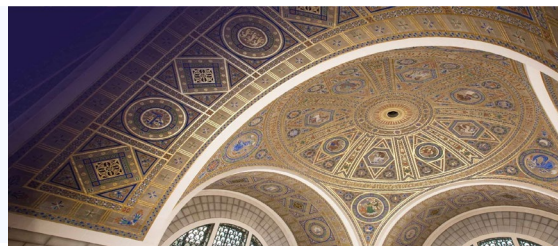


Paving the Way for Continental Scale Biology: Tools and Approaches for Connecting Research Across Scales (A Webinar Series)

Public Agenda for June 15, 2023



MEETING GOAL AND OBJECTIVES

This is the second of three public information gathering sessions exploring how biological research at multiple scales can inform the development of a continental scale biology. This session will focus on the application of networks, analytical and sampling tools, data integration and artificial intelligence approaches to continental scale biology, and the role of biological and ecological theory in continental scale biology, and challenges that limit their application. This event will provide a platform for creative collaboration among experts from multiple fields, organizations, and sectors.

THURSDAY, JUNE 15, 2023

12:30-12:35 pm ET	Welcome & Opening Remarks Jianguo (Jack) Liu, Michigan State University (Chair)
12:35-1:35 pm	Panel 1: Applications of Observatory and Data Gathering Networks Moderator: Phoebe Zarnetske, Michigan State University Panelists: Lisette de Senerpont Domi, Global Lake Ecological Observatory Network (GLEON), Netherlands Institute of Ecology Paula Mabee, National Ecological Observatory Network (NEON) Osvaldo Sala, Long Term Ecological Research Network (LTER), Arizona State University Margaret Torn, Ameriflux, Lawrence Berkeley National Laboratory
1:35-1:45 pm	Break
1:45-2:45 pm	Panel 2: Applications of Analytical and Sampling Tools Moderator: Scott Goetz, Northern Arizona University Panelists: Matthew Barnes, Texas Tech University Jessica Ernakovich, University of New Hampshire Susan Trumbore, Max Planck Institute, University of California Irvine
2:45-2:55 pm	Break
2:55-3:55 pm	Panel 3: Applications of Data Integration and Artificial Intelligence Moderator: Jeannine Cavender-Bares, University of Minnesota Panelists: Jennifer Balch, Environmental Data Science Innovation & Inclusion Lab (ESIL), University of Colorado Boulder Tanya Berger-Wolf, Ohio State University Matthew Jones, National Center for Ecological Analysis and Synthesis (NCEAS)

Yaxing Wei, Oak Ridge National Laboratory

3:55-4:00 pm

Break

4:00-5:00 pm

Panel 4 – The Role of Biological and Ecological Theory

Moderator: Brian Enquist, University of Arizona

Panelists:

Elena Litchman, Carnegie Institution for Science

Alan Hastings, University of California, Davis

James Heffernan, Duke University

Christopher Kempes, Santa Fe Institute

MEETING ADJOURNS

SPEAKER BIOS

JENNIFER BALCH, ENVIRONMENTAL DATA SCIENCE INNOVATION & INCLUSION LAB (ESIL), UNIVERSITY OF COLORADO BOULDER

Dr. Jennifer Balch is Director of the National Science Foundation's newest data synthesis center, the Environmental Data Science Innovation & Inclusion Lab (ESIL), at the University of Colorado-Boulder. She is an Associate Professor in the Department of Geography and a Fellow at the Cooperative Institute for Research in Environmental Sciences. Dr. Balch's research aims to understand the patterns and processes that underlie disturbance and ecosystem recovery, particularly how people are shifting fire regimes and the consequences. Her work spans from temperate regions to the tropics and leverages big data from satellites to social media. She has conducted research in the field of fire ecology for over twenty years, and has lit a few experimental burns to understand the consequences of altered fire regimes.

MATTHEW BARNES, TEXAS TECH UNIVERSITY

Matthew Barnes is an Associate Professor in the Department of Natural Resources Management at Texas Tech University, where his research and teaching focus on aquatic ecology, management of biological invasions, and environmental DNA. Before arriving at Texas Tech in 2014, Barnes earned his PhD from the University of Notre Dame and a BA degree in biology and sociology from Southwestern University, a liberal arts university in Georgetown, Texas.

TANYA BERGER-WOLF, OHIO STATE UNIVERSITY

Dr. Tanya Berger-Wolf is the Director of the Translational Data Analytics Institute and a Professor of Computer Science Engineering, Electrical and Computer Engineering, as well as Evolution, Ecology, and Organismal Biology at the Ohio State University. As a computational ecologist, her research is at the unique intersection of computer science, wildlife biology, and social sciences. Berger-Wolf is also a director and co-founder of the Artificial Intelligence for wildlife conservation software non-profit [Wild Me](#), home of the [Wildbook](#) project, which brings together computer vision, crowdsourcing, and conservation. Wildbook has been featured in media, including [Forbes](#), [National Geographic](#), [The New York Times](#), and [CNN](#). Prior to coming to OSU in January 2020, Berger-Wolf was at the University of Illinois at Chicago. She holds a Ph.D. in Computer Science from the University of Illinois at Urbana-Champaign. She is widely published and is a sought-after invited speaker. Berger-Wolf has received numerous awards for her research and mentoring, including the highest honor of University of Illinois Scholar, UIC Distinguished Researcher of the Year, US National Science Foundation CAREER, Association for Women in Science Chicago Innovator, and the UIC Mentor of the Year.

LISETTE DE SENERPONT DOMIS, GLOBAL LAKE ECOLOGICAL OBSERVATORY NETWORK (GLEON), NETHERLANDS INSTITUTE OF ECOLOGY

Dr. Lisette N. de Senerpont Domis is an aquatic ecologist at the Netherlands Institute of Ecology (NIOO-KNAW). She holds a PhD in Natural Sciences of Leiden University. She is interested in how different components of human-induced global changes, such as climate warming, eutrophication, and habitat fragmentation affect species interactions. Lisette is professor by special appointment at the University of Twente, holding a chair in "Smart ecological monitoring of aquatic systems". Over the years, stimulated by the urgency of the ecology crisis this planet is facing, she became more and more interested in making ecological principles operational for aquatic ecosystem management and conservation. She is head of the Aquatic Knowledge centre Wageningen or AKWA, a translational science unit at the NIOO-KNAW. AKWA translates state-of-the art fundamental scientific knowledge to encompassing solutions for the complex problems water users face in the light of fast environmental changes. Her current research spans the continuum from fundamental scientific research to applied research. Importantly, she builds on fundamental scientific insights to answer applied questions. As complex environmental issues require a multifaceted approach, she often adopts a team science approach, also reflected in her co-chair position at the Global Lake Ecological Observatory Network (GLEON).

JESSICA ERNAKOVICH, UNIVERSITY OF NEW HAMPSHIRE

Jessica Ernakovich is an Associate Professor of Microbial Ecology and the co-director of the Center of Soil Biogeochemistry and Microbial Ecology (Soil BioME) at the University of New Hampshire. Her research aims to understand how disturbance from environmental change—ranging from agricultural management to permafrost thaw—affects the function of ecosystems, with a specific emphasis on greenhouse gas production, soil organic matter formation, and nitrogen mineralization. Her research team does collaborative science investigating how microbial communities interact with and function in their physical, chemical, and biological environment using a mixture of science tools—including high-throughput sequencing of nucleic acids and tracing of chemical transformations with stable isotopes. Of particular interest to this webinar is her interest in scaling mechanistic understanding of microbial communities in thawing permafrost ecosystems to informing climate-feedbacks.

ALAN HASTINGS, UNIVERSITY OF CALIFORNIA DAVIS

Dr. Alan Hastings is a Distinguished Professor Emeritus in the Department of Environmental Science and Policy at the University of California, Davis. He has published over 300 papers on theoretical ecology including ecosystem management. He is an elected member of the National Academy of Sciences, a fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, the Ecological Society of America, SIAM and the Society for Mathematical Biology. He is the founding Editor-in-Chief of the journal Theoretical Ecology, co-editor in Chief of the Bulletin of Mathematical Biology and co-edited the Encyclopedia of Theoretical Ecology.

JAMES HEFFERNAN, DUKE UNIVERSITY

James B. Heffernan is an Associate Professor in the Nicholas School of the Environment at Duke. Dr. Heffernan was a co-leader of working group that generated the first published definition of macrosystems ecology. His research interests include the establishment and persistence of wetlands, the production and consumption of organic matter in river networks, and the homogenization and divergence of urban ecosystems. What unifies his work in these diverse topics is the effort to integrate understanding of local and regional-scale processes.

MATTHEW JONES, NATIONAL CENTER FOR ECOLOGICAL ANALYSIS AND SYNTHESIS (NCEAS), UNIVERSITY OF CALIFORNIA SANTA BARBARA

Matt directs the Informatics program at NCEAS, which focuses on both supporting efficient synthesis through scientific computing and on building new advanced infrastructure to support data sharing, preservation, analysis, and modeling. Matt is the Director of the DataONE program, a global network of interoperable data repositories, and of the NSF Arctic Data Center. In addition to data infrastructure work at NCEAS, Matt also helps to build the NCEAS Learning Hub through an emphasis on data science and reproducible research teaching. Matt's career

has focused on improving data science infrastructure to support cross-disciplinary and synthetic science, principally through the development of open source software for data repositories, metadata systems, and reproducible analysis and modeling. Matt has a M.S. in Zoology from the University of Florida that focused on the ecology of plant-animal interactions, and a B.A. from Dartmouth College.

CHRISTOPHER KEMPES, SANTA FE INSTITUTE

Christopher Kempes is a professor at the Santa Fe Institute. In the broadest terms Chris is interested in finding theories and principles that apply to a wide range of biological scales and hierarchies. Chris generally focuses his work on biological architecture—which may include phenomena ranging from explicit biological morphology to metabolic and genetic network structure—as an intermediate between organism physiology and environmental conditions. Mathematical and physical theories lie at the heart of his methodologies to predict how evolution has shaped architecture and how this, in turn, forms a foundation for reliable predictions of environmental response and interaction. His work spans the scales of genetic information architecture to the morphology of microbial individuals and communities to the regional variation of plant traits and their feedback with climate and available resources.

ELENA LITCHMAN, CARNEGIE INSTITUTION FOR SCIENCE

Elena Litchman is a faculty member in the Department of Global Ecology of the Carnegie Institution for Science and a Professor (by courtesy) in the Departments of Earth System Science and Biology at Stanford University. Prior to joining Carnegie and Stanford, she was an MSU Foundation Professor at Michigan State University. She received her undergraduate degree from Moscow State University, Russia, and Ph.D. in Ecology from University of Minnesota. Dr. Litchman is an ecologist, interested in community assembly, resilience, and eco-evolutionary responses of microbial communities to changing environments, including anthropogenic global change, and the consequences of community changes for biodiversity, biogeochemical cycles, and ecosystem functioning. She works on a wide range of systems, from freshwater lakes, to oceans, gut microbiota and algal biofuel communities. She uses experiments, field work, data analyses and models to investigate fundamental and applied questions in ecology and environmental science, from physiological to planetary scale. She received the G. Evelyn Hutchinson Award from the Association for the Sciences of Limnology and Oceanography (ASLO), and the Petersen Foundation Excellence Professorship Award from the Helmholtz Center for Ocean Research, Germany. She is the recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE) and the NSF CAREER Award, and an ASLO fellow.

PAULA MABEE, NATIONAL ECOLOGICAL OBSERVATORY NETWORK

Dr. Paula Mabee is the Chief Scientist and Observatory Director for the National Ecological Observatory Network (NEON). Previously she held the Nolo Distinguished Professor position in the Department of Biology at the University of South Dakota, serving in that capacity since 1997. She joined the National Science Foundation in 2015, serving until 2017 as Division Director for the Division of Environmental Biology in the Directorate of Biological Sciences. Mabee holds a BA in biology and a BA in religion from St. Olaf College in Minnesota, a Ph.D. in Zoology from Duke University, and was a postdoctoral fellow at the Smithsonian Institution in the Division of Fishes and an NSF postdoctoral fellow in developmental biology at Dalhousie University in Nova Scotia. Nationally she has served as the president of the Society of Systematic Biologists, and on the Board of Governors for the American Society of Ichthyologists and Herpetologists. She was awarded the Joseph S. Nelson Lifetime Achievement Award in Ichthyology in 2020. During her career, Mabee has authored more than 70 research publications, received 12 NSF and NIH research grant awards totaling close to \$7 million, and held numerous editorial and advisory board positions.

OSVALDO SALA, ARIZONA STATE UNIVERSITY

Osvaldo Sala is the Julie A. Wrigley, Regents' and Foundation Professor, at Arizona State University. He is also the Founding Director of the Global Drylands Center. He came to ASU in 2010 from Brown University where he was the founding Director of the Environmental Change Initiative and the Sloan Lindemann Professor of Biology. Osvaldo has been trained as an ecologist working from the local to the global levels. He is known for his large-

scale field manipulative experiments simulating climate change around the world. At the global scale, he participated in several assessments from the Global Biodiversity Assessment and the IPCC to the Millennium Ecosystem Assessment. He has developed highly-cited (>10,000 citations) scenarios of biodiversity change for the year 2100. He has had a prolific scientific production with more than 61,000 citations and H>100. His work has been truly interdisciplinary, collaborating with geologists, social scientists, mathematicians and humanists. Osvaldo Sala received PhD (1982) and MSc from Colorado State University and BSc from University of Buenos Aires. Osvaldo has received several recognitions to his academic work including being an elected Member of the American Academy of Arts and Sciences, the Academy of Sciences of Argentina, Fellow of the American Geophysical Union, the American Association for the Advancement of Science and the Ecological Society of America.

MARGARET TORN,

Margaret S. Torn is Senior Advisor in the [Climate and Ecosystem Sciences Division](#) (CESD) and lead of the [Biosphere-Atmosphere Interactions Program Domain](#), which includes the [Atmospheric Systems Research](#) and [Terrestrial Ecosystems Science](#) programs. She is lead PI for the [AmeriFlux Management Project](#) and Belowground Biogeochemistry Scientific Focus Area (SFA), and is co-PI for the Next Generation Ecosystem Experiments-Arctic. At U.C. Berkeley, Margaret is Adjunct Professor in the [Energy and Resources Group](#), where she advises graduate students and teaches a masters seminar. In 2003 she received the Presidential Early Career Award as one of the country's top young scientists and in 2015 was awarded an honorary doctorate by the University of Zurich. She is past-president of the AGU Biogeosciences Section. Margaret is an ecologist and biogeochemist who studies the natural carbon cycle and human impacts through land use, energy use, and climate change. Her research uses field experiments, isotopes (^{14}C , ^{13}C), and mathematical models. She has published more than 200 peer-reviewed articles on topics ranging from the basic mechanisms of soil carbon cycling and ecosystem-climate feedbacks, to ecological aspects of bioenergy production, to strategies for climate-change mitigation.

SUSAN TRUMBORE, MAX PLANCK INSTITUTE, UNIVERSITY OF CALIFORNIA IRVINE

Susan Trumbore is Director of the Processes Dept. at the MPI for Biogeochemistry in Jena and Professor of Earth System Science (20%) at the University of California Irvine. Her research uses radiocarbon produced by nuclear weapons testing to trace the flow of carbon through vegetation and soils. She applies the high sensitivity and throughput capabilities of accelerator mass spectrometry to develop methods for low-level radiocarbon labelling to determine rates and pathways of C flow in groundwater ecosystems. Trumbore co-leads the Amazon Tall Tower Observatory, a Brazilian/German project to study land-atmosphere-climate interactions in central Amazon tropical forest. She is the founding Editor-in-Chief of the new open access journal AGU Advances. She is a member of the National Academy of Sciences in the US, the Leopoldina in Germany, and a Fellow of the American Geophysical Union, the Geochemical Society and AAAS. She is the recipient of several prestigious international awards, including the Vernadsky Medal of the European Geoscience Union, the Balzan Prize for Earth System Dynamics and the Benjamin Franklin Award for Earth and Environmental Sciences.

YAXING WEI, OAK RIDGE NATIONAL LABORATORY

Yaxing Wei is the Lead Scientist for the [ORNL Distributed Active Archive Center \(DAAC\)](#) and a geoinformatics data scientist at the Remote Sensing and Environmental Informatics (RSEI) group in the [Environmental Sciences Division](#). Since joining ORNL in 2008, Wei has been dedicated in data management, visualization, sharing, and analysis for a number of research projects, including the [ORNL DAAC](#), the [Multi-scale Synthesis and Terrestrial Model Intercomparison Project \(MsTMIP\)](#), and the [Data Observation Network for Earth \(DataONE\)](#). He created the [Spatial Data Access Tool \(SDAT\)](#), a Web-based data infrastructure that standardizes a large collection of environmental sciences data archived at the ORNL DAAC and allows data users interactively visualize and download data in forms fitting their specific needs. Wei's research interests include leveraging cutting-edge geospatial information standards and technologies to increase the Findability, Accessibility, Interoperability, and Re-usability (F.A.I.R.) of scientific data and enables researchers focus on science analysis instead of data preparation. He is also interested in developing data fusion and machine learning techniques to produce data

products that support environmental, meteorological, and renewable energy researches and applications. Wei is an IEEE Senior Member. He received the International Council for Science's World Data System (WDS) Data Stewardship Award in 2015. He is currently serving in the NASA Earth Science Data and Information System (ESDIS) Standards Office (ESO).