

Claire Butler

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Education

Yale University

Aug 2021 - Present

Ph.D. in Chemical and Environmental Engineering

GPA: 4.0/4.0

University of Colorado Boulder

Aug 2017 - May 2021

B.S. in Environmental Engineering, Minor in Energy Engineering

GPA: 3.77/4.0 | Dean's List | Fundamentals of Engineering Exam 2021

Research Experience

Electrochemistry and Plasma for Water Treatment and Resource Recovery | Winter Lab | Yale University

May 2022 - Present

Present

- Designing an electrified membrane reactor to transform nitrate in wastewater for synthesis and recovery of ammonia.
- Developing plasma reactors and catalysts for water treatment and recovery of carbonaceous materials from per- and polyfluoroalkyl substances.
- Assessing the viability and costs of the above technologies using Life Cycle Assessment and techno-economic assessment to identify target areas for future research to maximize sustainability.

Biotechnology Special Investigation | Peccia Lab | Yale University

Aug 2021 – May 2022

- Researched global methane models including the Community Earth Systems Model and Ecosys, and began documenting the Ecosys global methane model. Ran practice code on the Yale High Performance Computer.
- Developed methods for preparing tree core samples for nucleic acid extraction to understand biological methane emissions from trees.
- Performed DNA and RNA extraction, clean up, and determination of concentration on soil samples and tree cores.
- Analyzed DNA using nanodrop spectrophotometry and quantified mcrA, pmoA, 16s bacteria, and 16s archaea gene expression using ddPCR.

Discovery Learning Apprenticeship | Cook Lab | University of Colorado

Aug 2020 - May 2021

- Assisted in the development of a Life Cycle Assessment and Life Cycle Costing model that aims to quantify the benefits of using organic municipal solid waste derived biochar for either leachate treatment or agricultural land application using SimaPro.
- Performed literature review to synthesize data into the process models while developing independent research on using municipal solid waste derived biochar as a landfill cover.

Field Research Assistant | Mansfeldt Lab | University of Colorado

Aug 2020 - May 2021

- Conducted pH, total suspended solids, microscopy, and RT-LAMP analysis on SARS-CoV-2 sewage samples.
- Collaborated with a team of researchers to perform daily maintenance on sewage collection sites and preemptively inform the university of any SARS-CoV-2 outbreaks.

Undergraduate Research Assistant | Livneh Lab | University of Colorado

Jun 2019 - Aug 2021

- Developed a novel method for visual ground cover analysis in RStudio using luminance of soil sample .png files to assess burn severity.
- Calculated rainfall intensities for the Fraser Experimental Forest sampling location based on precipitation frequencies and recurrence data from NOAA to confirm that laboratory rainfall intensities were comparable to environmental rainfall intensities.
- Performed wildfire hydrology and water chemistry research through field work, sample collection and data measurements; performed water chemistry tests (TSS, TOM); and created a series of normalized heat maps of the rainfall intensity using Matlab.
- Wrote methods for each sample processing step (sample collection, burning, rainfall, water chemistry).

- Performed a literature review to propose an alternative sampling method for calculating soil porosity for the geotechnical analysis.

Engineering Experience

Graduate Professional Fellowship | Yale Carbon Containment Lab

Aug 2021 - Present

- Investigating the feasibility and safety of incineration of wastewater sludge for the destruction of PFAS.
- Developing a techno-economic assessment of the incineration system to understand the feasibility of the technology.

Engineering Intern | Corona Environmental Consulting

May 2021 - Aug 2021

- Performed lead and copper coupon studies to compare the effectiveness of different corrosion inhibitors. Analyzed results in R.
- Developed script in R to create a nationwide PFAS drinking water database for the American Water Works Association.
- Assisted in running a nitrate sloughing study for the Water Research Foundation to understand the relationship between temperature and kinetics.
- Authored and reviewed test plans and project reports.
- Processed and prepared hazardous laboratory waste for safe disposal.

Capstone Project | WERC Environmental Design Contest | University of Colorado

Jan 2021- May 2021

Thermal Destruction of PFOA and PFOS Using Pyrolysis of Organic Municipal Solid Waste and Calcium Hydroxide

- Second Place | Pollution Prevention and Energy Efficiency Award (P2E2) | Terry McManus Outstanding Student Award
- Researched, evaluated, and designed a novel PFAS destruction technology to improve cost-effectiveness, energy efficiency, and practicality while meeting EPA advisory levels.
- Developed Life Cycle Assessment and Life Cycle Costing models using SimaPro and Excel to understand environmental impacts and cost effectiveness of the destruction technology, informing decision making for successful scale-up of the bench-model to meet field site parameters. Performed mass and energy balance calculations while modeling the system.
- Authored an IEEE style paper summarizing the results of the model and proposing next steps for developing the technology further. Presented research findings to a panel of six judges. Consulted experts in water engineering, environmental law and policy, and public health and safety to ensure design was logistically feasible.

Biogas Digester | University of Colorado | Bahia, Brazil (Study Abroad)

Jan 2019 - May 2019

- Constructed a biogas digester for the community of Serra Grande in Bahia, Brazil as part of a summer intensive course on sustainability principles in food systems and engineering.
- Collaborated with students in the Master of the Environment program at the University of Colorado and with students at the State University of Santa Cruz in Brazil via video calls and then in person to perform an economic assessment of the costs to build future digesters.

Publications

Butler, C., Fan, Y., Gerwal, S., Winter, L. (2022). "At-field fertilizer synthesis using sensor-controlled plasma processes", Invited article for ACS Sustainable Chemistry and Engineering, In Preparation.

Brucker, C., Livneh, B., **Butler, C.**, Minear, T., Rosario-Ortiz, F. L. (2022). "An analysis of wildfire effects on water quality and hydrology through laboratory simulation experiments", In Preparation.

Johnson, W., Reeves, K., Liebig, J., Feula, A., **Butler, C.**, Coe, E., Heuer, H., Jones, J. R., Key, S., Lilienfeld, J., Litton, S., Maggi, J., Nelson, L., O'Connor, K., Pulley, K., Wilkerson, P.J., Vigil, B., Zak, G., Alkire, M., Jones, K., Karr, M., Khojalakova, K., Maxwell, K., Freeman, N., Ortega, N., Saldana, E., Salvesson, L., Shimek, T., Singh, S., Tomlinson, K., Vargas-Barriga, J., Whittman, J., Bjorkman, K., Mansfeldt, C. (2022). "Effectiveness of building-level sewage surveillance during both community-spread and sporadic-infection phases of SARS-CoV-2 in a university campus population", FEMS Microbes, Accepted.

Reeves, K., Liebig, J., Feula, A., Saldi, T., Lasda, E., Johnson, W., Lilienfeld, J., Maggi, J., Pulley, K., Wilkerson, P.J., Real, B., Zak, G., Davis, J., Fink, M., Gonzales, P., Hager, C., Ozeroff, C., Tat, K., Alkire, M., **Butler, C.**, Coe, E., Darby, J., Freeman, N.,

Heuer, H., Jones, J. R., Karr, M., Key, S., Maxwell, K., Nelson, L., Saldana, E., Shea, R., Salveson, L., Tomlinson, K., Vargas-Barriga, J., Vigil, B., Brisson, G., Parker, R., Leinwand, L. A., Bjorkman, K., Mansfeldt, C. (2021). "High-resolution within-sewer SARS-CoV-2 surveillance facilitates informed intervention", *Water Research*, 204: 117613, ISSN 0043-1354, <https://doi.org/10.1016/j.watres.2021.117613>.

Selected Posters and Presentations

Undergraduate Research Symposium, CU Boulder | Poster and Oral Presentation **Apr 2021**

Organic Waste Management Systems: A Comparative Environmental Impact Assessment, *Claire Butler, Sherri Cook*.

WERC Environmental Design Contest | Poster and Oral Presentation **Apr 2021**

Thermal Destruction of PFOS and PFOA by Municipal Solid Waste Derived Biochar, *Claire Butler, Mahalie Hill, Shelby Tillema, Jenna Englken, Rita Trick, Azadeh Bolhari*, University of Colorado Boulder.

International Conference on Solid Waste Technology and Management | Oral Presentation **Mar 2021**

An Economic and Environmental Evaluation of a Novel Circular Economy Waste Management Strategy, *Brooke Marten, Claire Butler, Sherri Cook*, University of Colorado Boulder, USA.

Teaching and Mentorship

- Teaching Fellow for *Water-Energy Nexus* | Yale University **Aug 2022 – Present**
- Polygence Highschool Mentorship Program | Yale University **May 2022 – Present**
- Disability Peer Mentorship Program | Yale University **May 2022 – Present**
- Yale Graduate-Undergraduate Mentorship Initiative | Yale University **Oct 2021-Present**
- Environmental Engineering Peer Mentor | University of Colorado **Aug 2020 – May 2021**
- Undergraduate Learning Assistant | Applied Mathematics | University of Colorado **Aug 2019 – Dec 2019**
- Leadership Education and Programing (LEAP) Certification | Phi Sigma Rho | University of Colorado **Jul 2019 – Present**
- **Butler, C., Tillema, S., Trick, R. (2020)**, "Contaminant Transport in Groundwater: A Modeling Approach", *Teach Engineering*. In Preparation

Professional and Social Affiliations

- Association of Environmental Engineers and Science Professors | Yale University **Aug 2022 - Present**
- NSF ERC on Nanotechnology-Enabled Water Treatment (NEWT) | Yale University **Jun 2022 - Present**
- Graduate Engineering Community Organization (GECO) | Yale University **Feb 2022 – Present**
- Society of Environmental Engineers (SEVEN) | University of Colorado **Jan 2020 - May 2021**
- Phi Sigma Rho (A sorority for women in STEM) | VP of Communications | University of Colorado **Jan 2018 - May 2021**
 - Chapter ambassador for the 2019 National Conference
 - VP of Communications (Jan 2019 – Dec 2020) | Director of Scholarship (Aug 2018 – Dec 2019) | Sargent of Arms (Jan 2020 – Aug 2020)

Honors and Awards

- NSF GRFP Honorable Mention **Mar 2021**
- Outstanding Graduate for Research in Environmental Engineering | University of Colorado **May 2021**
- Terry McManus Outstanding Student Award | WERC Environmental Design Contest **Apr 2021**
- Phi Sigma Rho Scholarship Award | University of Colorado **May 2021**
- Phi Sigma Rho Outstanding Senior Award | University of Colorado **May 2021**
- Panhellenic Outstanding Senior Award | University of Colorado **Dec 2020**
- Thomas R. Flint Scholarship | University of Colorado **Jan 2018 - May 2021**

o President Horace M. Hale Award | University of Colorado

Aug 2017 - May 2021

Community Engagement and Volunteering

Lead Youth Rock Climbing Instructor | Movement Climbing and Fitness

Aug 2017 - Sep 2020

- o NOLS Wilderness First Responder certification (WFR) | Jul 2017 - Present
- o Climbing Wall Instructor certification (CWI) | Aug 2019 - Aug 2021

Bird Banding Research Teaching Assistant | Thorne Nature Experience

May 2014 - Jul 2017

- o Mentored students in data collection, field work, and proper laboratory etiquette when working with live birds.