

What is Soil Quality?

**Describes the “Fitness” of soils
to perform particular
ecosystem functions**



<http://soils.usda.gov/SQI/>



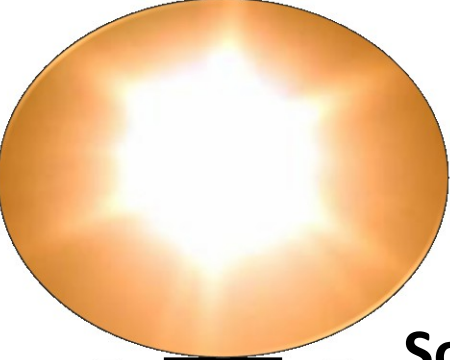








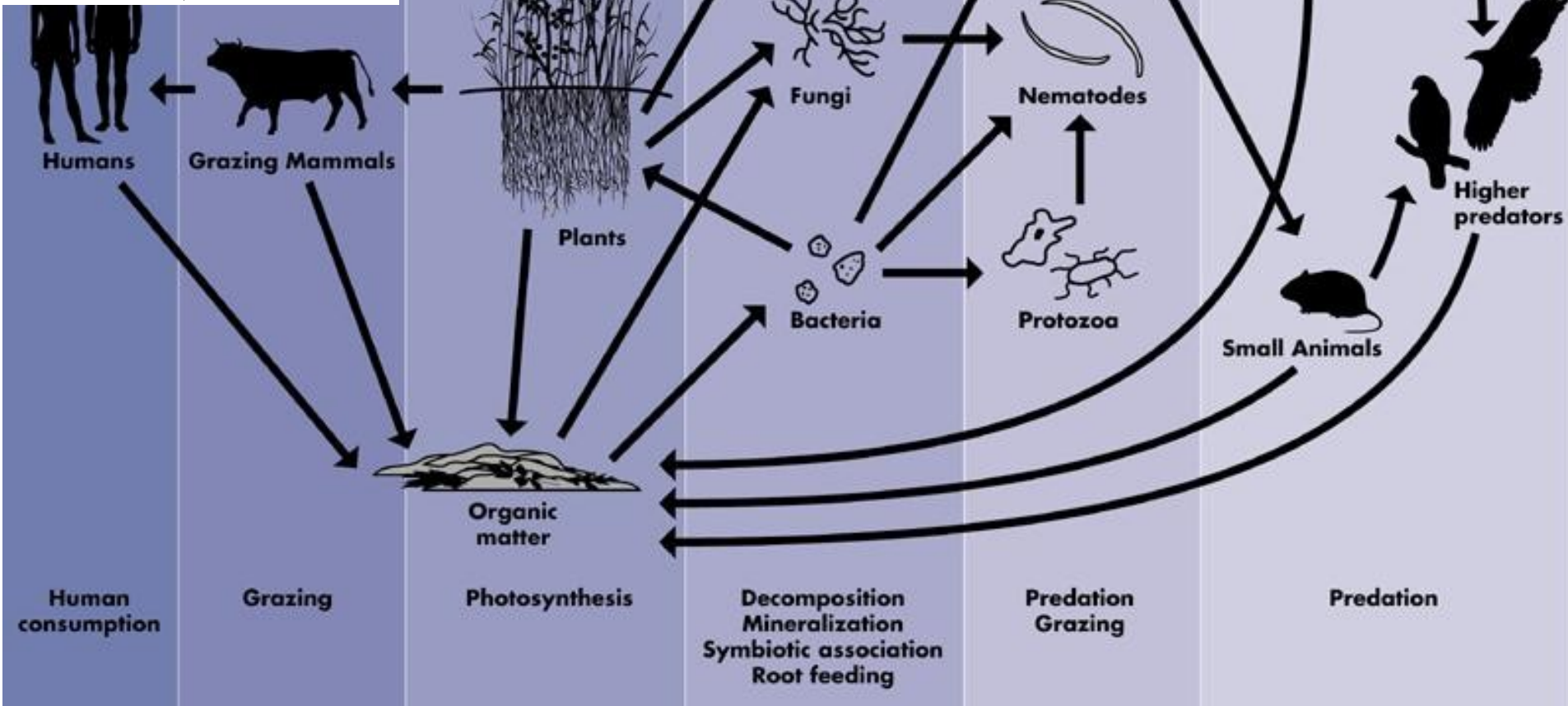




Soil Ecology

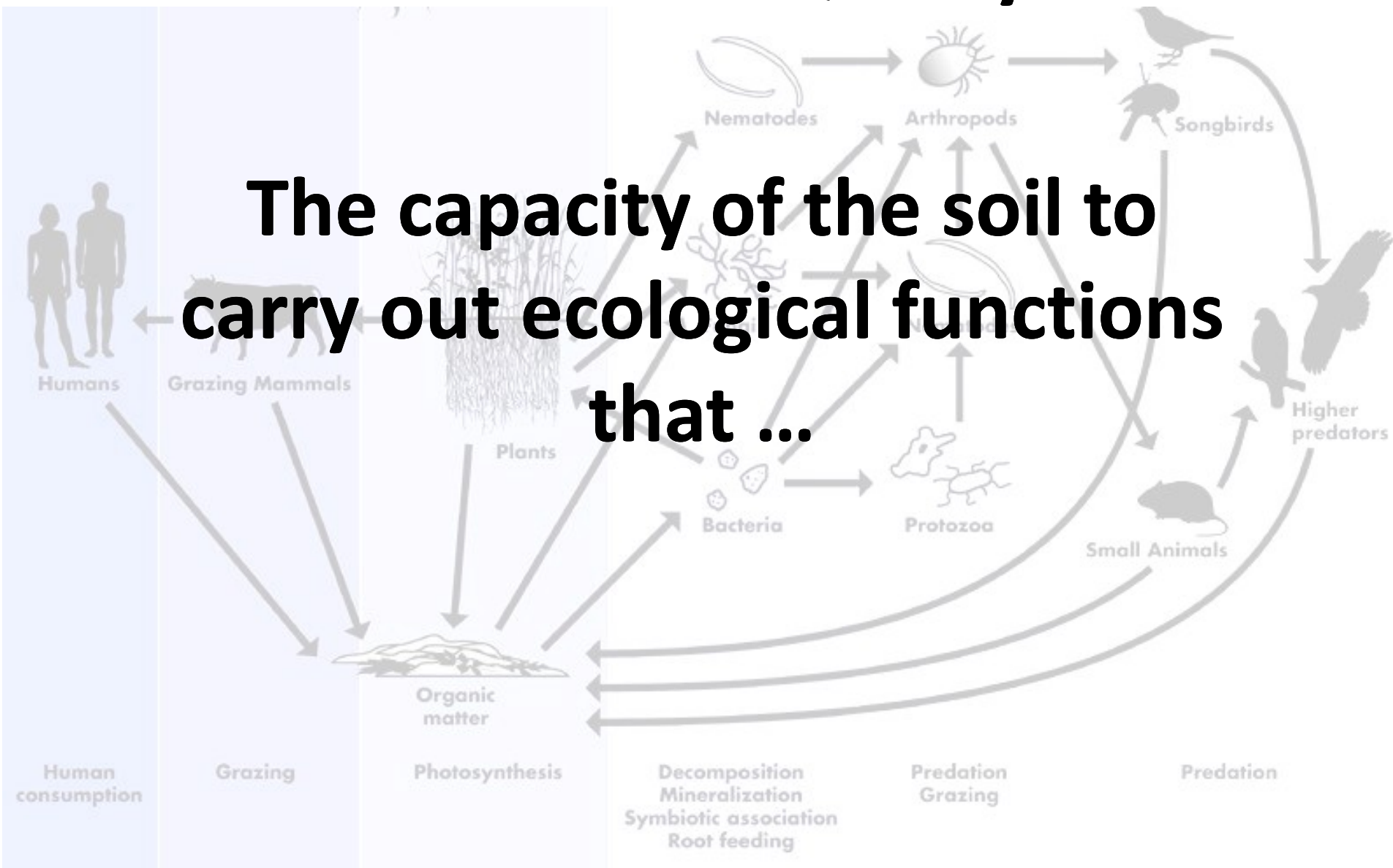


Soil Food Web



What is Soil Quality?

The capacity of the soil to carry out ecological functions that ...



1. Support terrestrial communities

Humans, wildlife





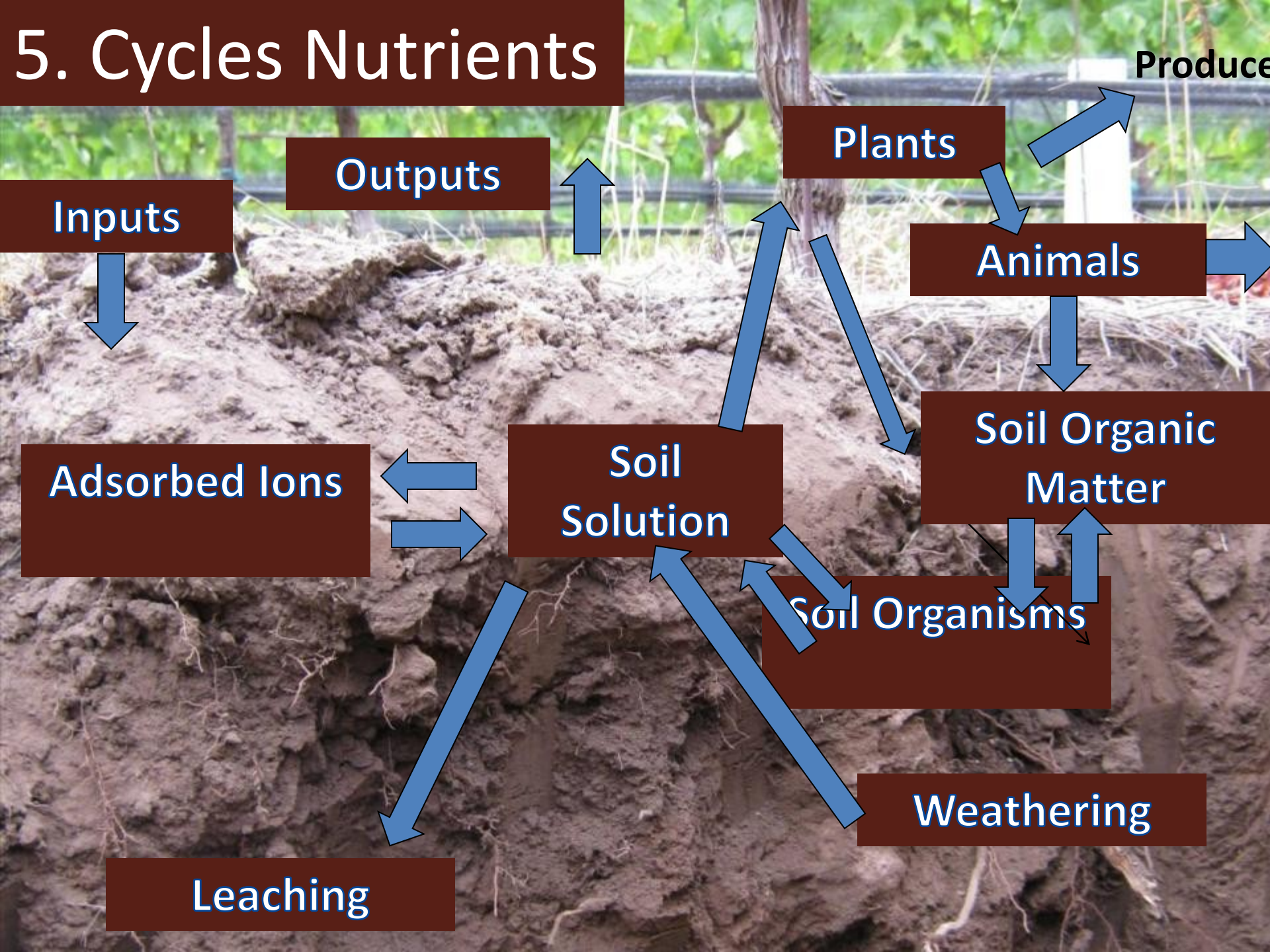
2. Resist Erosion

3. Reduce negative impacts associated with air and water resources



4. Promotes Plant Growth





5. Cycles Nutrients

Produce

Inputs

Outputs

Plants

Animals

Adsorbed Ions

Soil Solution

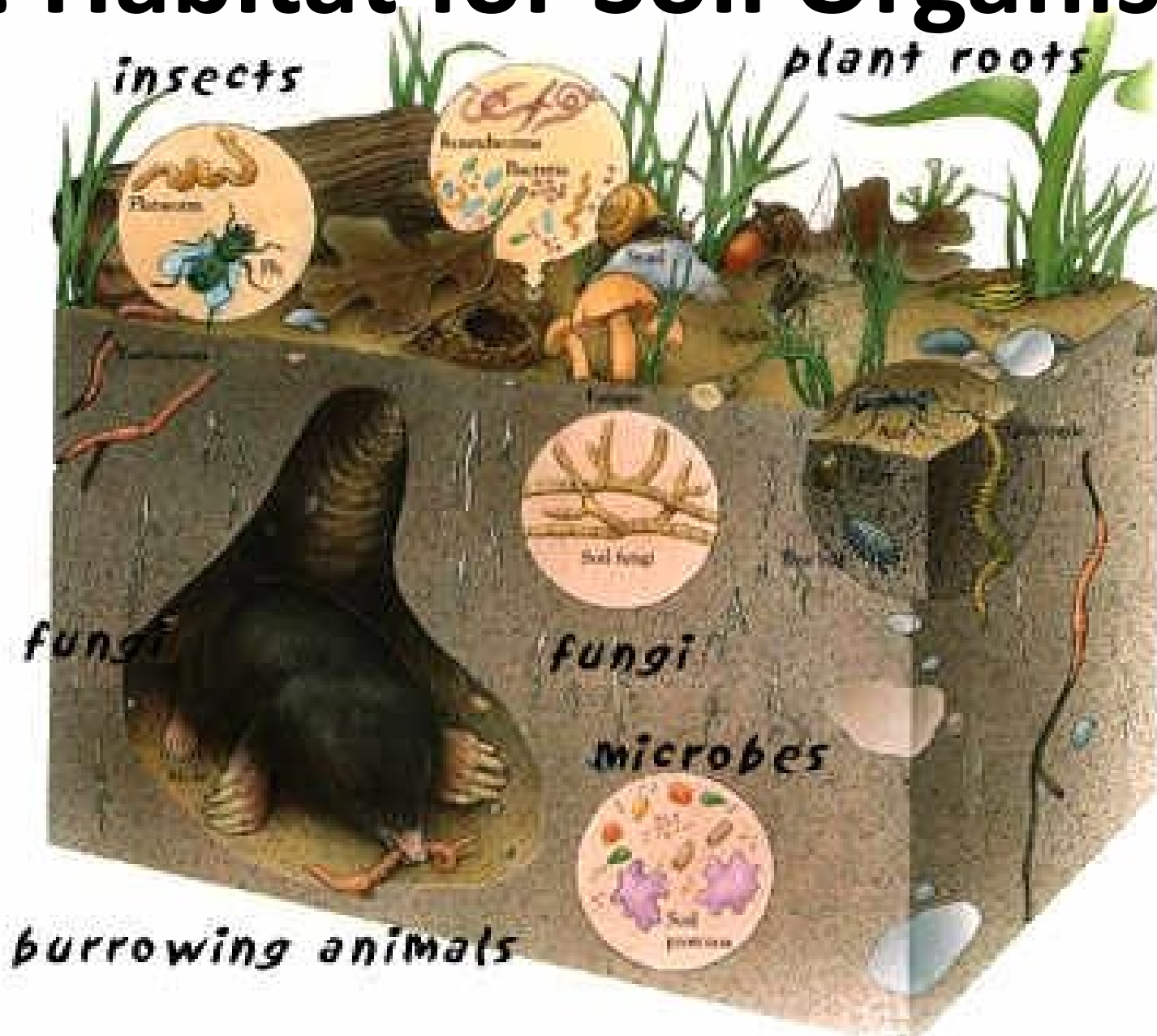
Soil Organic Matter

Soil Organisms

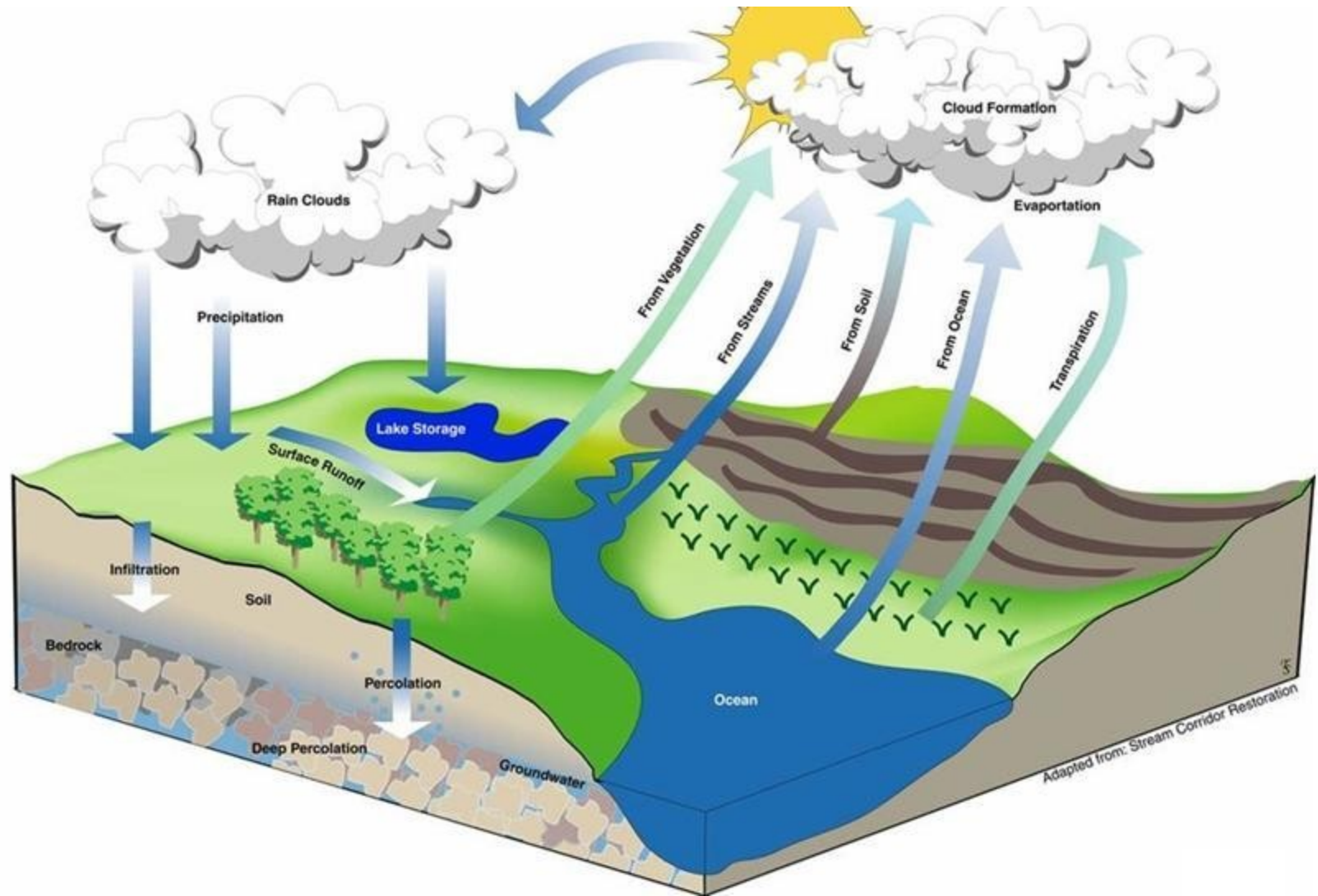
Weathering

Leaching

6. Habitat for Soil Organisms



7. Storage, translocation, & decontamination of water



8. Support and protect human structures and artifacts



What makes a Healthy Soil?

- Lack of degradation or contamination
- Overall fitness for carrying out ecosystem functions
- Ability to respond to environmental stresses

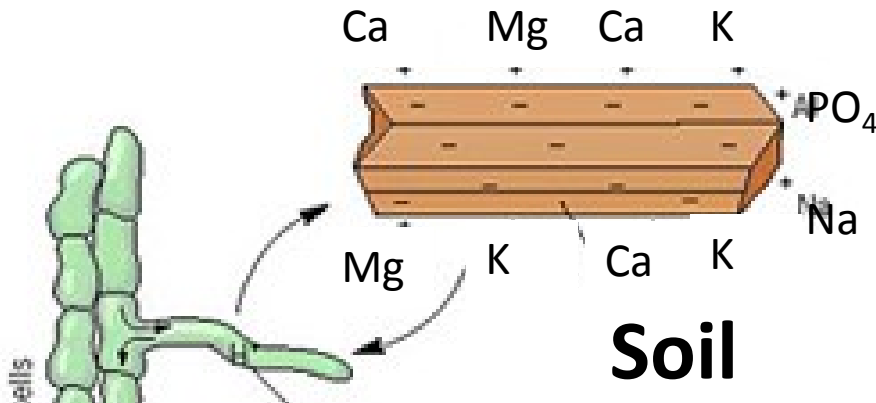


Soil Ecosystem Function for Plant Growth

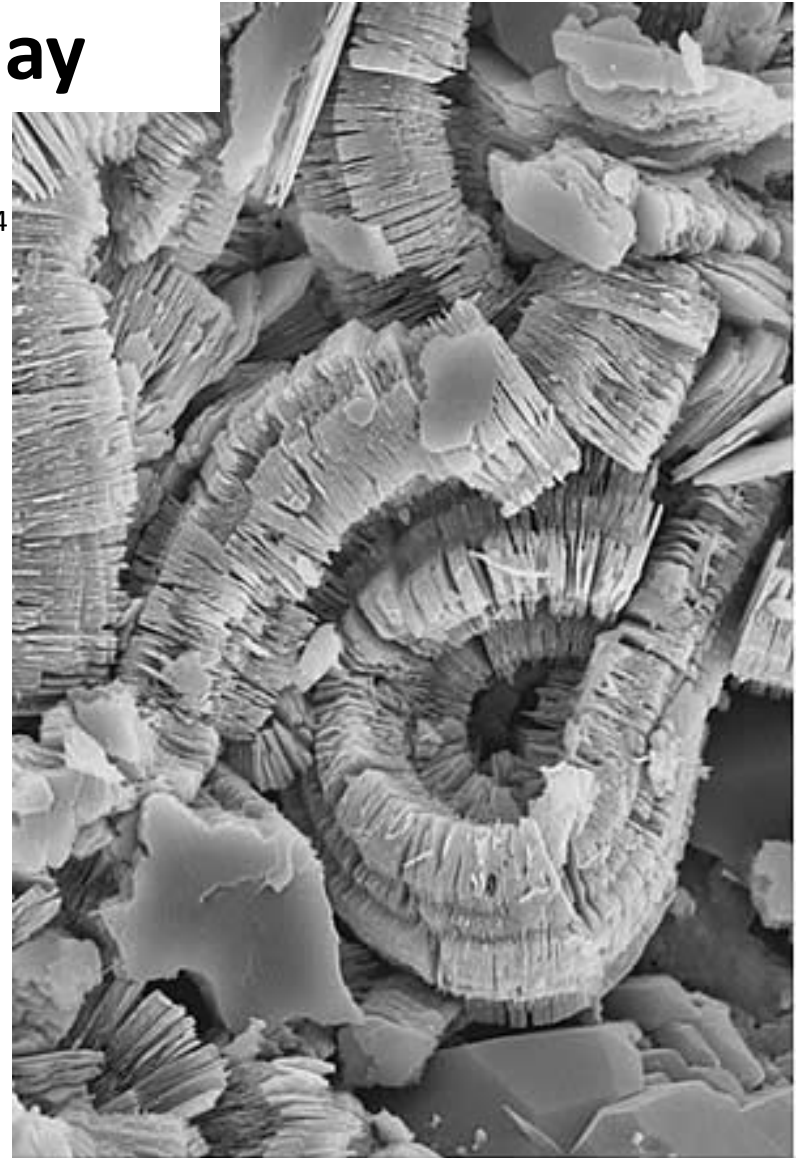


Mineral nutrients to plant roots

Clay



**Soil
Solution**



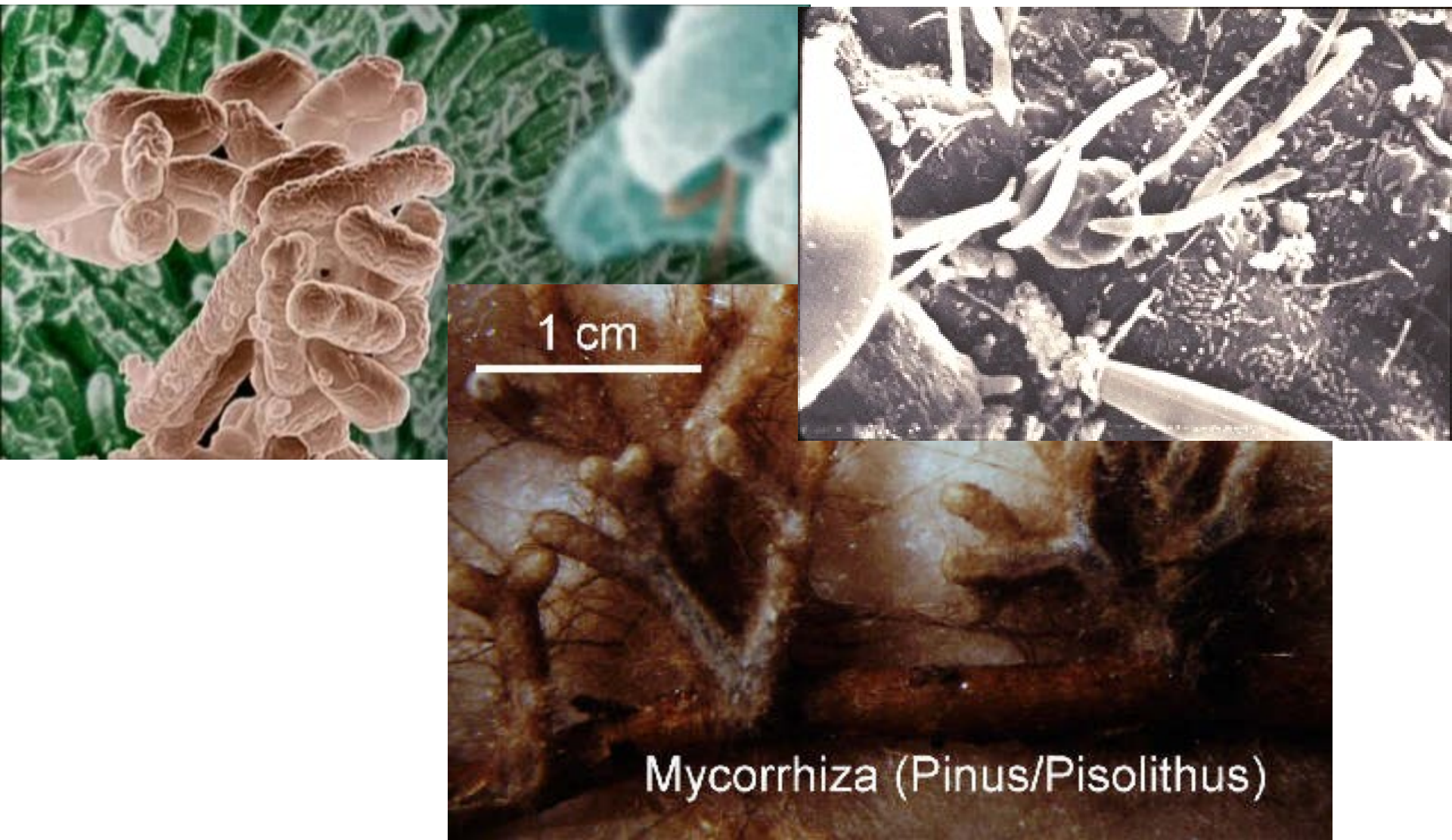
Retains water for plant use



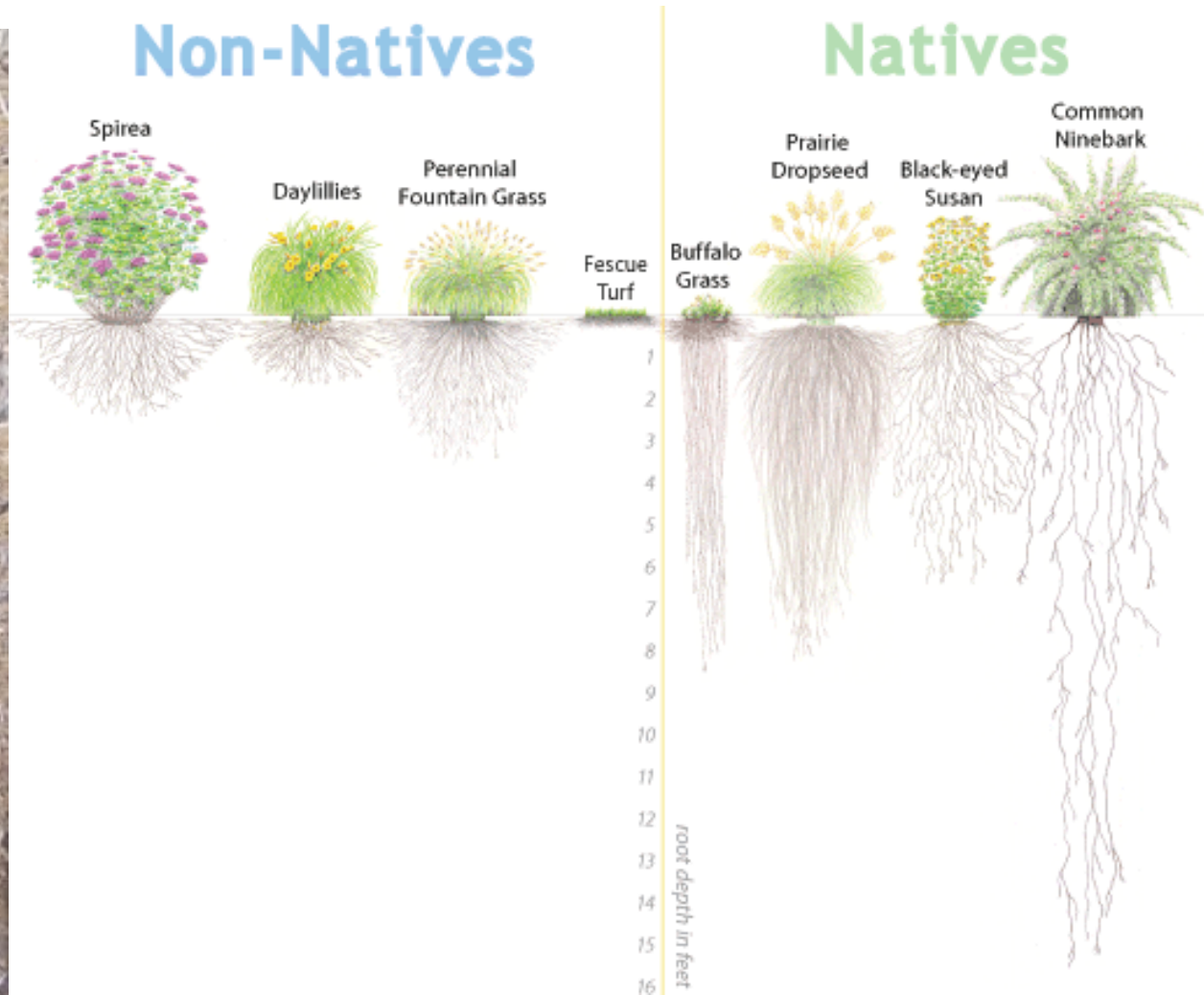
Low physical resistance to root growth



Promote soil microbial communities



Provide sufficient rooting depth & physical support for optimal plant growth



What do you have now?

- **Chemical Analysis**

- pH
- Nutrients
- Salinity (electrical conductivity)
- Sodium concerns
- Organic matter

<http://swatlab.nmsu.edu/>



- **Physical Analysis**

- Texture
- Bulk Density
- Infiltration
- Temperature



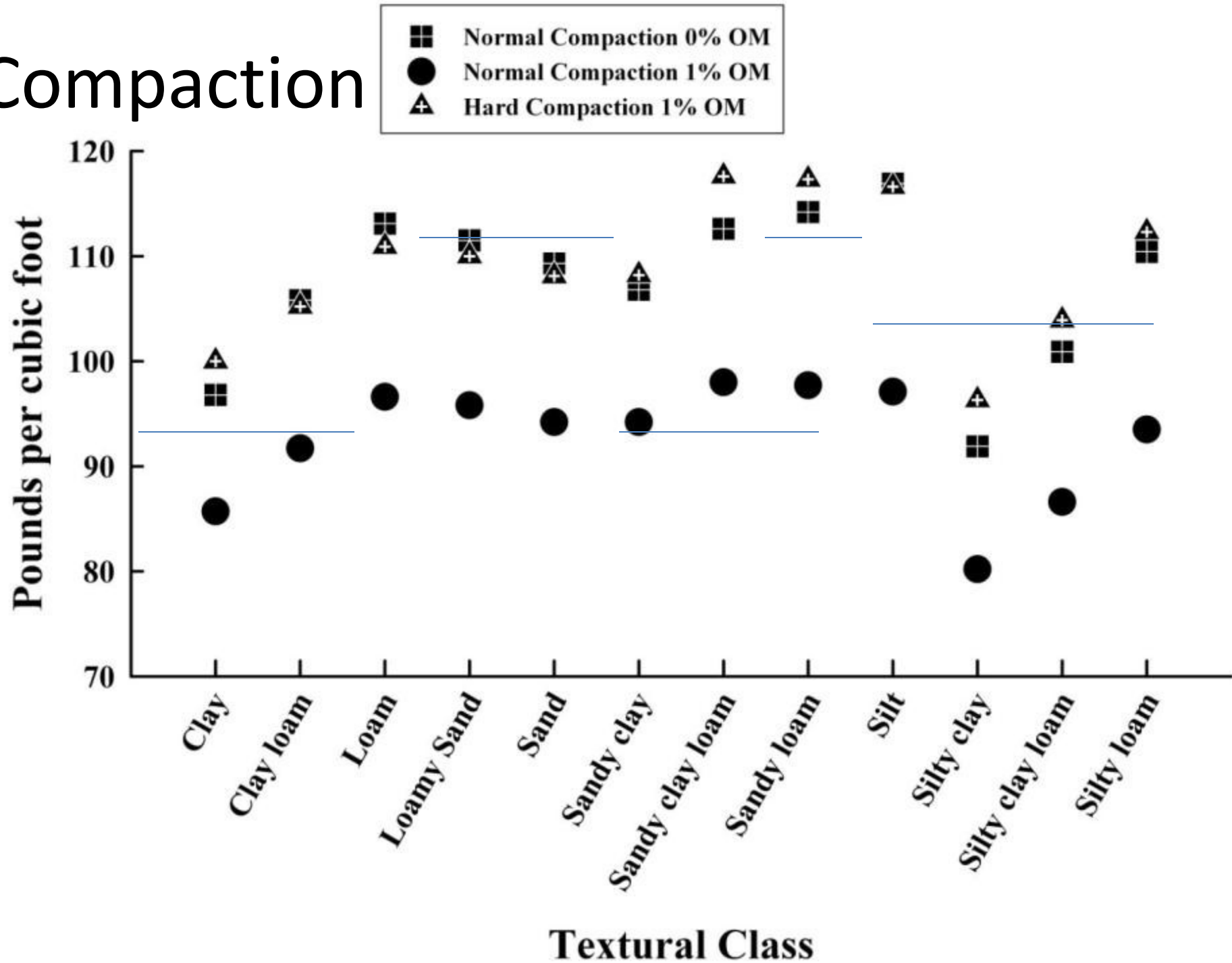
Bulk Density



Restrictive to Root Growth

- **Sandy**
>112.4 lb/cu ft
- **Silty**
>103.0 lb/cu ft
- **Clayey**
>91.8 lb/cu ft

Compaction



A photograph of a field site for soil sampling. A blue storage box, a yellow meter, a roll of Handi-Wrap, a syringe, a hammer, a mallet, a book titled 'Soil Quality Test Kit Guide', and various containers and tools are laid out on the ground next to a chili pepper plant.

<http://www.gemplers.com/product/RGM250/Soil-Test-Kit>

Infiltration



- **Saturated Soils**
 - Water filled pore spaces
 - No gas exchange
 - Plants can develop iron deficiency



Respiration



Slaking & Aggregate Stability



What do you have now?

- **Biological**
 - Active carbon
 - Nematodes
 - Good
 - Bad
 - Fungi
 - Arbuscular mycorrhizae & others
 - Bacteria
 - Rhizobium
 - Nitrobacter, nitrosomonas
 - Earthworms



Soil Quality Field Test Kit
Contact: Marsha Amlin,
amlin.1@osu.edu

Internet Resources



<http://websoilsurvey.nrcs.usda.gov/>



<http://plants.usda.gov/>



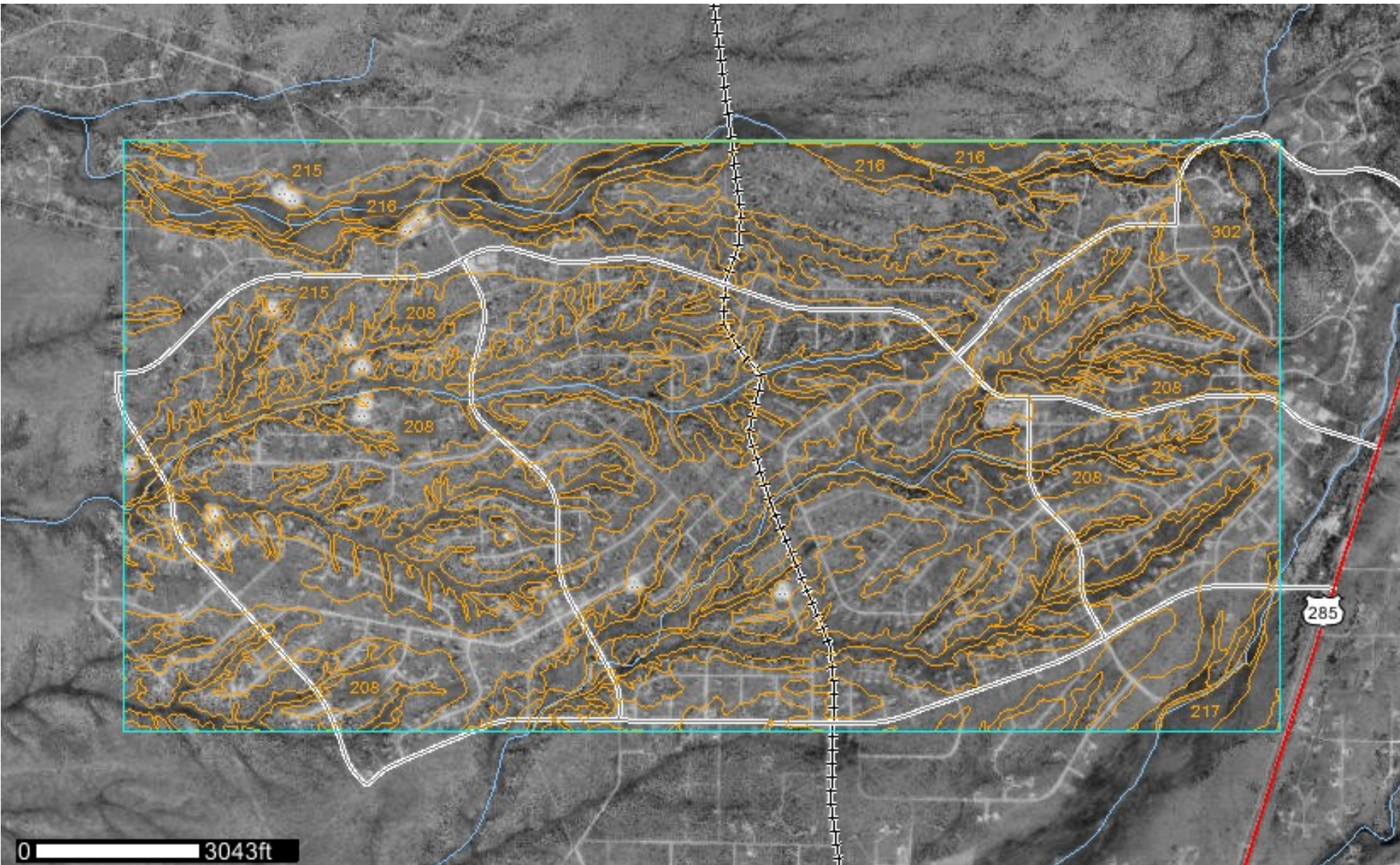
<http://swatlab.nmsu.edu/>



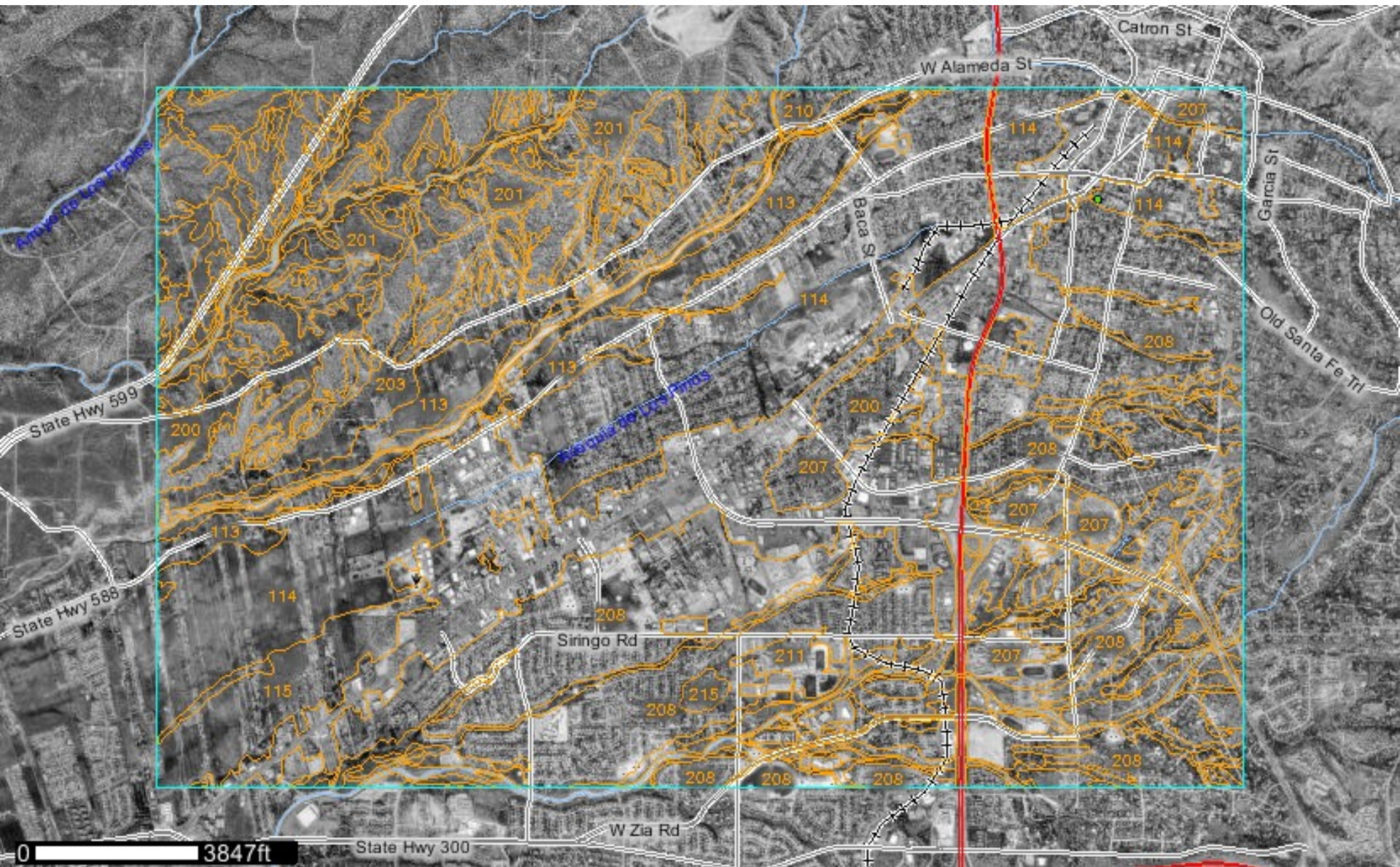
<http://aces.nmsu.edu/>

College of Agricultural, Consumer and Environmental Sciences

<http://websoilsurvey.nrcs.usda.gov/>

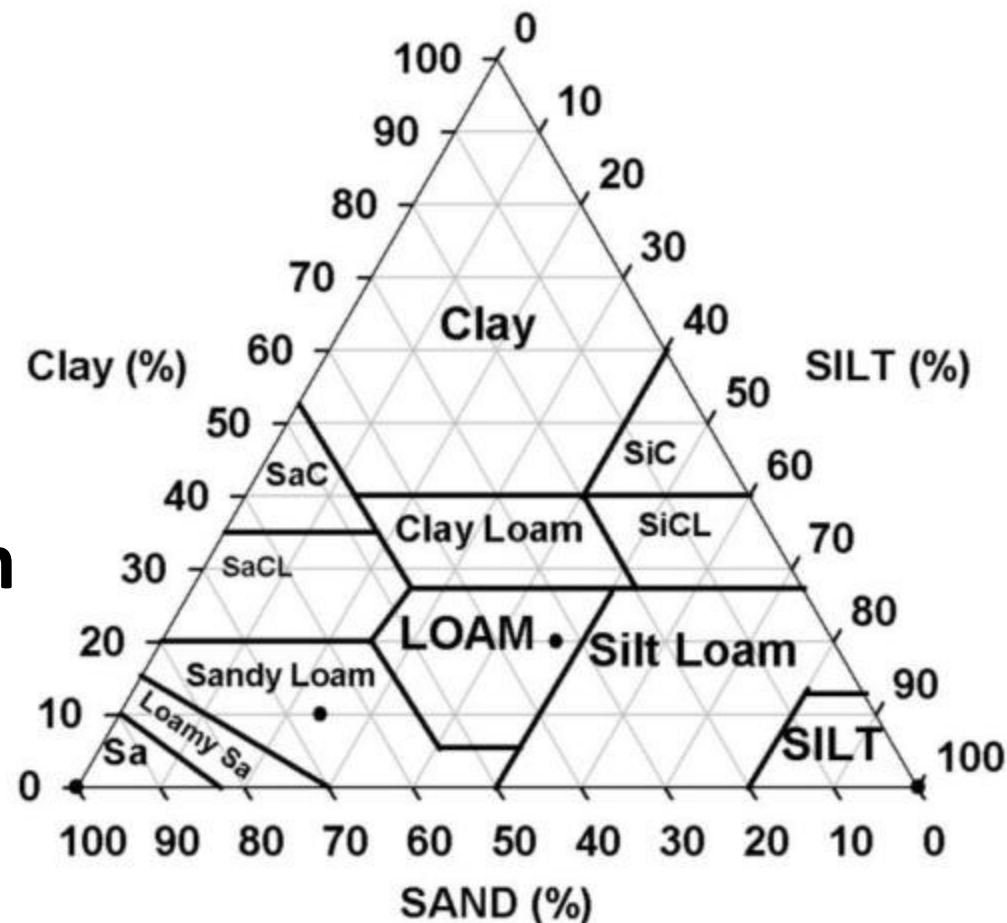


<http://websoilsurvey.nrcs.usda.gov/>

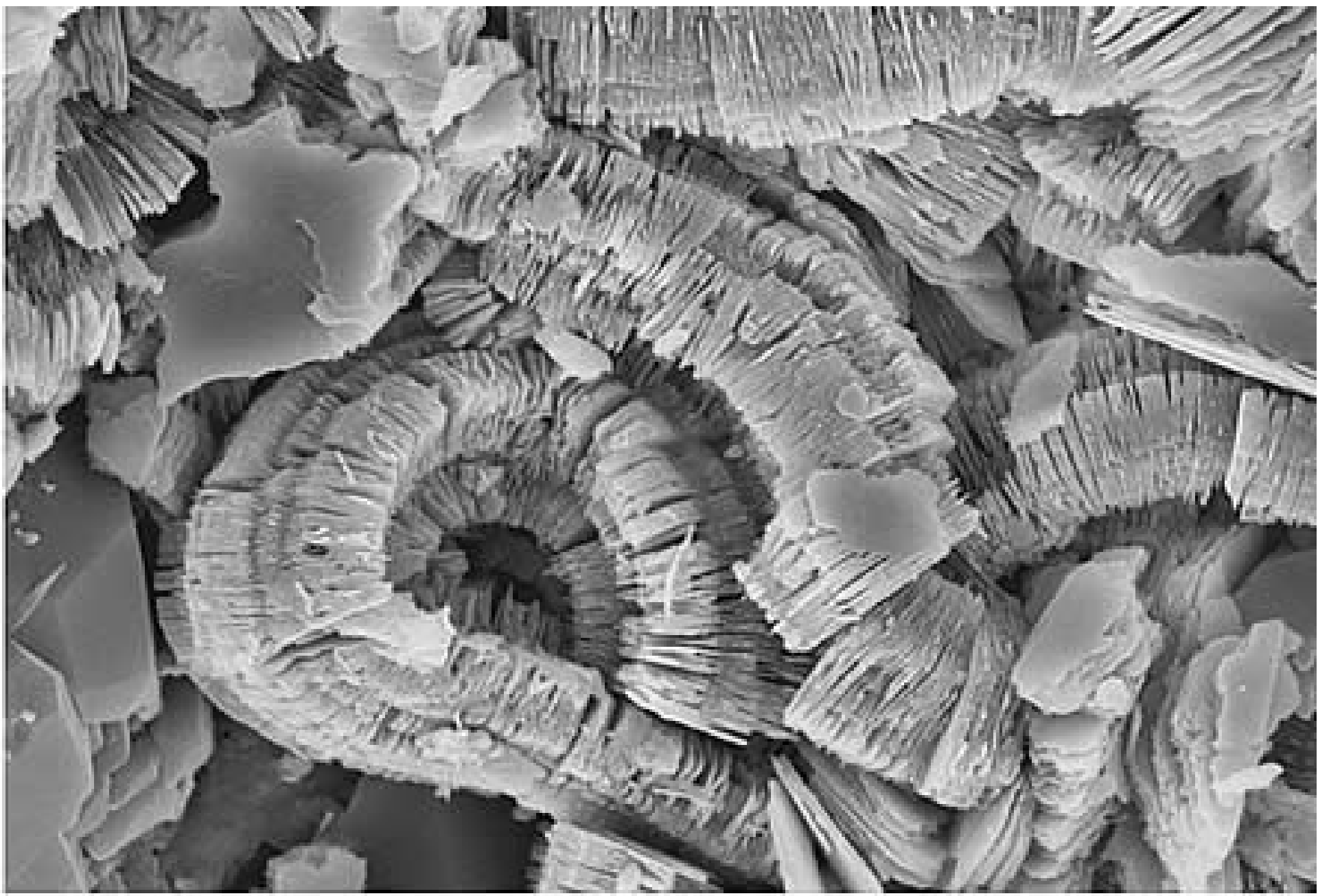


Soil Texture

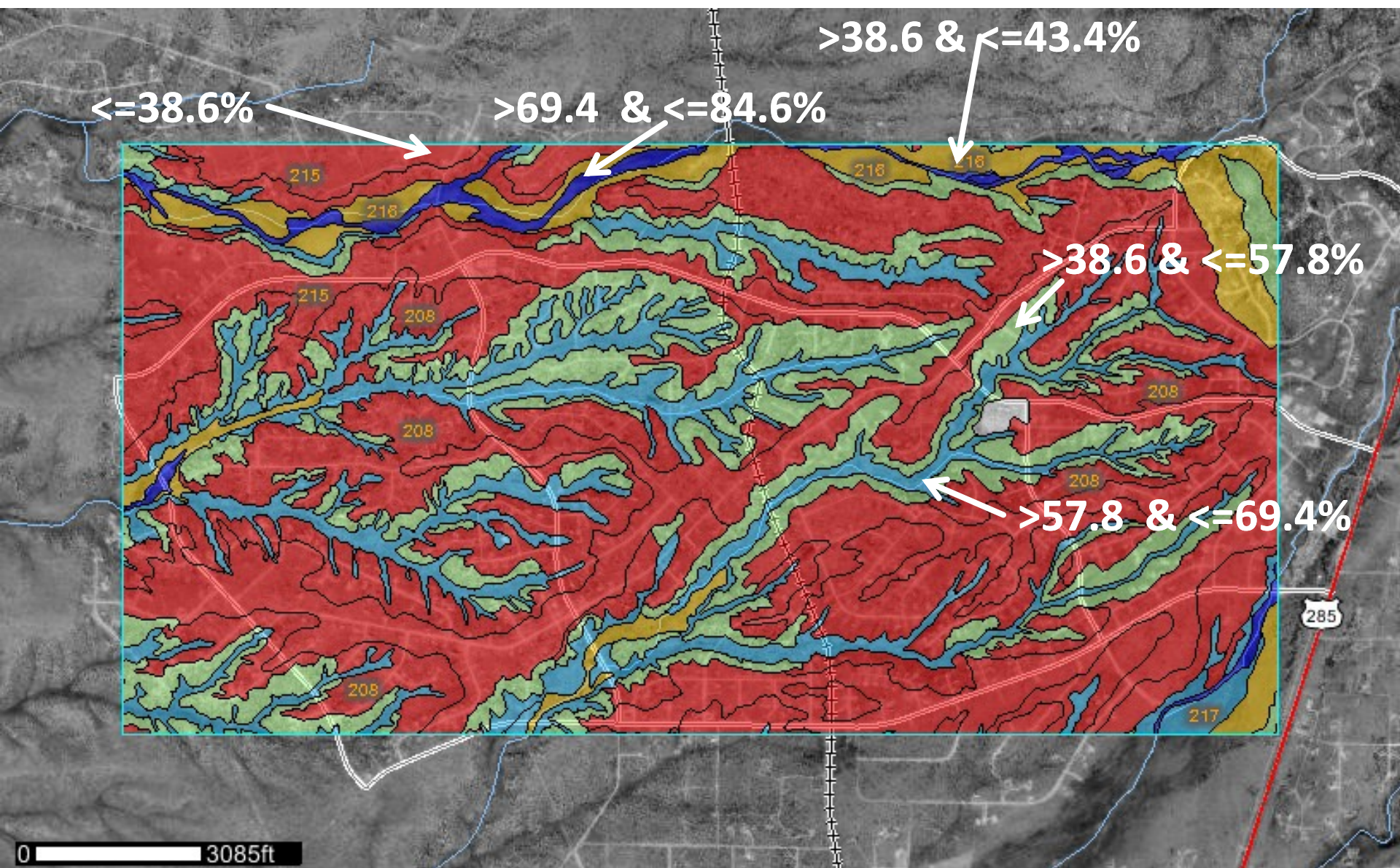
- Percent by weight
 - Sand
 - Silt
 - Clay
- Sands > 0.05 mm
- Silt 0.002 – 0.05 mm
- Clay < 0.002 mm



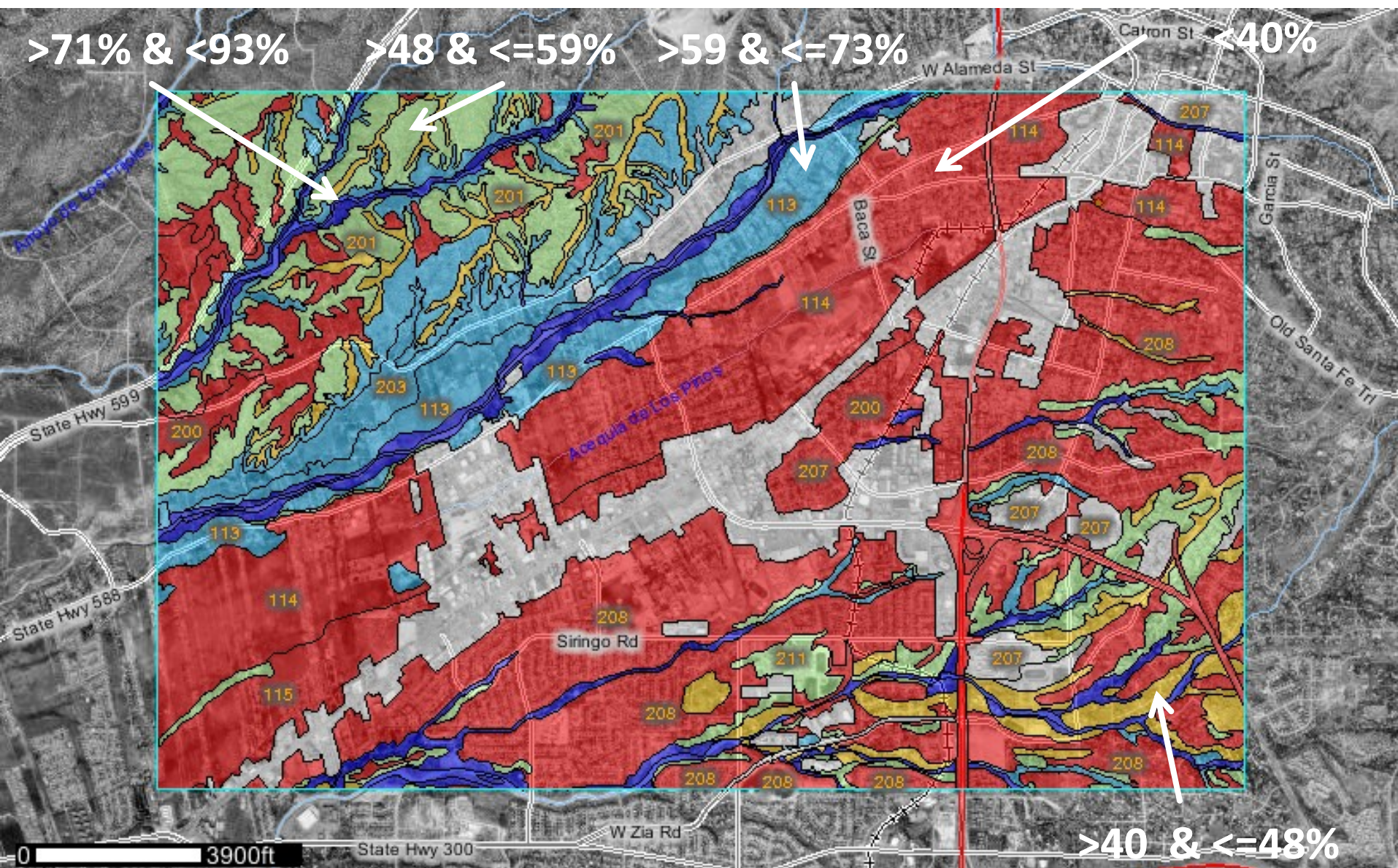
Clay particles – a very close-up view



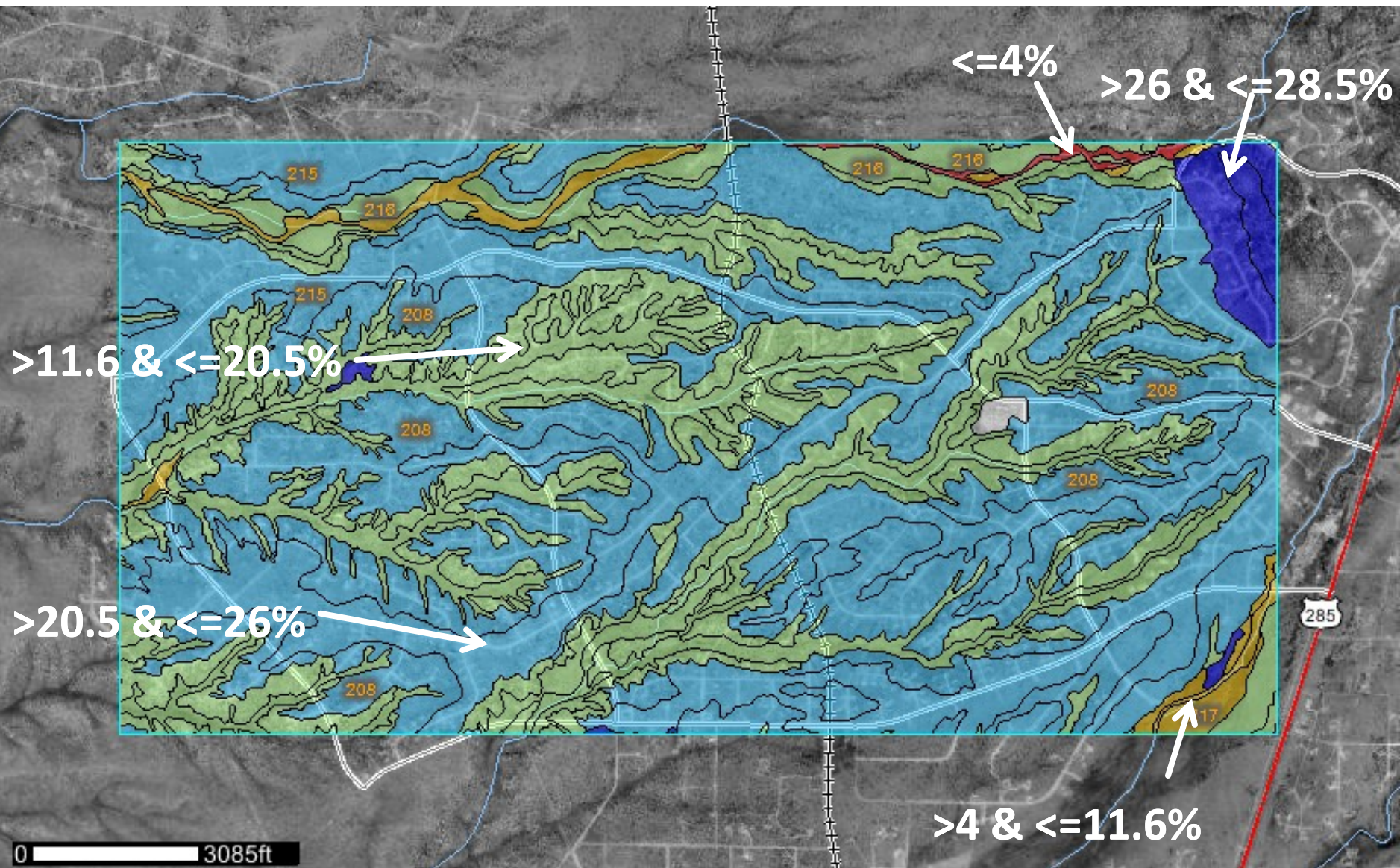
Web Soil Survey – Sand Content 6"



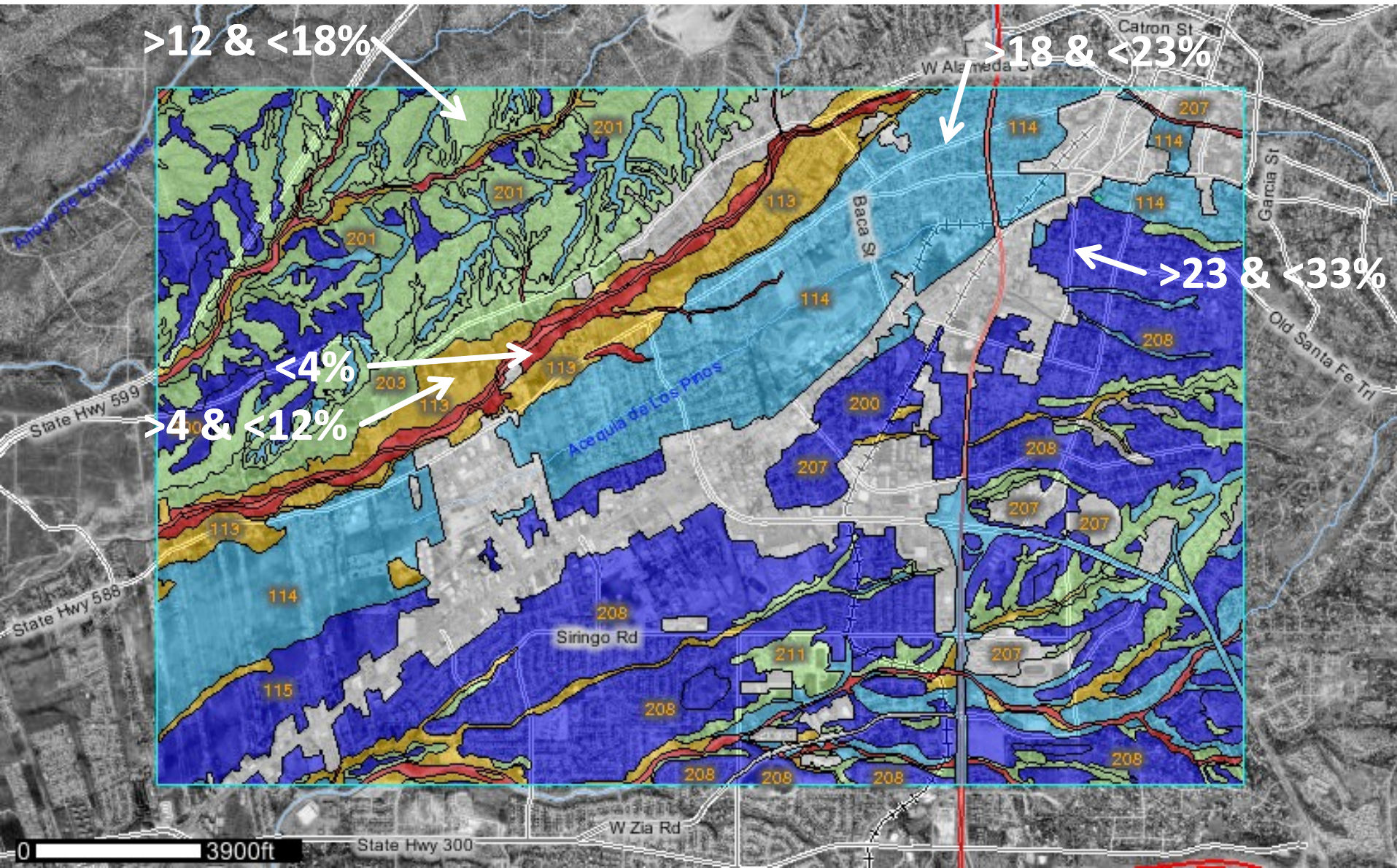
Web Soil Survey – Sand Content 6"



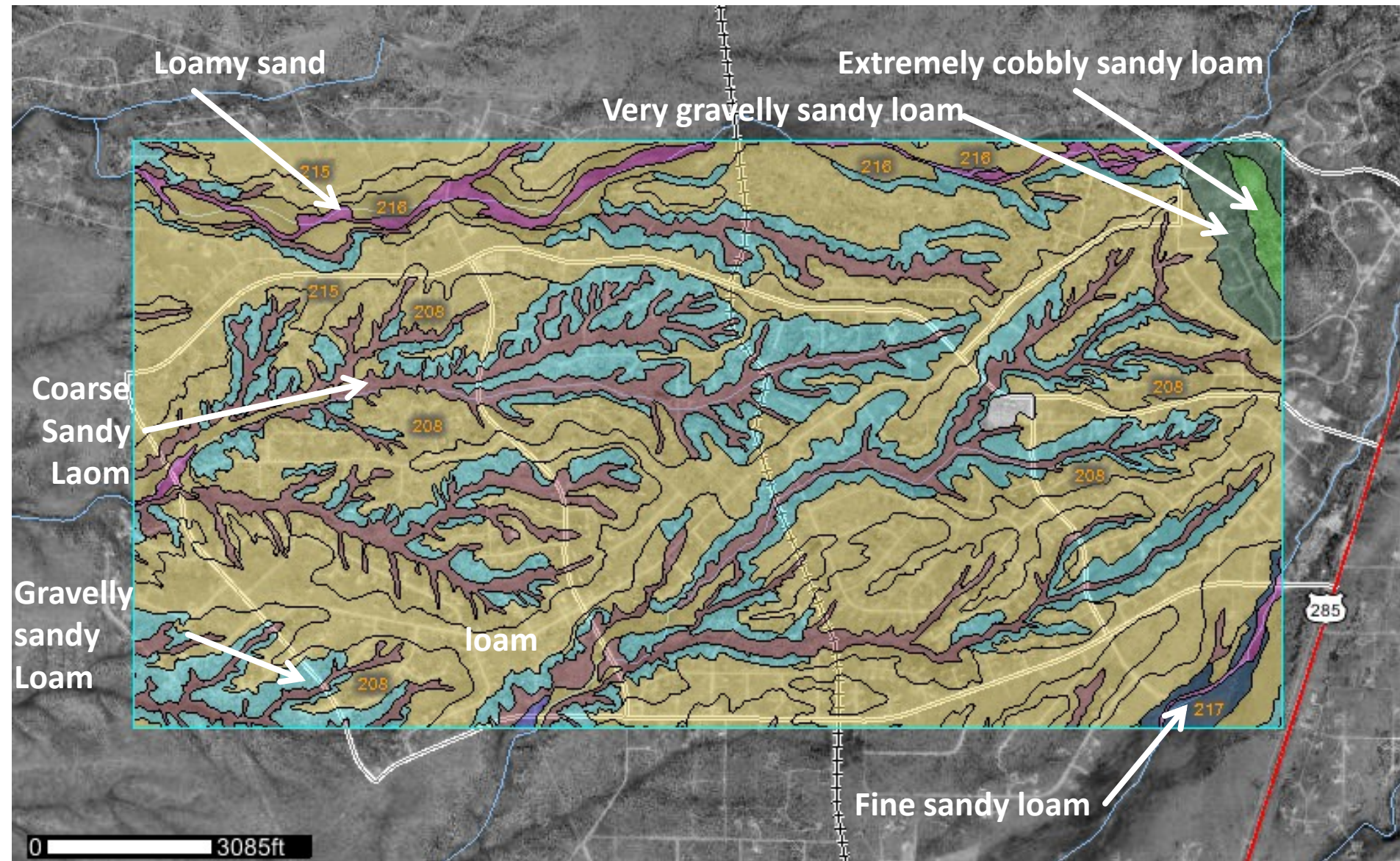
Web Soil Survey – Clay Content 6"



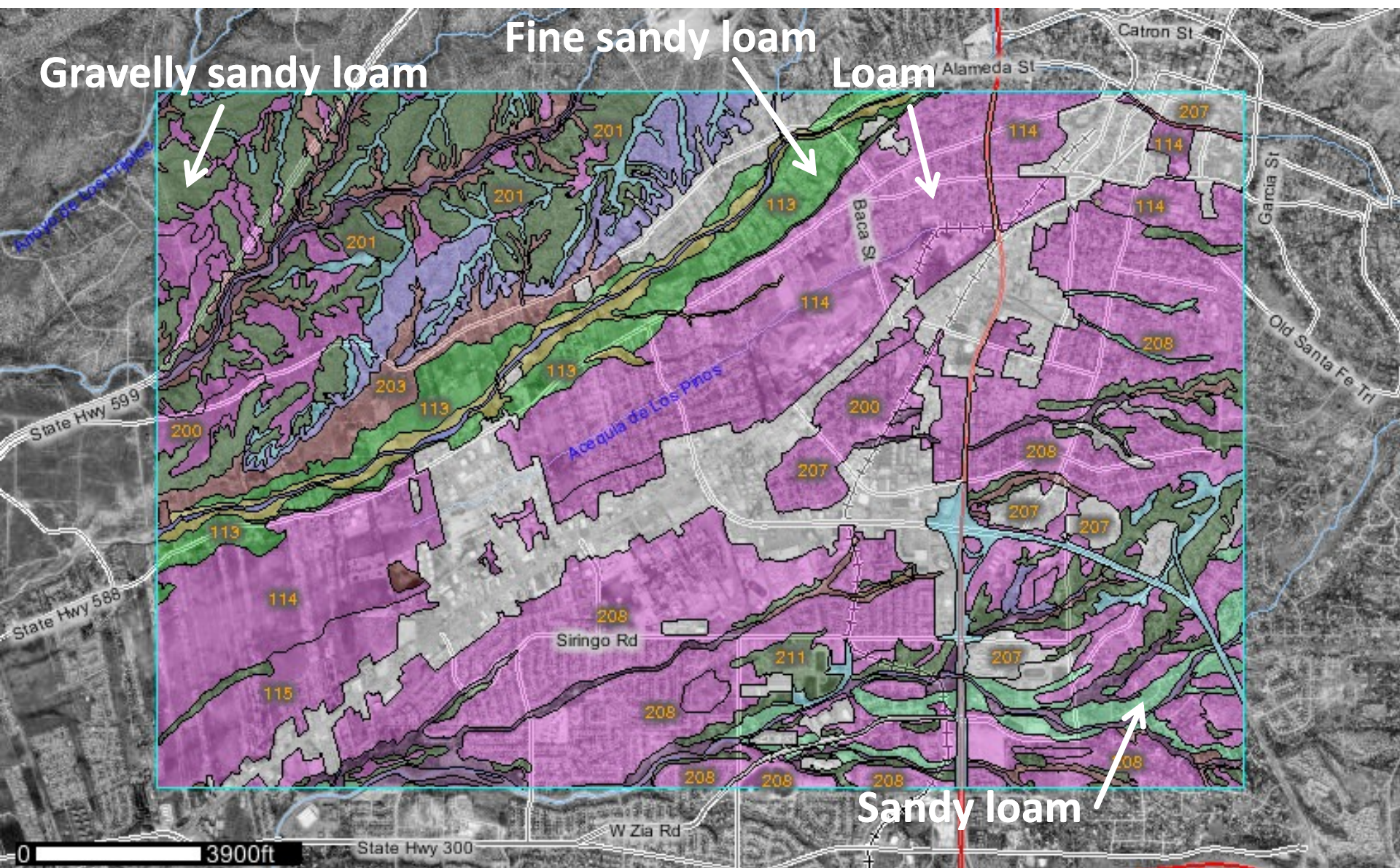
Web Soil Survey – Clay Content 6"



Web Soil Survey - Texture

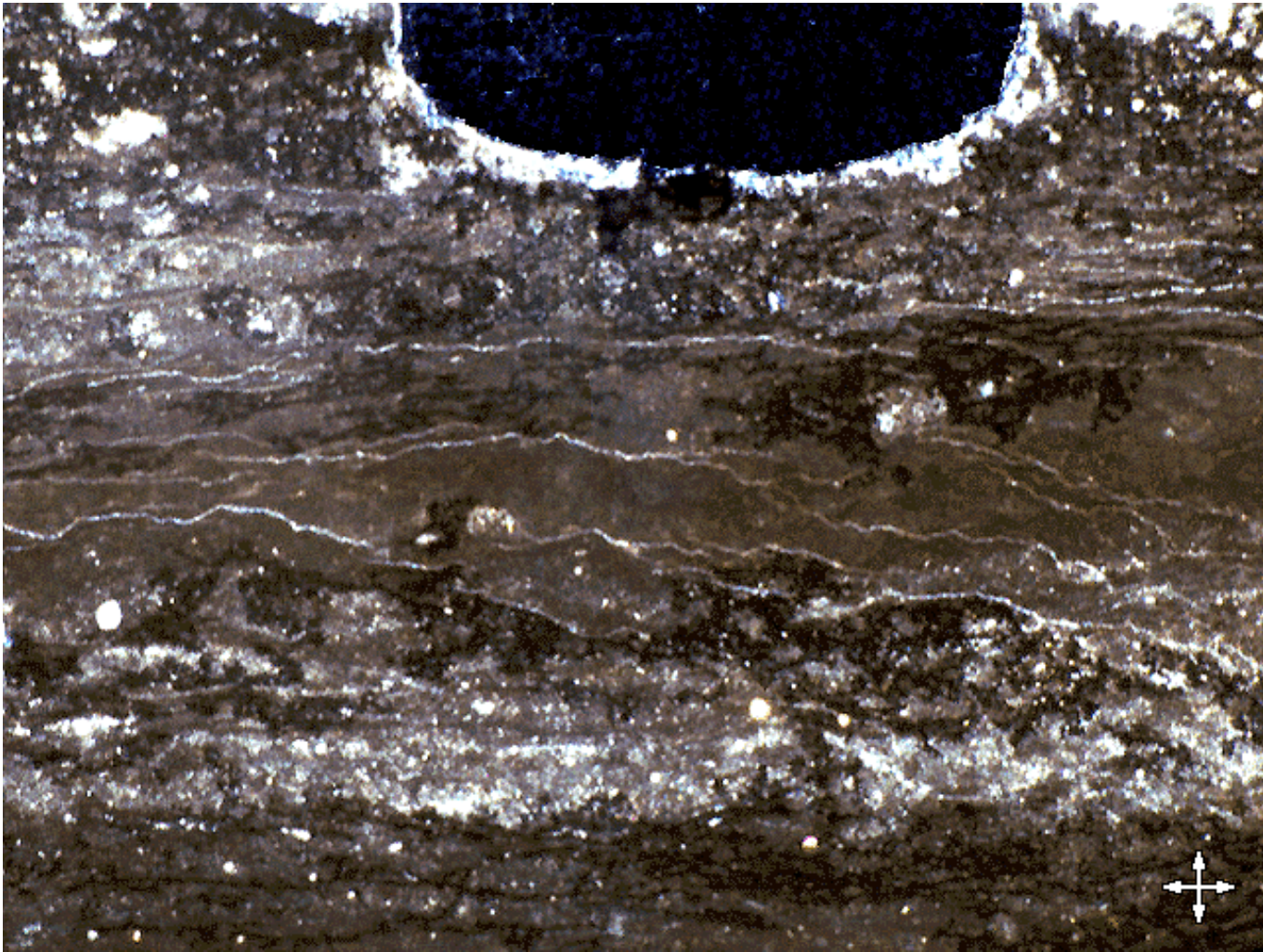


Web Soil Survey - Texture



Barriers to root growth

- Crusted Horizons (Petrocalcic)



Caliche

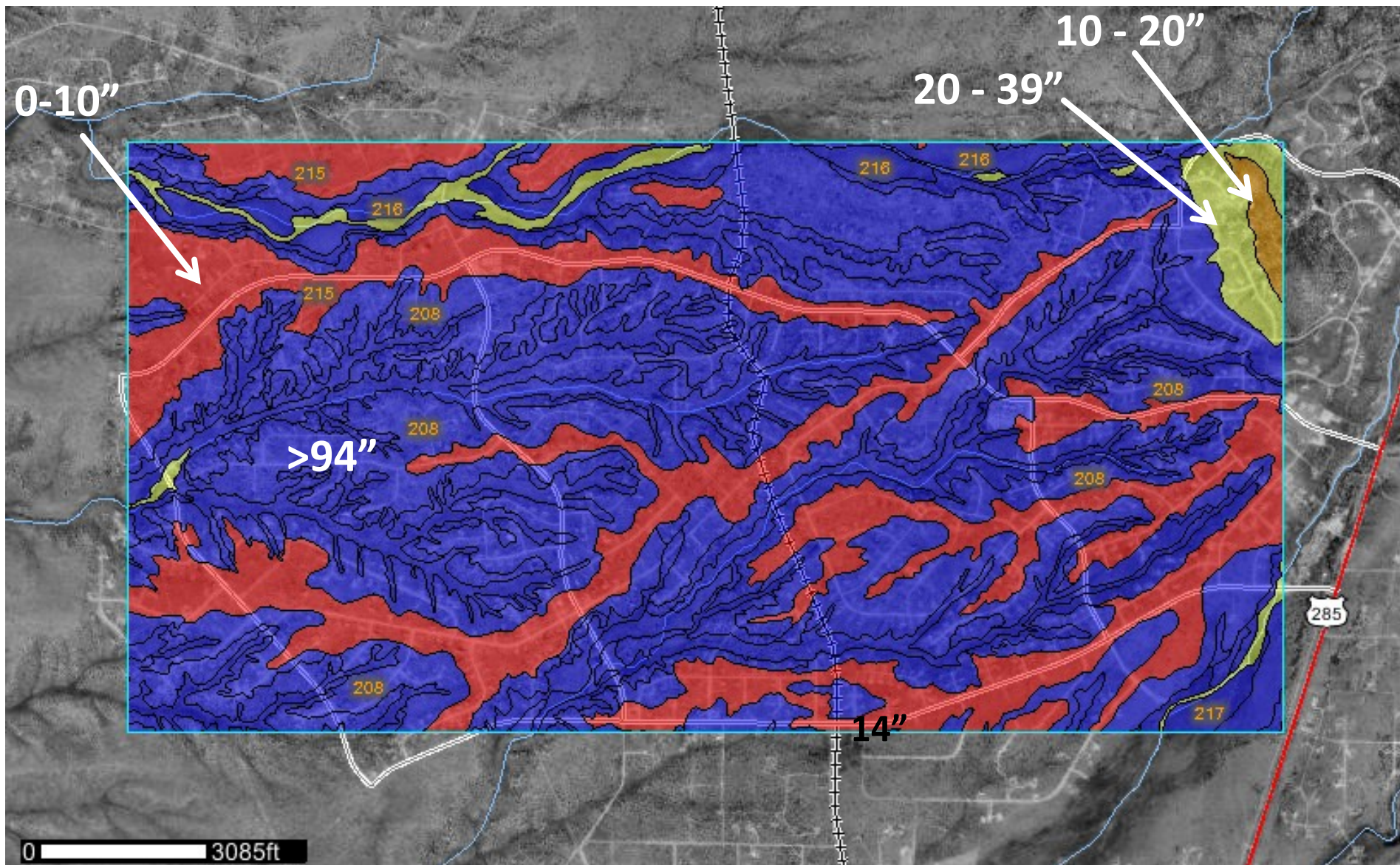


Durapan, hardpan, bedrock

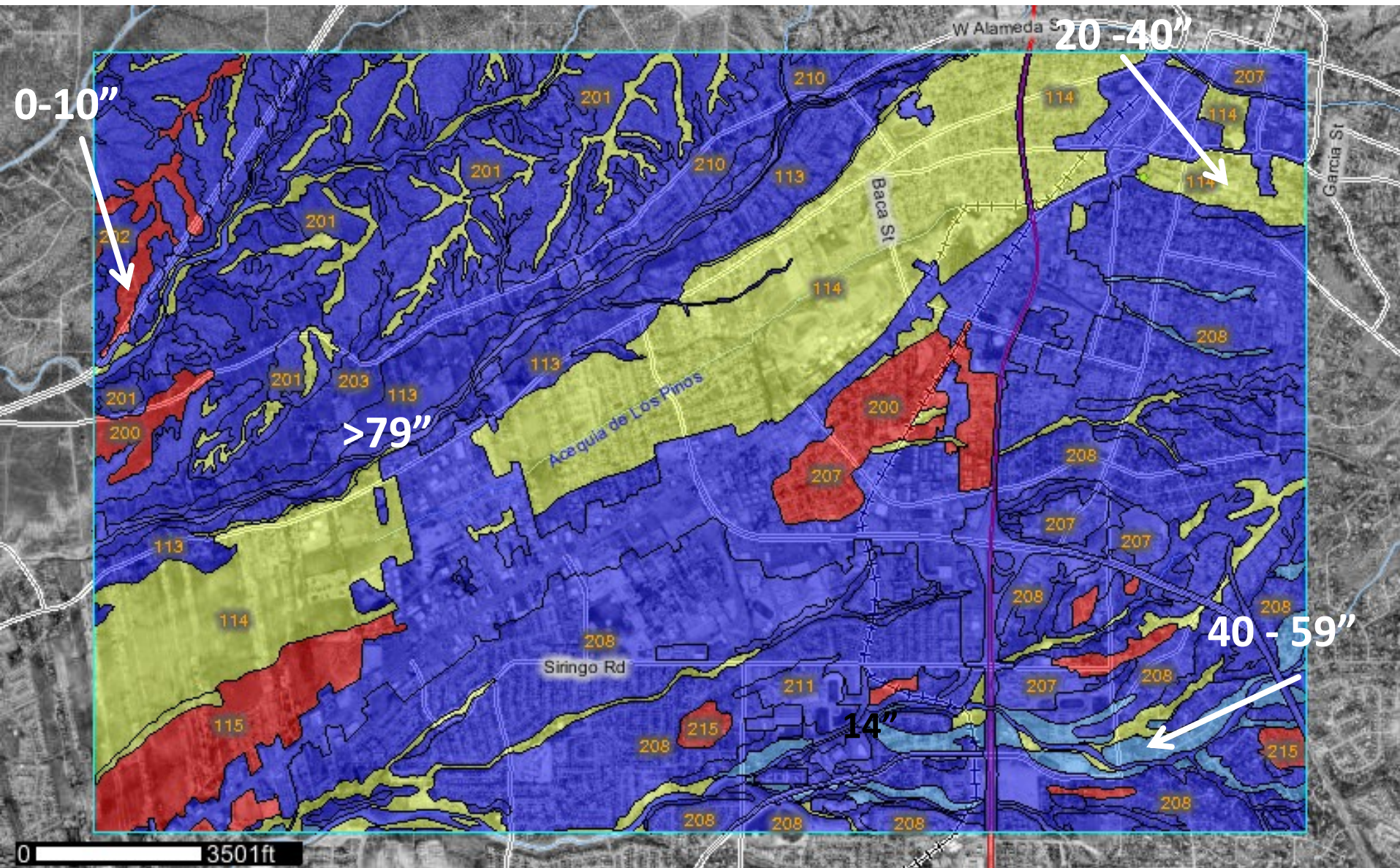




Depth to Restrictive Layer



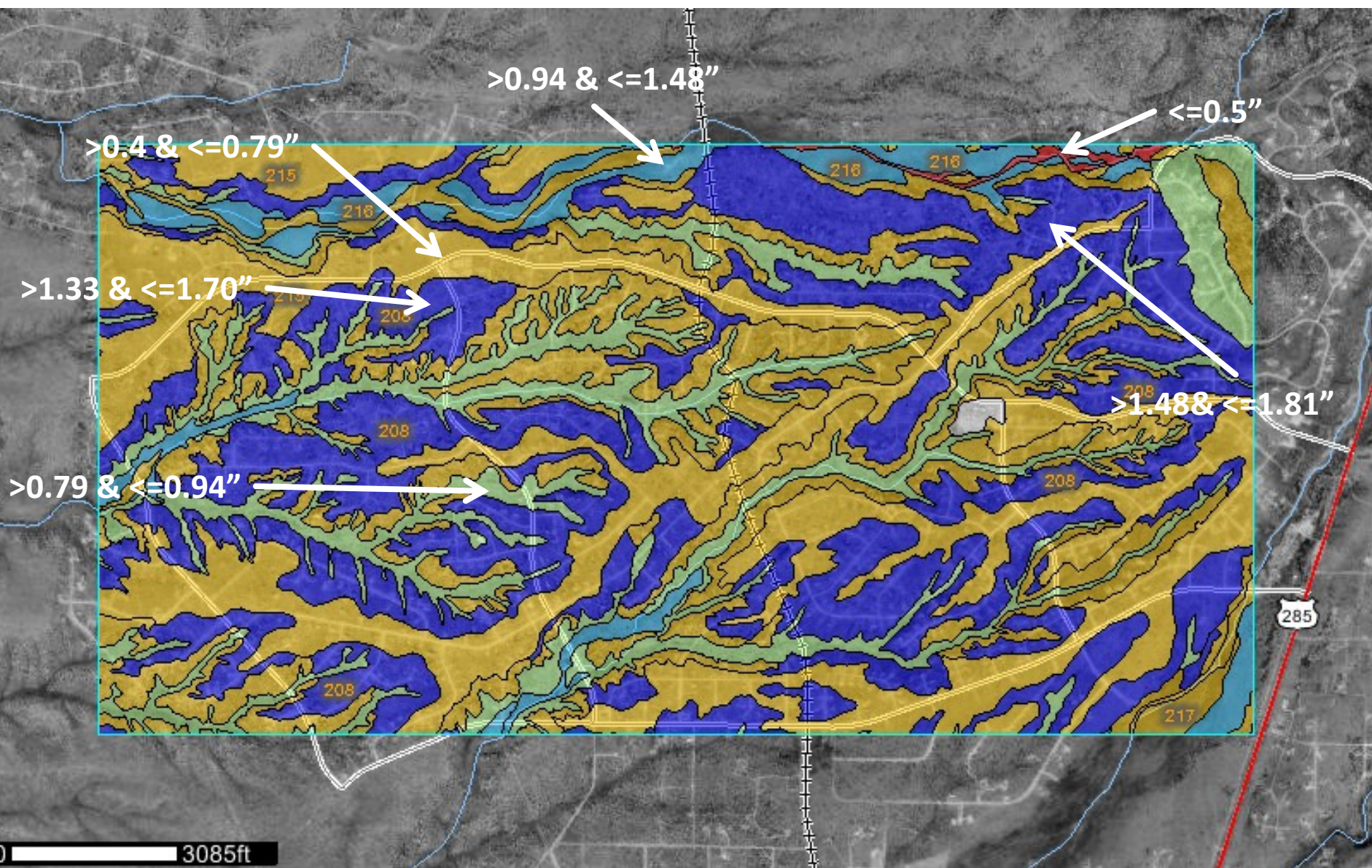
Depth to Restrictive Layer



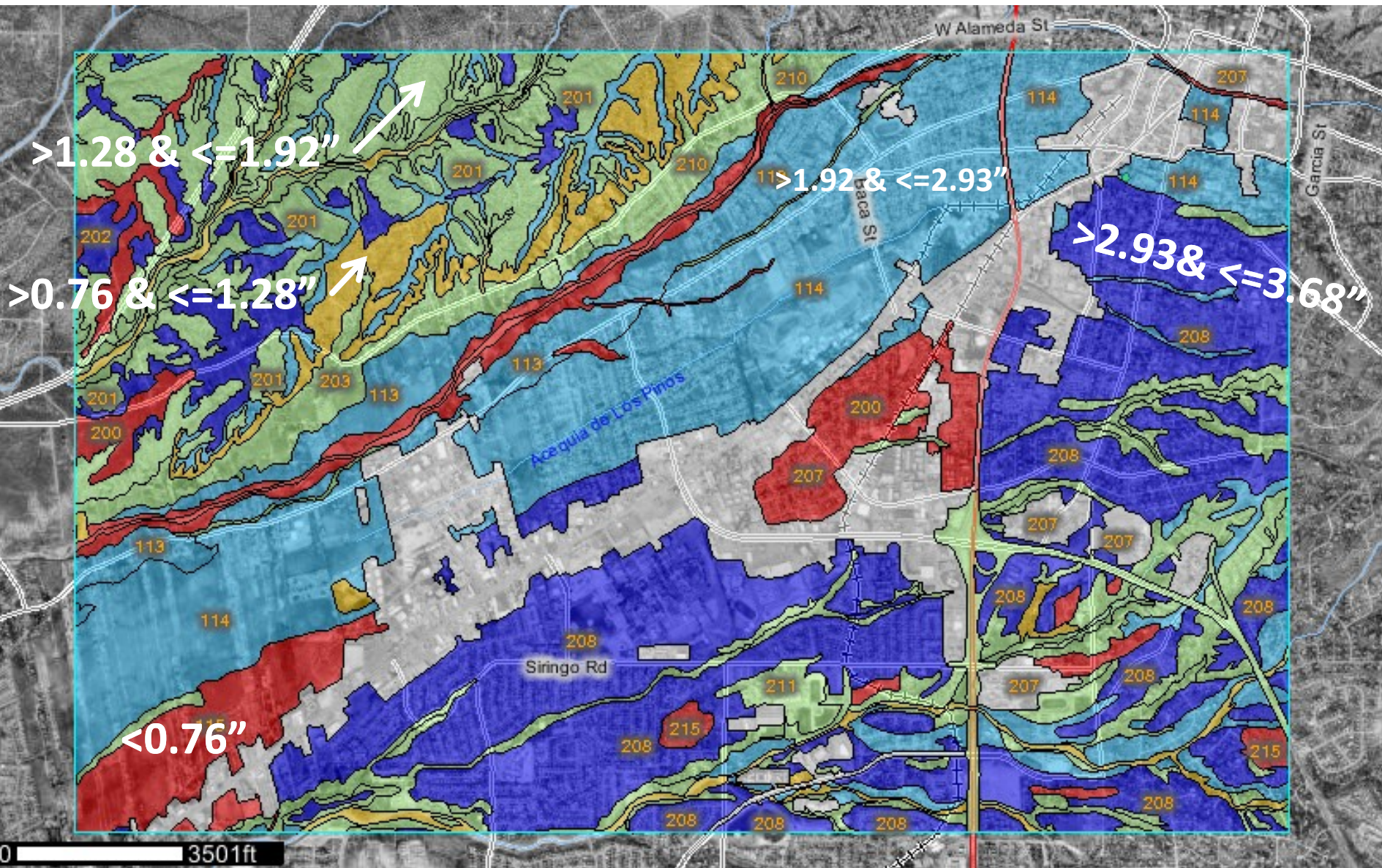
Estimate Texture for Plant Available Water

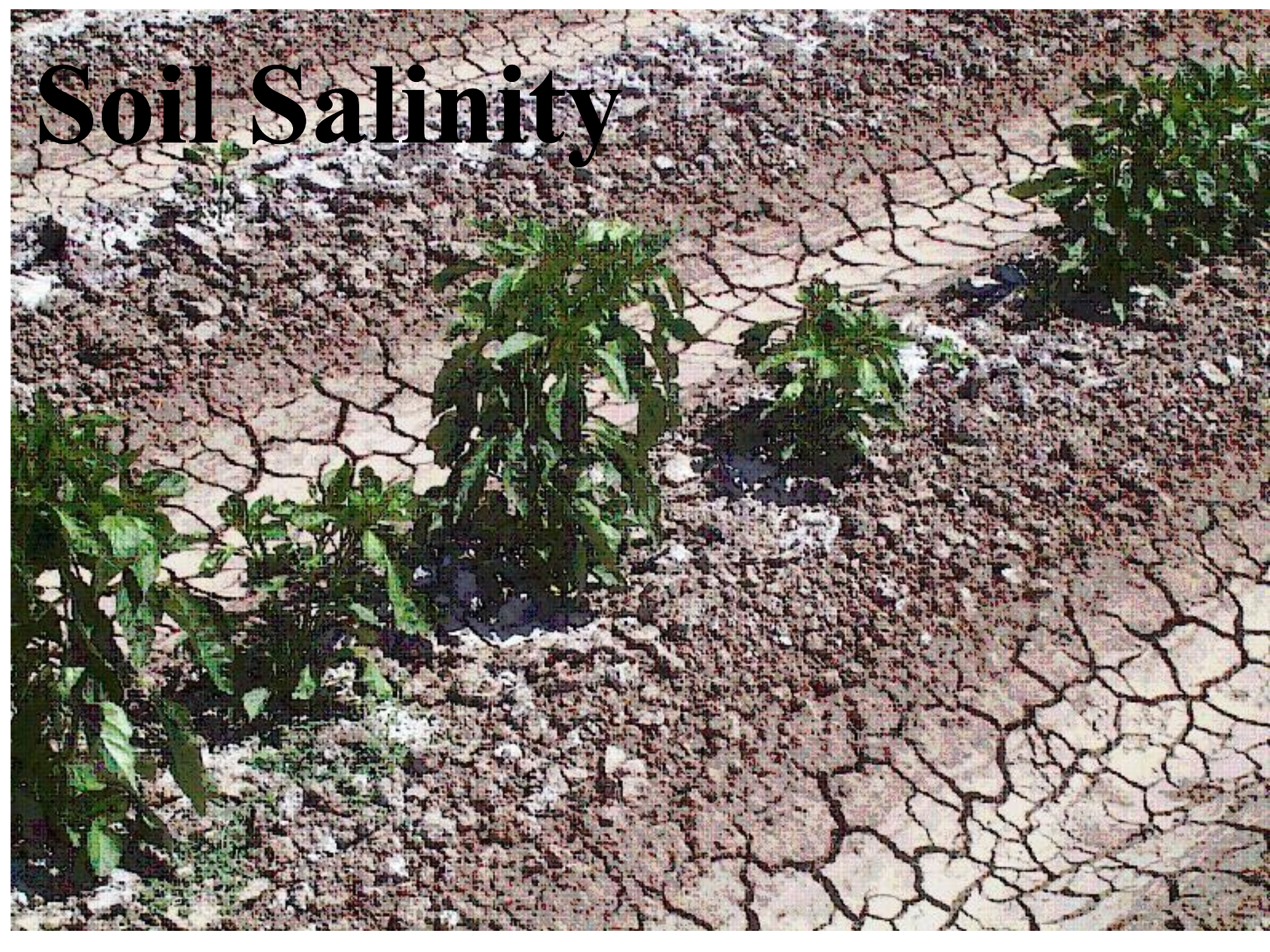


Plant Available Water (Top 20")



Plant Available Water (Top 20")





Soil Salinity



Microbe – Earthworm Interactions

- Earthworms enhance the dispersal of microbes by ingesting them at one location from a food source and excreting elsewhere.
- Good & Bad







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