Animals Can Make Soils Healthier

but management is key

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The Problem

- Introducing animals in western U.S. cropping systems has increased
  - Pressure to reduce grazing on public lands (Cox et al., 2017)
  - Declining space available for pasture
  - Prospects of reduced production costs due to localizing animals
- Many unknowns about long-term impacts
  - Forage production/quality
  - Plant diversity
  - Soil health – resiliency/sustainability

Management-intensive Grazing (MiG)

Forage Supply

Animal Demand

Soil carbon balancing act

Frequency of defoliation

Intensity of defoliation ~50%

Opportunity for regrowth

Potential Benefits of Managing Animals Properly

- Harvest efficiency
- Manure distribution

- Forage quality
- Increased carrying capacity
- Prolong forage longevity

- Drought management
  - Belowground C sequestration

- **Soil Health Benefits**

Potential detriments of improper animal management

How to overcome this issue in entire fields?

Altering Agroecosystems in the Western US; introducing MiG

1999

2003

Altering Agroecosystems in the Western US; introducing MiG

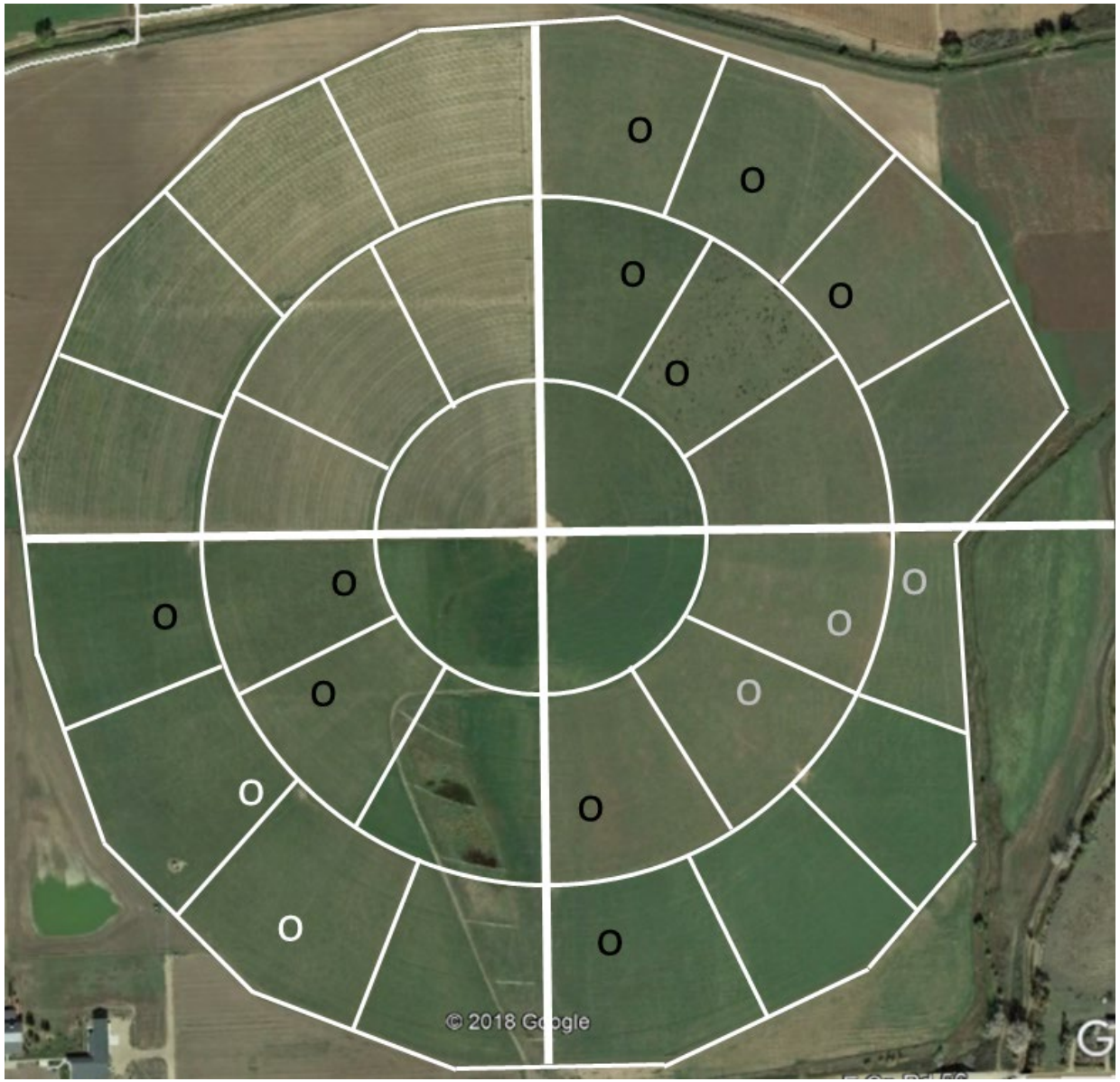
2006

2014

Altering Agroecosystems in the Western US; introducing MiG

2017 to present

Management-intensive Grazing (MiG)



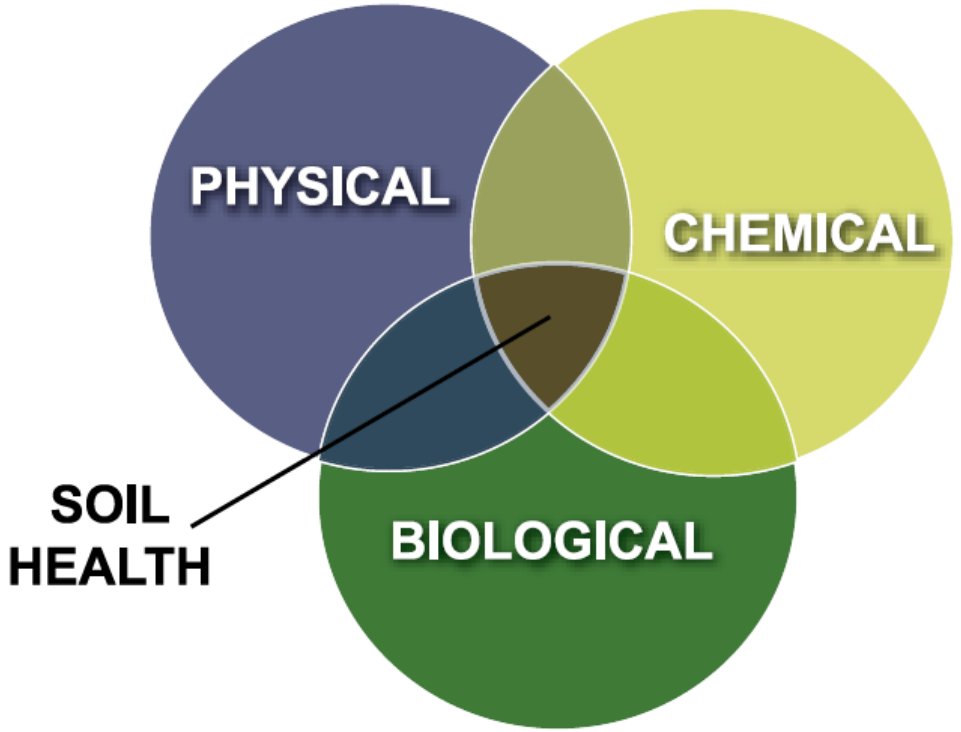
Is not intensive grazing.
It is intensive management!

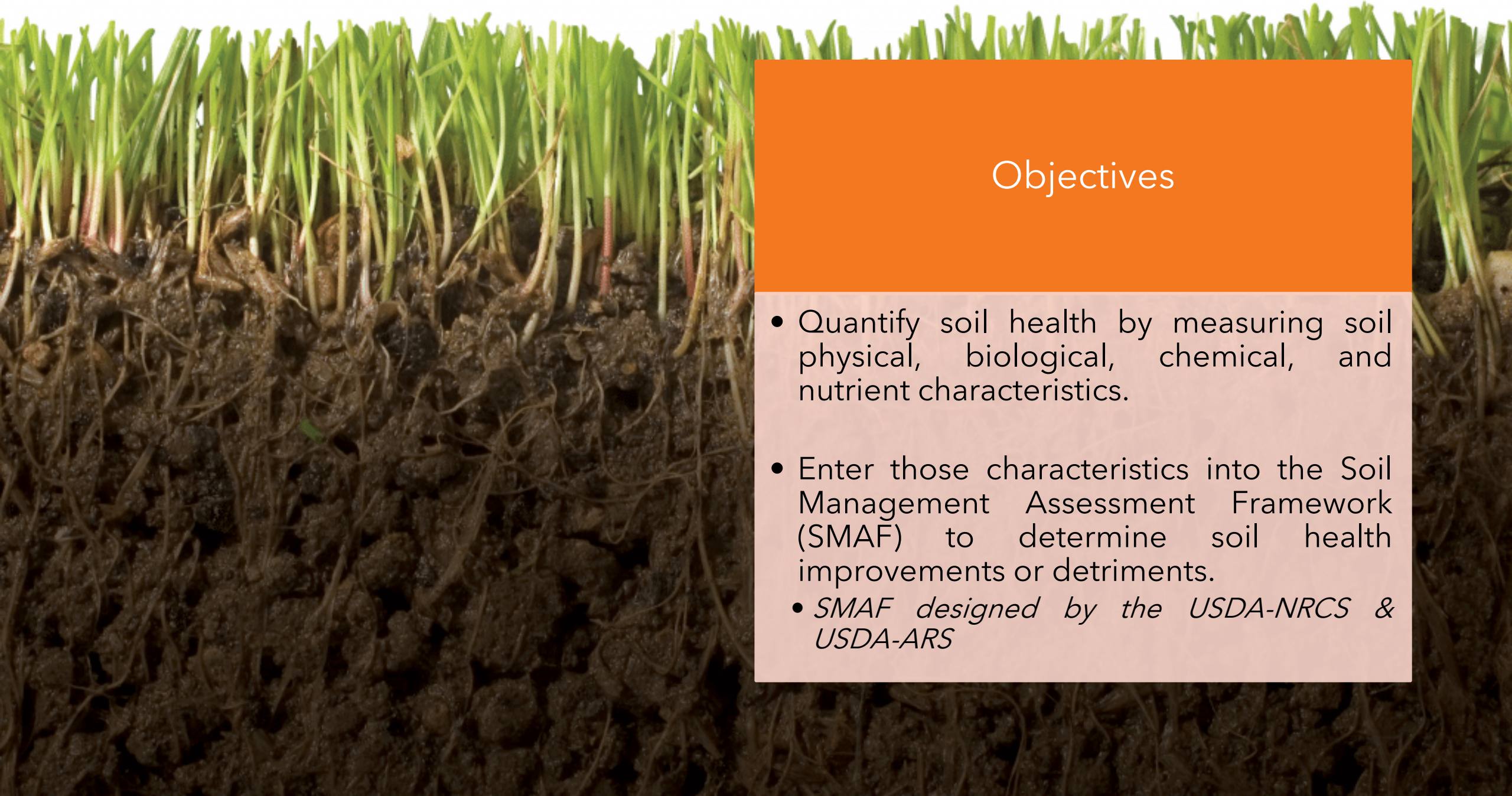
Forage Stands and Grazing Removal

~ 50% removal of above-ground plant

CONCEPT: If we utilize management intensive grazing correctly, we, theoretically, should improve soil health.

What is Soil Health?



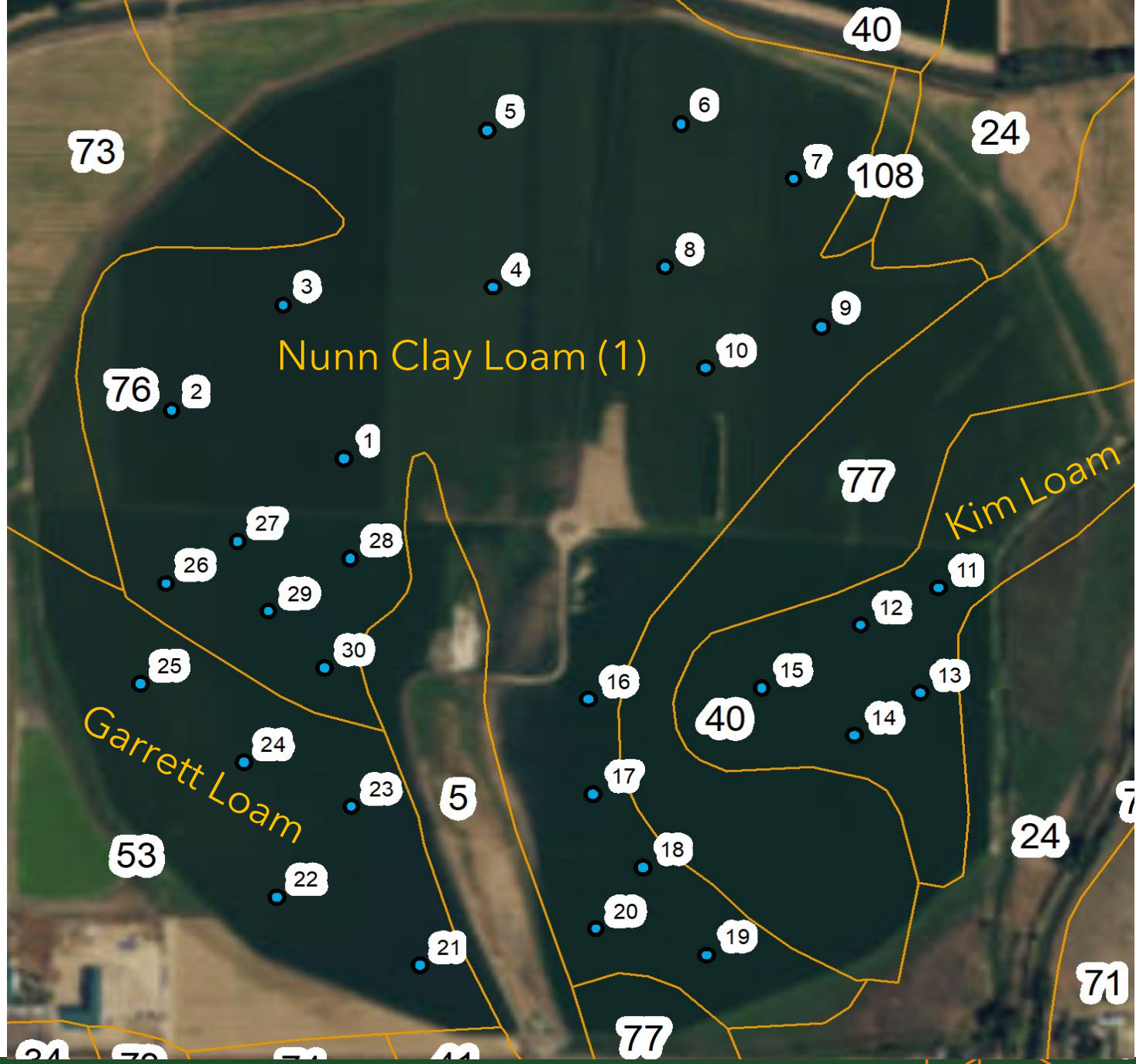


Objectives

- Quantify soil health by measuring soil physical, biological, chemical, and nutrient characteristics.
- Enter those characteristics into the Soil Management Assessment Framework (SMAF) to determine soil health improvements or detriments.
  - *SMAF designed by the USDA-NRCS & USDA-ARS*

Soil Health Sampling

- Yellow lines – separate specific soil series
- Blue dots – sampling locations
  - 40 soil cores at each location
  - 0-5, 5-15cm depths
- Sampled – May 2017, 2018
  - Currently no additional funding to support additional, longer-term research



Soil Management Assessment Framework (SMAF)

Physical

- Bulk Density
- Water Stable Aggregates
- Soil Texture

Chemical

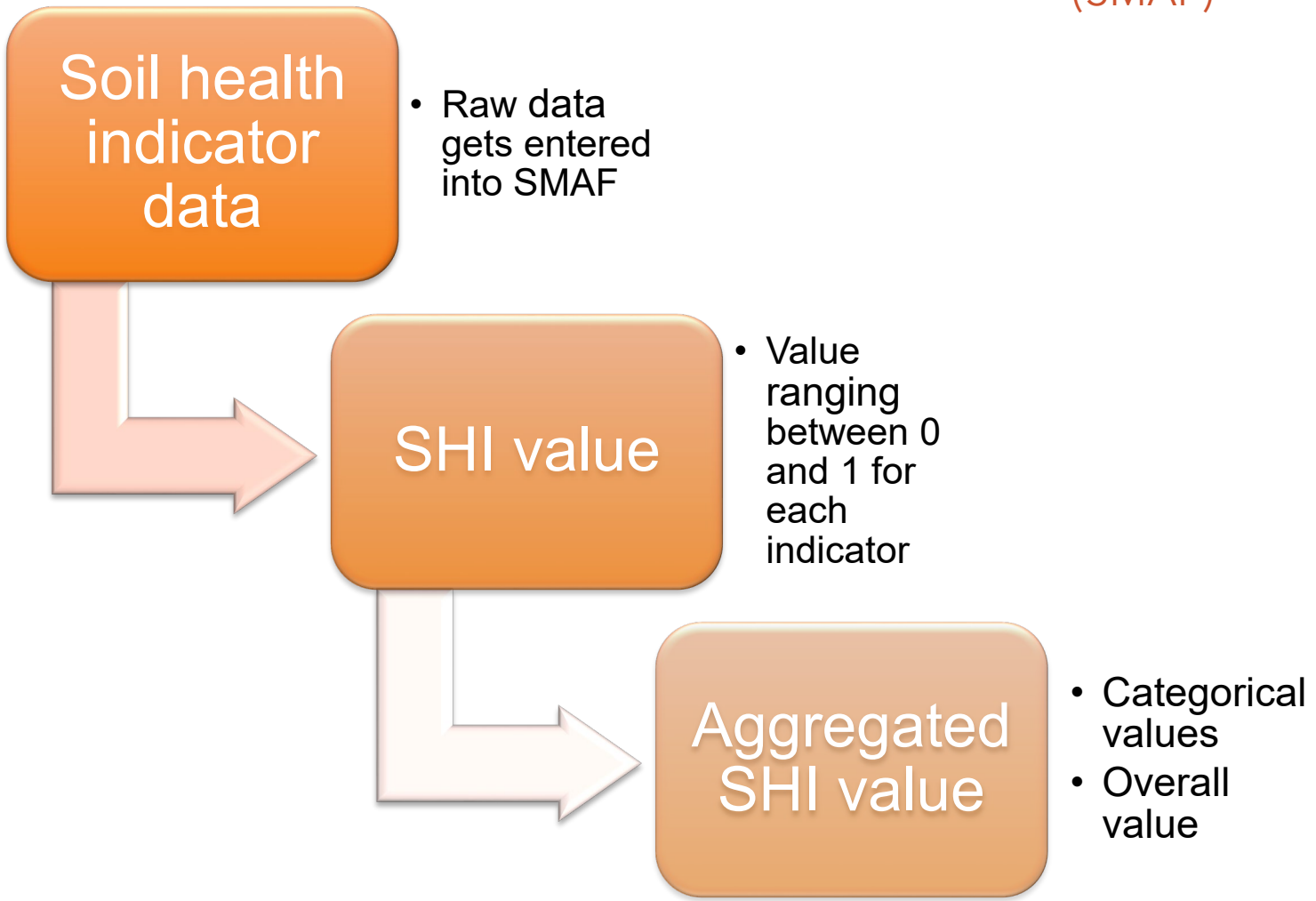
- pH
- EC

Biological

- Soil organic carbon
- Microbial biomass carbon
- Potentially mineralizable nitrogen
- Beta-glucosidase activity

Nutrient

- Phosphorus
- Potassium



Soil Health Scores: depth & time

	0-5 cm		5-15 cm			
	2017	2018	2017	2018	ANOVA (between years)	ANOVA (between depths)
Physical	0.794	0.551	0.753	0.616	**	NS
Biological	0.260	0.483	0.256	0.422	**	NS
Chemical	0.320	0.441	0.141	0.224	NS	NS
Nutrient	0.943	0.810	0.824	0.690	**	**
Overall	0.511	0.552	0.454	0.471	NS	NS

Questions?

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