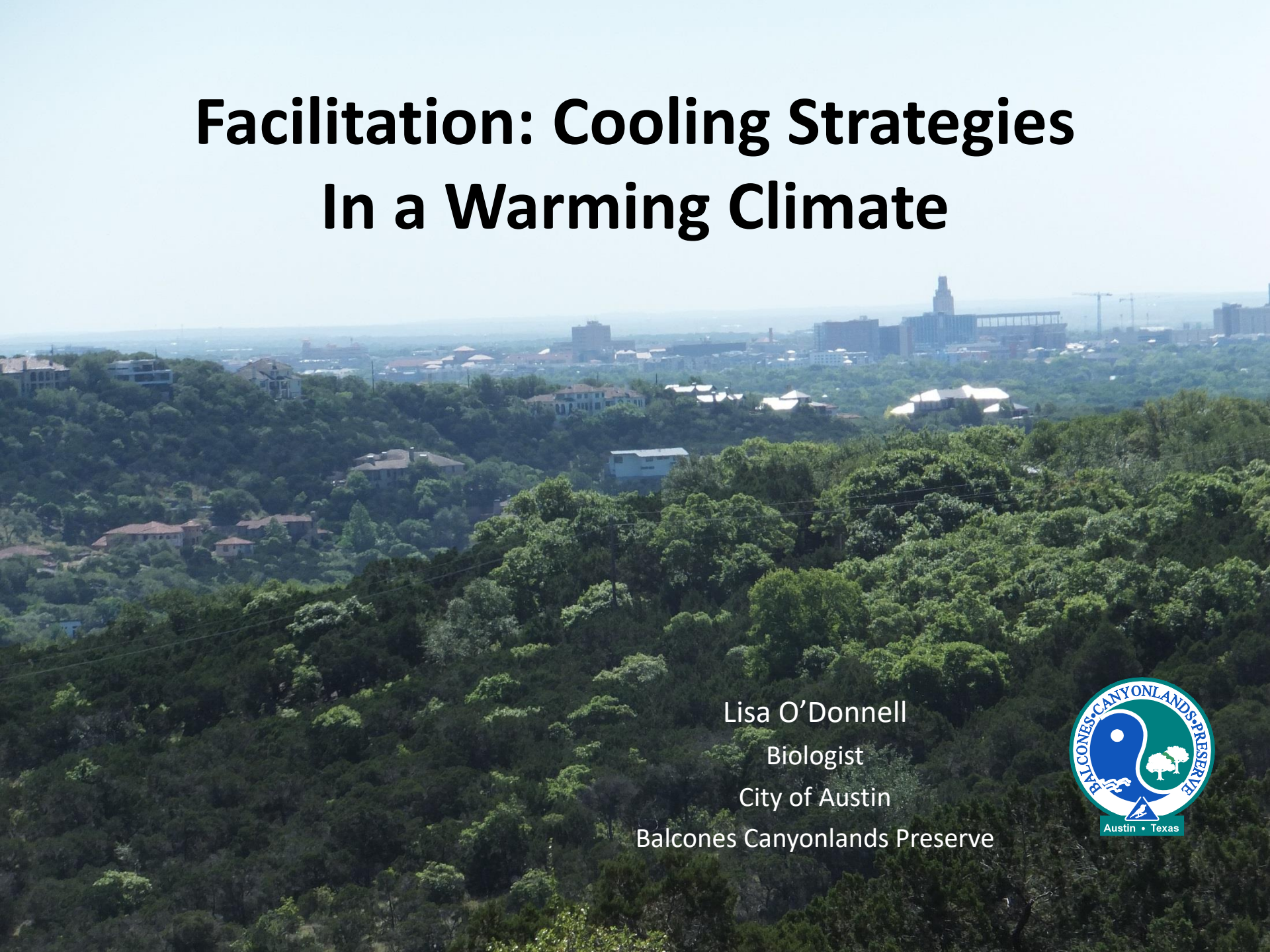
Facilitation: Cooling Strategies In a Warming Climate

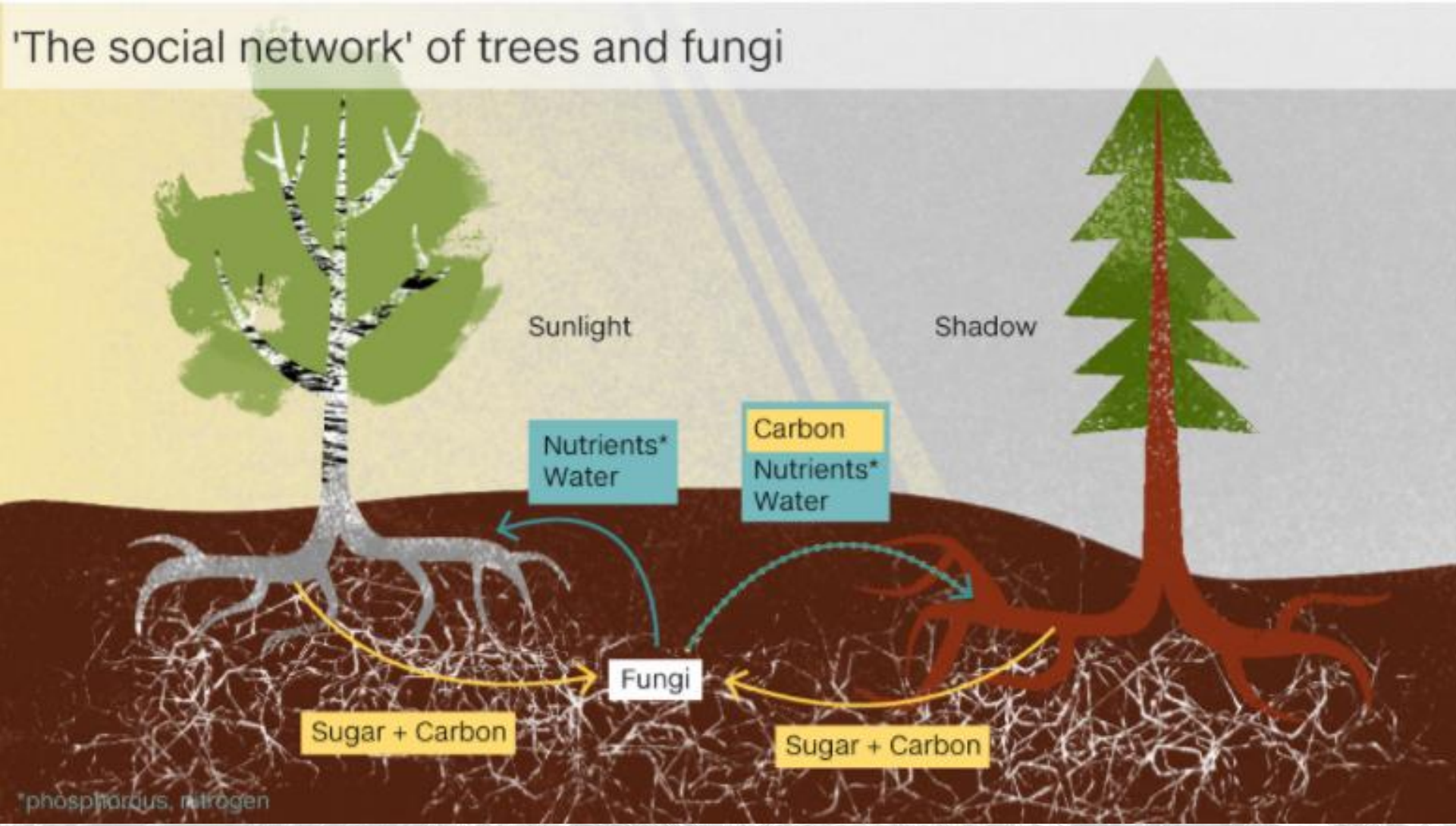


Lisa O'Donnell
Biologist
City of Austin
Balcones Canyonlands Preserve

Traditional View: Trees as Solitary Individuals Competing for Resources

Emerging View: Forests as Internconnected "Superorganisms" (facilitation)

Mycorrhizal Fungi: “Wood Wide Web”



https://www.youtube.com/watch?v=yWOqeyPIVRo

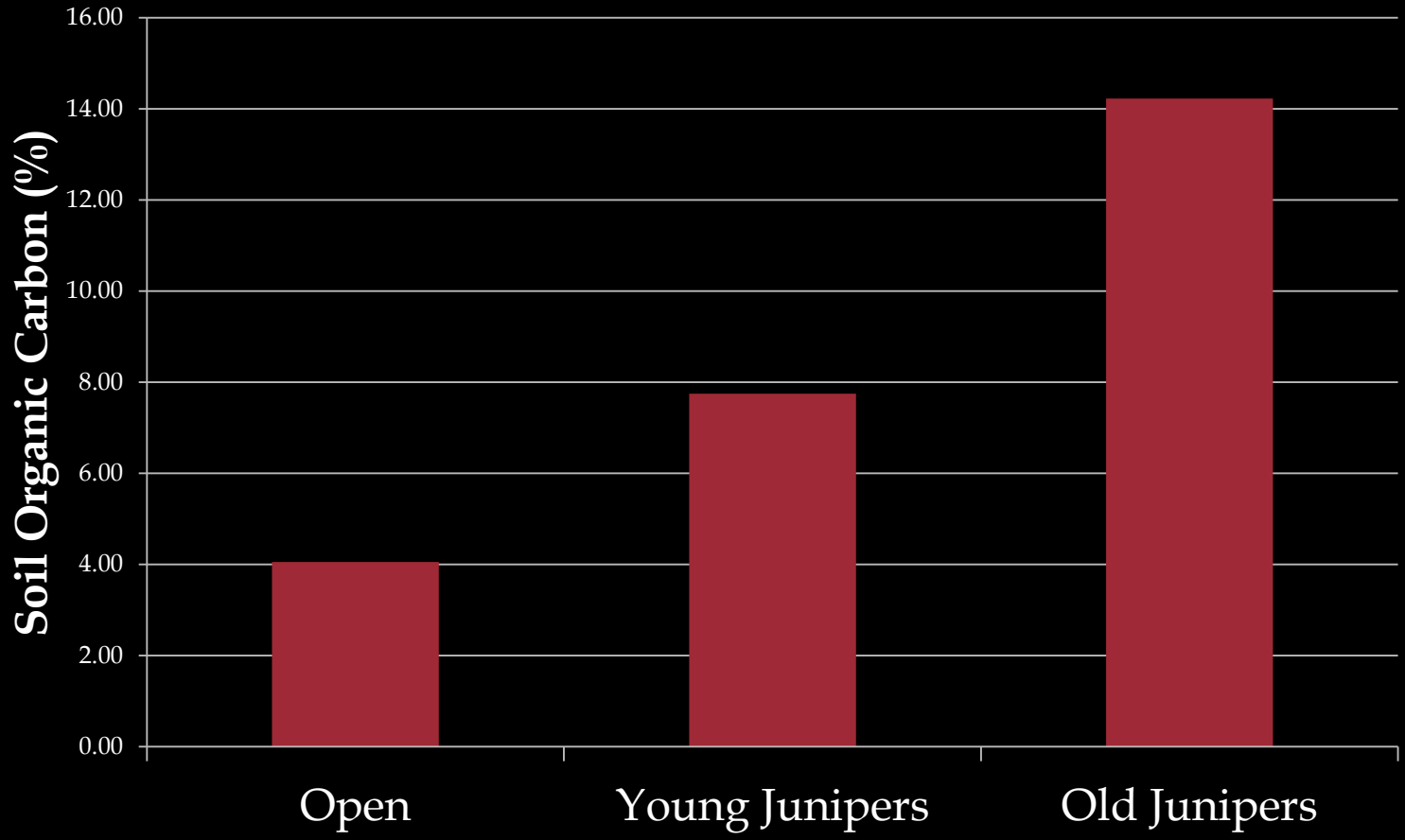
Dr. Suzanne Simard

Benefits of Mycorrhizal Fungi

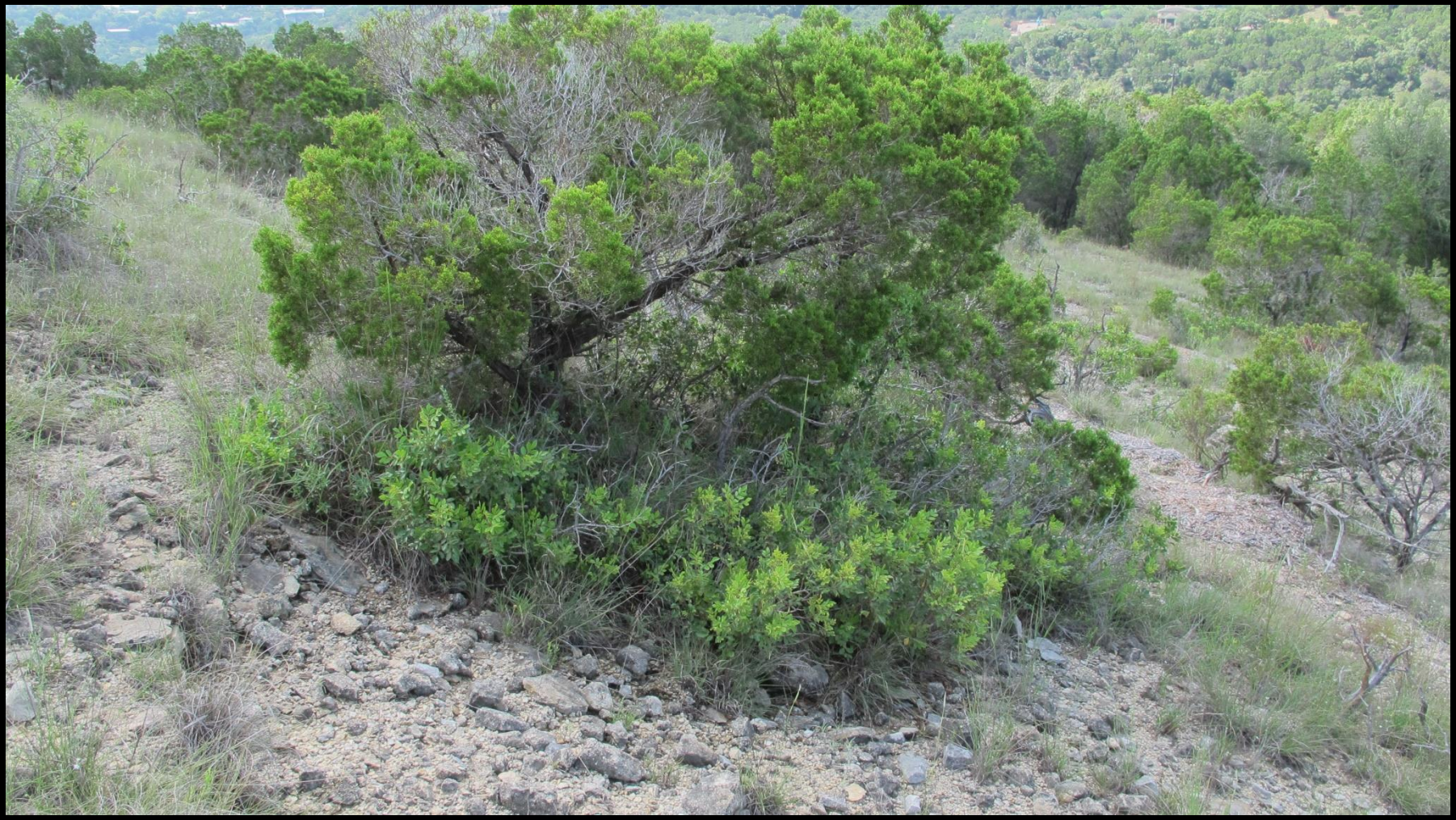
- Enhance water and nutrient uptake
- Increase drought resistance
- Increase pathogen resistance
- Increase plant health and stress tolerance
- Promote carbon sequestration and storage in soil

Ashe juniper and shin oak roots (and Dr. Brian Pickles)
Cotterell Cave

Soil organic carbon increases with stand age in Ashe juniper-oak forest Balcones Canyonlands Preserve

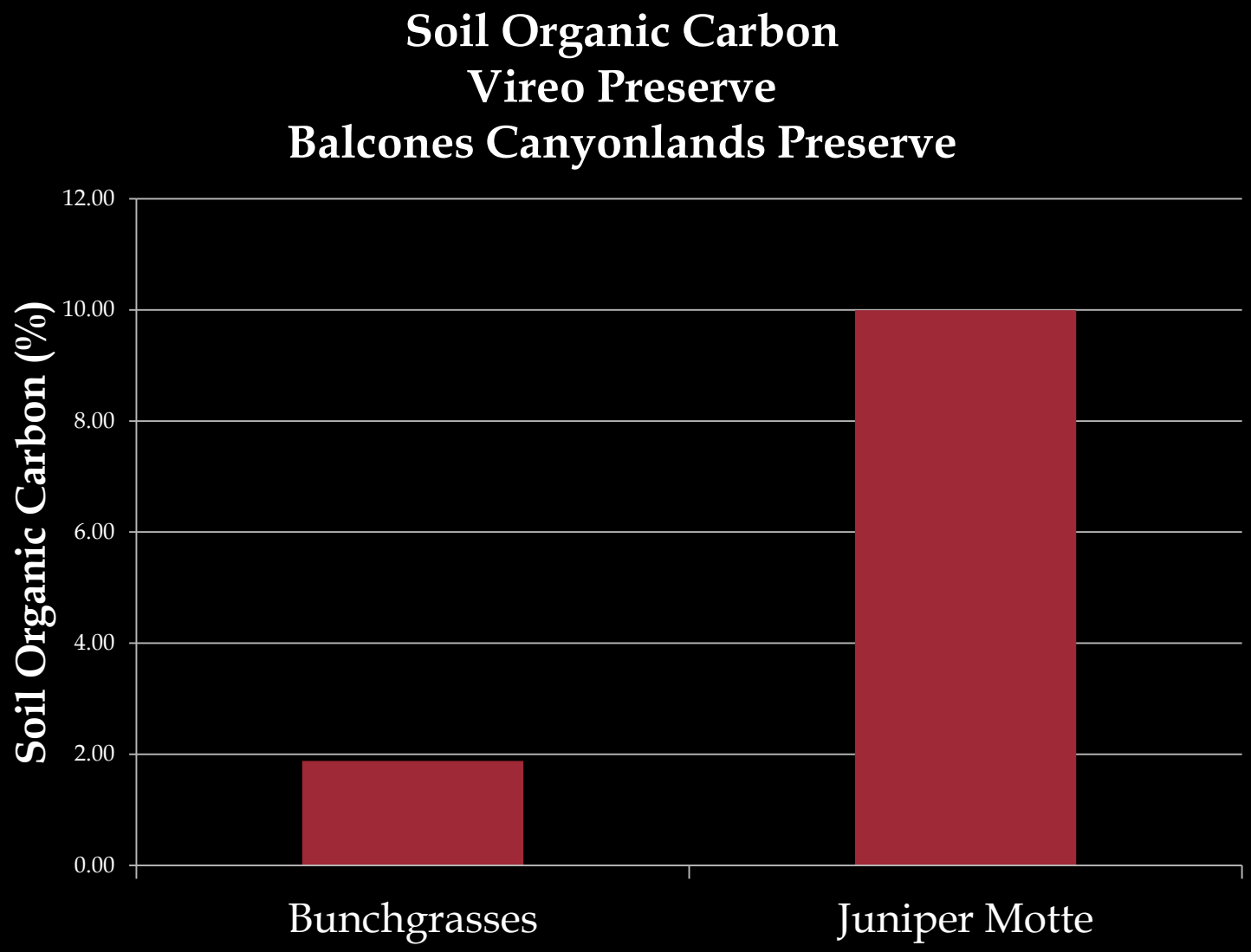


“Nurse Trees” (and roots)



Ashe Juniper Motte

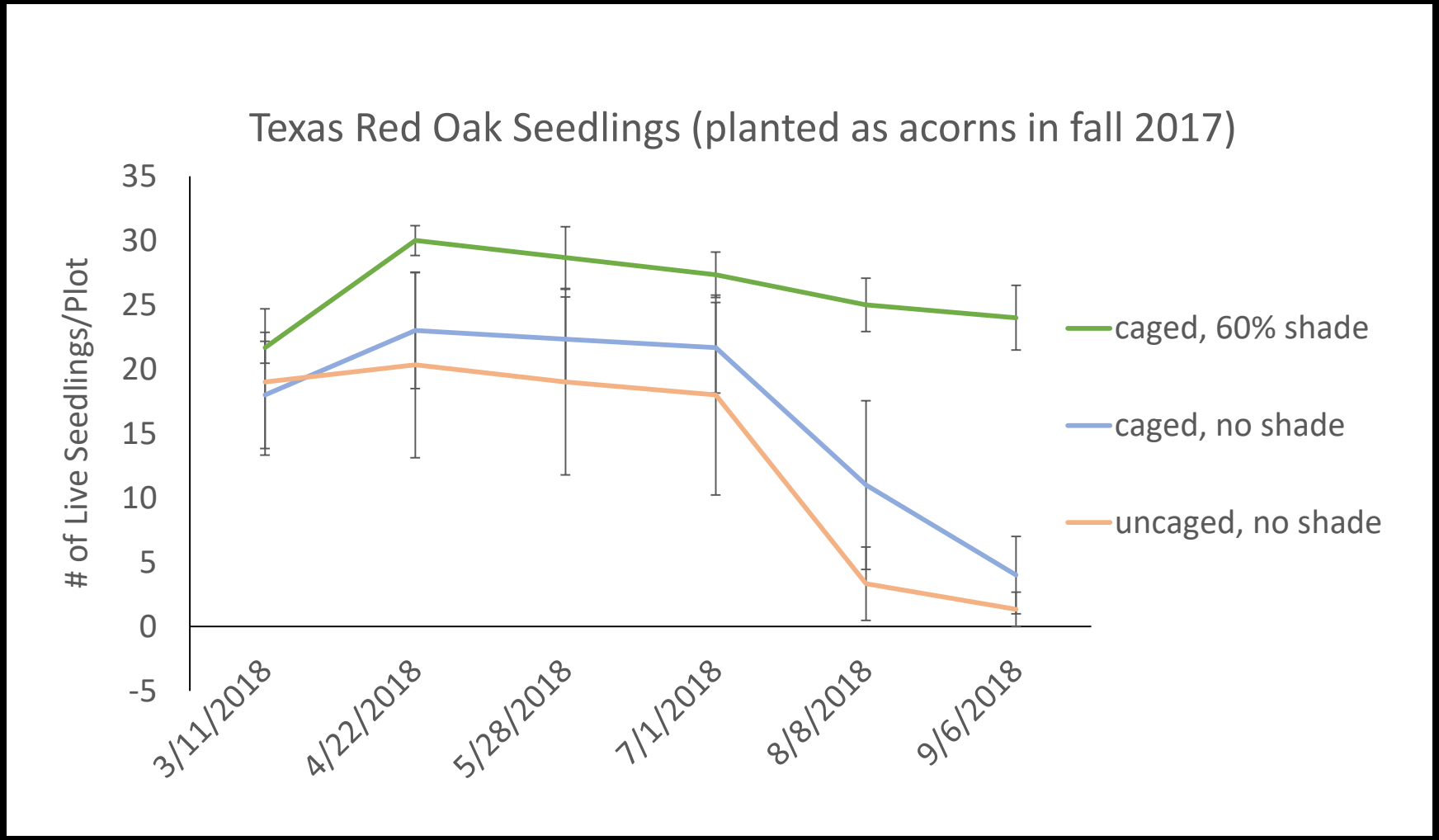
Adjacent Eroded Slope


Soil Organic Carbon
Vireo Preserve
Balcones Canyonlands Preserve
Soil Organic Carbon (%)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Bunchgrasses
Juniper Motte

Importance of Shade for Oak Regeneration

August 2019: Under Tree Canopy

August 2019: No Shade


Texas Red Oak Seedlings (planted as acorns in fall 2017)
# of Live Seedlings/Plot
35
30
25
20
15
10
5
0
-5
3/11/2018
4/22/2018
5/28/2018
7/1/2018
8/8/2018
9/6/2018
caged, 60% shade
caged, no shade
uncaged, no shade

Nurse trees can be living…or dead

Sapling growing under living tree

Sapling growing under dead tree

Endophytes

- **Bacteria or fungi that live within a plant (e.g., bark, leaves) without causing apparent disease**
- **May enhance host plant's**
  - **growth**
  - **nutrient acquisition,**
  - **ability to tolerate abiotic stresses (e.g., drought)**
  - **resistance to insects, pathogens and herbivores**
- **As with mycorrhizae, endophytes receive carbon for energy from the host plant**

Some cooling strategies (from soils to canopy)