Soil Health & Grazing

Building Healthy Soils

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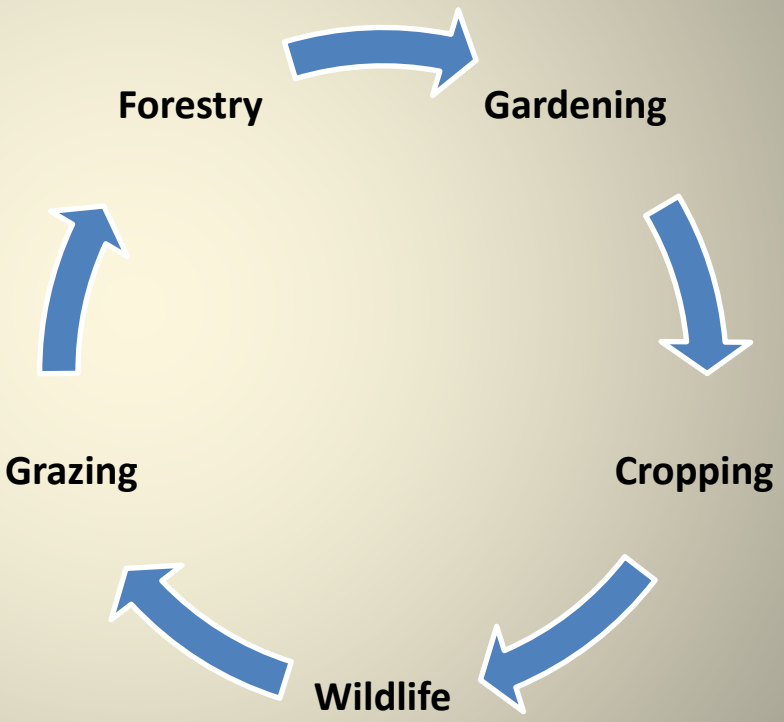
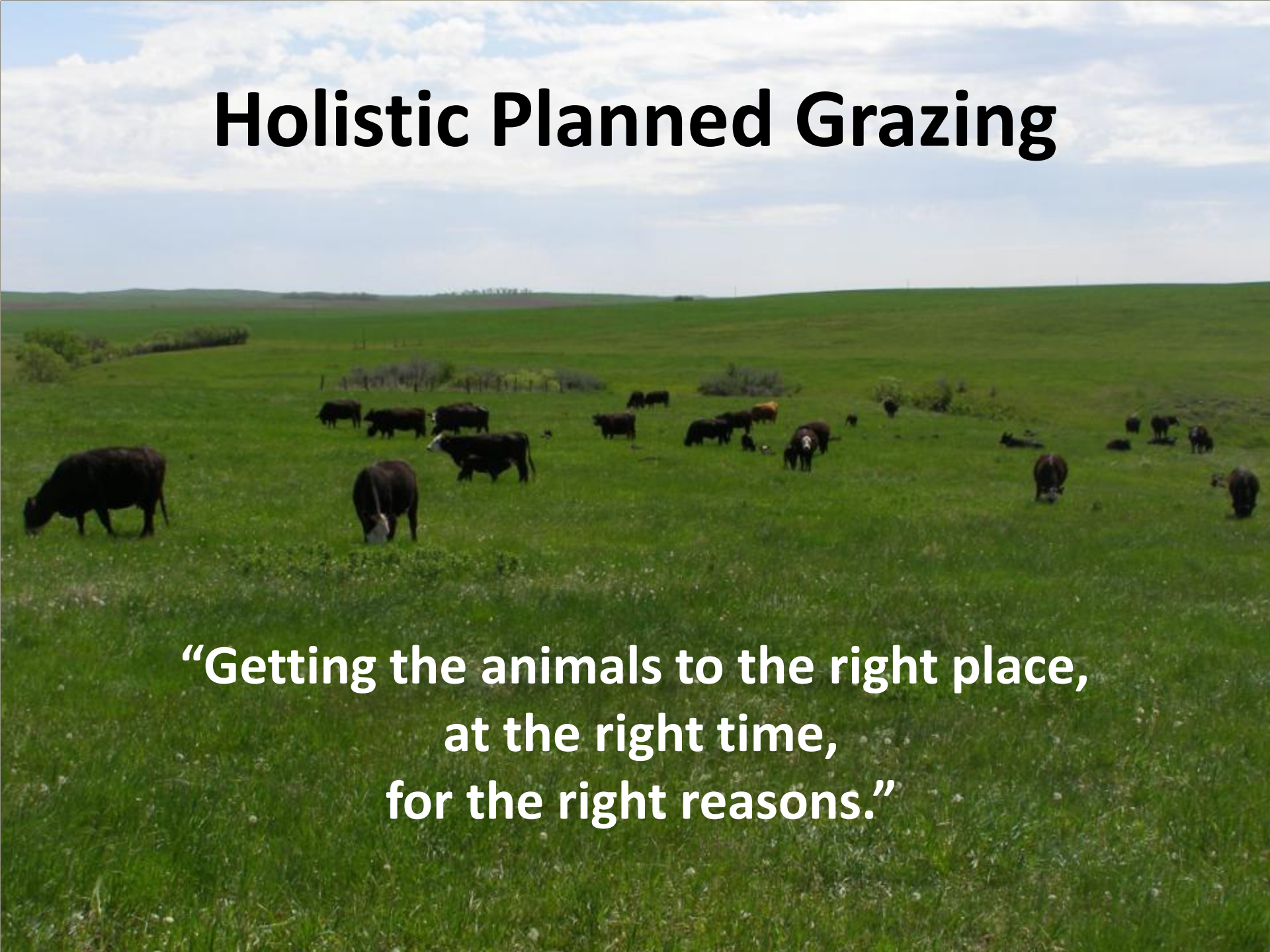
“Conservation is not enough.
Regenerative management is needed
to produce a sustainable future.”

Common Denominator: ***Soil Health***



We are taught all the parts…
Now how do we put it all together?

Holistic Planned Grazing



**“Getting the animals to the right place,
at the right time,
for the right reasons.”**

Forage Chain for Livestock & Wildlife

Winter	Spring	Summer	Fall	Winter
J F	M A M	J J A	S O N	D

LEGUME – based perennial pastures

Winter Annuals

Winter Annuals

Summer Annuals

High Quality Hays

Corn (grazing)

High Quality Hays

Diverse Native Perennial based pastures/forests

Forage Chain for Soil Microbes

Winter	Spring	Summer	Fall	Winter
J F	M A M	J J A	S O N	D

LEGUME – based perennial pastures

Winter Annuals

Winter Annuals

Summer Annuals

High Quality Hays

Warm Season Grass/BrdLeaf

High Quality Hays

Diverse Native Perennial based pastures/forests

Soil Food Web
The "Below Ground" Players…

- **Bacteria**
  - Feeds on root exudates; food for others
  - Decomposer of low carbon residue
  - Keeps nutrients in rooting zone and out of surface and groundwater
  - Enhance soil structure
  - Compete with disease causing organisms
  - Filter and degrade pollutants

Soil Food Web

The "Below Ground" Players…

- **Fungi**
  - **Decomposer of high carbon residue**
  - **Improve accumulation of organic matter**
  - **Helps retain nutrients**
  - **Food source for other members of food web**
  - **Compete with with plant pathogens**
  - **Mycorrhizal – transports nutrients**
  - **Forms the soil glue (glomalin)**

Soil Food Web

The "Below Ground" Players…

- **Protozoa**
  - **Mineralize nutrients by eating the little guys**
  - **Release nutrients stored in microbial biomass for plant use**
  - **Increase decomposition rates**
  - **Increase soil aggregation**
  - **Prevent some pathogens from establishing on plant roots**
  - **Provide prey for larger soil organisms**

Soil Food Web

The "Below Ground" Players…

- **Nematodes**
  - **Mineralize nutrients by eating the little guys (fungi & bacteria)**
  - **Regulate populations of other soil organisms**
  - **Taxi-cab for fungi & bacteria**
  - **Consume disease causing organisms**
  - **Large in size so compacted soil restricts their travel**

Soil Food Web

The "Below Ground" Players…

- **Arthropods**
  - **Shred organic material**
  - **Stimulate microbial activity**
  - **Enhance soil aggregation by leaving fecal pellets behind**
  - **Mineralize and distribute nutrients to plants**
  - **Control pests**

Soil Food Web

The "Below Ground" Players…

- **Earthworms**
  - **Bury and shred plant residue**
  - **Mix and aggregate soil**
  - **Increase infiltration**
  - **Improve water holding capacity**
  - **Create channels lined with nutrients**
  - **Process nutrients to make them plant available**

What Do They Weigh?

- **Bacteria** 2,000 - 2,500 Lbs/Ac
- **Fungi** 1,000 - 15,000 Lbs/Ac
- **Protozoa** 20 - 300 Lbs/Ac
- **Nematodes** 10 - 300 Lbs/Ac
- **Microbes in Humans** 3 lbs/Person

Source:

The Nature and Properties of Soils

Brady and Weil, Fourteenth Edition

Soil Biology Primer

National Geographic, Nathan Wolfe, January 2013


December 19, 2012
Texas Panhandle
23 Vehicles in Chain Reaction Crashes

Picture from Past or Present?

What Grazing Model do you have?

Continuous, Season long

Switchback Rotation

Deferment

Hay – Graze Rotation

Rest Recovery

Simple Rotation

Management Intensive Grazing

Mob Grazing

Grazing for Ecosystem Health

What Cropping Model do you have?

Conventional

Organic

Tillage

Strip Till/Mulch Till

Recreational Tillage

No-Till

Continuous No-Till

Biological Cropping

Cropping for Ecosystem Health

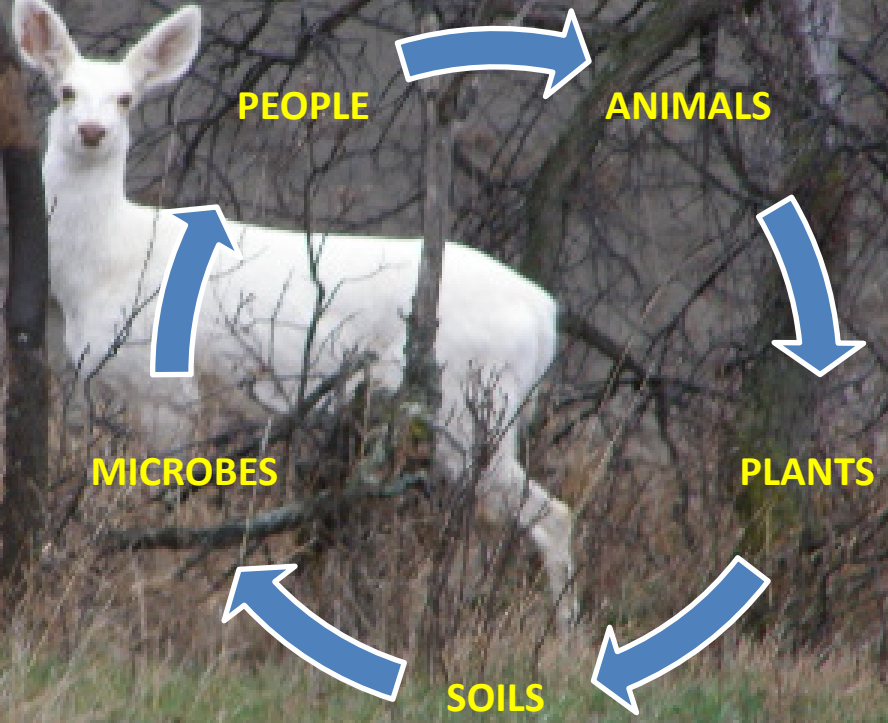
Nature as a Reference

Water Cycle

Mineral Cycle

Bio-Succession

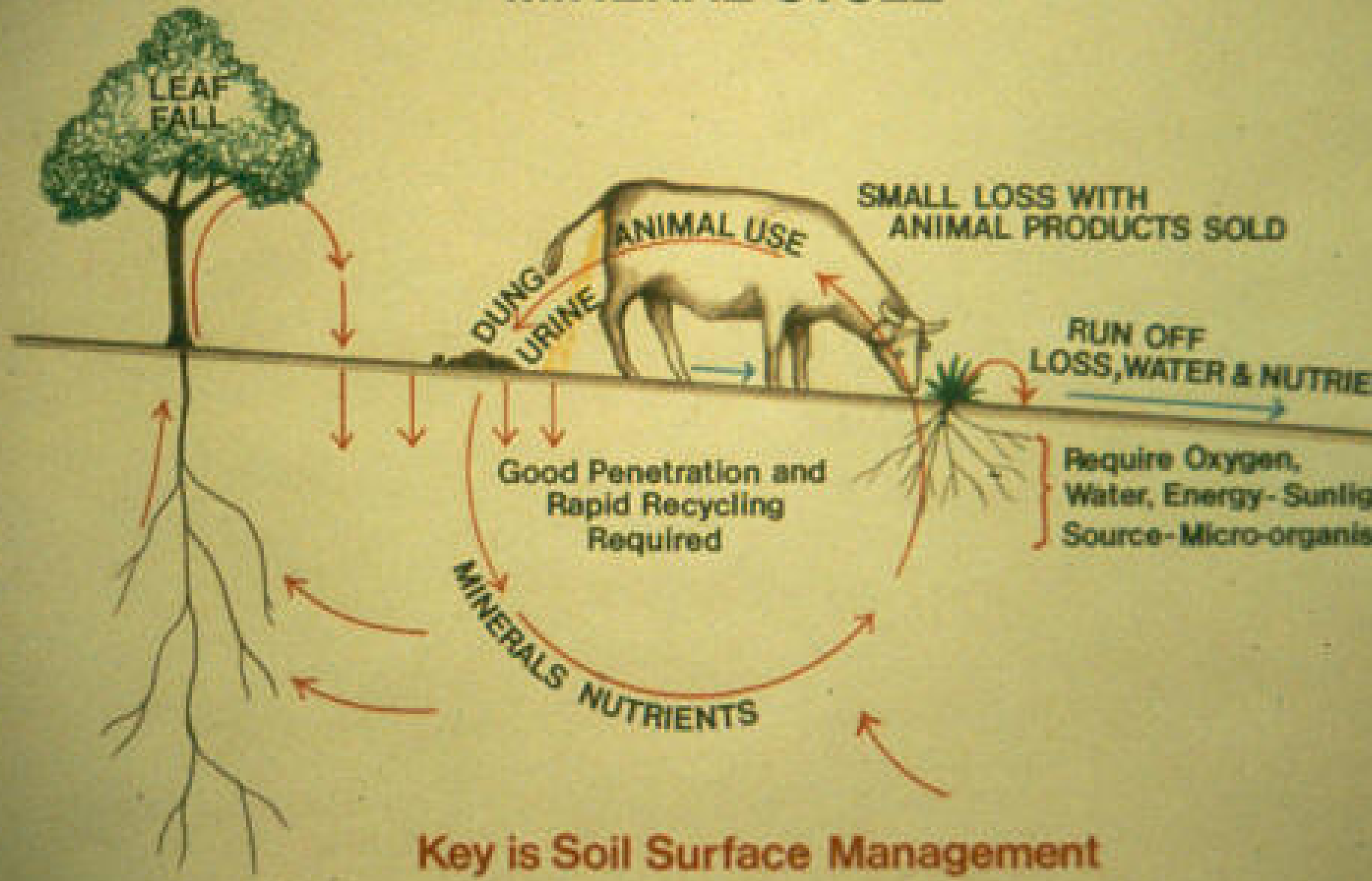
Energy Flow



"Can't manage for any one thing and maintain balance"

Cause or Effect?

MINERAL CYCLE



Key is Soil Surface Management

The Power of Diversity changes all the rules

Putting the “Sun” to work

Building the Soil

Our Influence

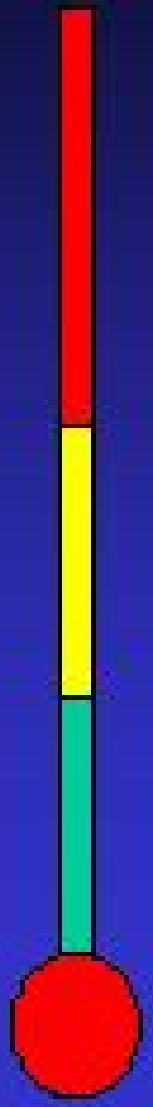
1. Armor
2. Diversity
3. Continual Live Plant Root
4. Minimal Disturbance
5. Adequate Recovery Time
6. Take your Reward….please!

No Wind Erosion on the Covered Field

Oilseed Radish - July 31

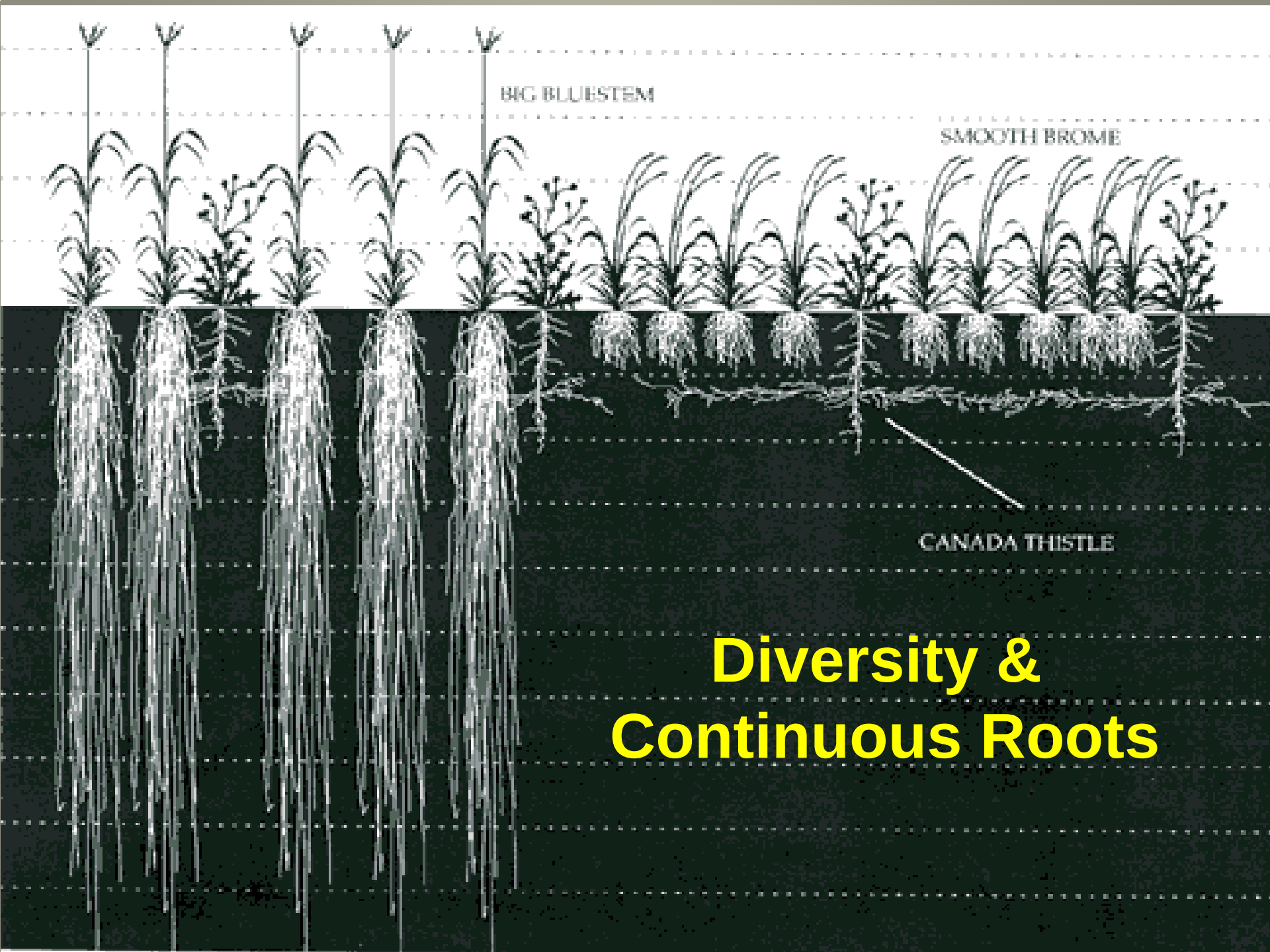
Cover Crop Mix - July 31

When soil temperature reaches...



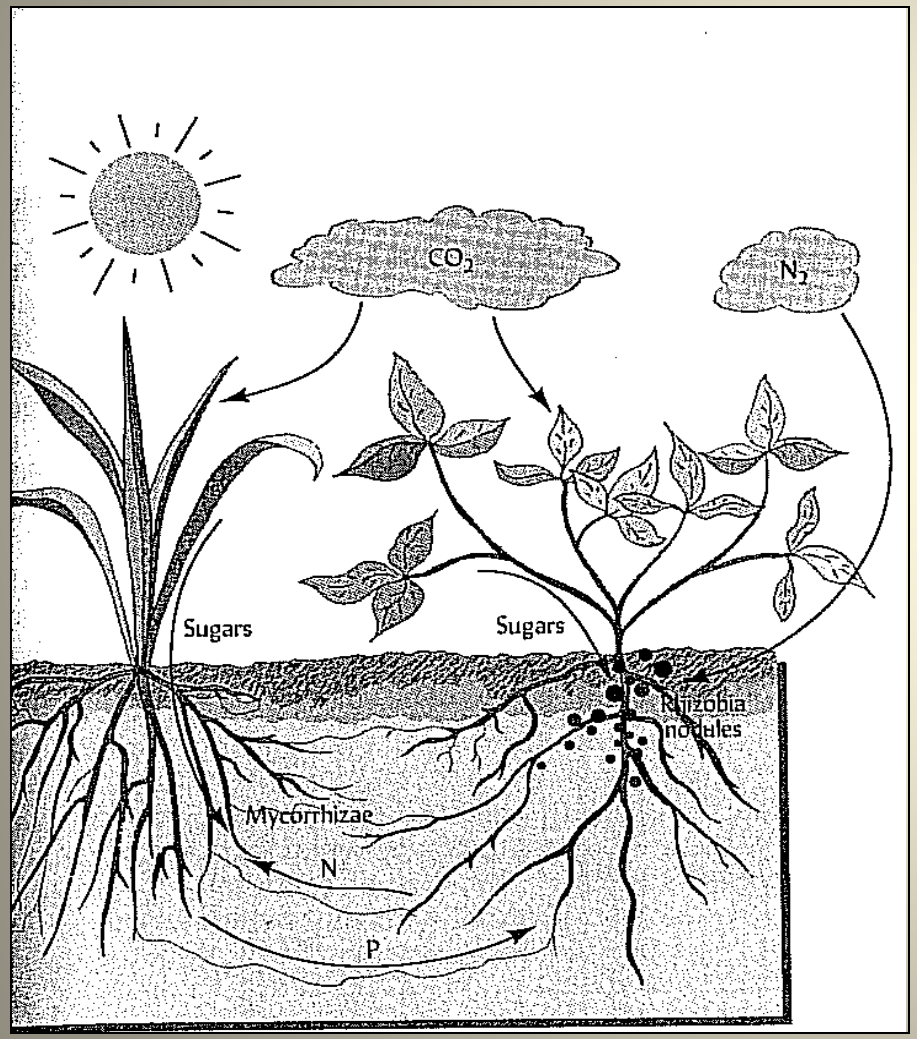
140 F	Soil bacteria die
130 F	100% moisture is lost through evaporation and transpiration
100 F	15% of moisture is used for growth 85% moisture lost through evaporation and transpiration
70 F	100% moisture is used for growth

J.J. McEntire, WWC, USDA SCS, Kerrville TX, S-68 4-R-12 198. 1956



Diversity & Continuous Roots

Plants Interacting with Mycorrhizal Fungi



- Assists with P uptake from the soil
- Moves P from the non-legume plant to the legume plant
- Moves N from the legume plant to the non-legume plant

The Nature and Property of Soils, Brady and Weil

Appropriate Disturbance

- Infiltration
- Compaction
- Surface Saturation

Sweep layer

Plow layer

Root breaking compaction layer


Is MOWING the same as GRAZING??
McPeak Ranch, Sterling, ND

Does Harvesting Method Matter?

Grazing 2007

- 91 bu/ac Corn (’08)
- 1 Herbicide Application
- Value of additional nutrients from manure?

Chopping 2007

- 68 bu/ac Corn (’08)
- 2 Herbicide Applications
- Value of nutrients hauled away?

Recovery…more than we realize

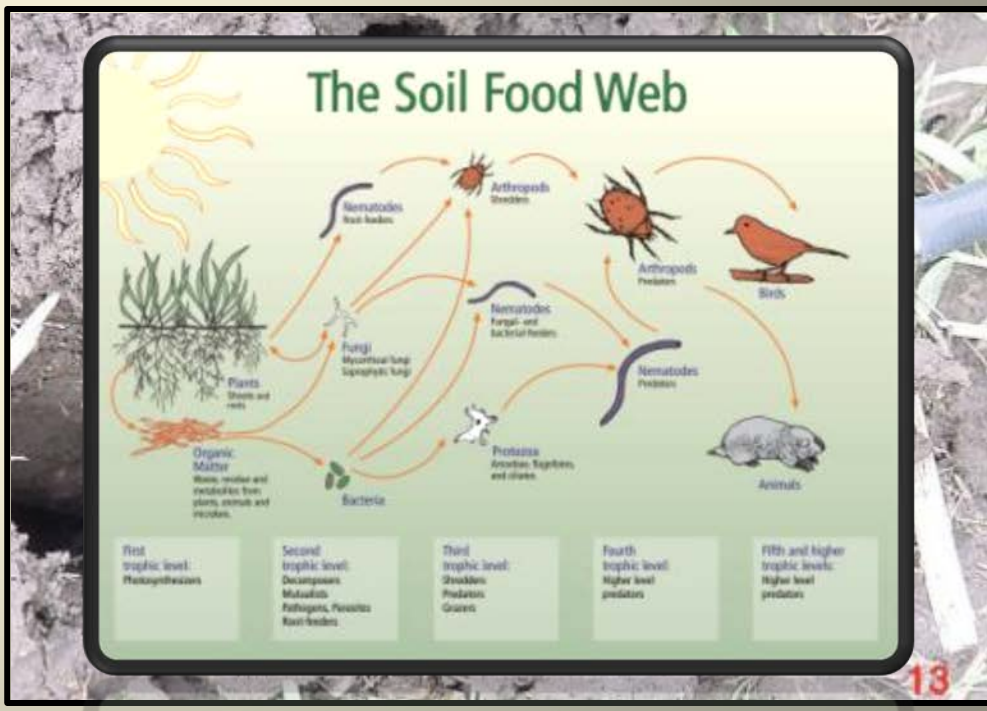

Biological Recovery
Soil Aggregate Formation

Feeding a Balanced Diet with a Constant Stream of Solar Energy

Soil organisms are like animals…they require a balanced diet to attain high performance and survivability


High Crop Diversity
Cover Crop
Animal Impact
Low Crop Diversity
No Cover Crop
No Animal Impact
Your Reward

Harvest The Sunlight = Feed The Soil



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