

Current positions

Postdoctoral scholar, Water Systems Management Lab, Prof. Josué Medellín-Azuara, University of California, Merced.
Lecturer for the School of Engineering, University of California, Merced.
President of the educational nonprofit 4Venir Inc., California.

afernandezbou@ucmerced.edu

Telephone: +1 209 455 0841

Research profiles

researchgate.net/profile/Angel_Santiago_Fernandez-Bou
scholar.google.com/citations?user=P4b6UBkAAAAJ

5200 N Lake Rd, Sustainable Research & Engineering, suite 231
Civil and Environmental Engineering, School of Engineering
Merced, CA 95343

wsm.ucmerced.edu | 4venir.org

Profile and expertise

Transdisciplinarity: As an Environmental Systems Engineer, I work on **transdisciplinary solutions** to preserve **resources and habitat** for **society and nature**. I aim for innovation, resiliency, environmental justice, financial robustness, and scientific-based communication.

Holistic systems understanding: I am experienced at modeling different systems, including aquatic systems to forecast river flow, floods, and hydropower generation; soil systems to understand greenhouse gas emissions and groundwater movement; socioeconomic systems, for which I study quantitative, qualitative, and spatial variables to predict hydro-agro-economic systems development.

Environmental and Social Justice: I work with disadvantaged community stakeholders directly and indirectly to improve communication with communities, to engage scholars in community-based research, and to inform other stakeholders about recommended multi-benefit approaches.

Technological Democracy: I develop **low-cost sensing devices** to democratize the creation of scientific knowledge. For example, I developed a flow-through chamber to measure convective CO₂ emissions from soils, I created a mass balance model to test the accuracy of the measurements, and a fluid dynamics model to validate the empirical data versus the conceptual results.

Educational outreach: I coordinate educational events for **K12 students** from **vulnerable backgrounds** about essential scientific topics such as climate change, robotics and computation, and social science. Our team has served hundreds of students since 2016.

Languages: I am trilingual in **English, Spanish, and Portuguese**, and I have moderate comprehension of other European languages.

Education

PhD in Environmental Systems.

University of California, Merced, USA (2015 to 2019).

Advisor: Prof. Thomas C. Harmon.

Dissertation: Leaf-Cutter Ant Engineered Nest Soil CO₂ Dynamics in a Neotropical Rainforest.

Permalink: <https://escholarship.org/uc/item/2mt20084>.

MSc in Biosystems Engineering - Water resources and Environment.

Fluminense Federal University (UFF), Brazil (2013 to 2015).

Advisor: Prof. Alexandre Lioi.

Thesis: Combined treatment of landfill leachate and wastewater using powdered activated carbon. In Portuguese: *Tratamento combinado de lixiviado de aterro sanitário e esgoto doméstico por processo PACT*

Permalink: https://sucupira.capes.gov.br/sucupira/public/consultas/coleta/trabalhoConclusao/viewTrabalhoConclusao.jsf?popup=true&id_trabalho=2397059 (in Portuguese).

BEng Agricultural Engineering (BS & MS).

Polytechnic University of Madrid (UPM), Spain (1998 to 2004).

Publications in peer reviewed journals

- Fernandez Bou**, J.P. Ortiz-Partida, K. Dobbin, H. Flores-Landeros, L. Bernacchi, J. Medellín-Azuara. Underrepresented, understudied, underserved: gaps and opportunities for advancing justice in disadvantaged communities. *Environmental Science & Policy*, 2021. <https://doi.org/10.1016/j.envsci.2021.04.014>
- Fernandez Bou**, D. Dierick, M.F. Allen, T.C. Harmon. Precipitation-drainage cycles lead to hot moments in soil carbon dioxide dynamics in a Neotropical wet forest. *Global Change Biology*, 2020. <https://doi.org/10.1111/gcb.15194>.
- Bernacchi L., **Fernandez Bou**, J.H. Viers, J. Valero-Fandiño, J. Medellín-Azuara. A glass half empty: Limited voices, limited groundwater security for California. *Science of the Total Environment*, 2020. doi.org/10.1016/j.scitotenv.2020.139529.
- Fernandez Bou**, D. Dierick, T.C. Harmon. et al. Diel pattern driven by free convection controls leaf-cutter ant nest ventilation and greenhouse gas emissions in a Neotropical rain forest. *Oecologia*, 2020. doi.org/10.1007/s00442-020-04602-2.
- Swanson A.C., L. Schwendenmann, M.F. Allen, E.L. Aronson, A. Artavia-León, D. Dierick, **Fernandez-Bou**, T.C. Harmon, C. Murillo-Cruz, S.F. Oberbauer, A.A. Pinto-Tomás, P.W. Rundel, T.J. Zelikova. Welcome to the Atta world: A framework for understanding the effects of leaf-cutter ants on ecosystem functions. *Functional Ecology*, v. 33, p. 1386-1399, 2019. doi.org/10.1111/1365-2435.13319
- Fernandez Bou**, D. Dierick, A.C. Swanson, M.F. Allen, A.G. Fitzimons Alvarado, A. Artavia-León, O. Carrasquillo-Quintana, D.A. Lachman, S. Oberbauer, A.A. Pinto-Tomás, Y. Rodríguez-Reyes, P.W. Rundel, L. Schwendenmann, T.J. Zelikova, T.C. Harmon. The Role of the Ecosystem Engineer, the Leaf-Cutter Ant *Atta cephalotes*, on Soil CO₂ Dynamics in a Wet Tropical Rainforest. *Journal of Geophysical Research: Biogeosciences*, v. 123, 2018. doi.org/10.1029/2018JG004723.
- Fernandez Bou**, B. Costa Pereira, L. Duarte Batista da Silva, J.A. Ferreira, J. Carbonelli Campos, A. Lioi Nascentes. Color removal in the combined treatment of landfill leachate and domestic sewage via PACT® process. *Engenharia Sanitária e Ambiental*, Rio de Janeiro, 2018. [dx.doi.org/10.1590/s1413-41522018150425](https://doi.org/10.1590/s1413-41522018150425) (in Portuguese).
- Fernandez Bou**, R. Ventura de Sá, M. Cataldi et al. Flood forecasting in the upper Uruguay River basin. *Natural Hazards (Dordrecht)*, v. 79, p. 1239-1256, 2015. [dx.doi.org/10.1007/s11069-015-1903-7](https://doi.org/10.1007/s11069-015-1903-7).
- Fernandez Bou**, A. Lioi Nascentes, B. Costa Pereira, L. Duarte Batista da Silva, J.A. Ferreira, J. Carbonelli Campos. Mathematical modeling of COD removal via the combined treatment of domestic wastewater and landfill leachate based on the PACT process. *Journal of Environmental Science and Health. Part A*, v. 50, p. 378-384, 2015. doi.org/10.1080/10934529.2015.987533.
- Fernandez Bou**, J.C. Soares de Mello. Analysis of the multi-criteria decision-making Veto method. *Ingeniare. Revista Chilena de Ingeniería*, v. 23, p. 556-568, 2015. [dx.doi.org/10.4067/S0718-33052015000400007](https://doi.org/10.4067/S0718-33052015000400007) (in Spanish).
- Fernandez Bou**, V.H. Ferreira. Short-term load forecasting using artificial neural networks. *Engevista (UFF)*, 2014. doi.org/10.22409/engevista.v16i1.591.

Publications in review and in preparation

- Flores-Landeros, M.S. Campos-Martinez, **Fernández-Bou**, J.P. Ortiz-Partida, C. Pells, J. Medellín-Azuara. Community perspective of environmental and socioeconomic inequities: Case of the Central Valley of California. Under review in *Environmental Justice*.
- Fernandez-Bou**, J.P. Ortiz-Partida, L.M. Classen-Rodríguez, K.B. Dobbin, V. Espinoza, J.m. Rodríguez-Flores, M.L. Maskey, A. Fencel, S. Cole, H. Flores-Landeros, C. Thao, C. Pells, A.G. Alvarado, L. Bernacchi, C.C. Naughton, R.M. DeLugan, J. Medellín-Azuara. Integrating disadvantaged community needs in climate change and technical research. Abstract accepted for a call in *Frontiers in Climate*.
- Fernandez-Bou**, et al. Increasing resilience in vulnerable communities in a multiple-benefit framework. In prep.
- Ortiz-Partida, **Fernandez-Bou**, M.L. Maskey, J.M. Rodríguez-Flores, J. Medellín-Azuara, S. Sandoval-Solis, T. Ermolieva, Y. Wada, T. Kahil. Hydro-economic modeling of water resources management challenges: current applications and future directions. In prep.
- Maskey et al. Hydroeconomic impacts from additional recharge facilities on water delivery. In prep.

Selected Reports

- Ortiz-Partida, C. Weintraub, **Fernandez-Bou**, M.L. Maskey. Climate Change in the San Joaquin Valley: A Household and Community Guide to Taking Action. Union of Concerned Scientists, 2020. ucsusa.org/sites/default/files/2020-10/climate-change-in-SJValley.pdf
- Fernandez-Bou**, J. Medellín-Azuara, J.H. Viers, A.L. Westerling, et al. 4th California Climate Change Assessment for the San Joaquin Valley Region. In preparation (expected publication in June 2021).

Academic Appointments and Teaching Experience

Postdoctoral Scholar at UC Merced.

Water Systems Management Lab. Civil and Environmental Engineering, since 2019.

Project *Innovation in the Nexus of Food, Energy, and Agriculture*: PI Characklis (UNC Chapel Hill).

Project *Innovation in the Nexus of Food, Energy, and Agriculture*: PI Conklin (UC Merced).

Project *The Future of San Joaquin Valley Agriculture Under Climate Change and SGMA*: PI McCullough (CalPoly).

Lecturer at UC Merced.

School of Engineering, since 2019.

Spatial Analysis and Modeling: introduction to geographical information systems and its applications (30 to 60 students).

Engineering Economic Analysis: fundamentals of economic analysis in engineering projects (80 students).

Guest Lecturer at Stanford.

Since 2020.

Sustainable and Equitable Water Management with Prof. Rosemary Knight (2021)

Third World Problems? Environmental Justice around the World with Dr. Maira Hayat (2020, 2021)

Leader of the Environmental Systems Seminar at UC Merced. 2018 – 2019.

Seminar leaders select and invite researchers and industry professionals (30 per year) to visit campus, meet with the academic community, and present their work on interdisciplinary environmental research.

Teaching Assistant at UC Merced.

School of Engineering and School of Natural Sciences, from 2016 to 2018.

Subsurface Hydrology with Prof. Thomas Harmon

Field Methods in Subsurface Hydrology with Prof. Thomas Harmon

Capstone Innovation Design with Prof. Alejandro Gutiérrez

Graduate Student Researcher at UC Merced.

School of Engineering and School of Natural Sciences, from 2015 to 2018.

Project Quantifying the footprint of a dominant organism: Impacts of leaf cutter ants on biogeochemical cycling in tropical forests with Prof. Thomas Harmon (NSF)

Visiting professor for INBEC, São Paulo City University.

Hydrology: practical applications and modeling.

Mentoring, Outreach, and Volunteering Experience

Outreach for k-12 students.

Board of Directors of 4 Venir (4venir.org). California. Since 2016.

Coordinate workshops and activities about scientific topics for K-12 students to motivate them to pursue higher education, including topics of ecology, climate change, robotics, archaeology, and bioengineering.

Raise funds, and I have negotiated about \$100,000 in stipends for our volunteers.

Trained tens of graduate and undergraduate students from UC Merced to become instructors.

Ongoing projects and projects in preparation:

Scientific outreach for children for UC Merced Labor and Automation in California Agriculture.

Computer science for women. Sacramento Office County of Education.

Robotics for children. Sacramento Office County of Education.

Air quality education for vulnerable communities.

Groundwater Technical Assistance Network.

Union of Concerned Scientists. California. Since 2019.

I serve as an expert in groundwater issues for stakeholders in need of assistance related to the Sustainable Groundwater Management Act in California. Focus on disadvantaged communities in the Solano county.

NSF-LSAMP REU mentor.

Organization for Tropical studies, La Selva, Costa Rica. 2016 and 2017.

Research mentor of four undergraduate students of underrepresented minorities on tropical carbon cycle and the effects of dominant organisms.

Ana Grace Alvarado is a PhD student in California. Yorelyz Rodriguez-Reyes is a graduate student in Puerto Rico. Shaquetta Johnson is a teacher in China (when we met. she had never gone out of her county in Jackson, Mississippi). Odemaris Carrasquillo is an Engineer in Puerto Rico.

Academic mentoring and training.

UC Merced, since 2019: Water Systems Management Lab (Medellín-Azuara Lab). Student mentoring.

Humberto Flores graduated with honors and won the outstanding student award. Now he is Junior Specialist and will start his PhD in Fall 2021.

UC Merced, 2016 to 2019: Harmon Lab, training workshops for visiting scholars and mentoring undergraduate students on how to fabricate low-cost devices for environmental monitoring.

UC Merced, 2017 to 2018: GRAD-EXCEL PEER MENTOR of three PhD students.

UFF, Brazil, 2013 to 2015: Graduate mentoring for MSc Biosystems Engineering students; Co-advisor of an undergraduate student; Committee member in environmental engineering project defenses.

Reviewer.

Journal of Geophysical Research: Biogeosciences; PLOS ONE; Ecosphere.

Selected public scientific presentations and media presence.

Talk: Hydrologic Sciences Graduate Group seminar, UC Davis, California. 2021. Title: Underrepresented, Understudied, underserved.

Interview: Unfiltered (documentary about water security in the San Joaquin Valley of California). 2021.

Talk: Voice for Change. Saint Louis University, April 2021. Title: Underrepresented, Understudied, underserved.

Talk: Diversity, Equity, and Inclusion in Water. University of California, Agriculture and Natural Resources Extension, Mar 2021. Title: Underrepresented, Understudied, underserved.

Panel coordination: Community Engaged Research Reception, UC Merced, Mar 2021. Title: Engineers and Community-engaged research.

Talk: The Water Talk Podcast, University of California, Agriculture and Natural Resources Extension, 2021. Title: Climate change in the San Joaquin Valley. Available at ciwr.ucanr.edu/WaterTalk.

Interview: The Hour of Truth, Fresno, Nov 2020. Topic: Educational guide for disadvantaged communities to adapt to climate change. Available at youtu.be/L5sqFAq-DHM?t=1690 (in Spanish).

Talk: Water Resources Webinar. University of California, Agriculture and Natural Resources Extension, Nov 2020. Title: A glass half Empty: limited voices, limited groundwater in California & Underrepresented, Understudied, underserved. Available at youtu.be/VO3U0fygMHg.

Talk: Environmental Systems Graduate Program Seminar. UC Merced, California. Feb 2020. Title: How Leaf-Cutter Ant Nests Change Soil CO₂ Dynamics in Neotropical Rainforests

Talk: V Workshop em Engenharia de Biosistemas, Brazil, Nov 2019. Title: Effects of leaf-cutter ants in a Neotropical Wet Forest soil. Available at facebook.com/pgebuff/videos/1000166943665344 (in Portuguese).

Talk: Week of Biological Sciences at the Universidad Nacional, Jul 2017, San José. Costa Rica. Title: En lo oscuro del hormiguero: emisiones de CO₂ por hormigas cortadoras de hojas (in Spanish)

Talk: Association of Tropical Biology and Conservation, 2017, Merida. Mexico. Title: The effects of a dominant organism (leaf cutter ants) on Neotropical Rainforest carbon cycling

Posters: American Geophysical Union, USA.

Leaf Cutter Ant (*Atta cephalotes*) Soil Modification and In Situ CO₂ Gas Dynamics in a Neotropical Wet Forest. 2016, San Francisco.
The Role of the Ecosystem Engineer, the Leaf-Cutter Ant *Atta cephalotes*, on Soil CO₂ Dynamics in a Wet Tropical Rainforest. 2018, Washington D.C.

Underrepresented, underserved, understudied: gaps and opportunities for advancing justice in disadvantaged communities. 2020, San Francisco.

Fellowships, Awards, Grants and Financial Support

2020. Highlighted Student Paper at *Oecologia*.

2019. Graduate Dean's Dissertation Fellowship. Granted by UC Merced Graduate Division. One per program and year.

2016 to present. Grants and awards for nonprofit education. \$100,000 in ten of awards (approximately).

2016 – 2017. Graduate Student Opportunity Program Fellowship. Granted by UC Merced Graduate Division. One per year.

2016; 2017. Environmental Systems Summer Fellowship. Granted by the School of Engineering, UC Merced.

2013 – 2015. Merit-based fellowship, MSc level. Granted by the Coordination for Improvement of Higher Education Personnel.

Experience in the Private Sector

Research consultant, 2013 – 2015. For *WX Energy* and *Statkraft*, Brazil. Watershed and river flow modeling to optimize hydropower generation. I coordinated and mentored two teams of ten researchers of environmental engineers.

Investments consultant, 2011 – 2013. For Grupo Morais Cunha, Rio de Janeiro. Real estate and investments.

Strategic consultant, 2009 – 2011. For 4allSOLUTIONS, Brazil and Belgium. Market and strategy to establish a software product.

Controller – Auditor, 2006 – 2008. For Grupo Soledad, Spain and Portugal. Supervision of 250 workers in processes quality control. Internal process definition; control of incomes, expenses, and purchases; market strategy; risk prevention.

Project Engineer, 2004 - 2005. For the *Government of Valencia*, Spain, at the *Natural Park of the La Mata and Torrevieja Lagoons*. Conservation of natural resources coexisting with local organic viticulture. Outreach projects of citizen science.

Computation

Programming languages:

R: sample at doi.org/10.1594/PANGAEA.887400.

MATLAB: sample at doi.org/10.6084/m9.figshare.11513994.

Arduino.

Mathematica.

Visual Basic. Excel macros.

Software:

ArcGIS.

HYDRUS (unsaturated soil modeling).

Maxent (ecological niche modeling).

Stella (systems modeling).

GIMP.

Camtasia.

Other selected skills

Greenhouse technology and automation: specialty course (211 hours) at the Polytechnic University of Madrid.

Wilderness First Aid and CPR training. Sierra Rescue, California.

Terrestrial and aquatic first aid. Red Cross, Spain (32h and 20h respectively).

International license to pilot recreational boats of up 12 m, including sailing ships.

Music studies from 1989 to 1997; tens of performances (national and international) with chamber orchestras and music bands.

ISO 9000. Regulation and auditory (20 h).

Organic vineyard farming. Government of Valencia, Spain. Legal habilitation to farm organic vineyards (30 h).

Realtor. Legal education required to represent real estate owners and buyers in Brazil (1640 h).

Real estate appraisal. Legal habilitation to conduct real estate assessments and appraisals in Brazil (20 h).

Muay-Thai (blue kruang).

Technical Sport Studies. Legal habilitation to lead a gymnasium in Spain (300 h).

Auto repair and tires. Legal habilitation to lead an auto repair store in Spain (16 h).

Salesman techniques (16 h).

Languages

English: Fluent. PhD from a US institution. Living in the US since 2015.

Spanish: Native. BEng from a Spanish institution.

Portuguese: Fluent. MSc in from a Brazilian institution and six years living in Brazil.

Moderate knowledge of other European languages: Catalanian, Italian, and French.