Facilitation: Cooling Strategies
In a Warming Climate

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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)
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)

- 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)