Soil Health

- By Cody Robertson NRCS

Soil Health What is It?

- THE CONTINUED CAPACITY OF THE SOIL TO FUNCTION AS A VITAL LIVING ECOSYSTEM THAT SUSTAINS PLANTS, ANIMALS, AND HUMANS
  - Nutrient cycling
  - Water (infiltration & availability)
  - Filtering and Buffering
  - Physical Stability and Support
  - Habitat for Biodiversity

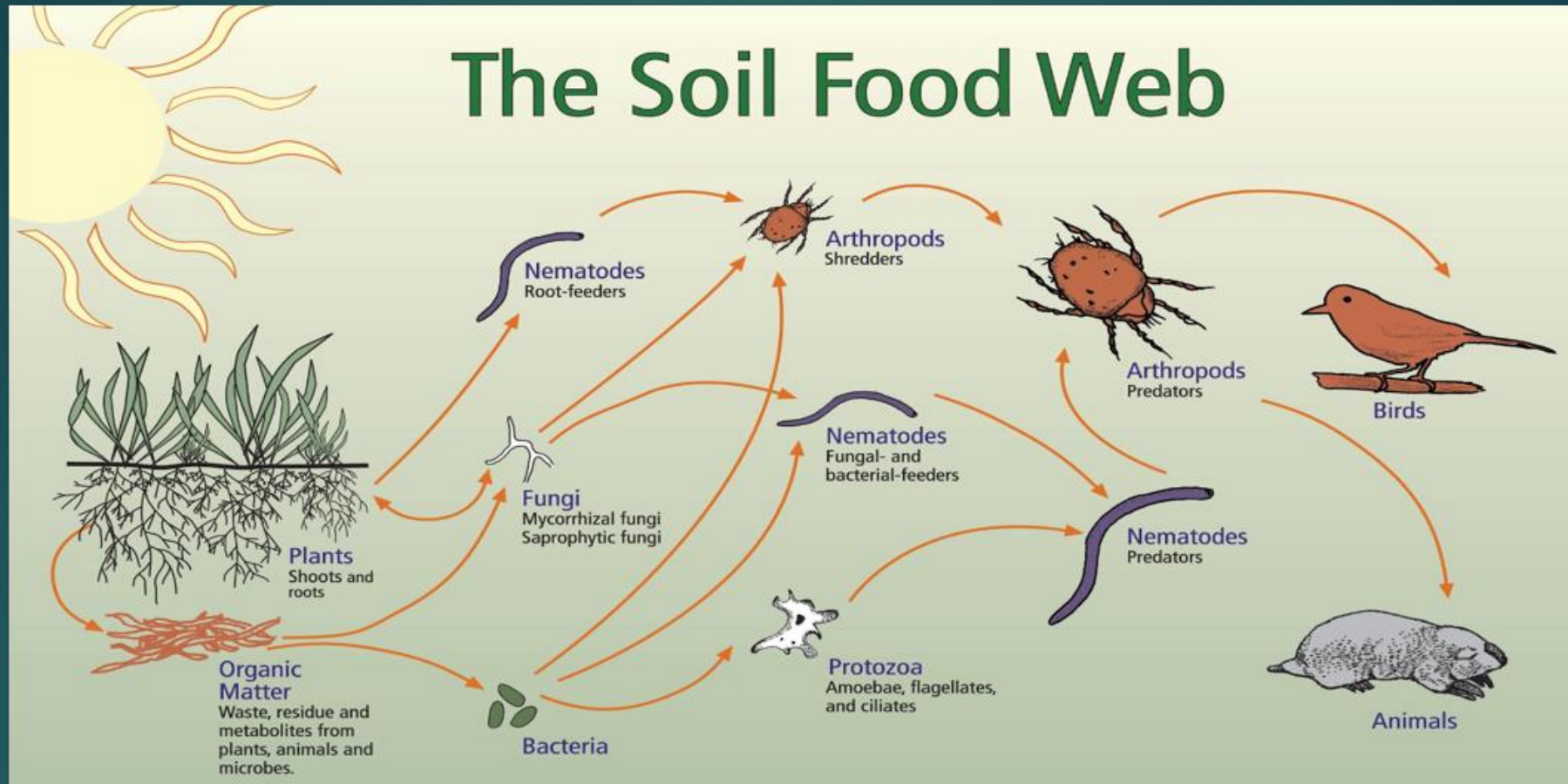
Managing for Soil Health

- MINIMIZE DISTURBANCE OF THE SOIL
- MAXIMIZE DIVERSITY OF PLANTS IN ROTATION/ COVER CROPS
- KEEP LIVING ROOTS IN THE SOIL AS MUCH AS POSSIBLE
- KEEP THE SOIL COVERED AT ALL TIMES WITH PLANTS AND PLANT RESIDUES
- CREATE THE MOST FAVORABLE HABITAT POSSIBLE FOR THE SOIL FOOD WEB

The Four Ecosystem Processes

- 1. Energy flow - Maximize the flow of solar energy through plants and soil.
- 2. Water cycle - Maximize capture and cycling of water through plants and soil. Reduce export and import.
- 3. Mineral cycle - Maximize cycling of nutrients through plants and soil.
- 4. Community dynamics - High ecosystem biodiversity with more complex mixtures and combinations of desirable plant species leads to increased stability and productivity.

The Soil Food Web



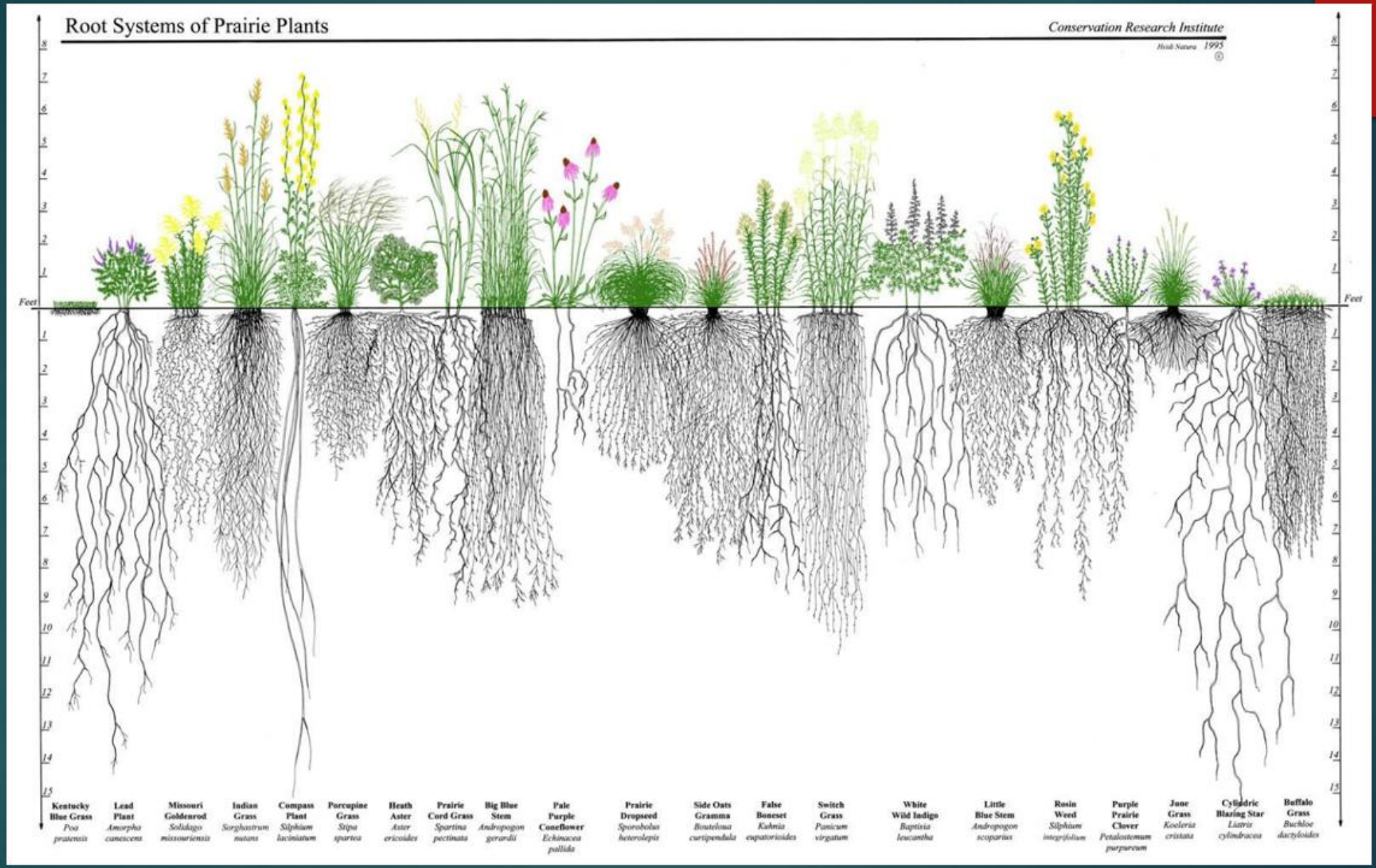
First trophic level:
Photosynthesizers

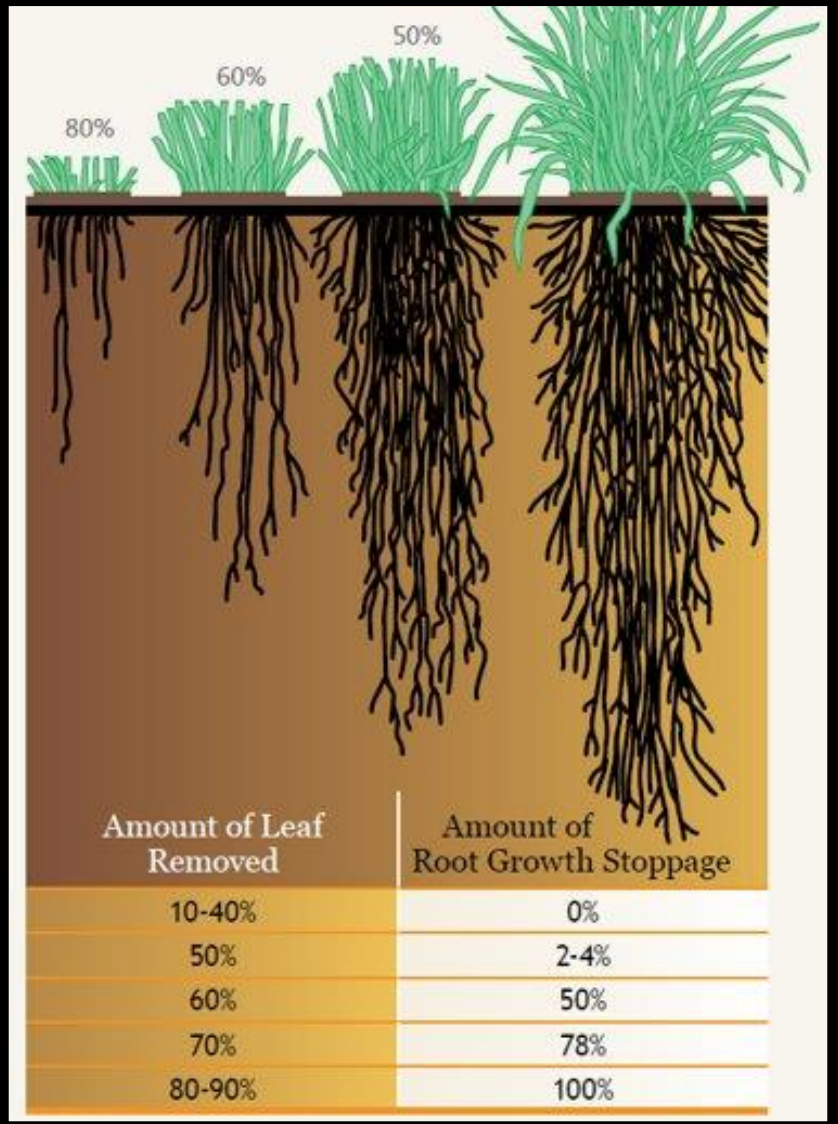
Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators


Root Systems of Prairie Plants
Conservation Research Institute
Prairie Nat. 1995
Feet
Feet
Kentucky Blue Grass Poa pratensis
Lead Plant Amorpha canescens
Missouri Goldenrod Solidago missouriensis
Indian Grass Sorghastrum nutans
Compass Plant Silphium laciniatum
Porcupine Grass Stipa spartea
Heath Aster Aster ericoides
Prairie Cord Grass Spartina pectinata
Big Blue Stem Andropogon gerardii
Pale Purple Coneflower Echinacea pallida
Prairie Dropseed Sporobolus heterolepis
Side Oats Gramma Bouteloua curtipendula
False Boneset Kuhnia eupatorioides
Switch Grass Panicum virgatum
White Wild Indigo Baptisia leucantha
Little Blue Stem Andropogon scoparius
Rosin Weed Silphium integrifolium
Purple Prairie Clover Petalostemum purpureum
June Grass Koeleria cristata
Cylindric Blazing Star Liatris cylindracea
Buffalo Grass Buchloe dactyloides



Amount of Leaf Removed	Amount of Root Growth Stoppage
10-40%	0%
50%	2-4%
60%	50%
70%	78%
80-90%	100%

SOIL GLUES

Healthy soils are held together by soil glues, or glomalin, that are produced by fungi. Soils rich in soil biota hold together, while soils devoid of soil life fall apart and form a layer of sediment in the bottom of the jar. Pictured above, the soil on the left is from a field that has been managed using no-till for several years. The soil on the right is from a conventionally-tilled field.

Biological Disturbance

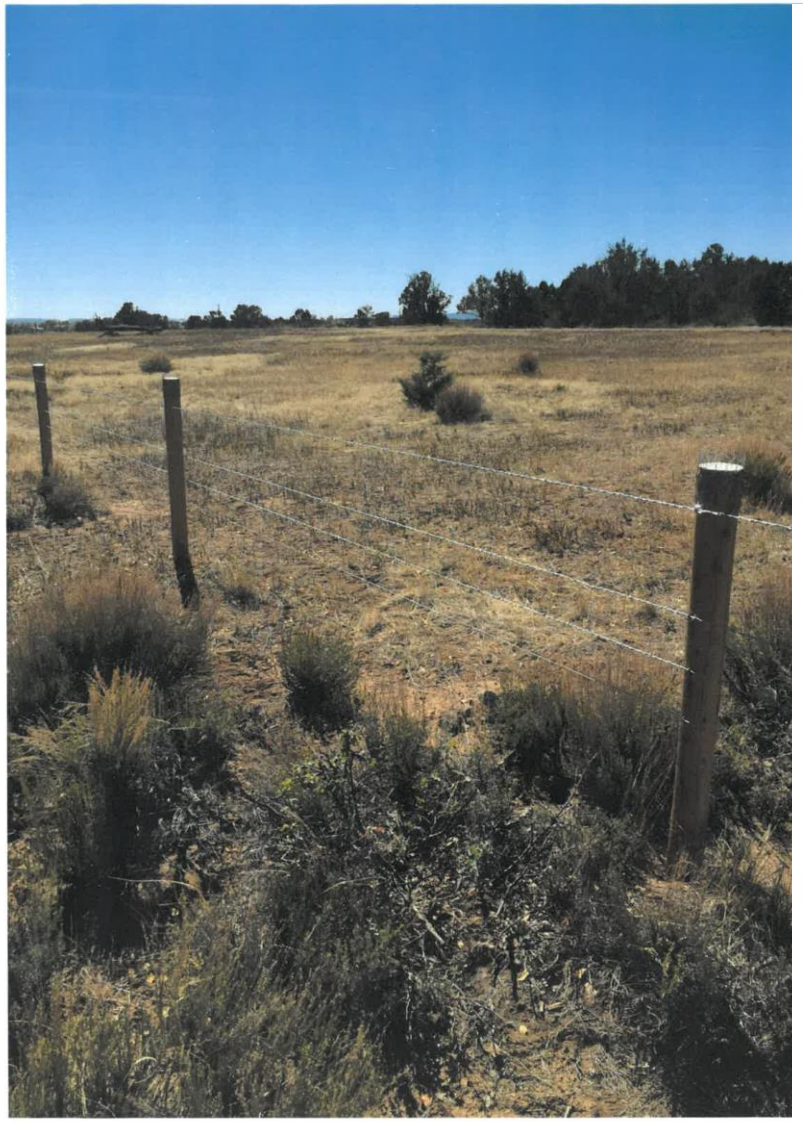
Overgrazing

- Plants are exposed to intensive grazing for extended periods of time, without sufficient recovery periods
- Opens up space for weed invasion (sometimes monoculture)

Basics of Grazing Management

- Stocking rate
  - The number of animals on a given area of land over a certain period of time
- Livestock rotation
  - Rotation includes managing when you graze, how long you graze, and how long you allow the area that is grazed to rest and recover before the area is grazed again
- Utilization rate
  - Refers to the grazing intensity
  - Often described as how heavily an area is grazed
- Plant rest and recovery
  - Allow for rest and recovery of your grasses and you will be rewarded with higher producing pastures and healthier, faster-gaining animals

NRCS Typical Fence



NRCS – Clipping study - Longmont

- Within the demonstration area there were six plots established. Each plot was clipped at a prescribed stubble height starting in May and ending the end of September.
- The treatments consisted of plots clipped every other week (Bi-weekly) at 1", 2", and 4" stubble heights as well as plots clipped every month at 1", 2", and 4" stubble heights.
- The forage clipped at the above stubble heights was collected and allowed to be air dried, weighed, and the weight recorded. At the end of the 2016 and 2018 seasons, soil health assessments (water infiltration, compaction, root health and density, etc.) were made for each treatment.

NRCS Study - Change in Production from 2015 to 2018

- The bi-monthly 1" change in production from 2015 to 2018 was a negative 1500 pounds of forage difference, versus the monthly 4" plot netted 1500 pounds of production.

NRCS Clipping study - Soil Slake Test

Soil slake tests look at soil structure stability as the soil is submerged in water. The more stable the soil the more soil that will stay intact overthe5minutetest.Of all the demonstration the 4" plots lost the least amount of soil, where the monthly 1", Bi-monthly 1", and Bi-monthly 2" lost the most amount of soil during the test.

Take Home Message!