

Matthew Sima, Ph.D.

From laboratory scale to pilot scale: using boron nitride photocatalytic systems to defluorinate environmental levels of PFAS in brackish groundwater

Matthew Sima is a Postdoctoral Fellow at the Rice Water Institute (RWI) at Rice University working with Professor Michael Wong and Professor Pedro Alvarez. He received his Ph.D. in Civil and Environmental Engineering (CEE) at Princeton University where he studied the biological remediation of PFAS in contaminated soils with Professor Peter Jaffe. His research at Rice has now expanded to include both PFAS policy research and PFAS remediation in alternate media including brackish water and ion exchange resin. Currently, Matthew is spearheading a joint USBR project between BGNDRF and Rice University to study the photocatalytic destruction of PFAS in brackish water using boron nitride (BN). His results are supported by the production of fluoride ions, short-chain intermediates, and a complete mass balance for the destroyed PFAS. For this project, he has completed the first field test of a pilot scale boron nitride photocatalytic reactor at BGNDRF and shown the destruction of PFAS in both natural brackish groundwater and reverse osmosis concentrate.

For his work in pollution remediation, Matthew has been recognized by various academic institutions, industrial partners, and professional organizations. He was awarded the 2024 Wallace Memorial Fellowship, the 2023 Award for Excellence, and the Science, Technology, and Environmental Policy Fellowship by Princeton University. He received the 2024 John J. Lagrosa Award by the New Jersey Water Environment Association and the 2023 Clark Soil Biology Graduate Student Scholarship by the Soil Science Society of America. Lastly, he placed 3rd in the Annual Conference Exposition Student Poster Competition held by the New Jersey Water Environmental Association and 2nd in the Geosyntec Groundwater Student Paper Competition held by Geosyntec Consultants. Matthew plans to continue his work on emerging contaminants, with a focus on PFAS catalysis, and will apply for both industry and academic positions this year.