**Presenting author’s email:** matthew.bowker@nau.edu
**Preference:** Poster / Oral presentation – regular (12+3 minutes) / Oral presentation - lightning talk (5+3 minutes)
**Theme (list any of the following that apply):**

1. Climate Change
2. Community Ecology/ Biodiversity
3. Ecological Restoration
4. Ecophysiology/ Organismal Biology
5. Ecosystem Ecology/ Biogeochemistry
6. Hydrology/ Erosion
7. Molecular Frontiers
8. Methodological advances
9. Land Use/ Disturbanc
10. Remote Sensing/ Landscape Ecology
11. Taxonomy/ Phylogeny
12. Other

**Early Careera: Yes/No if Yes: Consider for Early Career Showcase: Yes/No**

**Title:** Rapid culture of N-fixing soil lichens and biocrusts for rehabilitation of drylands

**Authors (presenter in bold): Bowker M.A.1, Antoninka A.J.**1

1School of Forestry, Northern Arizona University, Flagstaff, Arizona 86011 USA

**Abstract:** Degradation of drylands presents major challenges to restoration ecology due to resource limitations, biological invasions and persistent erosion. Rehabilitation of biological soil crusts (biocrusts) in degraded drylands may facilitate ecosystem recovery by capturing resources, discouraging invasive plants, and curbing erosion. In order for biocrusts to be rehabilitated, culture methods for biocrust organisms, including lichens, mosses, and cyanobacteria, must be optimized. We cultured six different biocrust lichens and mosses, alone or in various combinations, in a full-factorial experiment which also manipulated water quality and hydration schedule. All cultures resulted in a multi-species biocrust, often dominated by cyanobacteria. The lichen *Collema* was the best performer, increasing cover by up to 238% over the 5 month experiment, and also promoting the greatest cyanobacterial cover. This taxon is highly desirable as a restoration material because of its N-fixation activity and large role in ecosystem N-cycling. The mosses *Syntrichia caninervis*, and *Syntrichia ruralis* also attained positive growth, whereas 3 other target lichen species initially grew but eventually lost cover. Species combinations featuring *Collema* and both mosses exhibited greater growth rates for all species, compared to each species growing alone. This finding suggests that the initial species composition of a culture will likely affect the success of the various species, and that there may be facilitative species interactions to exploit in order to produce inoculum faster. All species either were unaffected by water quality, or performed better when irrigated with de-ionized water as opposed to tap water. Several species responded favorably to shorter dry periods, although shortening dry periods may favor undesired green algae in open cultures. If these culture techniques are refined and scaled up, we may have a means to culture the restoration-relevant amounts of biocrust materials necessary to combat land degradation, trigger favorable ecosystem state transitions, and reduce problematic dust emissions.

a Early career includes those who have not yet completed a terminal graduate degree (e.g. students), or have done so in the past 5 years (e.g. post-doctoral scholars).