



Bio crust Bounces Back

SOIL COMMUNITY RECOVERY
IN SOUTHERN UTAH

James Kennedy

What is biological soil crust?

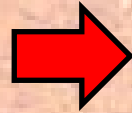
- Congregation of cyanobacteria, lichen and moss
- Uses soil as substrate—distinct from bark/rock communities
- Thrives on arid soils, competes with vascular plants



Succession of biocrust species



Light Cyanobacteria



Dark Cyanobacteria



Moss and Lichen

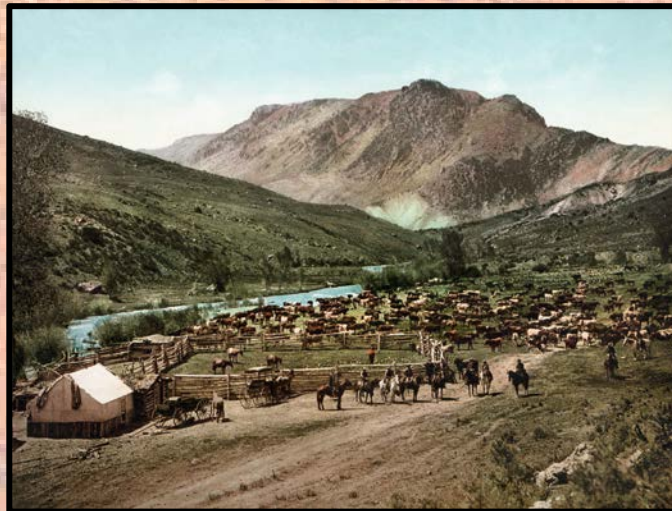
Why does it matter?

- Helps preserve soil stability during erosion events
- Fixes atmospheric nitrogen for the ecosystem
- Can be used as indicator of environmental health



How crust is destroyed

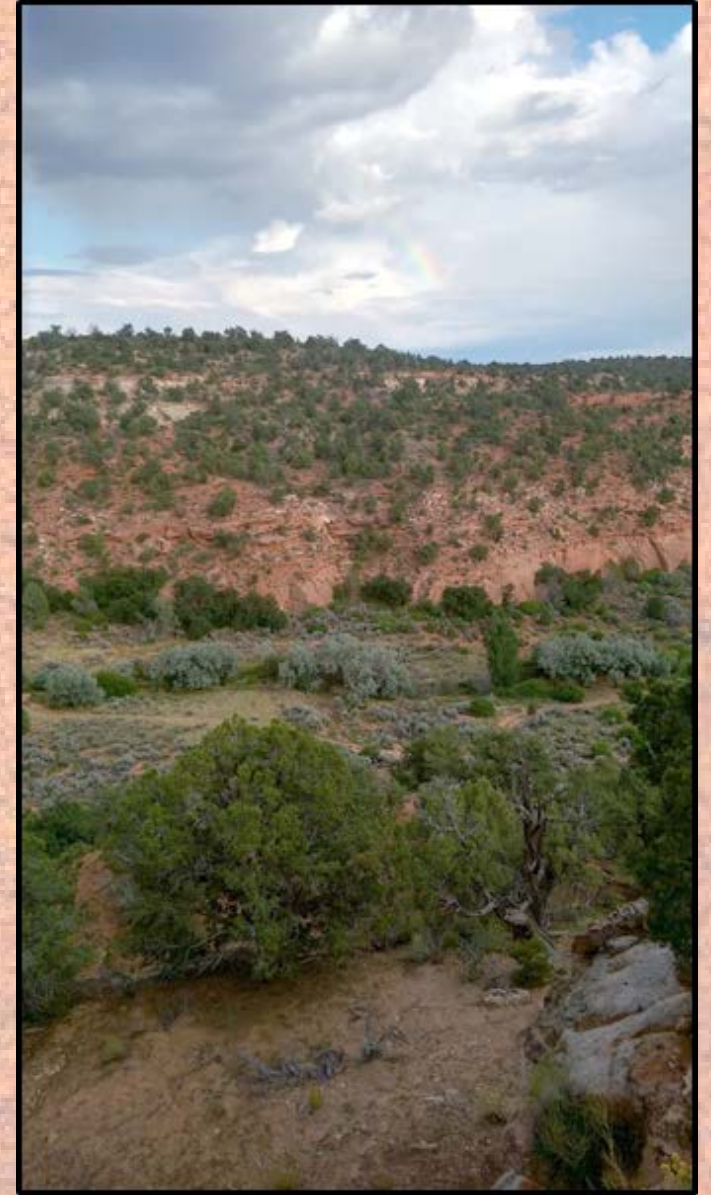
- Nearly all of public land in American Southwest is grazed
- Cattle trampling is the largest contributor to crust destruction
- Human traffic also damages—National Parks try to minimize
- Communities take years to decades to recover



My goal: tracking recovery



Grand Staircase Escalante National Monument
[*Actively grazed*]



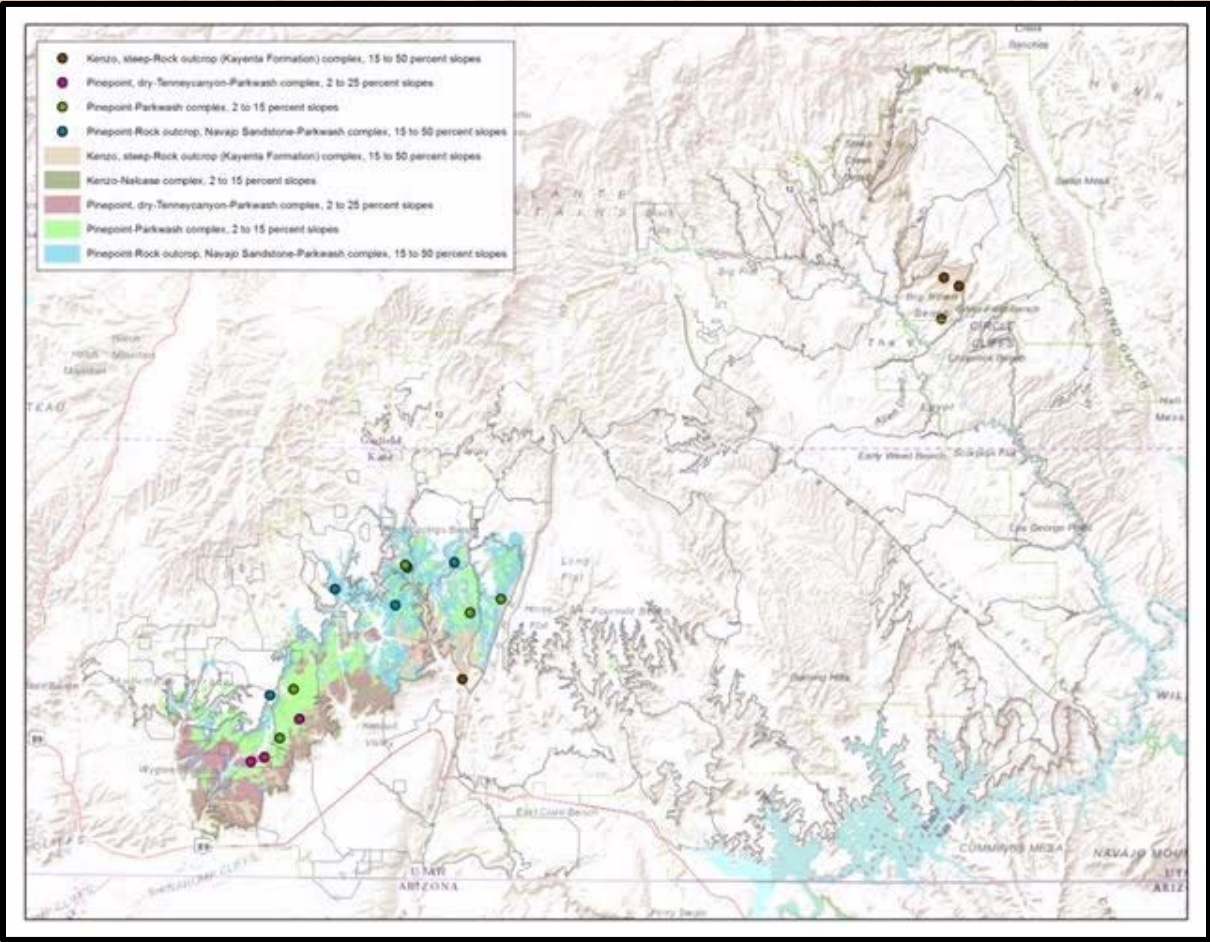
Johnson Lakes Canyon
[*Restricted 7 years*]

My hypothesis:

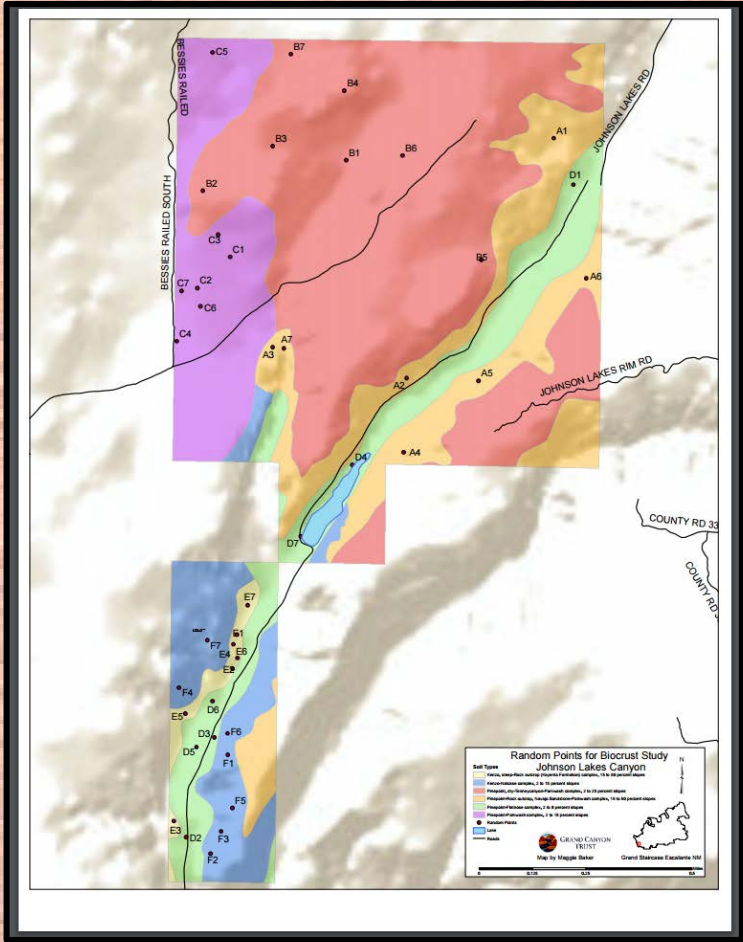
“Within a given soil type, an environment given rest from grazing will exhibit a more robust biocrust community”



Site selection



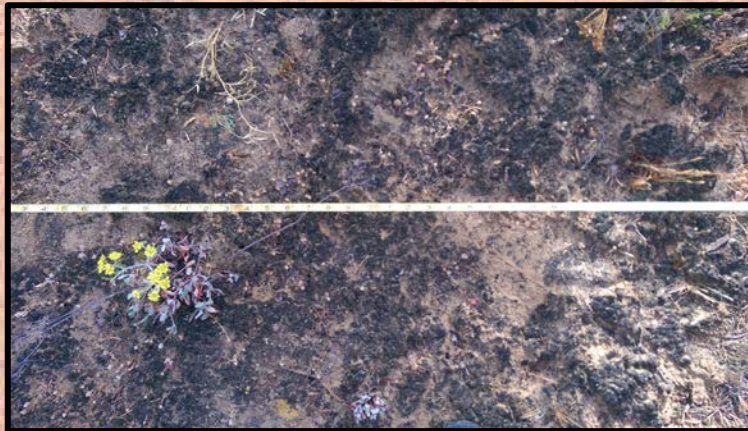
Grand Staircase Escalante National Monument



Johnson Lakes Canyon

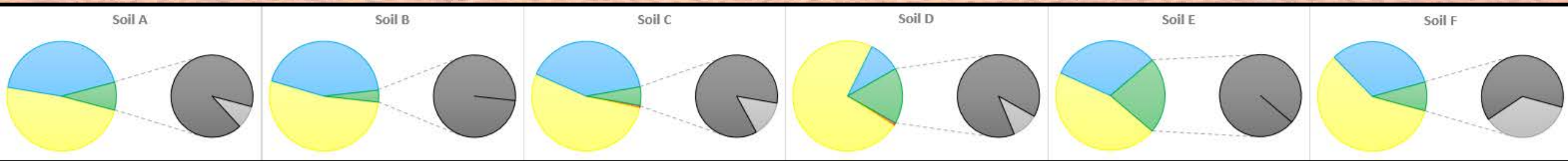
Methodology and data collection

- Line transect: 100 feet, data taken every 2 feet (representative)
- Cover vs. canopy, habitat vs. non-habitat
- Three transects (150 points) per soil, five soils total
- Also: Species index, LOD, stability, specimen collection

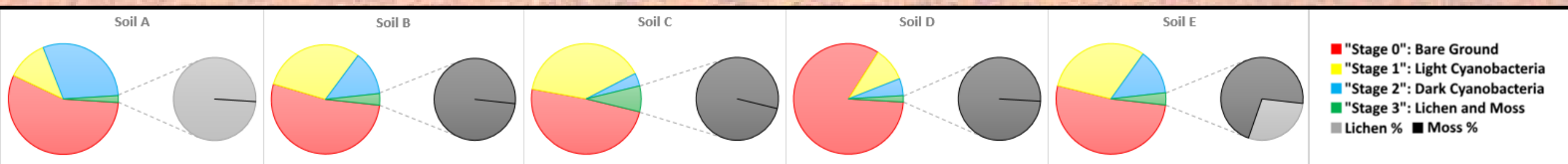


Comparing communities

Johnson Lakes Canyon



Grand Staircase Escalante



Statistical analysis (JLC vs. GSE)

Successional Stage of Crust				
Type of Soil		1	2	3
	A	✓	✗	✗
	B	✓	✓	✗
	C	✓	✓	✗
	D	✓	✓	✓
	E	✓	✓	✓

✓ = Significant at $p < .05$

- Number of “hits” pooled for each soil
- Compared to expected values via Chi square test to determine significance
- The following categories were significantly different at a $p < .05$ level:
 - Light Cyanobacteria in 100% of soils
 - Dark Cyanobacteria in 80% of soils
 - Moss and Lichen in 40% of soils

What does this mean?

- Earlier stages of succession show significant recovery after 7 years of protection from grazing/human traffic
- Late stage succession hasn't been allowed enough time to recover, but shows promise in coming years
- Grazing restriction is effective for preserving biocrust health



Future work

- JLC biocrust community development can be tracked
- Additional transect sites could be established
- Greater parity between JLC and GSE to expand findings



Acknowledgements

- Jonathan Barth
- Rick and Susie Knezevich
- Mary and Bob O'Brien
- David de Roulhac
- Maggie Baker
- Rebecca Gross
- Roger Rosentreter
- Hilda Smith
- Delbert Hutchison

