

Report from Microbial Ecology Working group:

“LTER-based perspectives on analyzing microbial community structure, function and process” (2-part working group)

Agenda

Session 1:

- Linda Amaral-Zettler, the lead PI on the MIRADA cross-site collaboration, and Lydia Zeglin, who has conducted cross-site experiments in grasslands and serves on the NEON advisory board, gave short presentations to the group.
- We formed groups by LTER site and composed a short description of microbial research at each site, including overarching themes, current activities, and next steps. This was compiled in a single reference document to enhance collaboration potential. Site groups reported back in a lightning-style presentation to the group.

Session 2:

- We presented results from a survey filled out by 69 microbial ecologists involved in long term research or at LTER sites
- Participants assembled into random groups to consider the questions outlined in the working group description
- We rejoined as an entire group and discussed future priorities and next steps

Participants

Name	LTER site	Role	Affiliation
Zach Aanderud	MCM/KBS	faculty	Brigham Young University
Sam Rossabi	Niwot Ridge	student	University of Colorado
Allison Veach	KPBS	postdoc/faculty	Kansas State University
Mariya Shcheglovitova	BES	student	University of Maryland, Baltimore County
Shelby Servais	FCE	student	Florida International University
Laura Ladwig	SEV	postdoc	University of Wisconsin - Madison
Andre Franco	SGS/JRN/KON	postdoc	Colorado State University
Brad Gottshall	KBS	postdoc	University of Louisville
steve schmidt	Niwot	professor	U Colorado
Eli Gendron	Niwot	student	University of Colorado
Kathy Barbeau	CCE	professor	SIO/UCSD
Mike Stukel	CCE & PAL	postdoc/faculty	Florida State University
Patrick Kearns	PIE	grad student	Univ. of Mass. Boston
Lauren Alteio	HFR	grad student	University of Massachusetts Amherst

Cristy Portales	CDR	grad student	University of Minnesota
Di Liang	KBS	grad student	Michigan State University
Robin Rohwer	NTL	grad student	University of Wisconsin - Madison
Jorge Ramos	CAP	grad student	Arizona State University
Mark Anthony	HFR	grad student	University of New Hampshire
Mustafa Saifuddin	HFR	grad student	Boston University
Teal Potter	Niwot	grad student	University of Colorado
Emily Jack-Scott	n/a	program associate	Aspen Global Change Institute
Clare Kazanski	CDR	grad student	University of Minnesota
Kimberly La Pierre	KNZ/CDR	postdoc	University of California, Berkeley
Lydia Zeglin	KNZ	faculty	Kansas State University
Emma Rosi-Marshall	BES	faculty	Cary Institute of Ecosystem Studies
Jenn Rudgers	SEV	faculty	Univ of New Mexico
Brendan O'Neill	KBS	grad	Michigan State University
Jessica Miesel	n/a	faculty	Michigan State University
Heather Buelow	MCM	grad student	University of New Mexico
George Kling	ARC	professor	University of Michigan
Hyewon Kim	PAL	grad student	Columbia University
Hugh Ducklow	PAL	faculty	Columbia University
Jessica Trout-Haney	MCM	grad student	Dartmouth College
Nathan Wisnoski	AND	grad student	Indiana University
Nick Schulte	FCE	grad student	Florida International University
Monica Palta	CAP	postdoc	Arizona State University
Cristina Takacs-Vesbach	MCM	Faculty	University of New Mexico
Luca Marazzi	FCE	postdoc	Florida International University
Anna James	SBC,MCR	grad student	Univ of California - Santa Barbara

Perspectives

Session 1 stimulated discussions about how to coordinate measurements. Many agreed that there was no need to duplicate efforts like NEON's or Earth Microbiome Project to collect cross-site data, but LTER could provide important contextual information for developing questions and analyzing data. Instead LTERs could achieve synergies with these efforts, and may want to outline aims to do this in the future (e.g. to be Genomic Observatories). Although research at each site was quite unique, many agreed that an overarching theme was

response to some disturbance or stress, and that additional metagenomic or SAG sequencing is necessary to improve our collection of environmental reference genomes, and that the broader application of gene expression data is necessary to connect microbial communities to environmental change..

Many good ideas emerged from our discussions in session 2. The survey revealed that the biggest priorities for microbial research are to: (1) standardize methods and measurements, (2) brainstorm research areas that can be addressed by long-term research, and (3) establish a cross-site experiment. It also showed that the most commonly-used methods are amplicon sequencing and biogeochemical assays.

Many were supportive of the idea of initiating a new cross-site observational or (particularly) experimental study to address how microbial structure and function differs in its sensitivity to stress across site, but also acknowledged that this should not necessarily be the exact same perturbation or response variables at each site. A “response ratio” approach was proposed to consider microbial sensitivity across processes, disturbances, and sites. Inherent in this question is linking structure to function, and participants agreed this is a major gap that could be addressed by LTER sites.

Next Steps:

The working group was enthusiastic about securing funds for another meeting, and reviving a formal LTER Microbial working group from 2007. This meeting would have two main goals:

1. Compose a white paper targeted toward NEON or other funding sources, that may include:
 - a. A summary of overarching research themes from LTER sites, highlighting potential for synthesis projects and coordination of methods
 - b. Provide recommendations for coordinated experiment at individual sites and follow up with proposal ideas for acquiring funds for metagenomic/metatranscriptomic sequencing (Community Science Program, JGI) for all participating LTER sites
2. Discuss ideas for a cross-site experiment, possibly in the form of a proposal to the JGI CSP program
 - a. Overarching question would address how sensitive are microbial communities at each site to primary and secondary stressors
 - b. The proposal would allow us to identify a common experimental framework and propose ways to standardize methods across sites
 - c. We would aim large and make use of (and test) new technologies relevant to JGI