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John Gunnell, Ph.D.

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Professional Profile

Dr. Gunnell is a quantitative ecosystem scientist with over fifteen years of experience analyzing environmental changes and their causes. He supports clients in litigation, natural resource damage assessments (NRDA), and regulatory decision-making, specializing in reconstructing historical environmental conditions. From land use and contamination to climate impacts, Dr. Gunnell uses advanced data integration, geospatial analysis, and environmental forensics to help clients clarify complex historical records, quantify ecological and chemical impacts, and distinguish natural variability from anthropogenic effects. His work provides science-based narratives for cases involving sediment quality, PFAS sourcing, water quality disputes, habitat impacts, and regulatory strategy, turning data into evidence for negotiation, settlement, or trial.

Dr. Gunnell frequently applies simulation modeling and statistical methods to integrate disparate data sets into a standardized spatio-temporal frame of reference. His work often assimilates geochronology, temporally ordered geochemical proxies, and geographic information (e.g., spatially registered land-use records, remotely sensed data, and aerial photography). Since his expertise occupies several disciplinary intersections, Dr. Gunnell frequently collaborates with multidisciplinary teams of physicists, geologists, fisheries ecologists, and restoration ecologists.

Dr. Gunnell's background in reconstructing baseline conditions and ecosystem trajectories makes his expertise especially useful for clients that need to fill significant historical knowledge gaps when evaluating contemporary and legacy impacts of environmental disturbances (e.g. land use change, contaminant exposure, and climatic stressors). Dr. Gunnell is a broadly trained environmental analytical chemist. His experience includes but is not limited to trace and minor element geochemistry (using X-ray fluorescence, ion chromatography, energy dispersive spectroscopy, and inductively coupled plasma mass spectrometry), radioisotope geochemistry (uranium-thorium-lead series), and water quality analysis (e.g., nitrate, orthophosphate, alkalinity, and chlorophyll-α).

Academic Credentials & Professional Honors

Ph.D., Marine Sciences, University of North Carolina, Chapel Hill, 2016

M.S., Marine Sciences, University of North Carolina, Chapel Hill, 2011

B.S., Ecology and Evolutionary Biology, University of Michigan, 2009

Prior Experience

Postdoctoral Fellow, Northeastern University, 2016-2020

Graduate Research Assistant, University of North Carolina at Chapel Hill, 2009-2016

Publications

Cameron LP, Reymond CE, Bijma J, Büscher J.V., De Beer D., Eagle R.T., Gunnell J., Müller-Lundin F., Schmidt-Grieb G.M., Westfield I. and Westphal H. "Impacts of Warming and Acidification on Coral Calcification Linked to Photosymbiont Loss and Deregulation of Calcifying Fluid pH." Journal of Marine Science and Engineering 2022; 10(8).

Westfield I, Gunnell J, Rasher DB, Williams B, Ries JB. "Cessation of Hardground Accretion by the Cold-Water Coralline Algae Clathromorphum Compactum and Clathromorphum Nereostratum Predicted Within Two Centuries." Geochemistry, Geophysics, Geosystems 2022; 22(5).

Greiner JT, McGlathery KJ, Gunnell JR, McKee BA. "Seagrass Restoration Enhances 'Blue Carbon' Sequestration in Coastal Waters." PLoS ONE 2013; 8(8).

Gunnell JR, Rodriguez AB, McKee BA. "How a Marsh is Built from the Bottom Up." Geology 2013; 41(8):859-862.

Presentations

Cameron, L.P., Reymond, C.E., Bijma, J., Büscher, J.V., De Beer, D., Guillermic, M., Eagle, R.A., Gunnell, J., Müller-Lundin, F., Schmidt-Grieb, G.M. and Westfield, I., 2022. Impacts of warming and acidification on coral calcification linked to photosymbiont loss and deregulation of calcifying fluid pH. Journal of Marine Science and Engineering, 10(8), p.1106.

Westfield, I., Gunnell, J., Rasher, D.B., Williams, B. and Ries, J.B., 2022. Cessation of hardground accretion by the cold-water coralline algae Clathromorphum compactum and Clathromorphum nereostratum predicted within two centuries. Geochemistry, Geophysics, Geosystems, p.e2021GC009942.

Gunnell JR. Reconstructing warming throughout the Meso-American Barrier Reef System over the past century. Invited oral presentation: UNC Marine Sciences, Chapel Hill, NC, 2019.

Gunnell JR, Courtney T, Westfield IT, Baumann J, Castillo K, Ries JB. Reconstructing the past century of seawater temperature across the Caribbean Mesoamerican Barrier Reef System from multi-elemental coral paleothermometry, Oral presentation: ASLO/AGU: Ocean Sciences, Portland, OR, 2018.

Westfield IT, Gunnell JR, Rasher DB, Williams B, Ries JB. Acidification and warming negatively impact calcification rate, skeletal microstructure, and strength of two ecologically important species of subarctic coralline algae (Clathromorphum compactum; Clathromorphum nereostratum), Poster presentation: ASLO/AGU: Ocean Sciences, Portland, OR, 2018.

Gunnell JR and McKee BA. Suspended Sediment Yield Response to Urbanization in the U.S. Southern Piedmont. Poster presentation: GSA-Southeastern, Columbia, SC, 2016.

Gunnell JR and McKee BA. Coastal Meringues: Are Salt Marshes Inflated with Excess Void Spaces? Poster presentation: ASLO/AGU: Ocean Sciences, New Orleans, LA, 2016.

Gunnell J.R. and McKee BA. Deeply Eroded Soils Dominate the Suspended Load in the Haw River, NC. Poster presentation: WRRI, Raleigh, NC, 2016.

Gunnell JR and McKee BA. Young and Restless: Rapid Carbon Burial in a Newly Emergent Marsh, Oral presentation: CERF, San Diego, CA, 2013.

Gunnell JR and McKee BA. Neon Carbon: Patterns of Land Creation and Carbon Sequestration at the Newport River, N.C.. Oral presentation: ASLO, Otsu, Japan, July 2012.

Capps W, Gunnell JR, Shay T, McKee BA. Trends in Nutrient and Chlorophyll Concentration along the Tar-Pamlico and Neuse Rivers. Poster presentation: Eddie and Jo Allison Smith Family Foundation Symposium, Chapel Hill, NC, 2011.

Jarman K, Gunnell JR, McKee BA. Connectivity and Marsh Accretion in a Coastal Plain River Estuary, Poster presentation: ASLO-NABS, Santa Fe, NM, 2010.

Project Experience

Litigation, NRDA & Expert Witness Support

- Directed statistical and modeling critiques in NRDA cases. Performed Sediment Quality Triad analysis and developed spatially explicit probabilistic sediment toxicity (Pmax) models, identifying key methodological flaws in opposing experts' approaches that strengthened the client's defensible, site-specific risk conclusions.
- Spearheaded geospatial and statistical forensic investigations for PFAS litigation. Developed watershed-scale source-attribution models and applied principal component analysis (PCA) to compositional data to differentiate industrial source signatures, directly supporting strategies where the alleged contributor was at issue.
- Managed large-scale, multi-state environmental databases for CWA-focused mass torts. Designed and implemented automated data-triage systems to rapidly filter complex federal and confidential databases, streamlining case strategy for dozens of parties.
- Conducted multivariate statistical analysis of population-scale exposure data to identify primary drivers of variability (e.g., population density, geographic scale), directly informing potential class certification.

Human Health & Ecological Risk Assessment

- Conducted a regional-scale assessment of cadmium bioaccumulation in spinach, combining literature-derived uptake factors with geostatistical soil data to model dietary exposure variability. Supported site-specific risk screening and regulatory strategy.
- Expanded a regional probabilistic sediment toxicity (Pmax) model for dioxins, incorporating site-specific data to inform risk management decisions and cleanup levels in the Northeast Atlantic Coastal U.S.
- Assessed habitat impacts for listed species following wildfires. Integrated empirical range data, behavioral literature, and vegetation recovery models within a sensitivity analysis framework to bound potential ecological effects.

Regulatory Strategy & Environmental Data Analytics

- Supported TSCA regulatory strategy by developing automated scripts to monitor and align client's internal chemical literature reviews with the EPA's published systematic review bibliographies, ensuring comprehensive coverage and audit-ready alignment with agency methodologies.
- Analyzed longitudinal soil metagenomic data using difference-in-differences modeling to statistically evaluate the impact of soil amendments on microbial diversity, supporting a water conserving soil health initiative.

- Synthesized disparate historical records for industrial sites to construct coherent source-sink narratives and clarify chemical transport pathways, providing pivotal analysis for toxic tort allocation.

Laboratory Operations and Safety Leadership

- Served as Laboratory Manager during doctoral and postdoctoral research, with full operational responsibility. Developed, implemented, and enforced all Environmental Health & Safety (EHS) protocols, including chemical hygiene plans, hazardous material procurement, and waste stream management in compliance with OSHA and institutional standards.
- Authored standard operating procedures (SOPs) and conducted safety training for all laboratory personnel, fostering a culture of safety and procedural rigor. Maintained chemical inventories and Safety Data Sheet (SDS) libraries, ensuring continuous readiness for audits.
- Directed procurement and lifecycle management for specialized analytical equipment, chemicals, and consumables, aligning purchasing with research objectives and budgetary constraints.