

GOOD
MORNING
& WELCOME!



Regenerative Farming,
Human Health, and You

March 14 | 9:00-5:00p | Country Heritage Winery

Aggregation Degradation

Luke Jones

Consultant - Understanding Ag
Impact Family Farms

Background

Born and raised in Astoria, IL

College - Spoon River College ----> Western Illinois (Fall 2010)

Two Rivers FS (2011) -----> Prairieland FS (Spring 2019)

Rebman Farms (2019- Spring 2022)

Understanding AG (Spring 2022-Current)

Raise livestock (sheep) and row crop (corn, soybean, wheat, and more)

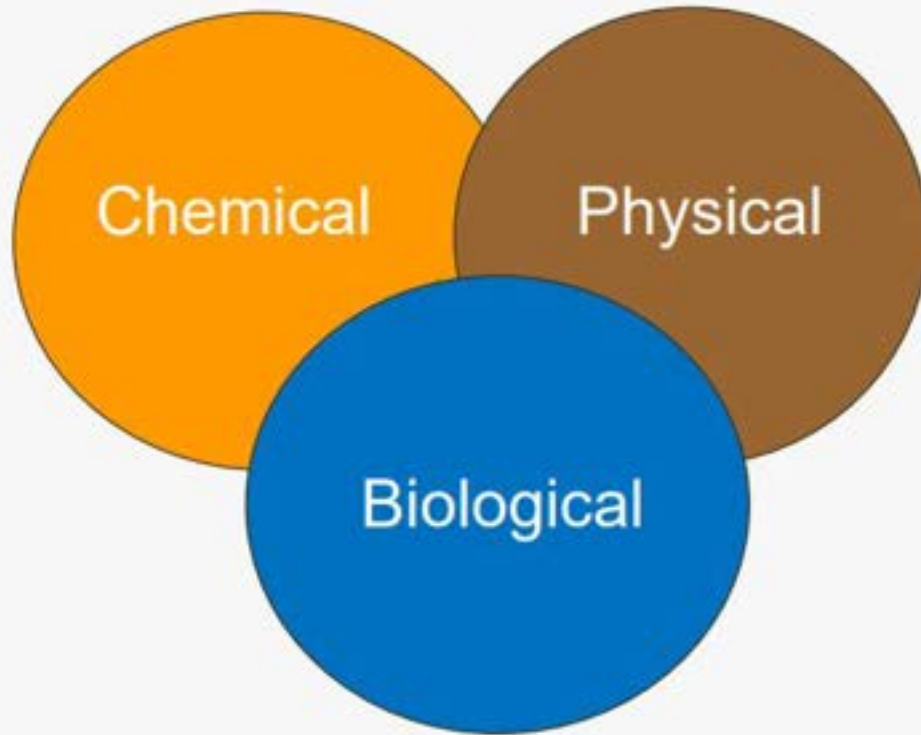
What Is Regenerative Ag?

IMPACT FAMILY FARMS





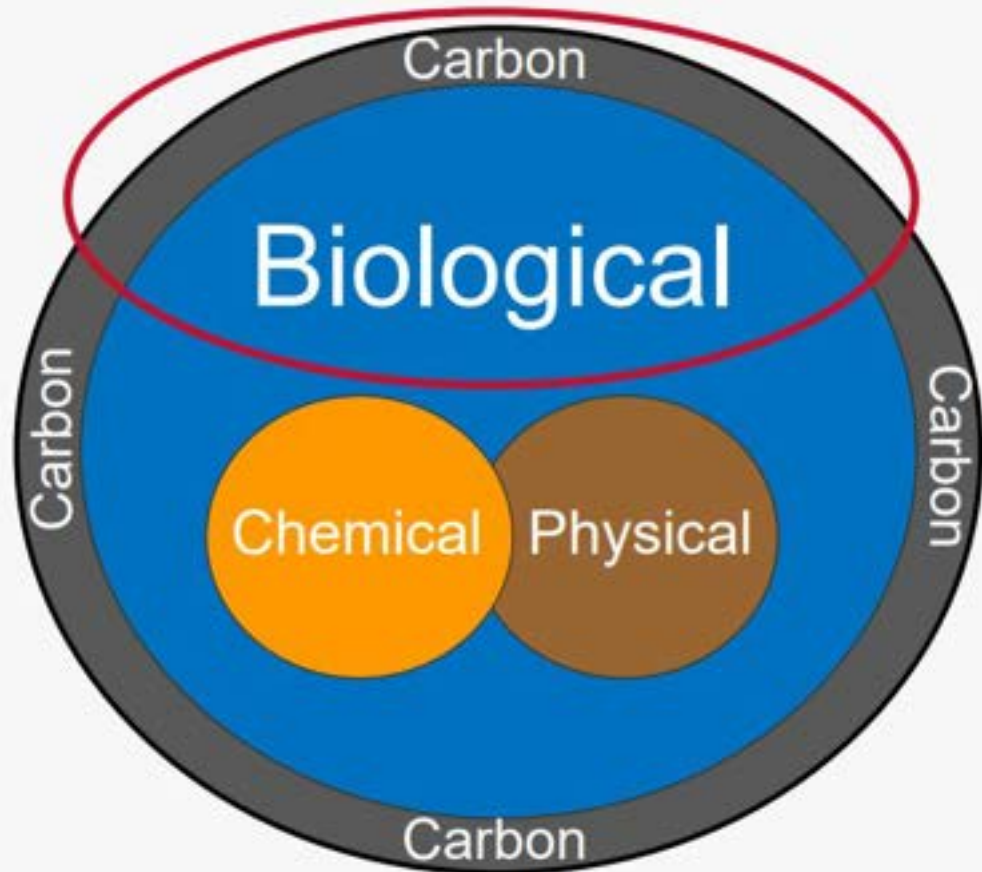
IMPACT
FAMILY FARMS



Regenerative model of soil function

The value is in
carbon and **biology**

“If you want to make small changes, change the way you do things. If you want to make major changes, change the way you see things.”





UnderstandingAGTM

What is an Aggregate?

-Clumps of soil held together by biological glues and root exudates



Aggregates are the engine that drives soil function



Aggregates provide conditions for life and nutrient cycling in the soil:

- ✓ Water films for biology to live in
- ✓ Aerobic and anaerobic pockets
- ✓ Areas of high and low pH

Soil aggregates - the building blocks of healthy soil

Aggregates are clumps of soil glued together by biological processes

- Various sizes and shapes
- Irregular arrangement
- 'Cottage cheese' look
- Lots of pore space for air/water exchange





“Plant and soil are one”
Ray Archuleta

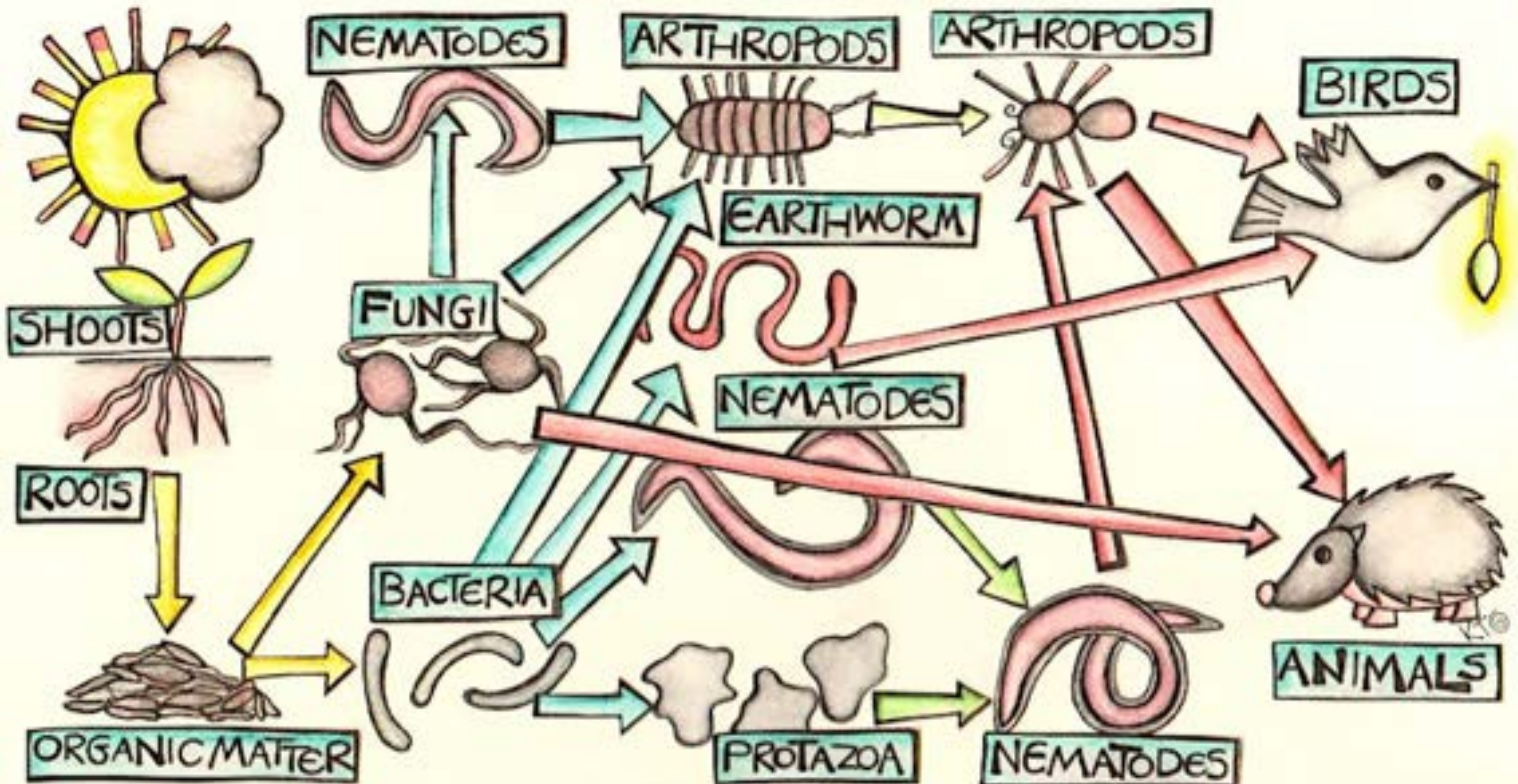




FOUR ECOSYSTEM PROCESSES™



SOIL FOOD WEB



1ST TROPHIC LEVEL
PHOTOSYNTHESISERS

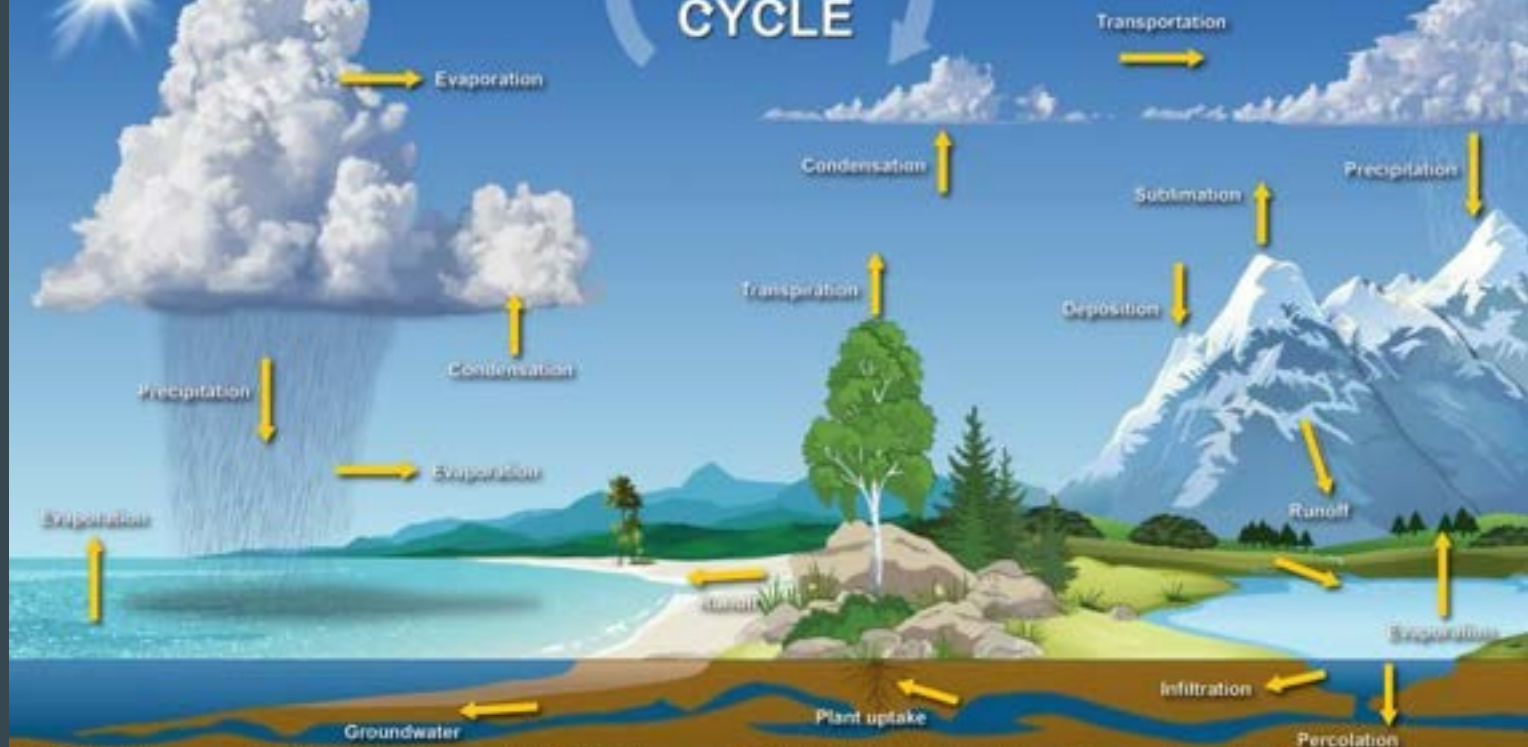
2ND TROPHIC LEVEL
DECOMPOSING
MUTUALISTS
PATHOGENS, PARASITES
ROOT-FEEDERS

3RD TROPHIC LEVEL
SHREDDERS
PREDATORS
GRAZERS

4TH TROPHIC LEVEL
HIGHER LEVEL
PREDATORS

5TH + HIGHER TROPHIC LEVELS
HIGHER LEVEL
PREDATORS

THE WATER CYCLE



EVAPORATION: The process where liquid water changes into water vapor (gas).

CONDENSATION: The process where water vapor (gas) changes into water droplets (liquid).

PLANT UPTAKE: Water taken from the ground-water flow and soil moisture.

TRANSPIRATION: Evaporation of liquid water from plants and trees into the atmosphere.

TRANSPORTATION: The movement of solid, liquid and gaseous water through the atmosphere.

RUNOFF: River, lake, and stream transport of water and transport of ice in glaciers.

PRECIPITATION: Water that falls to the earth. Most precipitation falls as rain but includes snow, sleet, drizzle, and hail.

GROUNDWATER: Underground water flow (aquifers).

DEPOSITION: The process where water vapor (gas) changes into ice (solid), skipping the liquid phase.

SUBLIMATION: The process where ice and snow (solid) change into water vapor (gas), skipping the liquid phase.

INFILTRATION: Movement of water into the ground from the surface.

PERCOLATION: Movement of water past the soil going deep into the groundwater.

National Weather Service
www.weather.gov/nwr



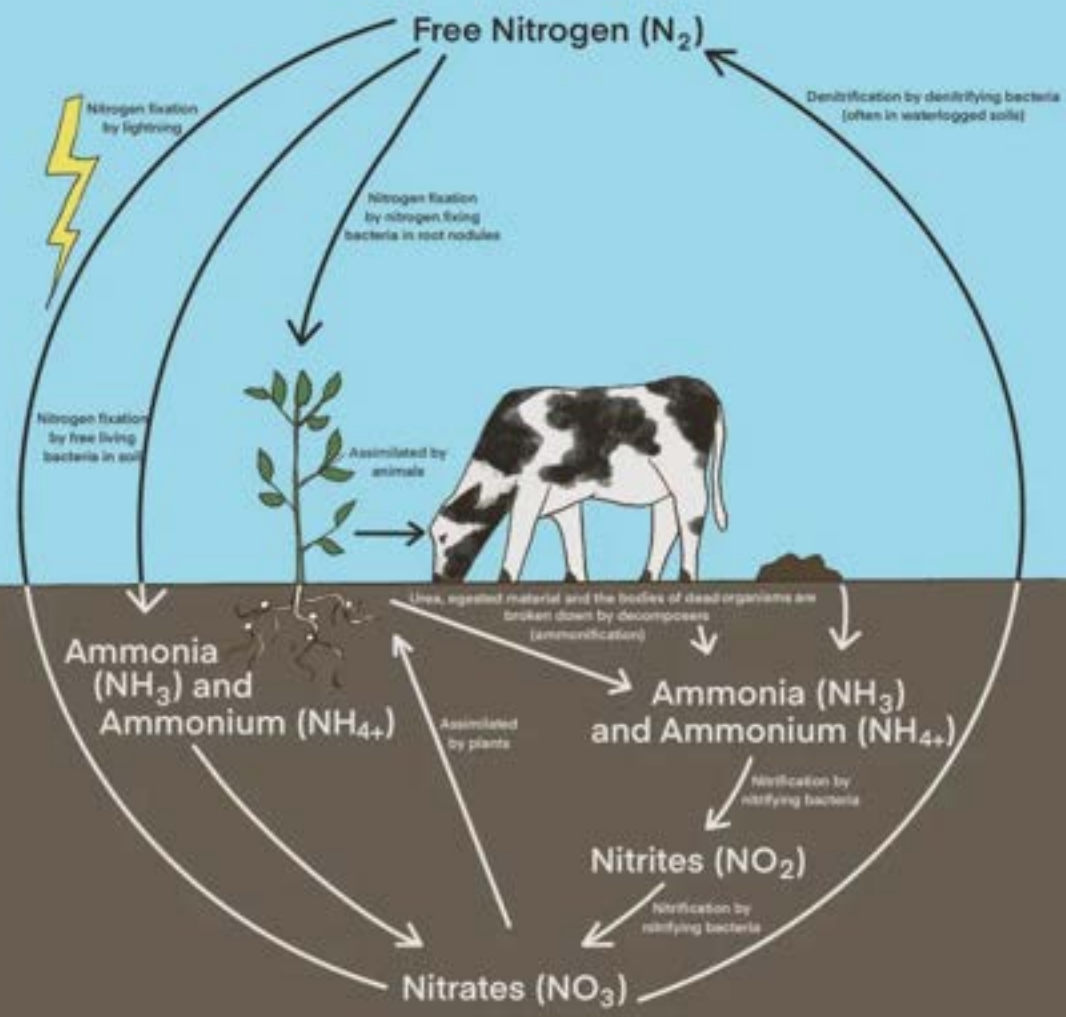


We must protect our most valuable asset..



UnderstandingAG™

N CYCLE



and livestock
ability fertilize
more carbon
in the soil



Microbes pull nitrogen from
the air, converting it to a form
plants can use.



Through their roots, plants
share some sugars to microbes
in exchange for nutrients
needed to grow.

Plant the soil

Plants break down
from the soil into hydrogen
oxygen (

Oxygen

Plants pull CO_2 from the air
and bind it to hydrogen
from the H_2O , which makes
sugar (CH_2O)

Sugars create the molecules
that form a plant

Community Dynamics



Context

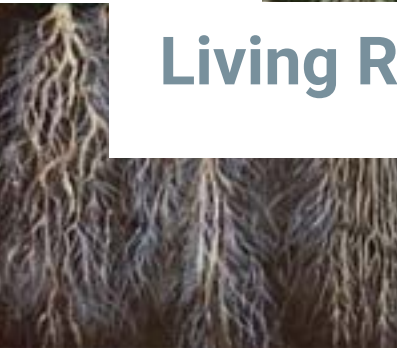
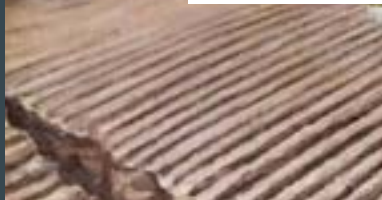
Armor

**Minimize
Disturbances**

Diversity

Living Root

**Animal
Integration**



6 Principles

Context:

What's your why?

Financial

Family

Goals

Equipment

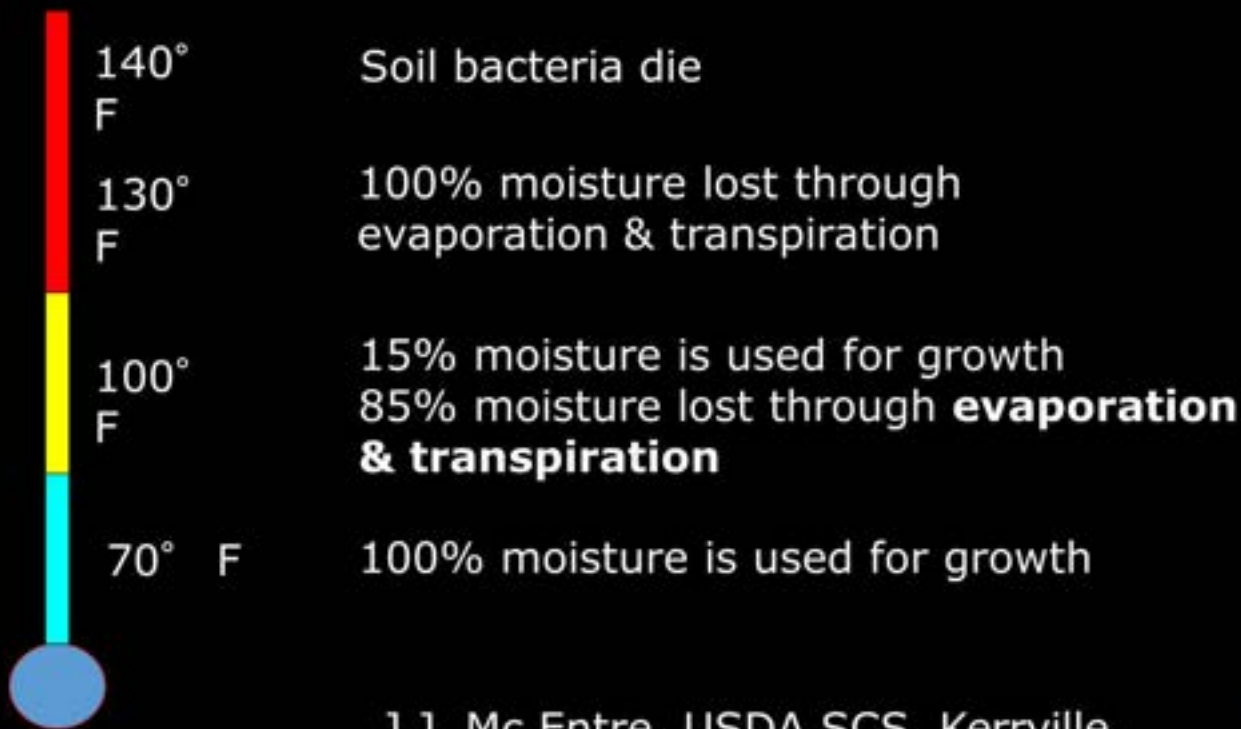
Climate, etc.....



Surface armor

- ✓ Controls erosion
- ✓ Reduces runoff
- ✓ Reduces evaporation rates
- ✓ Moderates temperature swings
- ✓ Reduces compaction (raindrop impact)
- ✓ Suppresses weeds
- ✓ Provides habitat for the soil food web

When soil temp reaches. . .



J.J. Mc Entre, USDA SCS, Kerrville,
TX, 1956







126



141



6 Principles

Tillage Tools:

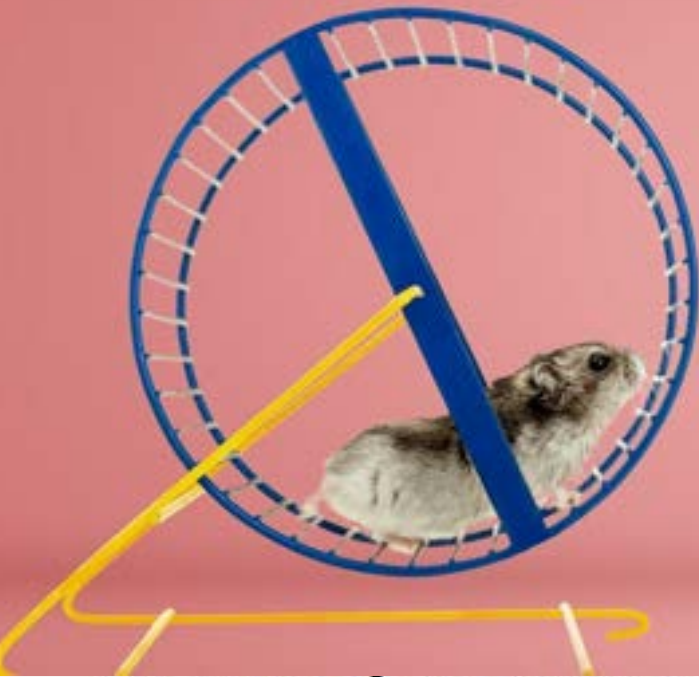
(Dwayne Beck, Dakota Lakes Exp. Station)

- All Tillage Tools Destroy Soil Structure
- All Tillage Reduces Water Infiltration
- All Tillage Reduces Organic Matter

Redu

-Physi

Management determines d

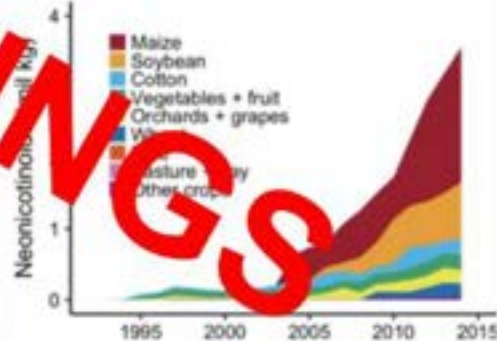


NOTICE

STOP

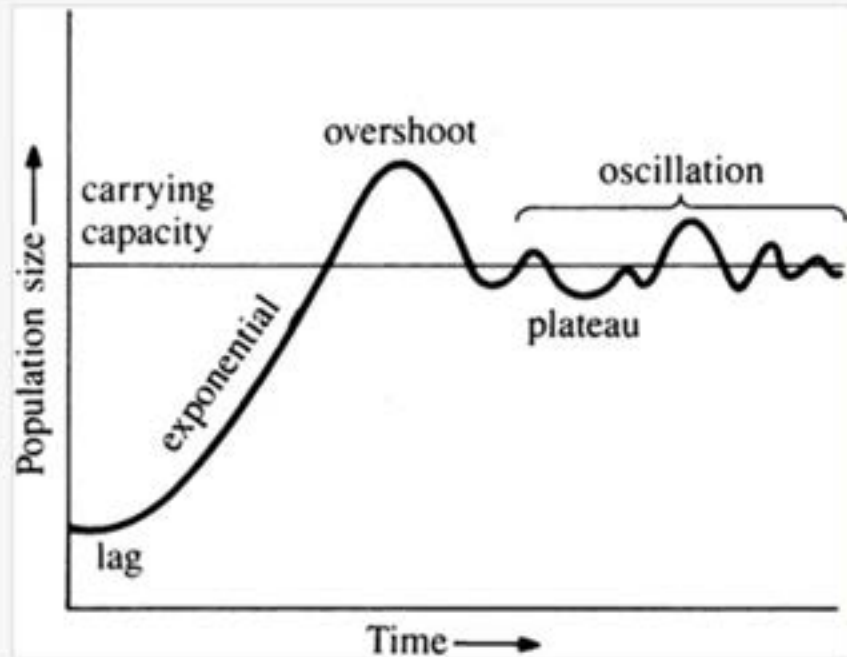


THE BEATINGS WILL
CONTINUE UNTIL
MORALE IMPROVES



Diversity – Community dynamics

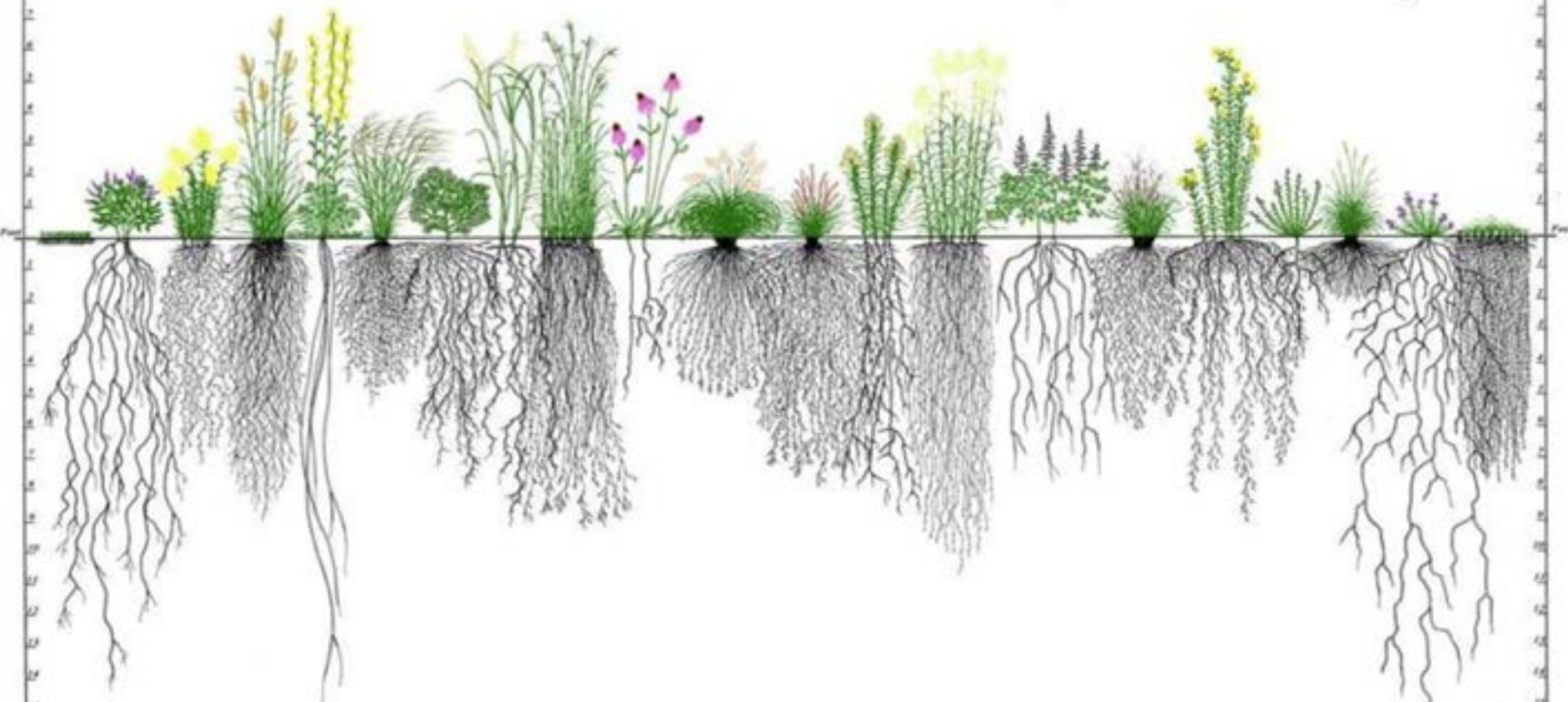
- Each organism plays an important role in keeping the system in balance.
- The greater the diversity, better everything functions.
- Your job is to **increase the overall carrying capacity for biology.**



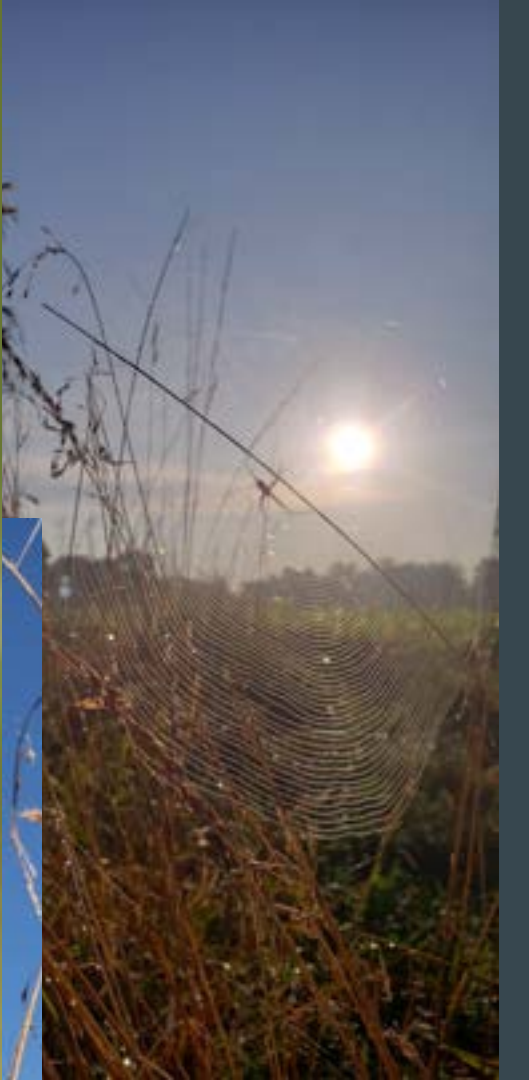
Root Systems of Prairie Plants

Conservation Research Institute

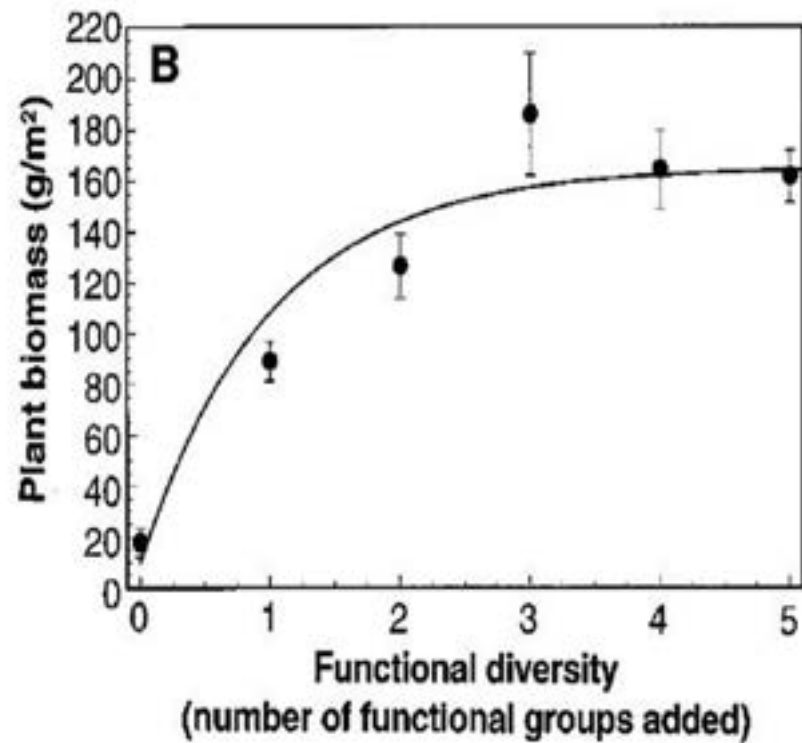
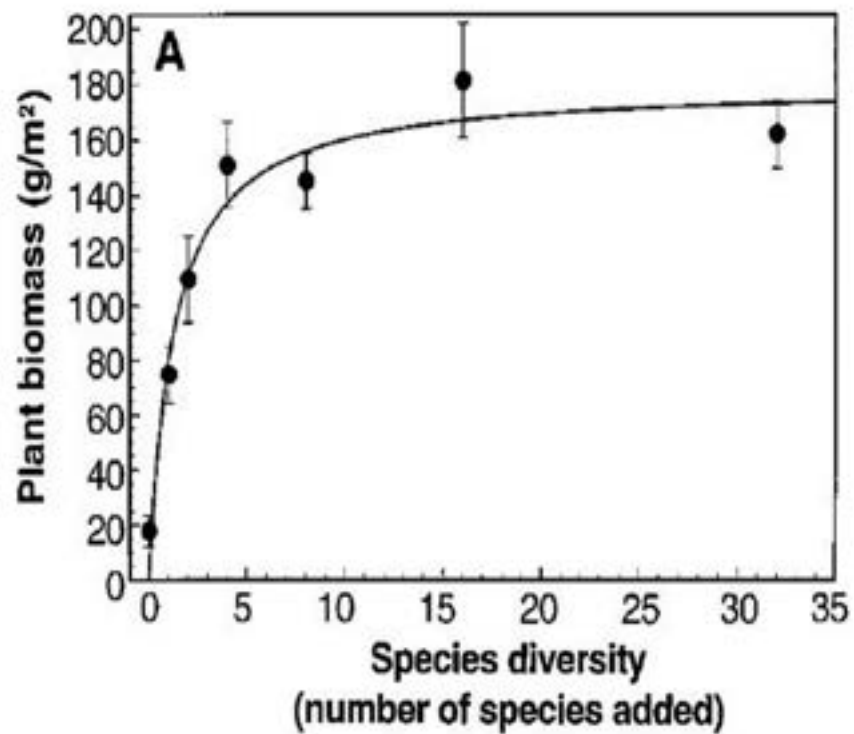
First Edition 1997



- | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|--|---|--|--|--|--|--|---|--|--|--|---|--|--|---|---|---|---|
| Kentucky
Blue Grass
<i>Poa
pratensis</i> | Lead
Plant
<i>Amorpha
canescens</i> | Missouri
Goldensrod
<i>Salpiglossis
missouriensis</i> | Indian
Crown
<i>Sorghastrum
nutans</i> | Cowpen
Plant
<i>Siphocampylus
decumbens</i> | Purshian
Grass
<i>Sida
spicata</i> | Black
Joker
<i>Aster
prenanthoides</i> | Prairie
Card
Grass
<i>Spiranthes
perfoliata</i> | Big Blue
Stem
<i>Andropogon
gerardii</i> | Pink
Purple
Coneflower
<i>Echinacea
pallida</i> | Prairie
Dogwood
<i>Sporobolus
heterophyllus</i> | Side Oats
Grass
<i>Bromus
cortopendula</i> | Pink
Blowout
<i>Eriogonum
rigens</i> | Switch
Grass
<i>Panicum
virgatum</i> | White
Woolly
Sedgwick
<i>Ruppia
leucostachya</i> | Little
Blue Stem
<i>Andropogon
angustifolius</i> | Blue
Woolly
Sedgwick
<i>Ruppia
leucostachya</i> | Purple
Prairie
Clover
<i>Psudotsuga
perparvula</i> | Iron
Grass
<i>Aristida
aristata</i> | Cyanide
Shooting Star
<i>Lonicera
cyathocarpa</i> | Buffalo
Grass
<i>Panicum
discolor</i> |
|--|---|---|--|---|--|--|--|--|--|---|--|--|--|---|--|--|---|---|---|---|







Negative plant-soil feedbacks are more common

This explains why natural systems don't grow monocultures, why succession happens and why diversity is the natural outcome.

- Individual related plants slowly create an unfavorable environment.
- Nothing dominates, things keep moving around.
- In the absence of crop rotation, feedbacks become stronger.
- If feedbacks were more positive, monocultures would be easier to grow.

Nothing in nature is black and white!



Living Roots

-Its the exudates from
the soil particles to



and help hold

**How many months of the year
do you have a living root in the soil??**



The rhizosphere

The **#1 food source** of most soil organisms are the **exudates from a living root**.

Living roots release many types of organic compounds into the rhizosphere around the surface of the root to start the nutrient cycle.

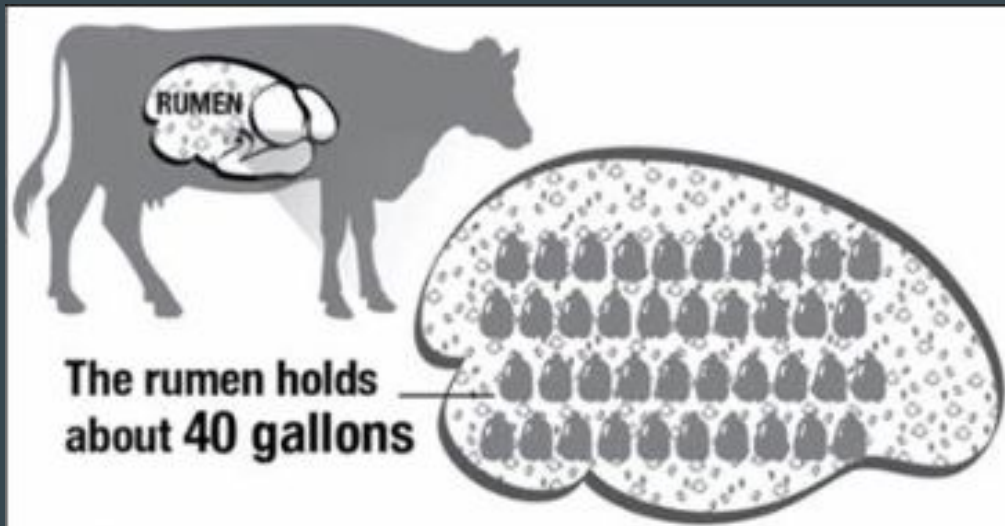
The plants are in control!!



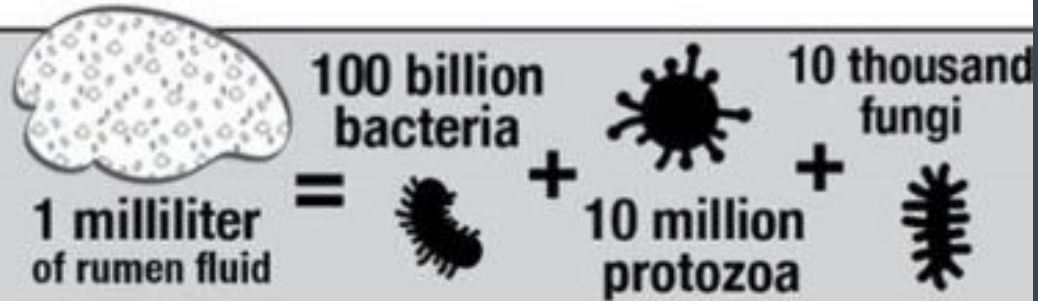
Animal Integration

-Does not have to be above ground to start out. Think of livestock in the soil first!

**GET LIVESTOCK BACK
ON THE LAND!!!!!!**



The rumen holds
about 40 gallons



**$\geq 1,000,000,000,000,000$
rumen bugs per cow**

I wouldn't recommend
you ask me to peel you
an apple very often!



3 Rules

- Compounding
- Diversity
- Disruption

Compounding

- Nothing is singular in action
- Either positive or negative
- Epigenetics are developed through this

Diversity Delivers

Grasses - Legumes - Forbs

Secondary & Tertiary compounds

Diversity in microbial species

Exponential rather than linear





Medicinal Pasture” – Potent Antioxidants

Sericea Lespedeza

Annual Lespedeza

Birdsfoot Trefoil

Arrowleaf Clover, Berseem Clover

Crown Vetch

Multiflora Rose

Autumn Olive

Mulberry

Mimosa

Plant Species	Crude Protein	IVDMD
Redroot Pigweed	25	73
Lambsquarter	25	68
Common Ragweed	25	73
Smartweed	24	51
Curly Dock	30	73
Henbit	20	78
Pepperweed	32	86
Giant Foxtail	18	62
Barnyardgrass	18	70

Disruption

Nature has tremendous resilience and responds well to challenges.

Planned, purposeful disruptions.

Creates host of positive compounding effects.

Ways to Disrupt

Alter stocking densities - “Pulsing”

Do not move through rotations in same pattern

Alter grazing heights on and off paddocks

Alter rest periods for paddocks

Alter species order (if doing multi-species grazing) – Or, multiple at once

Alter time of season/year a paddock is grazed & Grazing Days

Alter paddock configuration & paddock direction

Planned Burns

Leader-Follower

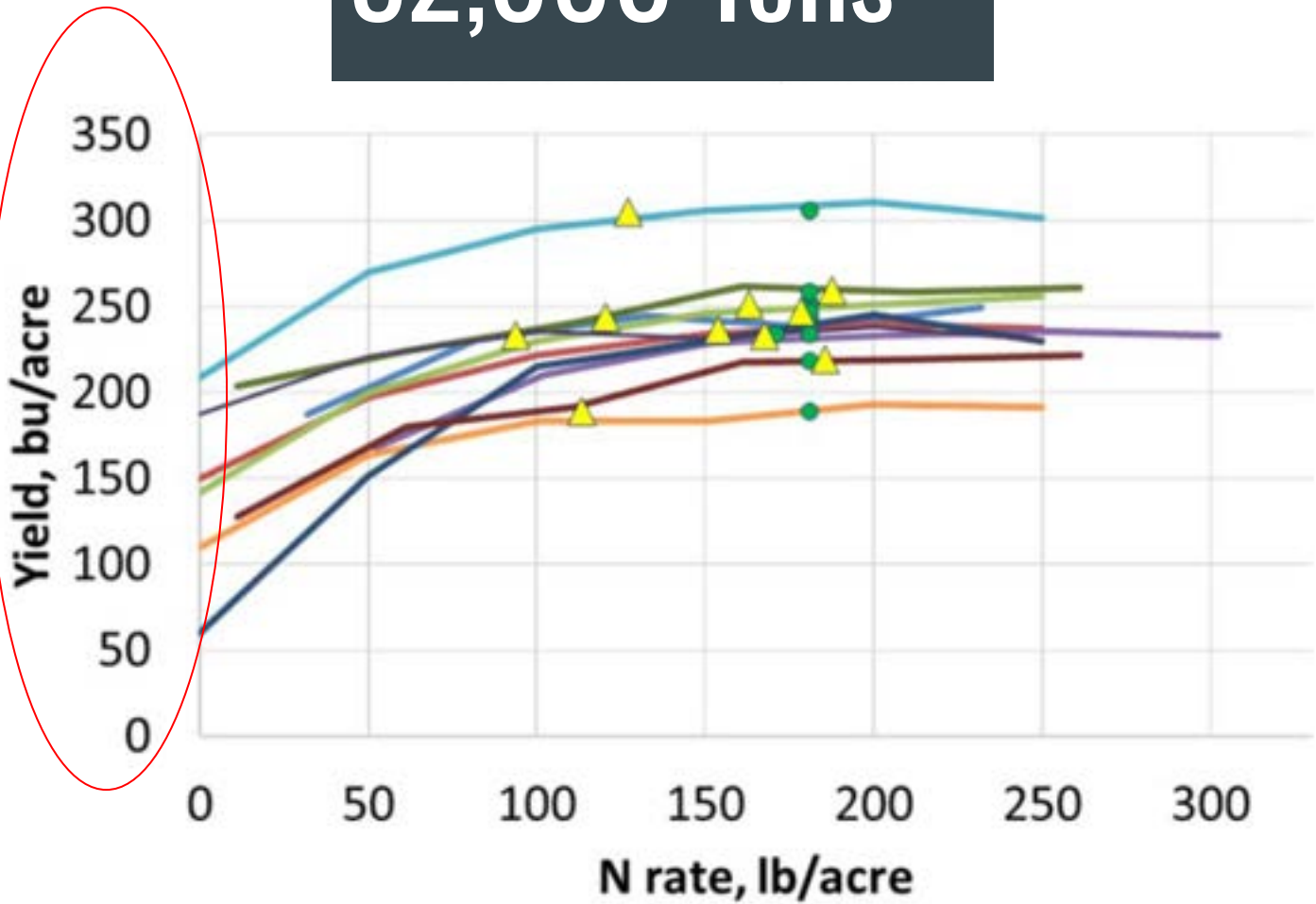
Unintended Consequences



9 Sc

32,000 Tons

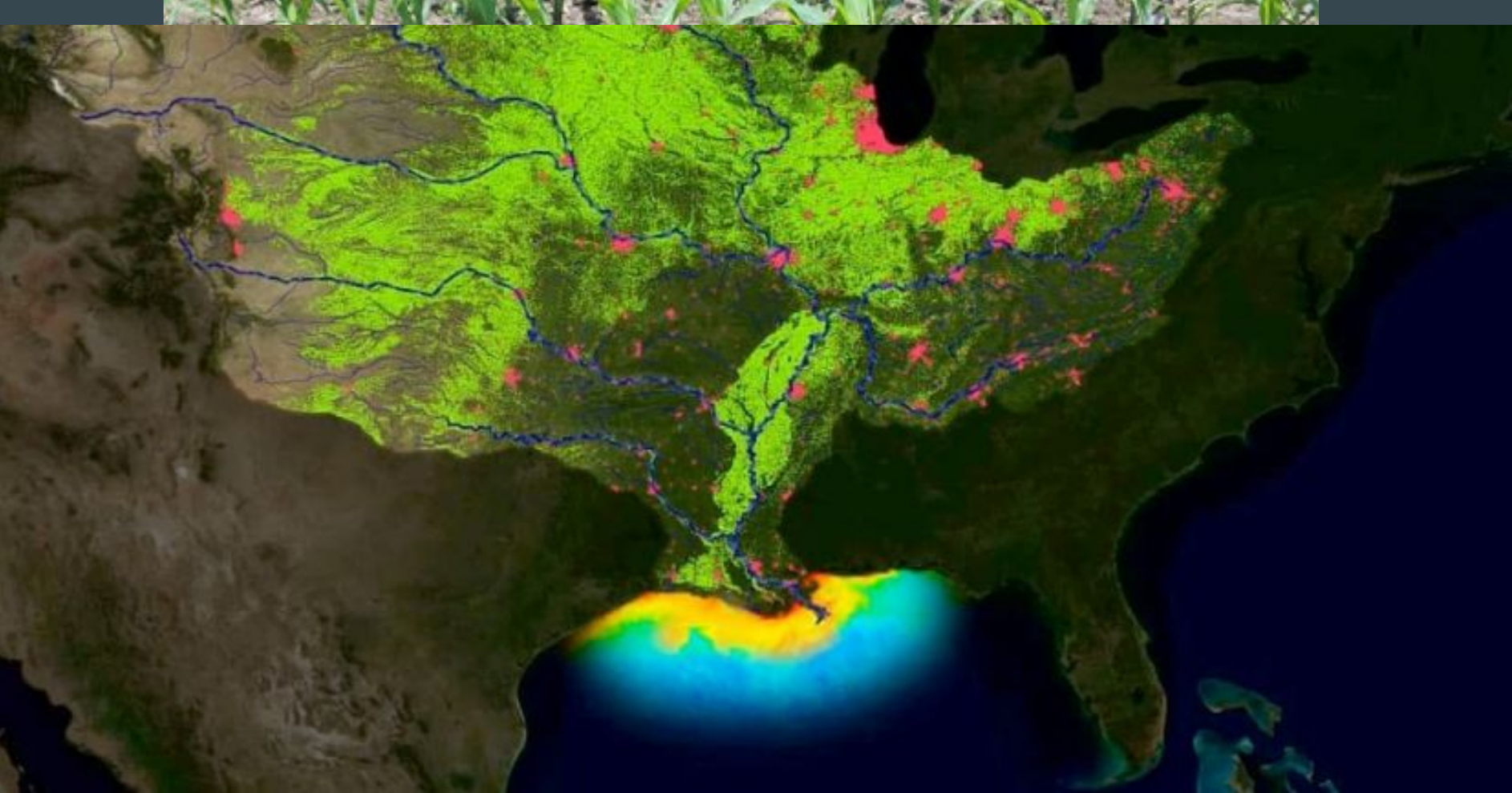
2022

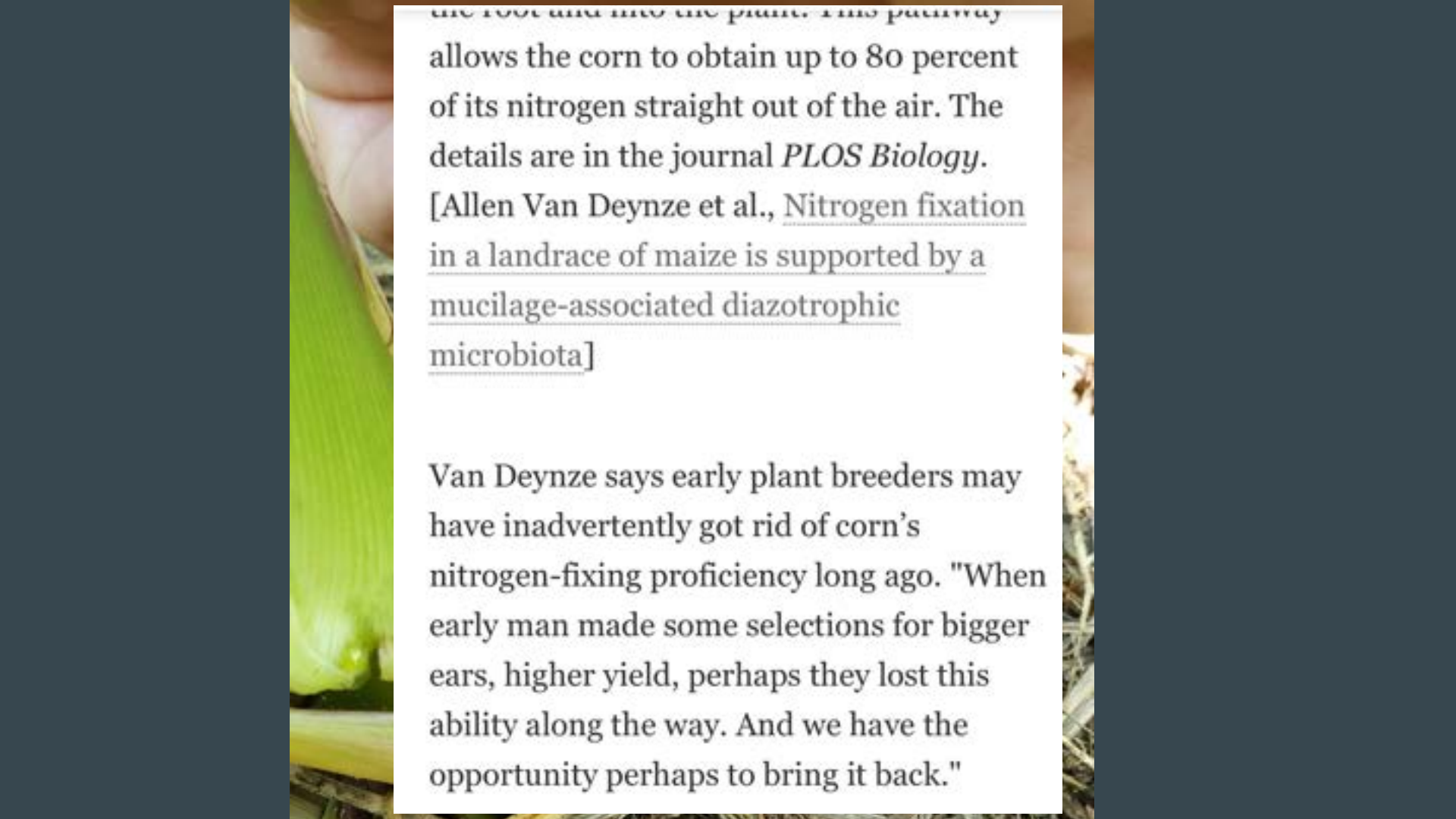


The potassium paradox: Implications for soil fertility,

from depletion. The need for routine K fertilization should also be questioned, considering the magnitude and inorganic occurrence of profile reserves, the recycling of K in crop residues and the preferential nature of K uptake. An extensive survey of more than 2100 yield response trials confirmed that KCl fertilization is unlikely to increase crop yield. Contrary to the inculcated perception of KCl as a qualitative commodity, more than 1400 field trials predominately documented a detrimental effect of this fertilizer on the quality of major food, feed and fiber crops, with serious implications for soil productivity and human health.

Research output: Contribution to journal > Article > peer-review





the root and into the plant. This pathway allows the corn to obtain up to 80 percent of its nitrogen straight out of the air. The details are in the journal *PLOS Biology*. [Allen Van Deynze et al., Nitrogen fixation in a landrace of maize is supported by a mucilage-associated diazotrophic microbiota]

Van Deynze says early plant breeders may have inadvertently got rid of corn's nitrogen-fixing proficiency long ago. "When early man made some selections for bigger ears, higher yield, perhaps they lost this ability along the way. And we have the opportunity perhaps to bring it back."



The city has applied for many grants over the years.

Now it's taking matters into its own hands on a 2 million dollar water treatment plant.

"The city of Pretty Prairie was not able to get a block grant, they're financing the whole thing," says Brace.



PLFA ANALYSIS REPORT

Lab #

34353

Total Biomass, PLFA ng/g soil

Value

Rank

Overall Rank

Functional Group Diversity Index

662.24

1.010

Community Breakdown

<u>Functional Group</u>	<u>Value</u>	<u>Units</u>	<u>% of Total Biomass</u>
Total Bacteria	315.56	PLFA ng/g	47.65
Gram +	195.51	PLFA ng/g	29.52
Actinomycetes	67.48	PLFA ng/g	10.19
Gram -	52.57	PLFA ng/g	7.94
Total Fungi	7.06	PLFA ng/g	1.07
Arbuscular Mycorrhizal	0.00	PLFA ng/g	0.00
Saprophytic	7.06	PLFA ng/g	1.07
Protozoa	0.00	PLFA ng/g	0.00
Undifferentiated	339.62	PLFA ng/g	51.28

Ratios

<u>Community</u>	<u>Value</u>
Fungi:Bacteria	0.0224
Protozoa:Bacteria	All Bact
Gram+:Gram-	5.0031
 <u>Stress Indicators</u>	
Sat:Unsat	8.3130
Mono:Poly	All Mono
Pre 16:Cyclo 17	None Found
Pre 18:Cyclo 19	All Pre18:1

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CNN

US

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Interstate in Illinois reopens after more than 70 vehicles crashed in a dust storm, leaving at least 7 dead



By [Joe Sutton](#), [Rebekah Riess](#) and [Brad Parks](#), CNN

🕒 3 minute read · Updated 1:17 PM EDT, Sat May 6, 2023



So how do we fix it?

A large, bold, green number '6' is centered in the left section of the graphic.

Six Principles of
Soil Health

A large, bold, green number '3' is centered in the middle section of the graphic.

Three Rules of
Adaptive Stewardship

A large, bold, green number '4' with a small 'TM' trademark symbol at the bottom right, centered in the right section of the graphic.

Four Ecosystem
Processes







Can Improve
Soil Function!

WHETHER YOU
THINK YOU CAN OR
THINK YOU CAN'T,
YOU ARE RIGHT

HENRY FORD



Thank You and God Bless

Luke@understandingag.com

217-490-3236