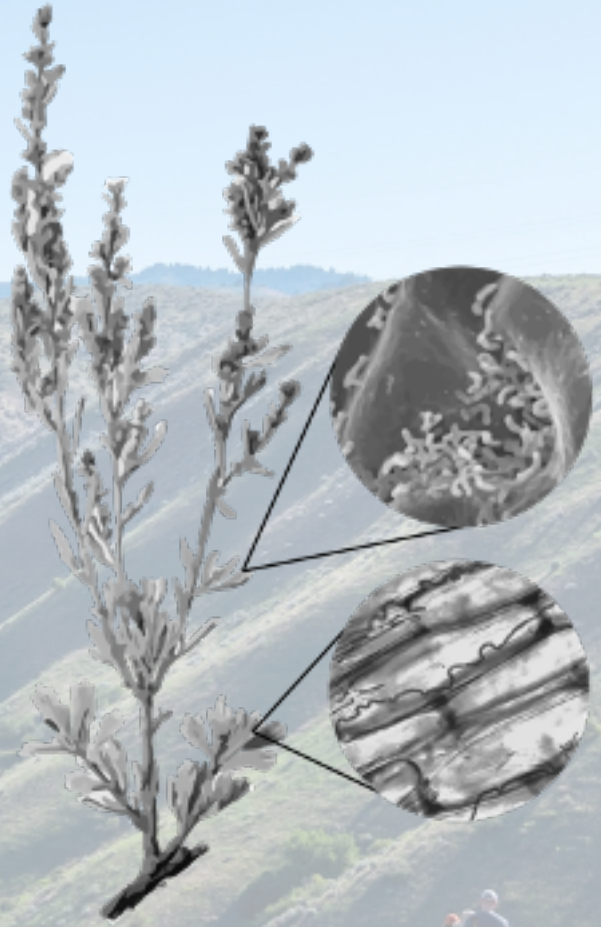
Investigating the sagebrush leaf microbiome

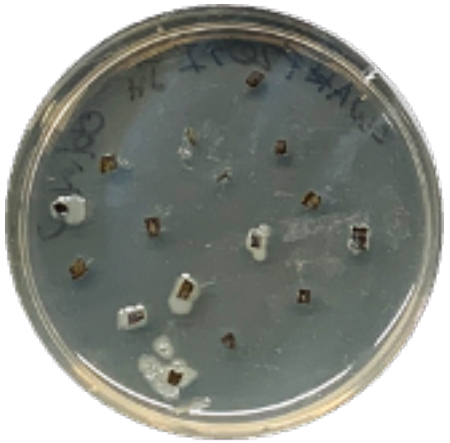


Leonora Bittleston

Assistant Professor

Dept. of Biological Sciences, BSU

Rationale



- Microbes can have large effects on eukaryotic hosts
- Leaf microbiomes linked to plant secondary metabolites, herbivore defense, pathogen tolerance, drought tolerance, nutrient content, and growth rates
- Microbiome is part of the plant's 'extended phenotype' and has high potential to drive evolutionary feedback
- Leaf microbiome may affect organisms that feed on sagebrush either positively or negatively, by assisting with detoxification or by increasing toxic compounds

Large seed grant team

PIs

Leonora Bittleston
BSU

Kathryn Turner
ISU

Bruce Finney
ISU

Carolyn Dadabay
College of Idaho

Students

Jacob Heil
BSU, PhD

Elle Horwath
BSU, PhD

Adedotun
Arogundade
BSU, MS

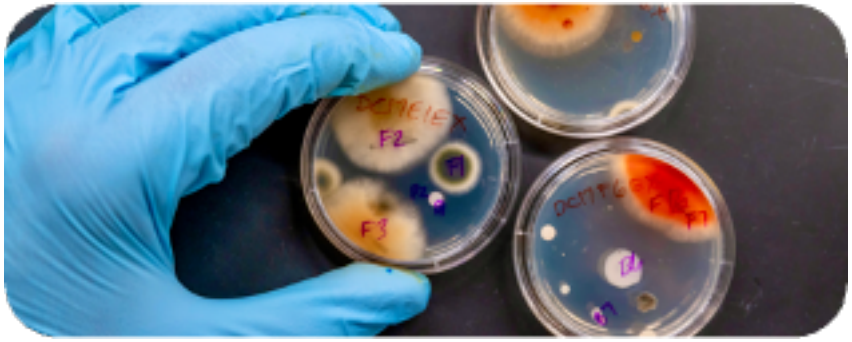
Therese
Balkenbush
ISU, PhD

Danielle Trawick
ISU, MS

Brayden
Christensen
CoI, Undergrad

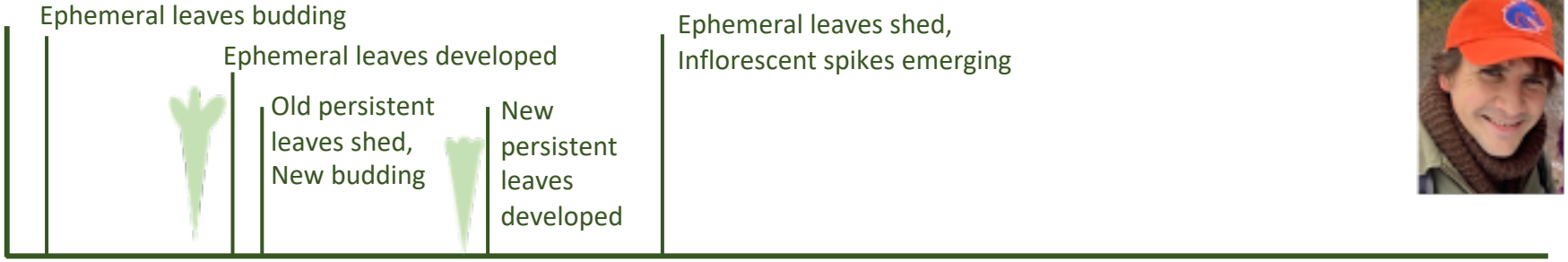
Results so far:

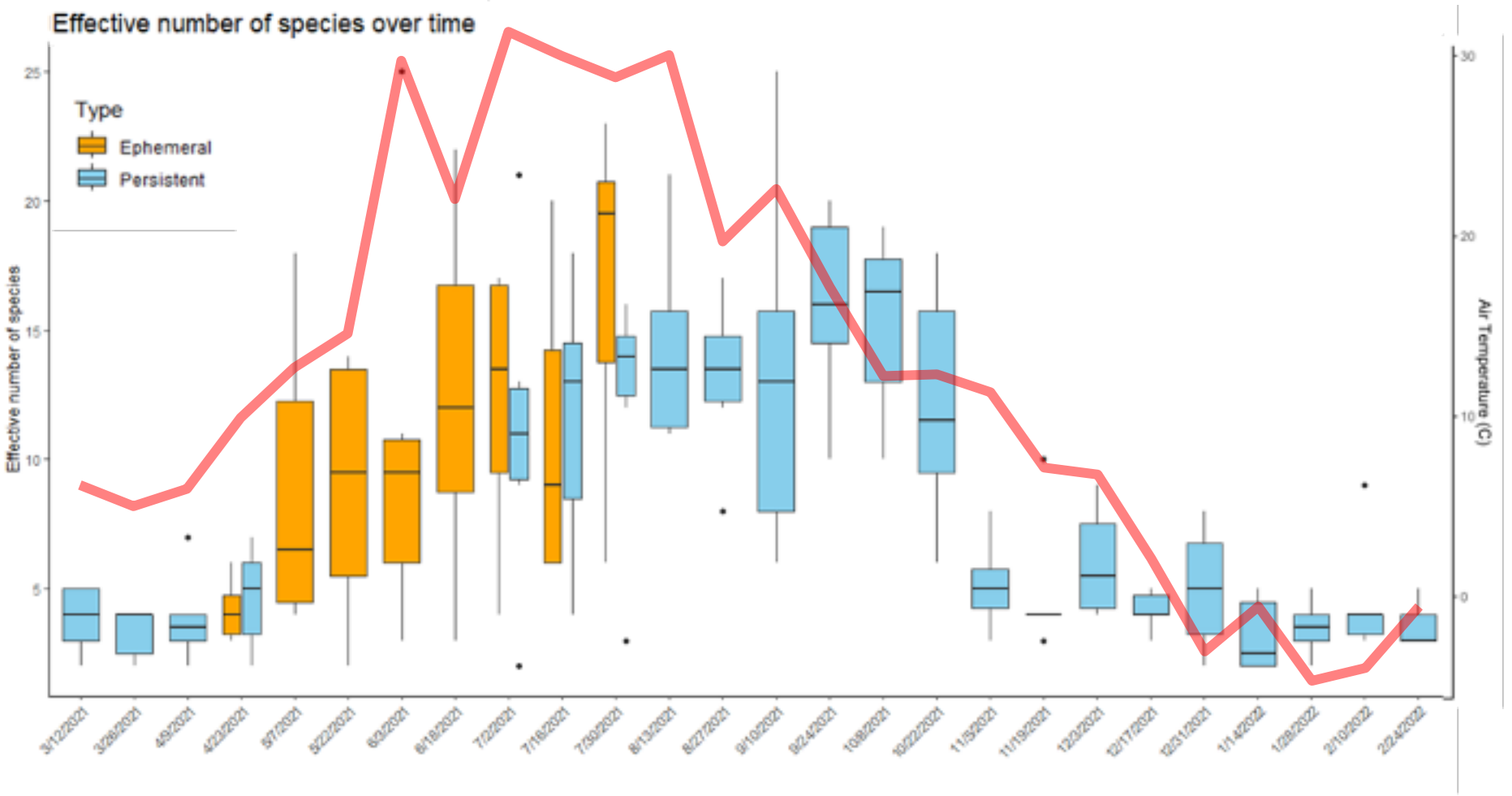
- Measuring change in fungal diversity across a full year, with temperature, wind speed, precipitation, and time, among individual plants at Dry Creek
- Connecting the microbiome with subspecies and leaf chemistry across a 9-year span at Orchard Common Garden
- Building capacity through education, workforce, and resources



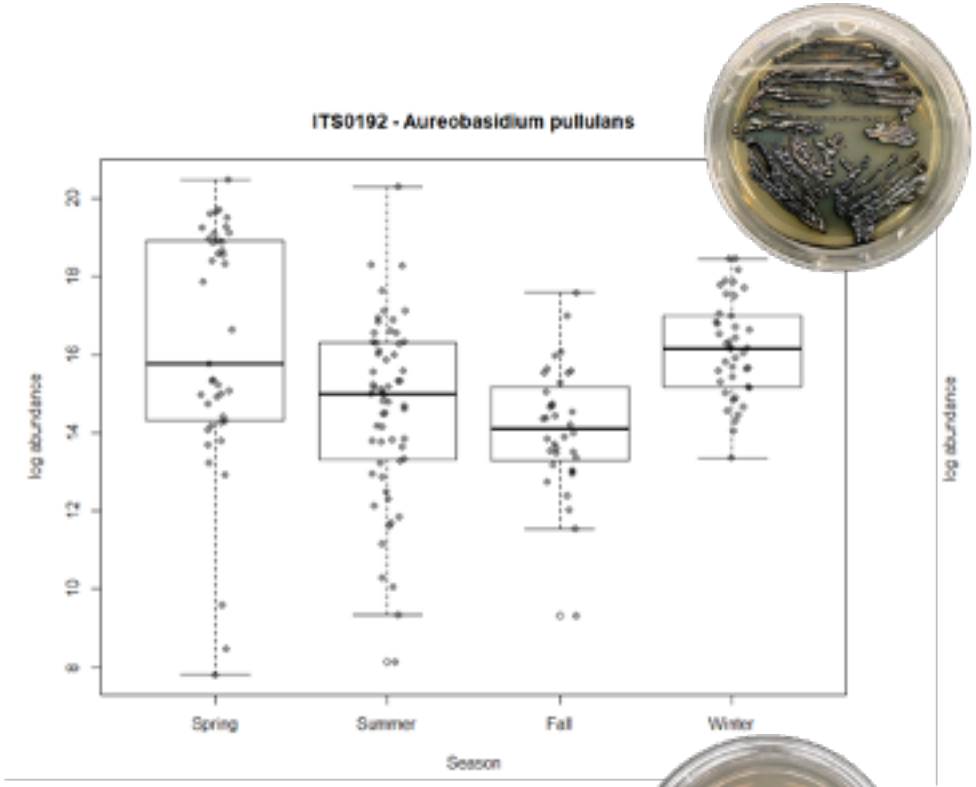
Sagebrush Phenology

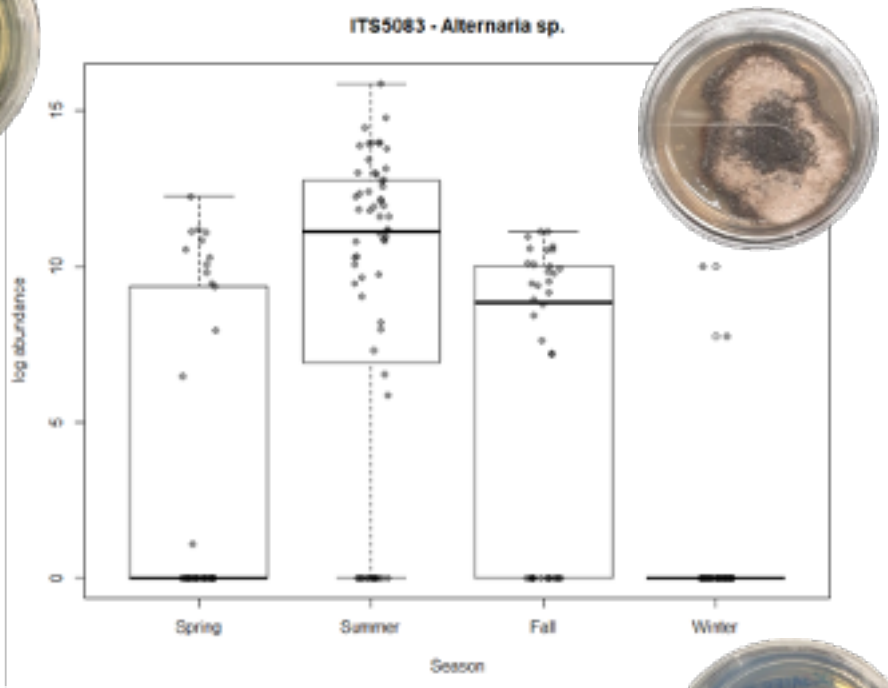
One year – Dry Creek

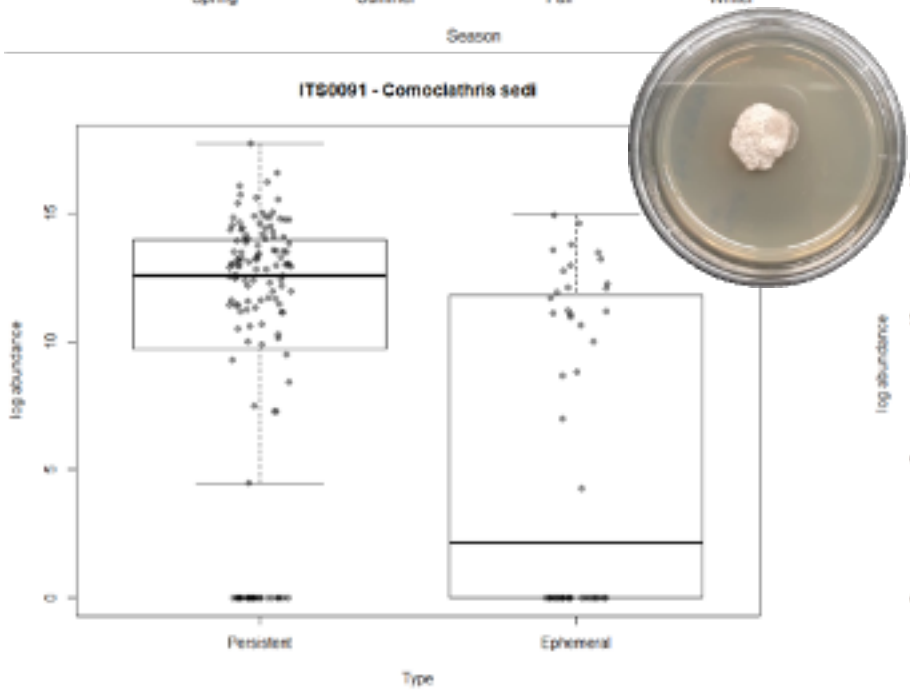


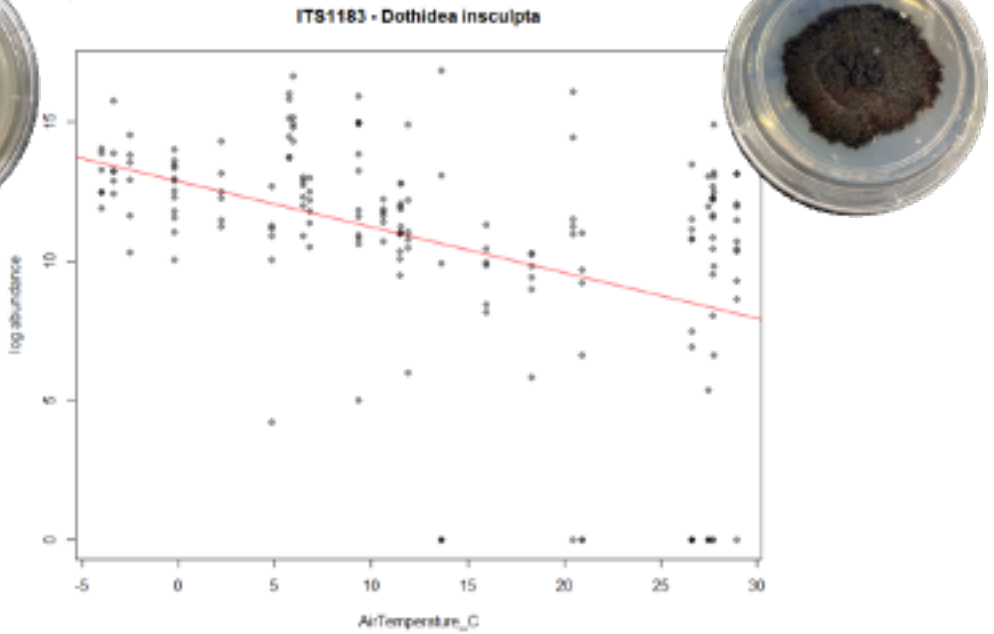


One year – Dry Creek

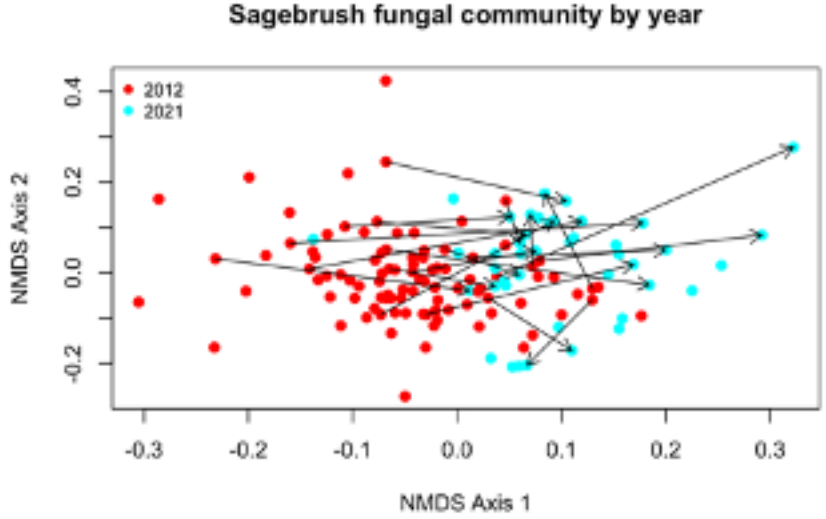




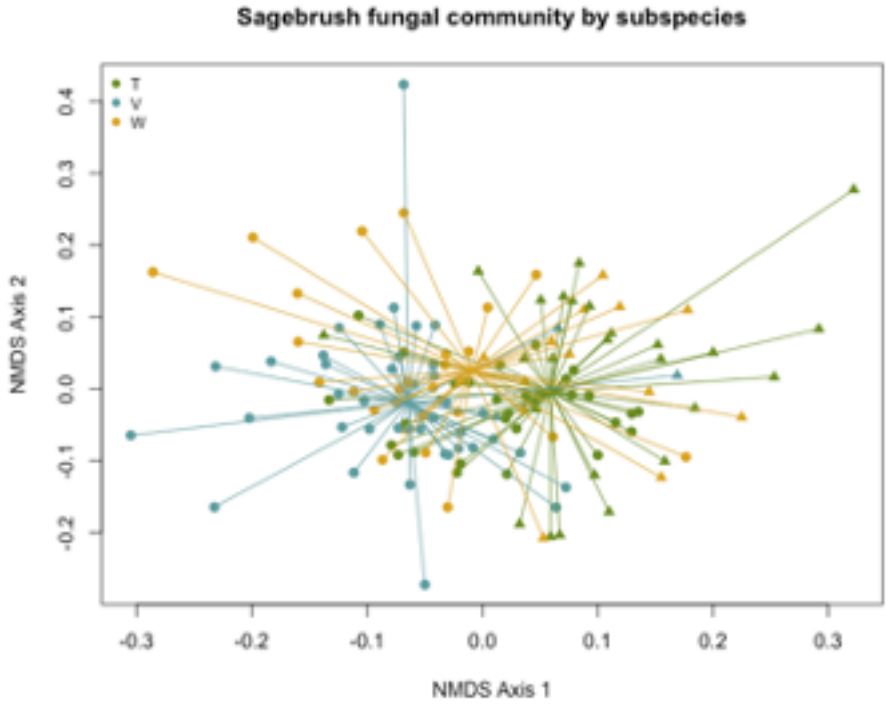


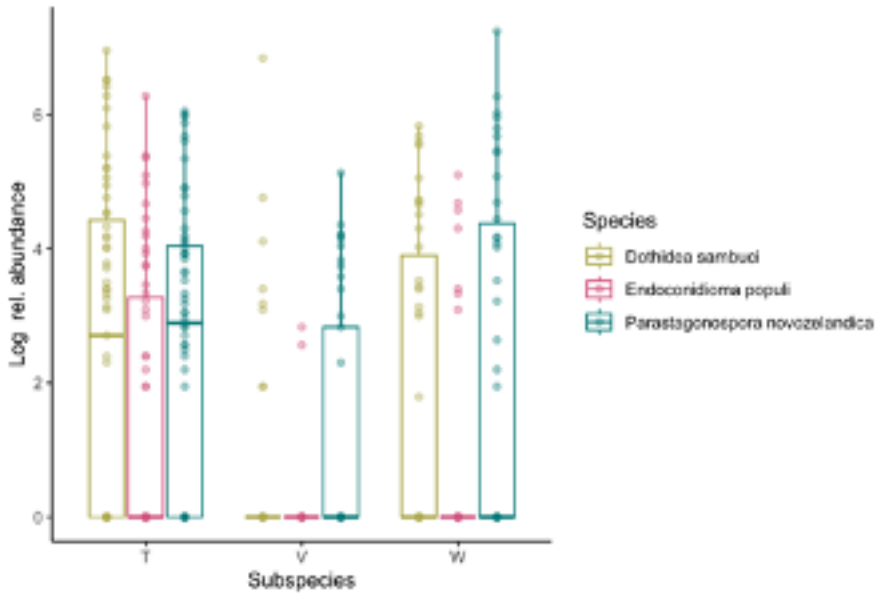


2012 vs. 2021 – OCG



Fungal communities on leaves at Orchard Common Garden show differences by year and across subspecies

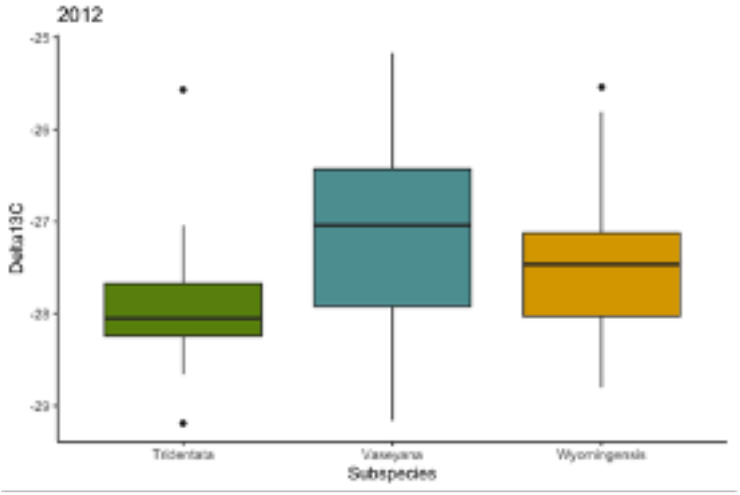


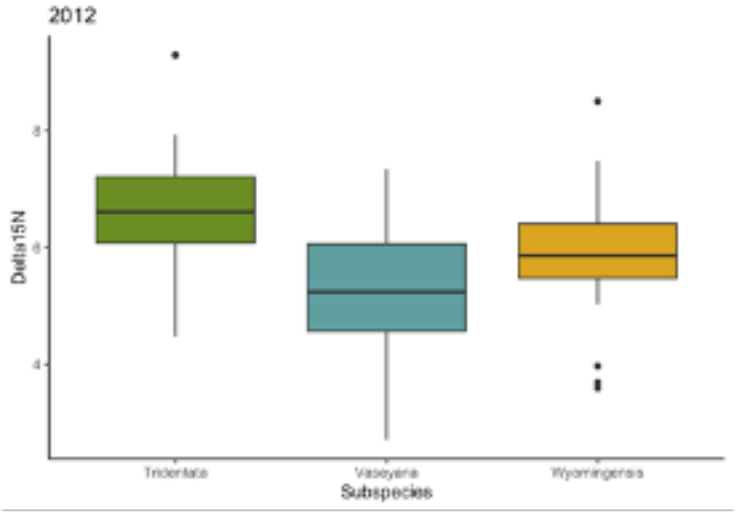


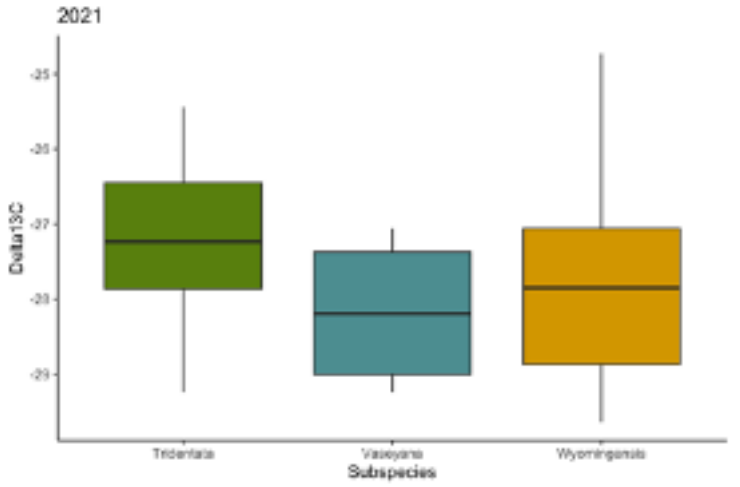
2012 vs. 2021 – OCG

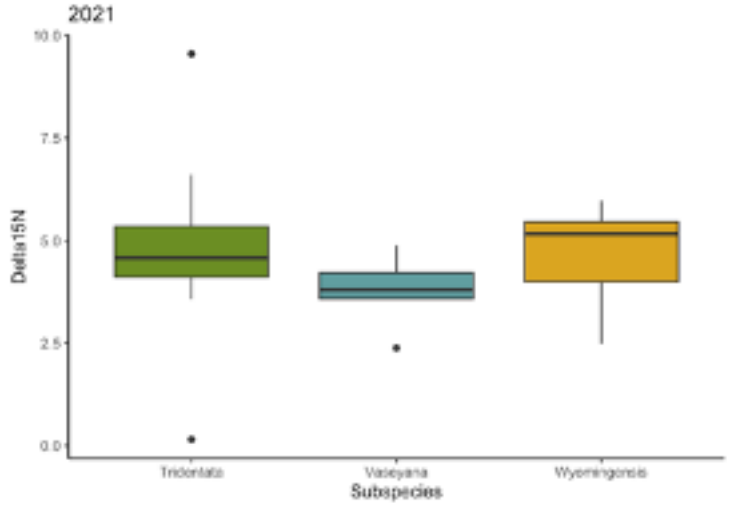
Carbon and Nitrogen isotope ratios show differences across subspecies and year

Danielle Trawick
ISU, MS



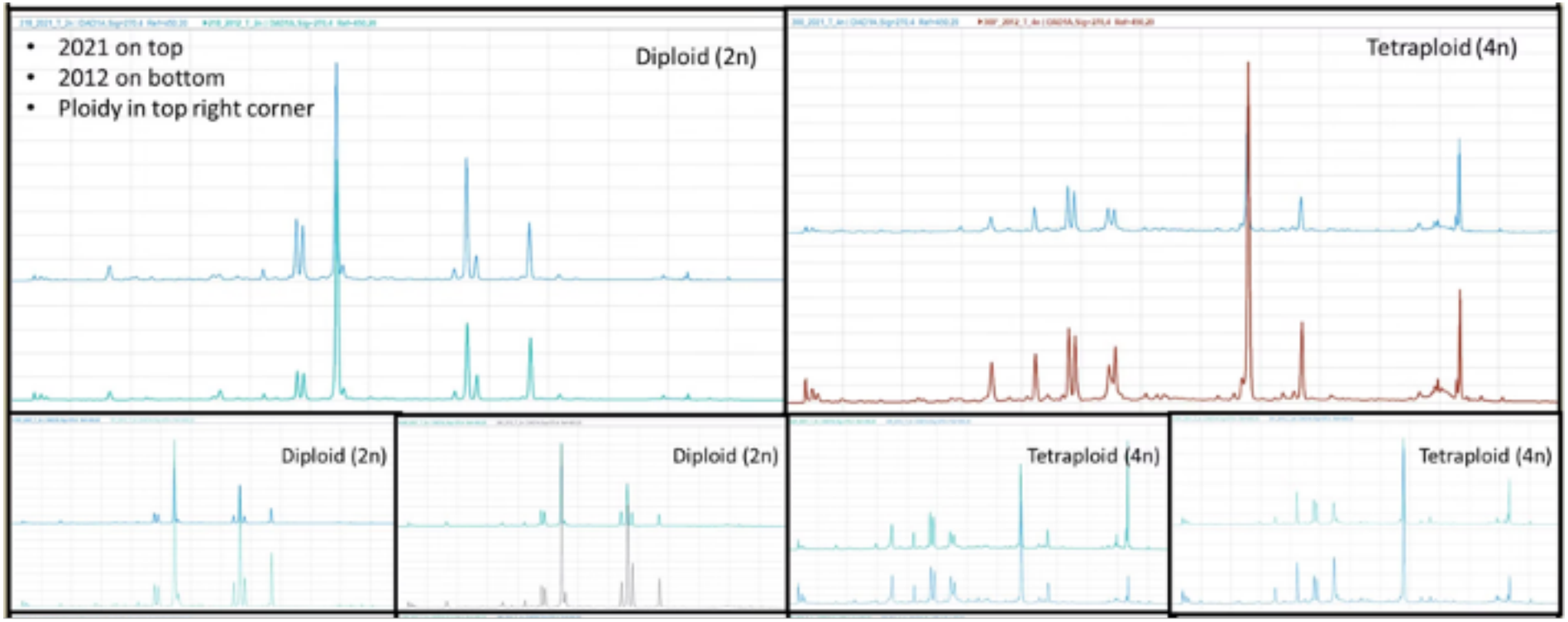






HPLC Chromatograms of *A. tridentata* subsp. *tridentata* foliar extracts

Brayden Christensen
CoI, Undergrad



No difference in chemical profile across years (2012-2021), but differences across subspecies and ploidy

C3 VIP Course

- now in its 4th semester
- 36 undergraduate participants, 14 from CWI
- 5 graduate student instructors and mentors

Module for culturing sagebrush microbes

- developed with CWI instructor Miranda Striluk
- has reached ~700 CWI microbiology students

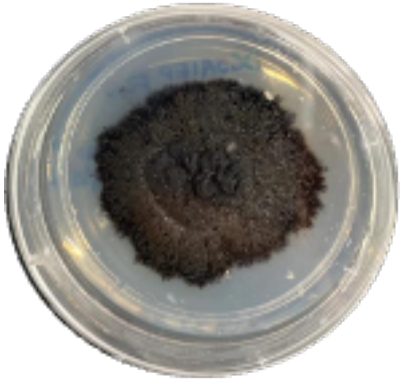
SARE program

- 10 students over 3 summers
- 1 manuscript submitted with a SARE stude co-author so far, 2 more in preparation

Culture database

Education, workforce & resources

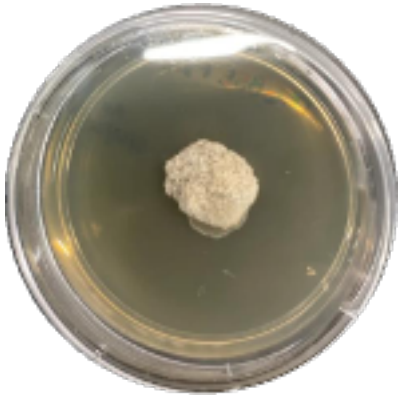
Aureobasidium pullulans



Dothidea insculpta

Filobasidium wieringae

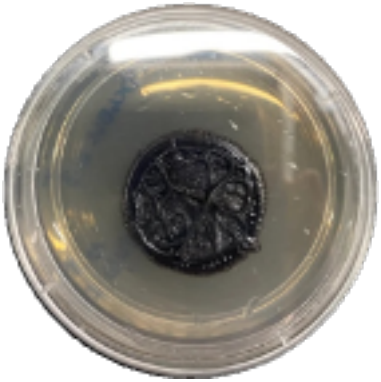
Preussia sp.



Cladosporium iridis

Cladosporium herbarum

Pseudozyma sp.



Phaeococcomyces sp.

Currently: 103 fungi from 26 genera and 11 bacteria, *Bacillus sp.*

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Initial Amendment Date:	July 21, 2023
Latest Amendment Date:	July 21, 2023
Award Number:	2236782
Award Instrument:	Continuing Grant
Program Manager:	Andrea Porras-Alfaro aporrasa@nsf.gov (703)292-2944 DEB Division Of Environmental Biology BIO Direct For Biological Sciences
Start Date:	January 1, 2024
End Date:	December 31, 2028 (Estimated)
Total Intended Award Amount:	$869,161.00