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You can also find us at the U.S. Geological Survey booth
Third International Workshop on Biological Soil Crusts

September 26-30, 2016
Star Hall • Moab, Utah, USA

Agenda & Program

The following Northern Arizona University entities generously provided support: School of Forestry; Office of the Vice President for Research; Office of the Provost; College of Engineering, Forestry, and Natural Sciences; School of Earth Sciences and Environmental Sustainability; and Merriam-Powell Center for Environmental Research.
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Welcome to the Third International Workshop on Biological Soil Crusts (Biocrust3)!

The International Workshop on Biological Soil Crusts provides a global forum to exchange discoveries and ideas about biocrusts. It is our great pleasure to welcome you to the third workshop of this kind. The way we have organized the conference is designed to bring together a wide range of disciplines, to cut across traditional hierarchical divisions of science, and to provide a venue where biocrust geneticists, taxonomists, physiologists, ecologists, inoculum producers, and land managers can share insights about one of the most widespread and fascinating groups of organisms on Earth.

Biocrusts are like a living skin of the Earth, composed of many distinct organisms regulating ecosystem processes, and serving as a modern analog for some of the earliest ecological communities on land. As a whole, biocrusts represent a complex consortium of organisms that structures soils and defines ecosystem properties. Biocrusts have long been recognized for their key roles in creating soil stability and their interactions with vascular plants, but increasingly, biocrusts are recognized for their role in moving water, carbon, nutrients, and energy through ecosystems. Biocrusts are at the interface between the atmosphere and mineral soils. In this regard they integrate the biotic and abiotic components of systems, and based on their importance in helping to determine ecosystem structure and function, the desire to understand and restore biocrusts has continued to expand.

Biocrust3 is truly a global conference for a growing international community of scientists and resource managers. Approximately 150 people, including presenters from 21 countries (and 10 US states), and many land managers will join together for a week of scientific and social exchanges. We can expect to learn about exciting new discoveries and also reflect on the wisdom of past and present “giants” in the field of biocrust science. This emersion of knowledge will help catalyze new ways of thinking and advance our abilities to study and understand biocrusts across scales, as well as to use this understanding in the management of our landscapes. We thank you for coming and hope that Biocrust3 will inspire you and provide many opportunities for future research and management collaborations.

Biocrust3 Co-organizers: Matt Bowker and Sasha Reed

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General Information

Historic Star Hall
159 E. Center St.
Moab, UT 84532

Built in 1905, Star Hall is a historic building located in the heart of downtown Moab is the site of BioCrust3. The building, which is owned by Grand County, Utah, has been beautifully restored and is now used for films, plays, concerts, festivals, and events. **No food or drink are allowed in Star Hall, with the exception of water** because of its uniqueness and the effort put into restoring and maintaining it.

Parking: Convenient free conference parking is available in front of Star Hall, located at 159 E. Center Street, or at the nearby Moab Information Center, 25 E. Center Street.

Opening Reception: The opening reception will take place at Eddie McStiff’s Bar and Restaurant in the private reception room at the rear of the restaurant. Located at 57 S. Main Street, the restaurant down the street from Star Hall.

Poster Session: The poster session will be hosted at the Moab Arts & Recreation Center, or MARC, at 111 E. 100 N., which is also walking distance from Star Hall.

Registration

Registration will take place in the lobby of the Star Hall and will be open at the following times:

- Monday, September 26: 8:00 AM – 5:00 PM
- Tuesday, September 27: 8:30 AM – 3:00 PM

Special Thanks

The conference organizers would like to thank all of the people who organized special sessions, talks, and posters for Third International Workshop on Biological Soil Crusts. Our deepest thanks go to the conference sponsors for their generous financial support!!

BioCrust3 Sponsors

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Conference Planning & Organization

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Southwest Biological Science Center
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Monday, September 26, 2016

8:00 AM  Registration and Light Breakfast Refreshments
9:00 AM  Welcome: Sasha Reed, U.S. Geological Survey, USA, and Matthew Bowker, Northern Arizona University, USA
9:50 AM  Break
10:00 AM  Plenary 1: Biological soil crusts: new findings, knowledge gaps, new directions, Bettina Weber, B. Büdel, J. Belnap. Max Planck Institute for Chemistry, Germany

Contributed Session 1 – Part 1
10:50 AM  Eldridge D.J. and S. Soliveres. Are shrub cover and grazing effects on biocrust richness mediated by soil heterogeneity and/or intransitivity?
11:05 AM  McCune B. and J. Di Meglio. Up against the wall of lichen biodiversity in soil crusts: the case of Aspicilia in the Columbia Basin
11:35 AM  Saha, D., C.B. Pandey, S. Kumar. Species composition, distribution patterns of biological soil crusts in varied geomorphic units of Jaisalmer district of Indian Thar Desert
11:50 AM  Havrilla C.A. and N.N. Barger. The role of biocrusts in regulating grass germination and establishment

Lunch – On Your Own (12:05 to 1:30 PM)

Contributed Session 1 – Part 2
1:30 PM  Moger-Reischer R.Z., Y.A. Chung, and J.A. Rudgers. Interactions among Bouteloua grasses, soil type, moisture, and crust cyanobacteria in the Chihuahuan Desert grassland
2:00 PM  Root H.T., J.C. Brinda, and E.K. Dodson. Lichen and bryophyte biotic soil crust recovery 12-16 years following wildfire in Idaho, USA
2:15 PM  Glaser K., K. Baumann, P. Leinweber, and U. Karsten. Linking biological soil crust diversity to ecological functions
2:30 PM  Truscott T., Z. Pan, W.G. Pitt, Y. Zhang, N. Wu, and Y. Tao. The upside-down water collection system of Syntrichia caninervis
3:00 PM  Oren N., H. Raanan, O. Murik, Y. Shotland, N. Keren, S.M. Bercowicz, and A. Kaplan. What distinguishes those that can from those that can’t: the desiccation tolerance of biological sand crust-inhabiting cyanobacteria
3:15 PM  Raanan H., N. Oren, O. Murik, Y. Shotland, N. Keren, S.M. Bercowicz, and A. Kaplan. Adaptation of microorganisms to harsh soil crust conditions: experimental and genomic approaches
3:30 PM  Break
Early Career Showcase

3:50 PM  Introduction to early career showcase

3:55 PM  Baughman J.T., K. Millette, and K.M. Fisher. Desert terraria: characterization of a Mojave Desert moss community under quartz rocks


4:11 PM  Young K.E., H.S. Grover, and M.A. Bowker. Can and should we merge our ecosystem rehabilitation efforts with assisted migration of biocrusts?

4:19 PM  McIntyre C.L., S. Archer, and J. Belnap. Influence of biocrusts on grass germination and establishment in two North American deserts

4:27 PM  Chilton A.M., J.N. Woodhouse, and B.A. Neilan. Microbial community changes over successional stages of Australian biocrusts


4:43 PM  Mugnai G., F. Rossi, V.J.M.N.L. Felde, C. Viti, R. De Philippis. Effect of inoculated cyanobacteria on the structure and development of induced biological soil crust

4:51 PM  Rengifo M.C., and C. Arana. Effects of natural disturbances of biological soil crust on moisture retention in fog oasis of the Peruvian desert

5:15 PM  Welcome Reception: Eddie McStiff’s Brewery (Hot appetizers and no-host bar)

Tuesday, September 27, 2016

8:00 AM  Registration and Light Breakfast Refreshments

9:00 AM  New Phytologist Climate Change Symposium - Co-Chairs: Manuel Delgado Baquerizo, University of Colorado, Boulder, USA, and Scott Ferrenberg, U.S. Geological Survey, USA

9:00 AM  Plenary 2: Biocrusts as modulators of ecosystem responses to climate change in drylands, Fernando Maestre, Universidad Rey Juan Carlos, Spain

9:50 AM  Break

10:00 AM  Ferrenberg S., C. Tucker, R. Reibold, A. Howell, S.C. Reed. Interactions among biocrust community states and warming temperatures could drastically reduce dryland soil fertility


10:30 AM  Darrouzet-Nardi A., S.C. Reed, E.E. Grote, and J. Belnap. Effects of warming and watering-induced moss death on CO₂ exchange in biocrust soils over an 8-year period

10:45 AM  Fernandes V.M.C., D. Roush, N.M. Machado de Lima, S.L. Collins, J. Rudgers, and F. Garcia-Pichel. Cyanobacteria response to extreme drought in hot desert biocrusts

11:00 AM  Raggio J., T.G. Allan Green, L.G. Sancho, A. Pintado, C. Colesie, B. Weber, and B. Büdel. Metabolic activity is strongly linked to environmental factors in biological soil crusts across Europe


11:30 AM  Tucker C.T., S. Ferrenberg, and S.C. Reed. Warming results in accelerated carbon loss from biological soil crust and soils in greenhouse mesocosms

11:45 AM  Zaady E., Y. Knoll, and S. Shuker. The role of cyanobacterial crusts, as an ecosystem engineer, on survival of planted trees during severe drought
Lunch – On Your Own (12:00 to 1:30 PM)

Mixed Standard & Lightning Talks 1

1:30 PM  Yin, B.F., X.B. Zhou, Y.M. Zhang. Ecological and Physiological Adaptability of *Syntrichia caninervis* Mitt in Different Microhabitats of a Temperate Desert

1:45 PM  Williams W., and B. Büdel. Cyanobacterial diversity and abundance facilitates increases in bioavailable N in the northern Australian savannah

1:53 PM  Jia R.L., L.C. Liu, Y.H. Gao, R. Hui R., H.T. Yang, and Z.R. Wang. Mutual antagonistic effect between drought and sand burial enables crust moss *Bryum argenteum* survive the two co-occurring stressors in a temperate desert, China

2:01 PM  Cano Díaz C., P. Mateo, M. Delgado-Baquerizo, and F.T. Maestre. Climate change interactions alter the abundance of cyanobacteria in a semiarid grassland

2:09 PM  Fischer T., L.S. Mykhailova, and T. Raab. Characterization of hydrological regimes of moss and algal biocrusts under temperate climate using multispectral imagery

Poster Session 1: Moab Arts & Recreation Center (2:30–3:30 PM) (Refreshments will be served)

Baldauf S., F.T. Maestre, B. Tietjen. Multiscale effects of biological soil crusts on dryland hydrology – a modeling framework to assess the impacts of global change

Concostrina-Zubiri L., C. Branquinho, M.A. Bowker, R. Cruz de Carvalho, P. Giordani, J. Marques da Silva, P. Matos, I. Molla, and E. Velizarova. Functional diversity of biocrusts in drylands: from ecological indicators to ecosystem services contribution


Korfhage J., N. Pietrasjek, J.R. Johansen, and P. DeLey. Tardigrades display preferential grazing of soil algae

Liu L., R. Hui. And M. Xie. Effects of snowfall on carbon exchange of biocrusts and the physiological and biochemical characteristics of their micro-organisms from desert biocrusts

Morales-Sánchez D., E. Huber-Sannwald, R.L. Riego-Ruiz, N.E. López-Lozano, V.M. Reyes-Gómez, and D.R. Smart. Differences in bacterial diversity of dark biocrusts across a gradient of disturbance by livestock grazing in semiarid grasslands of Mexico

Pombubpa N., P. De Ley, N. Pietrasjek, and J.E. Stajich. Biological soil crusts microbiome diversity at Joshua Tree National Park, Granite Mountain, and Kelso Mountain

Ruckteschler N., L. Williams, B. Büdel, and B. Weber. *Fulgensia fulgens* and *Trichostomum crispulum*: an unbalanced coexistence


Contributed Session 2

3:50 PM  Sancho L.G., T.G.A. Green, and A. Pintado. Late-lying snow dramatically disrupted lichen colonization process in the maritime Antarctic

4:05 PM  Zhang Y., X. Zhou, and B. Yin. The effects of simulated nitrogen deposition on growth and photosynthetic physiology of three different successional biocrusts

4:20 PM  Büdel B., H. Reichenberger, and W. Williams. Net primary productivity of a cyanobacterial biological soil crust in Northwest Queensland, Australia
Wednesday, September 28, 2016

Free time and off-site excursions
Meals are on your own

Thursday, September 29, 2016

8:00 AM Registration and Light Breakfast Refreshments
9:00 AM Ecological Restoration Symposium – Co-chairs: Nichole Barger, University of Colorado Boulder, USA, and Yunge Zhao, Institute of Soil and Water Conservation, China
9:00 AM Barger N. – Introduction to Ecological Restoration Symposium
9:05 AM Antoninka A.J., M.A. Bowker, P.F. Chuckran, N. Barger, and J. Belnap. Rapid culture of N-fixing soil lichens and biocrusts for rehabilitation of drylands
9:15 AM Nelson C., A. Giraldo Silva, S. Velasco Ayuso, N. Barger, and F. Garcia-Pichel. Creating the seeds of restoration: two approaches to producing compositionally explicit, location-specific biological soil crusts inoculum
9:35 AM Grover H.S., M.A. Bowker, and A.J. Antoninka. Rapid cultivation of “fire moss” as a potential tool for burned area emergency response
9:45 AM Zhao Y. Ecological adaption of moss species—the fundamental for moss crust restoration
9:55 AM Break
10:50 AM Hu C., L. Shubin, W. Li, G. Hongmei, and O. Hailong. Environmental constraints of biocrustal application
11:00 AM Reeve S., and D. Lipson. Improving ecosystem function: facilitating restoration of degraded biocrusts using mixed culture inoculation
11:10 AM Zhang Z.S., Y.L. Chen, B.X. Xu, Y. Zhao, H.J. Tan, and X.J. Dong. Topographic differentiations of hydraulic properties induced by biological soil crusts in fixed sand dunes
Lunch – On Your Own (12:00 to 1:30 PM)

Mixed Standard & Lightning Talks 2


1:45 PM  Duniway M.C. Biological soil crusts and rangeland management: role for crusts in state and transition models?

2:00 PM  Seitz S., P. Goebes, K. Kämpfer, M. Nebel, and T. Scholten. Development of biological soil crusts and their impact on soil erosion in an early successional subtropical forest ecosystem


Poster Session 2: Moab Arts & Recreation Center (2:30–3:30 PM)

R. Li, C. Wang, Y. Zhaob, S. Yuan, B. Li, X. Li, and C. Bu. Rapid restoration of moss biocrusts on field slope under spray-seeding and broadcasting


Haynes A. Parking lots, pavements, and pollution—a review of biocrusts’ life in the city

Navas Romero A.L., M.A. Herrera Moratta, and E.E. Martinez Carretero. Distribution of the biological soil crust and dominant functional groups in a system of paleodunes in the province of San Juan, Argentina

Serpe M.D. Bromus tectorum litter alters photosynthetic characteristics and the hydration period of biocrusts from sagebrush steppes

Sorochkina K.S., S. Velasco Ayuso, and F. Garcia-Pichel. Biological soil crust dispersal rate

Warren S.D. Natural establishment of biological soil crusts on disturbed desert landscapes

Zaady E., I. Katra, S. Shuker, Y. Knoll, and S. Sarig. Restoration of moving sand dunes with cyanobacterial crust; growth enhancement using artificial silt and clay size particles

Davenport I., and K. White. Spectral properties of cyanobacterial soil crusts, implications for detection using remote sensing

Lababpour A. Modeling and simulation of the Microcoleus biofilm growth on dryland soil surface

Baldarelli L.M., J.R. Johansen, N. Pietrasiak. Nostoc and Mojavia species isolated from the Atacama Desert, Chile

Lababpour A., M. Kaviani, and S. Mehrpooyan. An image processing method development for monitoring the cyanobacteria Microcoleus covered area

Hosseini N., A. Lababpour, N. Farrokhi, P. Derk-vand, K.A. Warren-Rhodes, and C.P. McKay. Molecular identification of microorganisms in colonized Lut desert rocks and relevance to the search for life on Mars

Contributed Session 3

3:50 PM  Rosentreter R. Biological soil crust diversity and cheatgrass cover in six vegetation types of SW Idaho


4:50 PM  Gypser S., and M. Veste. Application of chlorophyll fluorescence, CO₂ gas exchange and NDVI for the detection of spatial variances of photosynthesis of biological soil crusts on anthropogenic degraded soils
Friday, September 30, 2016

8:00 AM  Registration and Light Breakfast Refreshments

9:00 AM  Molecular Frontiers Symposium -- Co-Chairs: Ferran Garcia-Pichel, Arizona State University, USA, and Zachary Aanderud, Brigham Young University, USA

9:00 AM  Plenary 3: Linking microbial community structure, activity and carbon cycling in biological soil crust, Trent Northen, Lawrence Berkeley National Laboratory, USA

9:50 AM  Break

10:00 AM  Symposium Talks

10:00 AM  Garcia-Pichel F. In crusts we trust


10:30 AM  Lennon J.T., and Z.T. Aanderud. A trait-based approach to understanding the microbial moisture niche


11:00 AM  Giraldo Silva A., E. Couradeau, F. De Martini, and F. Garcia-Pichel. Microcoleus vaginatus carries a nitrogen-fixing microbiome that can help it colonize nutrient-deficient arid substrates


11:45 AM  Baughman J.T., A.C. Payton, A.E. Paasch, S.F. McDaniel, and K.M. Fisher. Males of the Mojave Desert moss Syntrichia caninervis (Pottiaceae) are rare and shy

Lunch – On Your Own (12:00 to 1:30 PM)

Mixed Standard & Lightning Talks 3


1:45 PM  De Philippis R., A. Adessi, and F. Rossi. Complex role of the exopolysaccharidic matrix in biological soil crusts

2:00 PM  Williams W., A. Apan, and B. Alchin. Key landscape function indicators determined using hyperspectral reflectance in a dry sub-humid native grassland in southern Queensland, Australia

2:15 PM  Proposals for next workshop! Discussion and vote.

3:00 PM  Farewell and departure

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