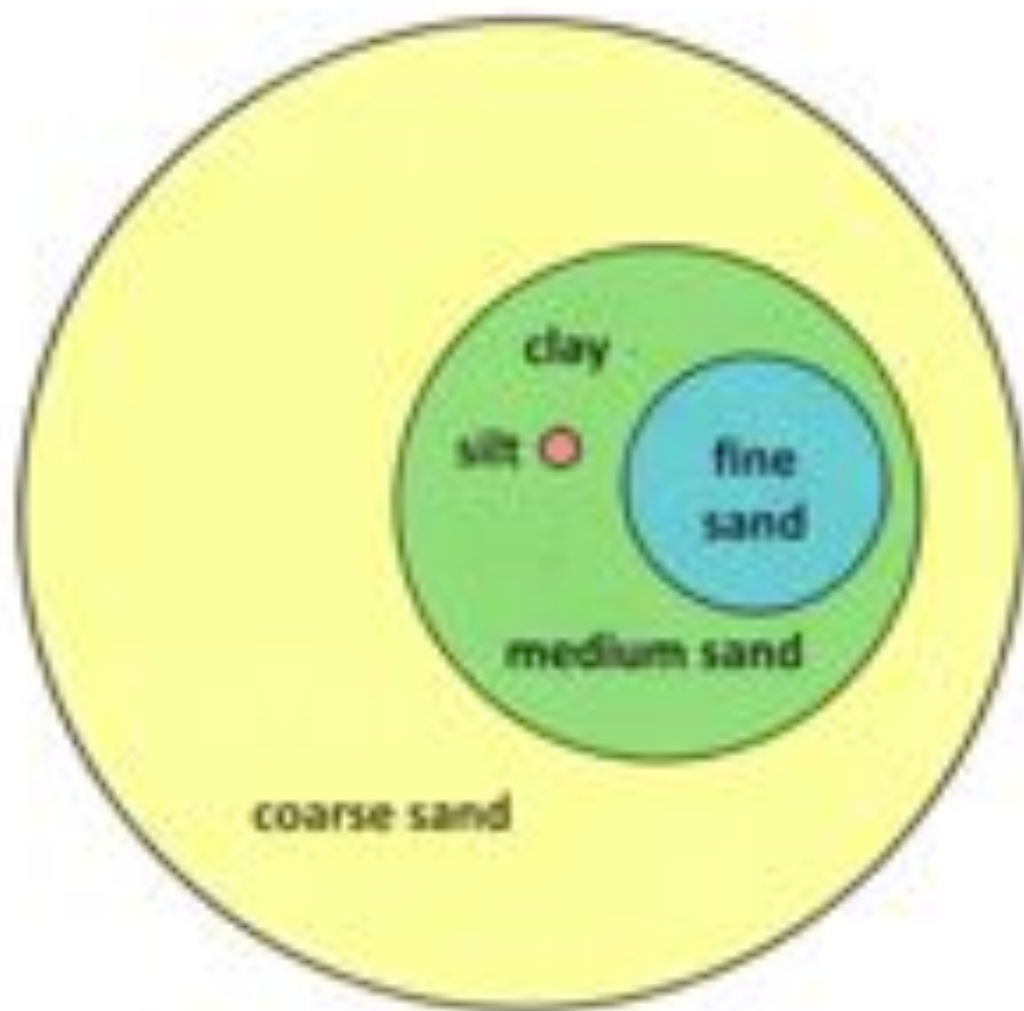


A microscopic view of soil particles, showing various sizes and shapes, some with internal structures and colors like blue, orange, and yellow.

Does Size Matter? Investigating the Physical Properties of Soil

Emily Dittmar & Russ Stolberg



If a particle
of **sand** were
the size of a



basketball,

then **silt** would
be the size
of a



baseball,

and **clay**
would be the
size of a



golf ball.

Sand

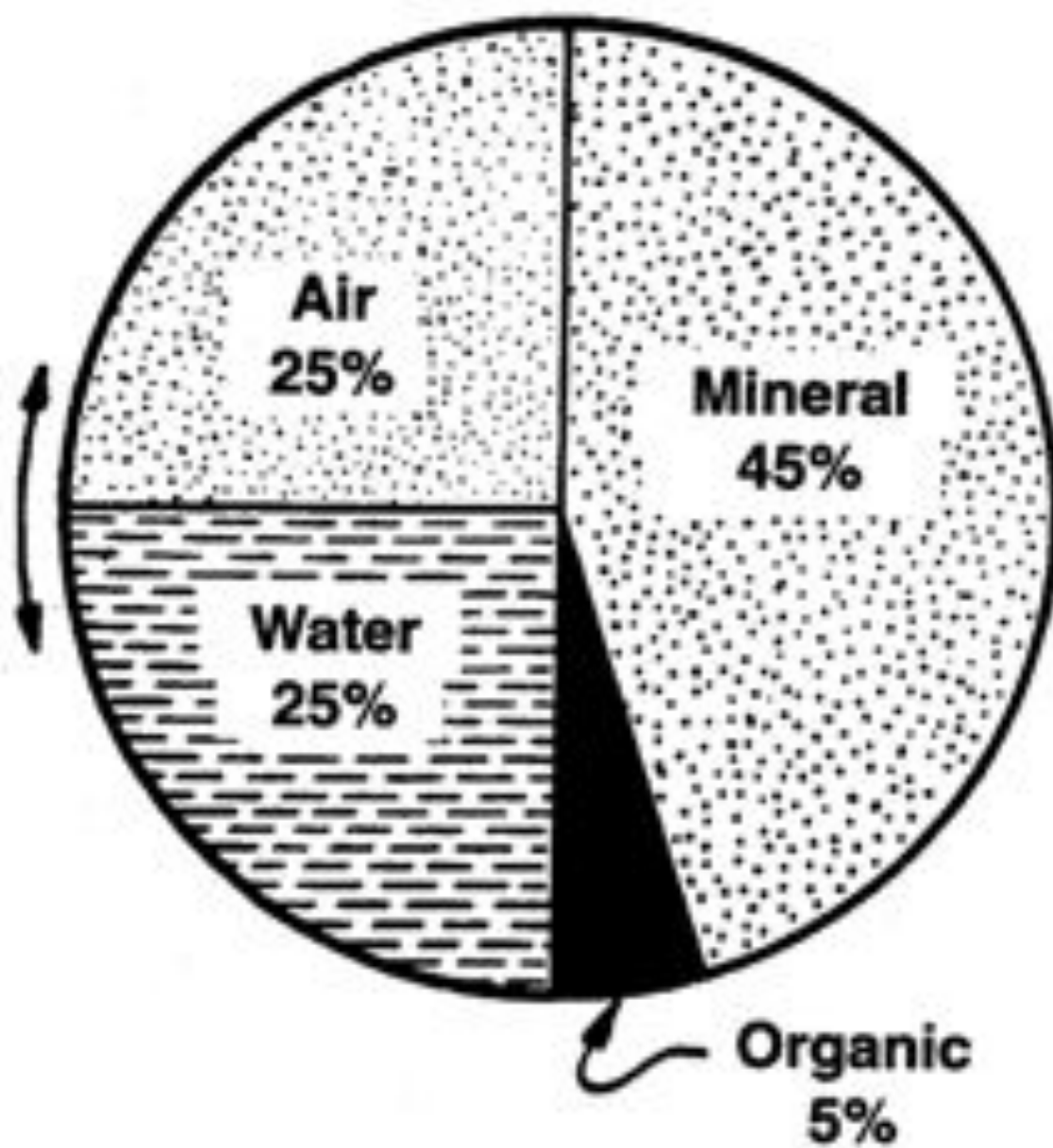
- Most common constituent is silica, usually in the form of quartz
 - Quartz is the most common mineral resistant to weathering
- Second most common type of sand is calcium carbonate (derived from life forms- coral, shellfish)
- Quartz sand is usually angular; sand that is transported by long distances by water or wind is typically rounded

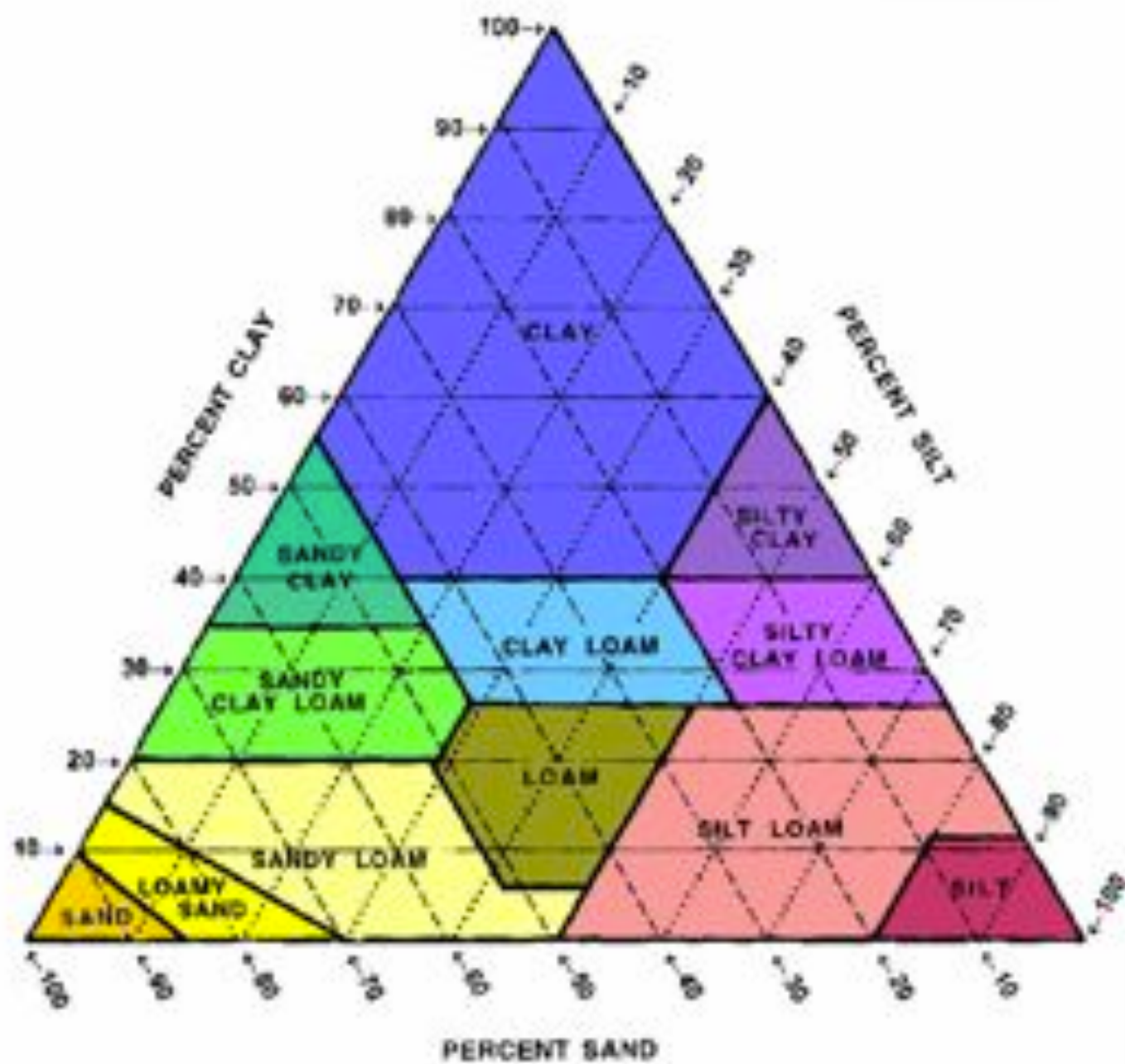
Silt

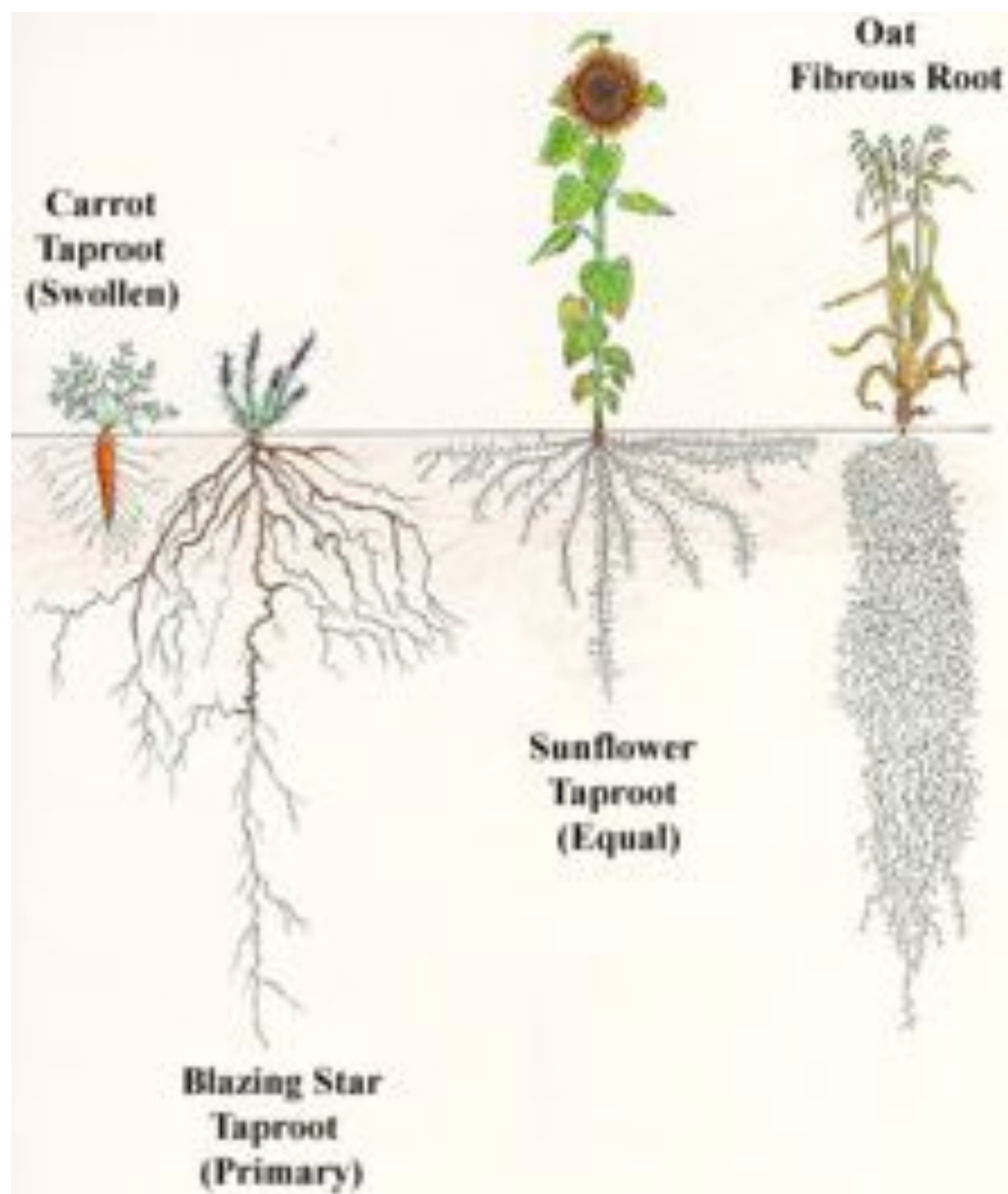
- Mineral origin is quartz or feldspar
- Created by physical processes that split sand-sized crystals
 - Movement through streams, wind, or glacial action; chemical weathering, stress from freeze-thaw cycles, growth of salt crystals
- Silt is easily transported by water and fine enough to be carried by air

Clay

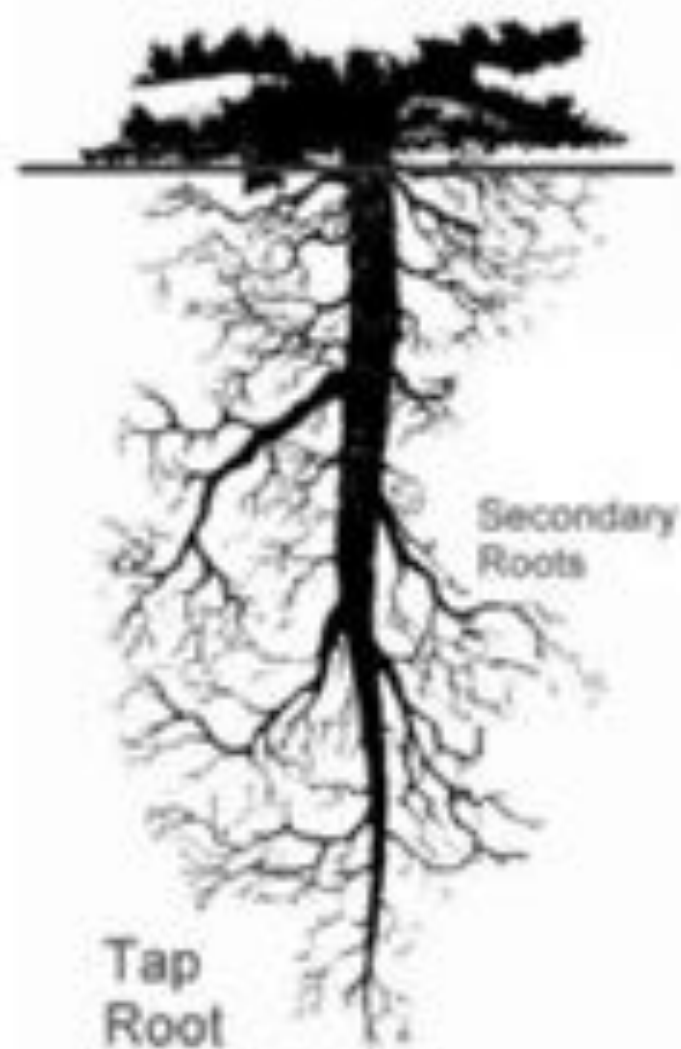
- Combines one or more clay minerals with traces of metal oxides and organic matter
- Formed over long periods of time by the gradual weathering of rocks by low concentrations of acidic solvents such as carbonic acid
- Some clay minerals may be formed from hydrothermal activity (usually due to volcanic activity)







Thistle

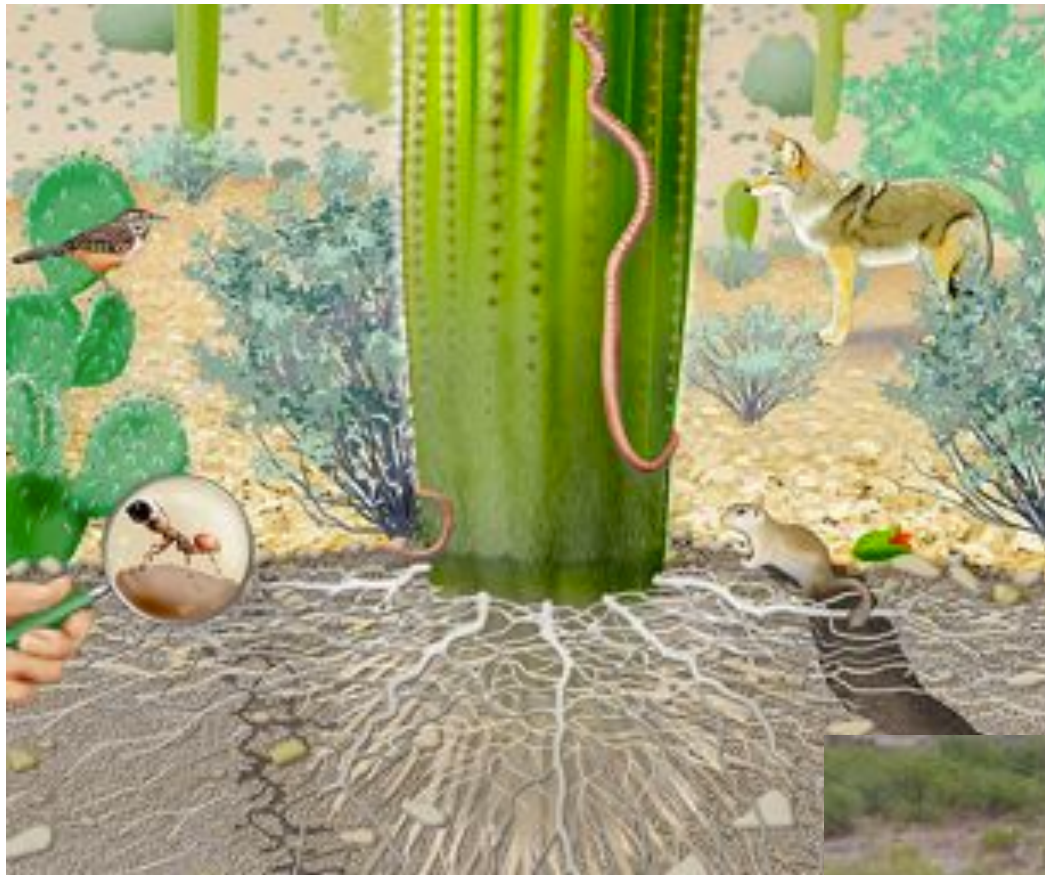




American Beachgrass









Serpentine Soil



Properties

- Low Calcium
- High Magnesium
- High in heavy metals
- Low water holding capacity



Serpentine minerals

- Greenish, brownish, or spotted minerals found in serpentinite rocks
- Olive green color and smooth/scaly appearance -> “serpent rock”
- Serpentine is the CA state rock





Serpentine Flora

- Lots of **Endemic** species
- Serpentine- 1% of surface of CA, but 10% of plant diversity

Jasper Ridge Biological Station



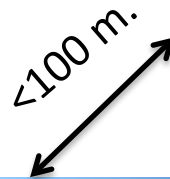


Leptosiphon parviflorus



Jasper Ridge

Serpentine soil



Sandstone soil



1. Are populations locally adapted to their home soil?
2. What environmental characteristics are imposing selection in each habitat?
3. What traits are adaptive?
4. Is there a trade-off to being adapted to one environment?

Locally adapted to soil?

- Reciprocal transplant studies

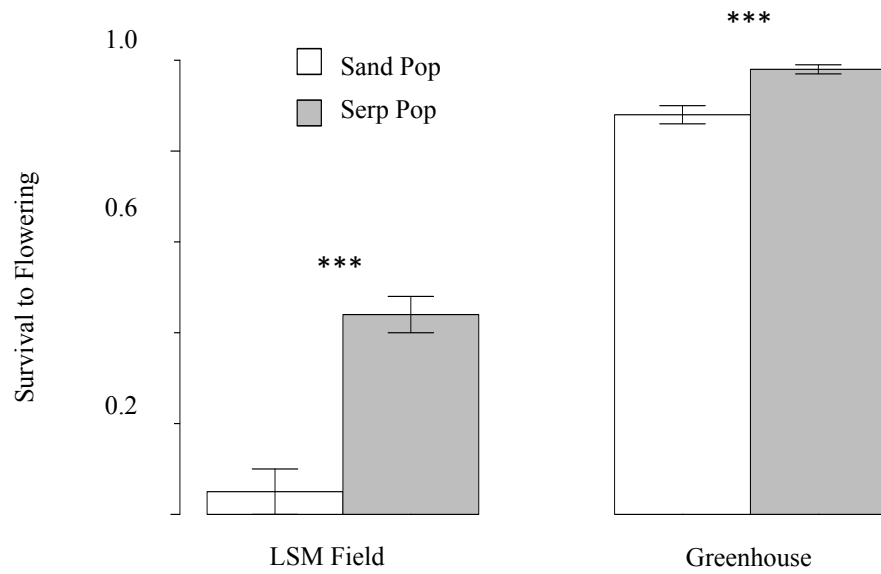




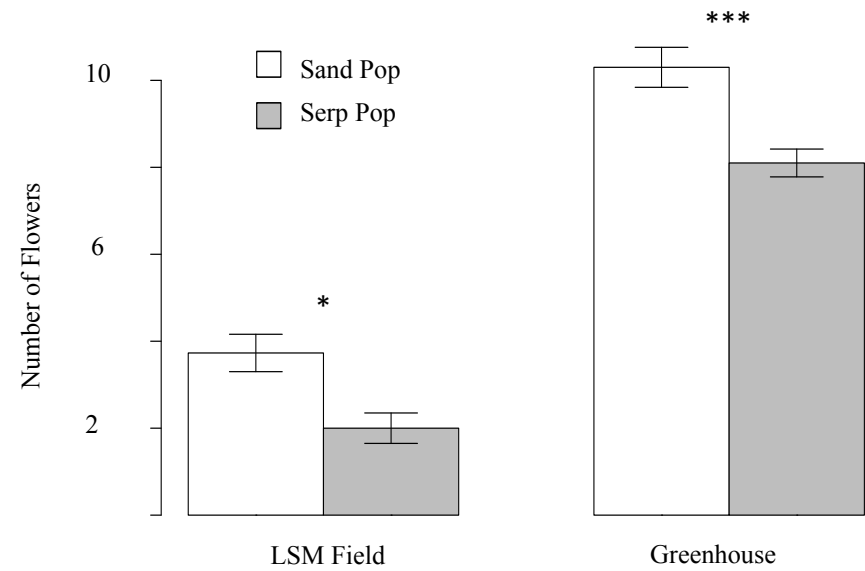


Results

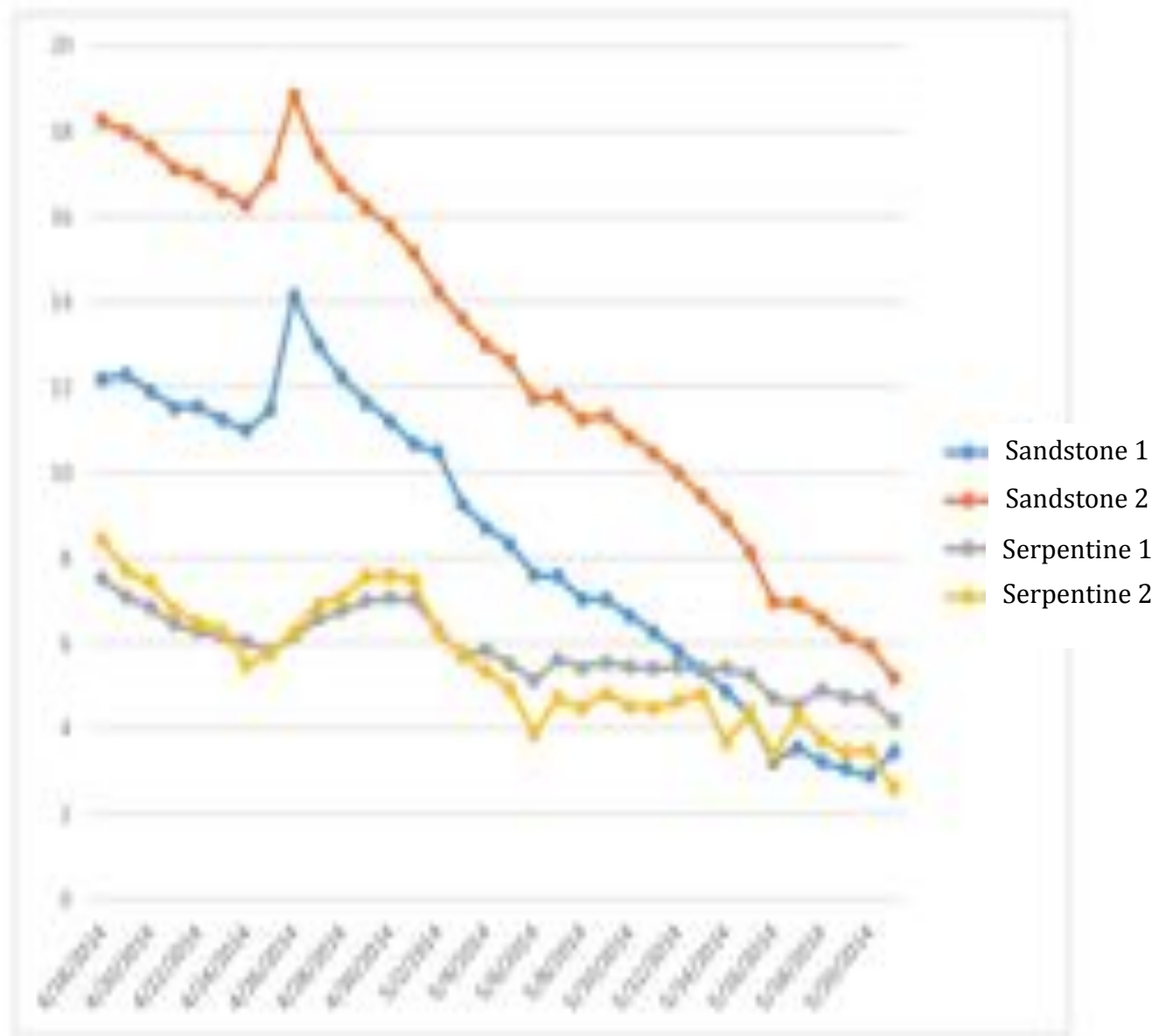
a.) Serpentine Soil



b.) Sandstone Soil



% Soil Moisture



Date

Inquiry-based Extensions

- Have students design an experiment to test the ideal amounts of sand, silt, and clay for growing a particular plant
- Observe roots growing in different substrates
 - Carrots
 - Can angle a fish tank or other container with clear surface to force roots to grow against the window

Take-Home Messages

1. Sand, Silt, and Clay are distinguished by their different sized particle
2. Water flows more quickly through soils with greater sized particles than soils with smaller sized particles
3. Plants have adaptations that equip them for living in different soil types
4. Geological Processes play a large role in the types of plants we see in different environments!