (Geosyntec)           | 2021         |
| 9. Utsav Thapa (post-doc at SUNY-Buffalo)  | 2021         |

### **Chair for UNR MS Students**

- |                                             |               |
|---------------------------------------------|---------------|
| 1. Lauren Edwards                           | Expected 2025 |
| 2. Haley Grable (Keller Associates)         | 2023          |
| 3. Michael DeNicola (USGS)                  | 2023          |
| 4. Kevin Stewart (Keller Associates)        | 2022          |
| 5. Elizabeth McKenna (Corona Environmental) | 2020          |
| 6. Saeed Arabi                              | 2020          |
| 7. Andrew Poustie (Stantec)                 | 2018          |

### **Undergraduate mentees at UNR**

- |                                                 |              |
|-------------------------------------------------|--------------|
| 1. Diego Castellano                             | 2023-present |
| 2. Jordyn Dashiell                              | 2023-present |
| 3. Vivian Fyda                                  | 2023, 2024   |
| 4. Eden Ansell                                  | 2022-2023    |
| 5. AJ Mathew                                    | 2022-2023    |
| 6. Aditya Prathap                               | 2022-2023    |
| 7. Dalia Marin-Rios (Lumos and Associates)      | 2022-2023    |
| 8. Jacquelyne Kittredge (Keller and Associates) | 2021-2022    |

9. Aron Chan (NV DOT)	2019-2021
10. Jackson Alicata	2018-2019
11. Paul Wilkerson	2018
12. Richard Mannschreck	2018
13. Chelsea Cluff	2016-2017

#### **Committee member while at UNR**

1. Alyssa Radakovich	2024-present
2. Anil Timilsina	2024-present
3. Dilara Hatinoglu (U Maine)	2023-present
4. Zhizhen Zhang – PhD	2021-present
5. Abrar Shahriar - PhD	2022-2023
6. Niloufar Gharoon Dastjerdi - PhD	2022-2023
7. Srinidhi Lokesh – PhD	2020-2023
8. Nicolas Silva – PhD	2018-2022
9. Laura Haak – PhD	2018-2020
10. Grant Busse – MS	2019-2020
11. Dinesh Adhikari – PhD	2018
12. Nicole Furtaw – MS	2017

#### **Visiting Scholars**

Richard Jacquet, France	2017
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#### **Graduate mentees while at ASU**

Xiaobin Liao	2013-2014
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#### **Undergraduate mentees while at ASU and MU**

Arthur Petit	2010-2015
Hanna Huling	
Nora Aoudjehane	
Dylan Lesan	
Harsha Sharma	
Lesley Le	
Ted Grimes	

## **SERVICE**

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American Water Works Association Organic Contaminants Research Committee	
Chair	2019-2023
Vice Chair	2018-2019
Stead Elementary School Volunteer	2016-2024
Water Environment Federation Awards & Recognition Committee	2015-present
IWA Leading Edge Technology Conference Organizing Core Committee	2021-2022
AWWA ACE Special Topics Session Chair	2021
ACS Fall Conference ENVR Symposium Co-Chair	2020
American Water Works Association Scholarship Committee	2019
NSF CBET Review Panelist	2019
Water Reuse Research Foundation Project Advisory Committee Member	2016-2019
American Water Works Association Organic Contaminants Control Committee	2016-2018
National Science Foundation Environmental Chemical Sciences ad hoc reviewer	2018
Nevada Regional Science Olympiad Dynamic Planet Event Supervisor	2018
Nevada State Science Olympiad Hydrogeology Event Supervisor	2017
National Science Foundation Graduate Research Fellowship Program (NSF GRFP)	2016
Civil and Environmental Engineering Review Panelist	
Founder and President, Graduate Students for the Environment, Arizona State University	2013-2014

Social Chair, Association of Graduate Civil Engineers, School of Sustainable Engineering and the Built Environment, Arizona State University 2013-2014  
Journal Reviewer - I regularly review for the following journals: Industrial & Engineering Chemistry Research, Separation Science and Technology, Water Research, ACS Symposium Series Book Chapter, Environmental Science and Pollution Research, Environmental Engineering Science, Science of the Total Environment, Environmental Science & Technology, Journal of Environmental Sciences, RSC Advances, Chemosphere, Journal American Water Works Association, Environmental Science & Technology Letters, Journal of Cleaner Production, Environmental Science: Water Research & Technology

## TEACHING

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Environmental Engineering Systems: Principles and Design (CEE 390) Every Spring, 2018-2023  
Design of Water Treatment Systems (CEE 456/656) Every Fall since 2017  
Physiochemical Water Treatment (CEE 752) Every Fall since 2017

## OTHER EXPERIENCE

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**Hanigan Consulting LLC, Reno, NV**  
Development and Validation of Vapor Phase PFAS Methods, RTI International 2023-2024  
Disinfection By-product mitigation, Keller Associates 2022-2024

## IN PUBLIC MEDIA

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1. [Breaking the Forever Cycle: PFAS Destruction & EPA Methodologies \(concentratingonchromatography.com\)](http://concentratingonchromatography.com)
2. [Maine Is a Warning for America's PFAS Future - The Atlantic](http://The Atlantic)
3. ['Forever chemicals' confirmed at multiple North Valleys locations: What we know \(thisisreno.com\)](http://thisisreno.com)
4. ["Forever chemicals" in Swan Lake remain unconfirmed but have officials concerned \(thisisreno.com\)](http://thisisreno.com)
5. [PFAS in Swan Lake | City of Reno](http://City of Reno)
6. [Officials: Swan Lake contaminated with 'forever chemicals' \(thisisreno.com\)](http://thisisreno.com)
7. ["Forever chemicals" found in Swan Lake | KRNV \(mynews4.com\)](http://mynews4.com)
8. [High Level of 'Forever Chemicals' Found in Swan Lake | Local News | 2news.com](http://2news.com)
9. [Swan Lake: New worries, same distrust \(kolotv.com\)](http://kolotv.com)
10. [High Levels Of PFA Chemicals Found In Swan Lake | News | 2news.com](http://2news.com)
11. [The National Journal – "California burning: How wildfires are threatening the West's water"](http://The National Journal)
12. [Environmental Science: Water Research & Technology blog – "Emerging Investigator Series – David Hanigan"](http://Environmental Science: Water Research & Technology blog)
13. [PBS Newshour Science Wednesday – "Scientists Trace Cancer-causing Chemical in Drinking Water back to Methadone"](http://PBS Newshour Science Wednesday)
14. [American Chemical Society Chemical & Engineering News – "Heroin Analog May Form Carcinogen in Drinking Water"](http://American Chemical Society Chemical & Engineering News)
15. [Chromatography Online – "Methadone Linked to NDMA Contamination in Drinking Water"](http://Chromatography Online)
16. [Water Online – "Methadone in the Water: What's the Real Risk?"](http://Water Online)
17. [US Finance Post – "Drinking Polluted Water Could Cause Cancer?"](http://US Finance Post)
18. [Water Online – "Chloramination May Introduce Cancer-Causing Chemicals"](http://Water Online)
19. [Water Conditioning & Purification Magazine – "On Tap: Methadone Creates Harmful Byproducts in Treated Drinking Water"](http://Water Conditioning & Purification Magazine)