

- JANUARY 21, 2021 -

Pasture Biodiversity for Animal Health



- PRESENTED BY -
Kara Kroeger
NCAT/ATTRA

- HOSTED BY -

FACT
Food Animal Concerns Trust

Introductions



Food Animal Concerns Trust (FACT) is a national nonprofit organization that works to ensure that all food-producing animals are raised in a humane and healthy manner.



- **Larissa McKenna**
- Humane Farming Program Director
- Email: lmckenna@foodanimalconcerns.org
- Website: foodanimalconcernstrust.org/farmer

FACT's services to support livestock and poultry farmers include:

- **Conference scholarships - ongoing**
- **Free webinars**
- **Fund-a-Farmer Grants**
- **Humane Farming Mentorship Program**

Our Presenter



Kara Kroeger

Sustainable Agriculture Specialist, NCAT



Pasture Biodiversity for Animal Health

January 21, 2021

KARA KROEGER, SUSTAINABLE AGRICULTURE SPECIALISTS



NATIONAL CENTER FOR
APPROPRIATE TECHNOLOGY

- ▶ Helping people to build resilient communities through local and sustainable solutions that reduce poverty, strengthen self-reliance, and protect natural resources since 1976.
- ▶ Agriculture and Energy Programs
- ▶ ATTRA launched in 1987
- ▶ NCAT is headquartered in Butte, Montana, and has six regional offices.



Photo: Den Paul Cortez

An initiative to catch and hold more rainwater in soil

- ▶ We aim to create a critical mass of landowners who are applying regenerative agricultural practices that improve soil health and the water cycle.
- ▶ We act as a facilitator, networker, and educational resource to an expanding web of partners.



Photo: HMI

Podcasts, Publications, Tutorials, Etc.

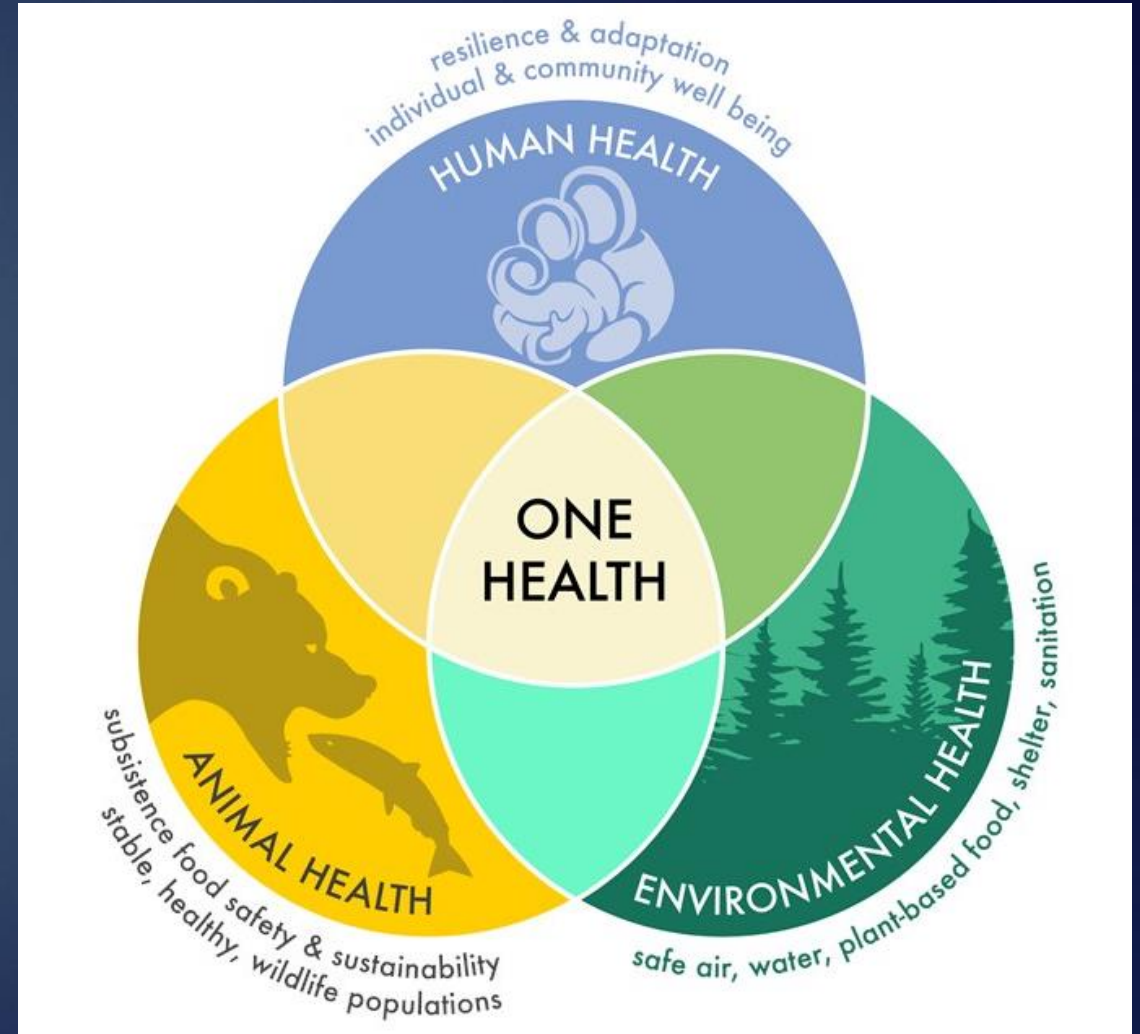
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► www.ATTRA.NCAT.org

The screenshot shows the ATTRA website homepage. At the top right, there is a navigation bar with links for Home, Login/Register, Contact, and Español, along with social media icons for Facebook, Twitter, Instagram, YouTube, LinkedIn, and Pinterest. The ATTRA logo is on the left, featuring a sun icon and the text 'ATTRA SUSTAINABLE AGRICULTURE' and 'NCAT'. To the right of the logo is the contact information: '1-800-346-9140 or askanag@ncat.org'. Below the logo and contact info is a horizontal menu with dropdown arrows for 'The Latest', 'Internships', 'COVID-19', 'Sustainable Agriculture Topics', 'Multimedia', 'About', 'DONATE', and 'Subscribe'. A magnifying glass icon is positioned to the right of the 'Subscribe' link. The main content area features a large banner for 'LIVESTOCK AND PASTURE' on a dark blue background. The banner includes a 'LEARN MORE' button and a photograph of several black and white cows with yellow ear tags. In the bottom right corner of the banner, there is a green box with the text 'We are here!' and 'Online' below it.

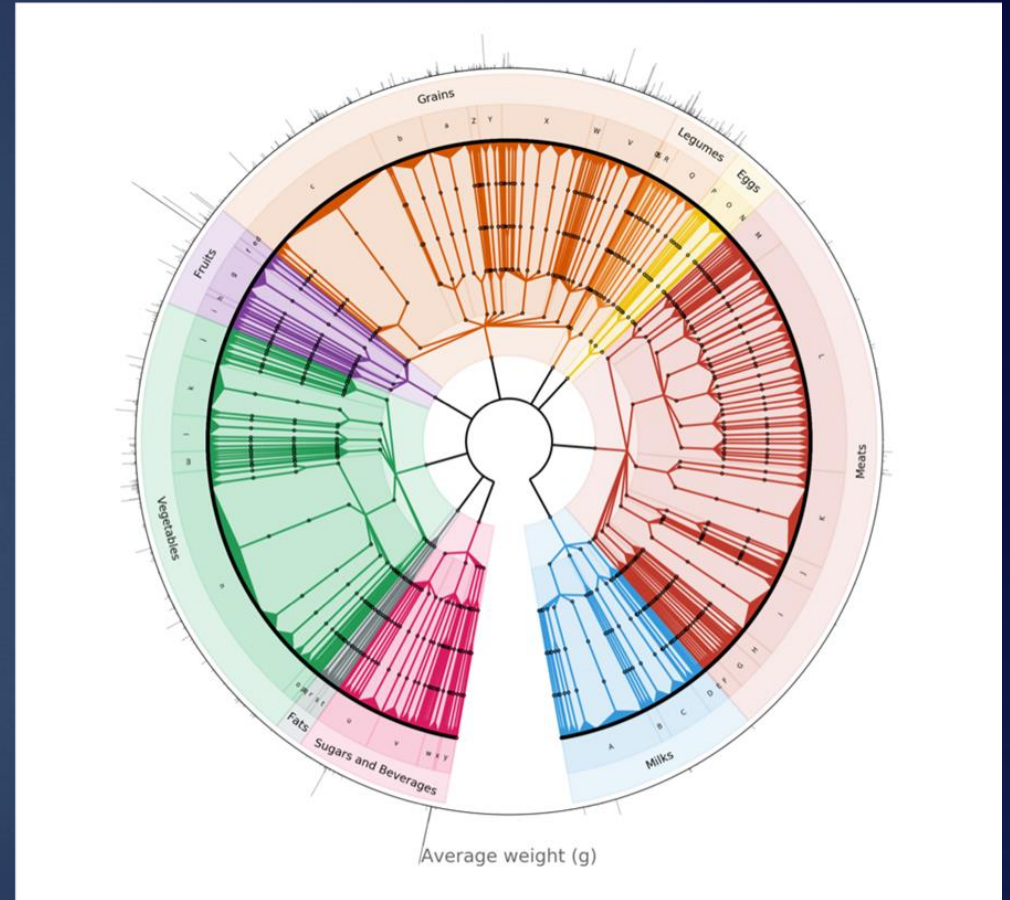
One Health

- ▶ There should be some profound resemblance between our treatment of our bodies and the treatment of the earth. We need to move our focus away from organs to organisms. – Wendell Berry
- ▶ This goes for humans, animals, and the earth alike.



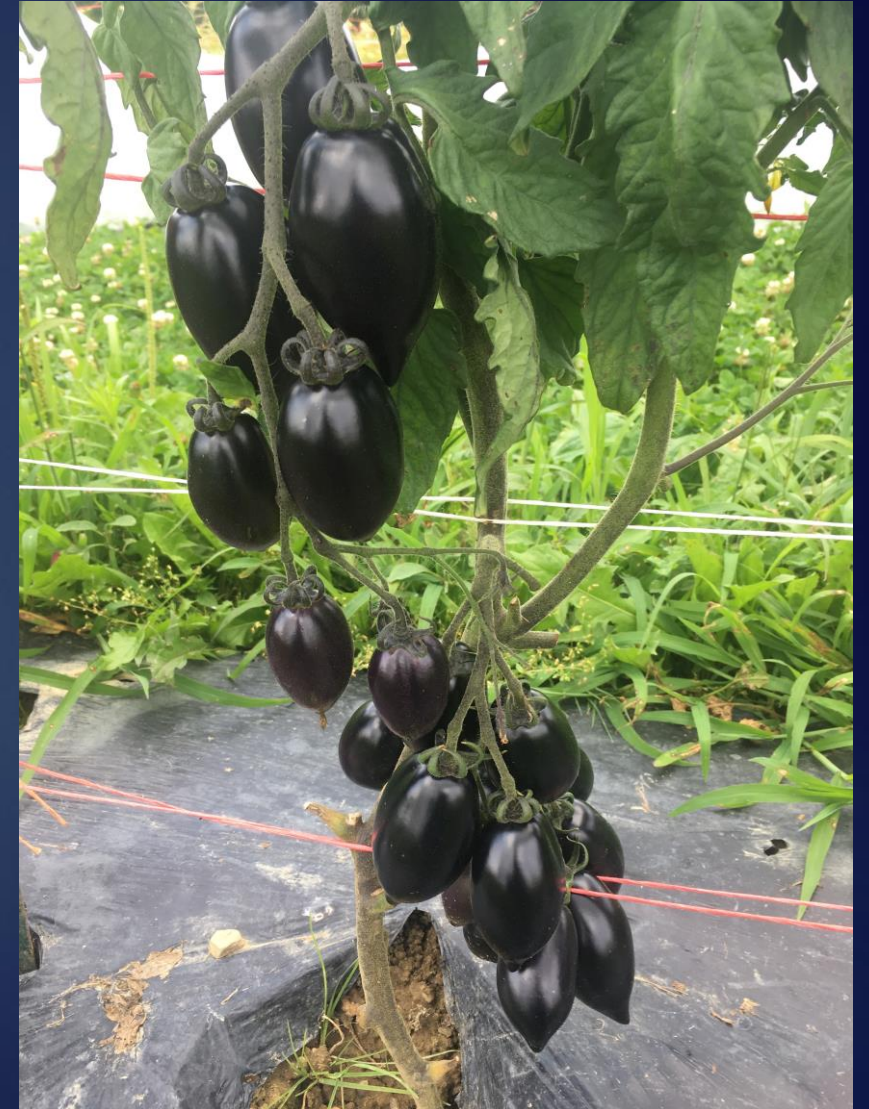
Emerging Nutrition Research

- ▶ Through foodomic technology and foodomes it is possible to investigate all the potential connections among foods (including composition, quality, and safety), diet, and the organism (including food impact on health and illness).
- ▶ Livestock health is enhanced when raised on phytochemically rich landscapes.



Nutritional Dark Matter

- ▶ 150 nutritional components tracked in food composition tables.
- ▶ This represents .5% of the 26,625 chemical compounds documented in food.
- ▶ 99% of the biochemicals (plant secondary compounds PSC) present in food are untracked by nutritional databases and are considered nutritional dark matter but are also biologically functional.



Pasture Biodiversity

- ▶ Increases milk, meat, and egg nutrient density and production.
- ▶ Increases plant (forage) immunity against pests and disease.
- ▶ Reduces or eliminates need for chemical inputs.
- ▶ Reduces or eliminates animal dependence on pharmaceutical drugs.
 - Cost
 - Side effects
 - Concerns over residues










Increase Soil Biodiversity

- ▶ 36 trillion species on the planet with only 1 million identified.
- ▶ Most of the diversity on this planet lives as microbes underneath our feet in the soil.
- ▶ There can be up to 10 billion viruses in a teaspoon of soil.
- ▶ WHAT ARE THEY DOING?



Functions of Healthy Rangelands

Rangeland Functions	Why is the function important?
Productivity 	<ul style="list-style-type: none">✓ Consumable products for all life forms (e.g. insects, decomposers, etc.)✓ Forage production for livestock and wildlife
Site Stability 	<ul style="list-style-type: none">✓ Maintain the potential productivity of rangelands✓ Protect soils✓ Support stable long-term biomass production
Capture and Slow Release of Water 	<ul style="list-style-type: none">✓ More moisture available for plant growth and other organisms✓ Less runoff and potential for soil erosion✓ More stable ecosystem during drought✓ Storage, retention and slow release of water

Nutrient Cycling 	<ul style="list-style-type: none">✓ Rangeland systems do not require fertilizer inputs✓ Conservation and recycling of nutrients available for plant growth
Plant Species Diversity 	<ul style="list-style-type: none">✓ Maintain biodiversity of all living things✓ Support high quality forage plants for livestock and wildlife✓ Maintain a diversity of grasses, forbs, shrubs and trees

Adapted from: Rangeland Health Assessment Field Workbook BEEFRESEARCH.CA

Perennial Root Systems of Healthy Prairie

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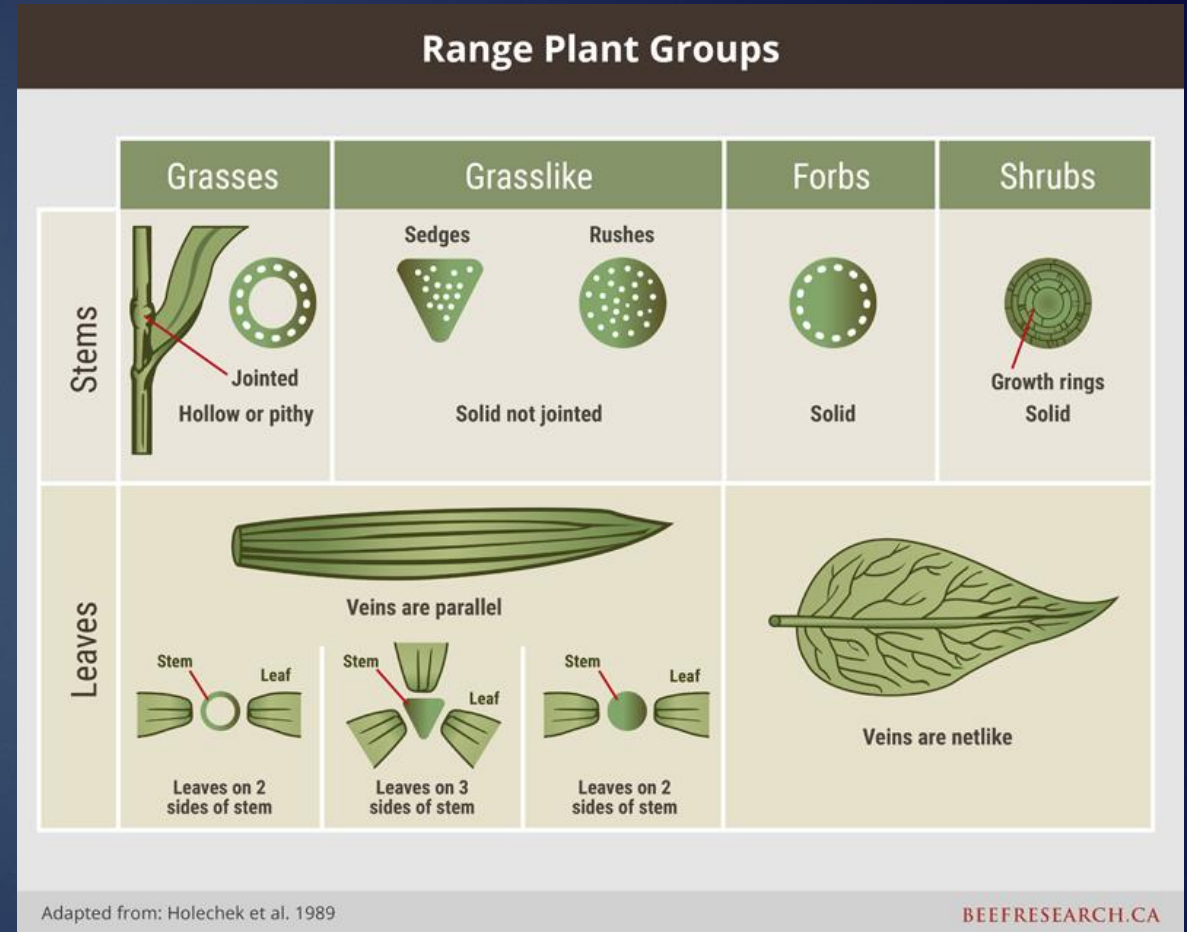


Photo: Betty Ford Alpine Gardens, Exposed: Secret Life of Roots Exhibit

Benefits of Indigenous Pasture Plants

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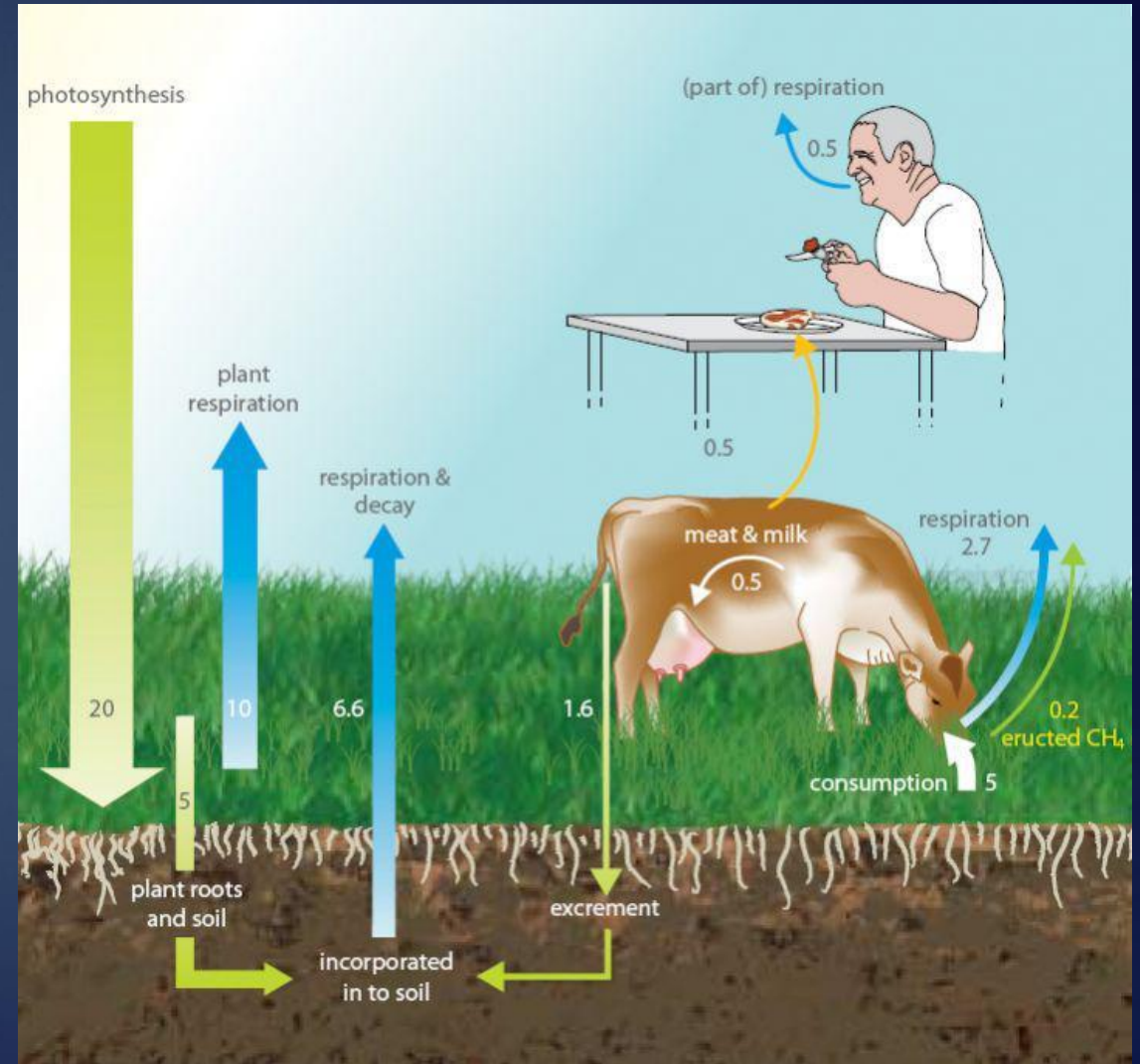
- ▶ Indicators of soil conditions
- ▶ Deep rooted perennials
- ▶ Medicinal bouquets
- ▶ Nutrient dense (i.e. high forage value)
- ▶ Palatable
- ▶ Drought resistant
- ▶ Accumulate minerals
- ▶ Condition the soil



Increase in Atmospheric CO₂ Associated With:

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- ▶ Decreased weight gain in the growing season.
- ▶ Decreased zinc and iron in grasses and legumes.
- ▶ Decreased protein content of floral pollen for pollinators causing a decrease in pollinators.



Nutritional Benefit to Animals & Humans

- ▶ Carbohydrates
- ▶ Amino Acids
- ▶ Fatty Acids
- ▶ Minerals
- ▶ Vitamins and cofactors
- ▶ Trace elements
- ▶ Enzymes
- ▶ Hormones
- ▶ Aromatic oils
- ▶ Tannins
- ▶ Pigment
- ▶ Rumen flora stimulants

Indigenous Herbs & Legumes

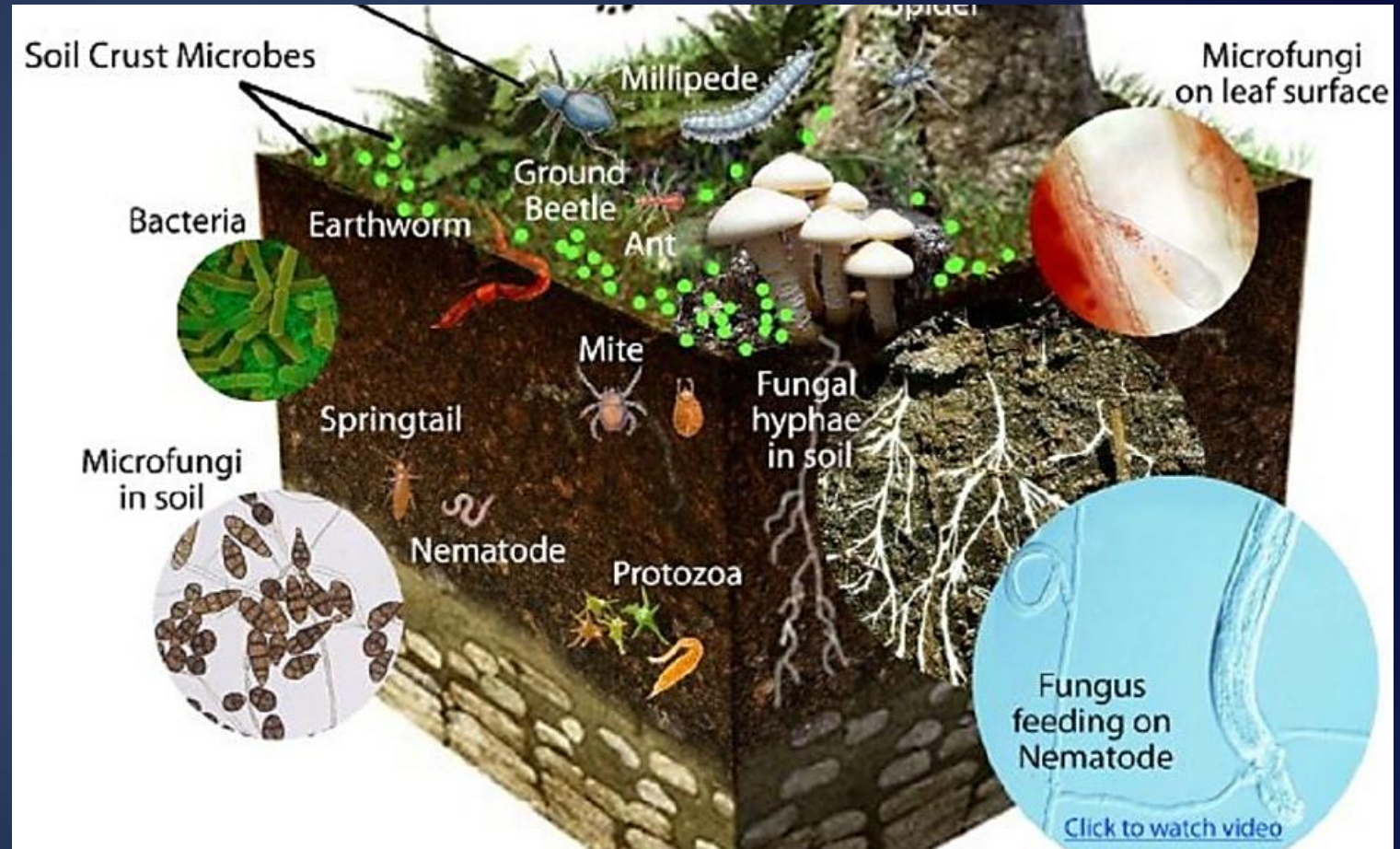
- ▶ Aerate the subsoil with roots from chicory, plantain, chickweed, vetch, clover and dandelion.
- ▶ If you have a variety of herbs and legumes bloat and toxicity decrease because they don't eat too much of any one thing.



Soil Ecology Benefits

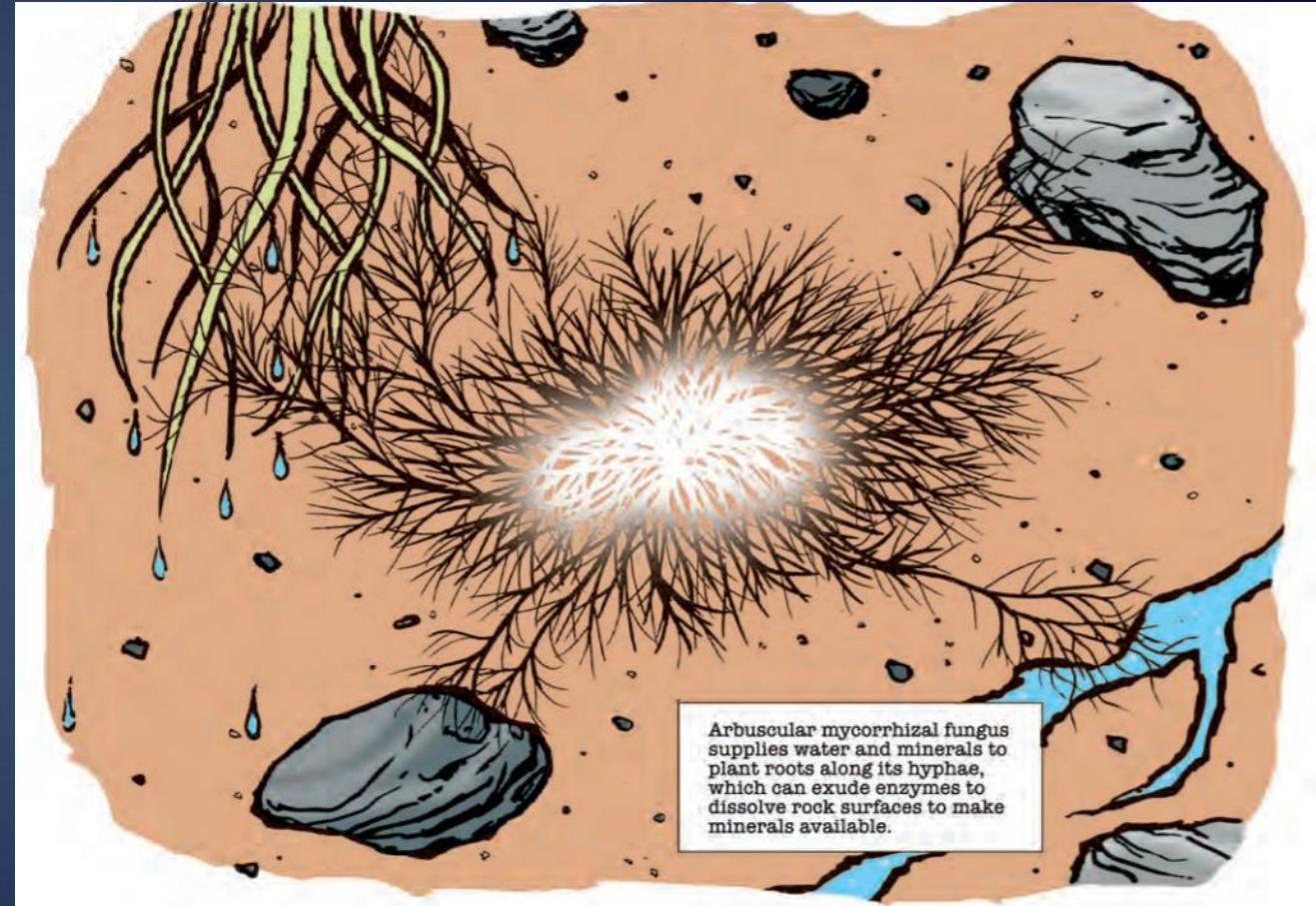
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- ▶ Soil microbiology creates soil structure, produces soil nutrients, helps the soil hold water, and controls disease.
- ▶ Look for spider webs in the pasture.



Continual Live Plant/Live Root

- ▶ Living plant roots provide carbon exudates to feed the soil food web in exchange for nutrients.
- ▶ Exudates promote aggregate formation in soil, increasing pores for improved water and air exchange.



Arbuscular mycorrhizal fungus supplies water and minerals to plant roots along its hyphae, which can exude enzymes to dissolve rock surfaces to make minerals available.

Illustration: John Sherffius, Soil Carbon Restoration: Can Biology do the job?

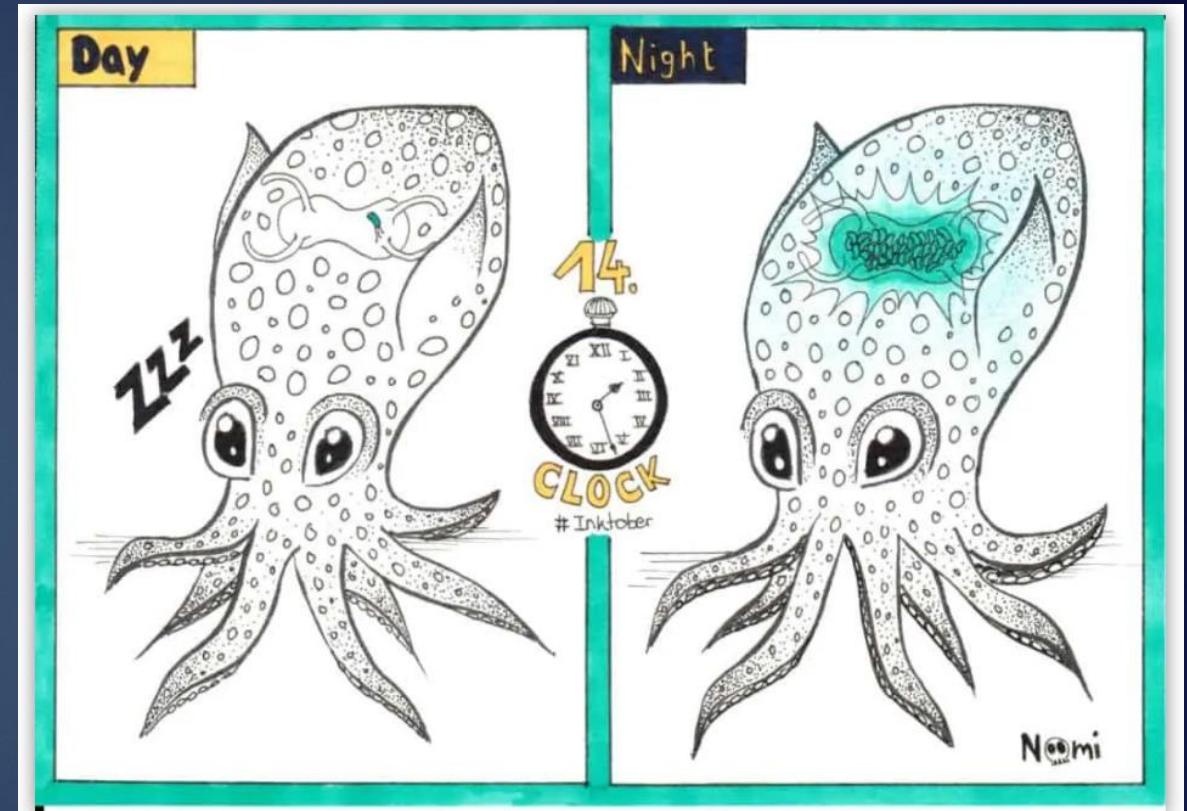
Plant Microbe Symbiosis



Photos: Bo Ren, Purdue University,
Cathy L. Cripps, Mycologist, Montana State University

Quorum Sensing

- ▶ Quorum Sensing is when bacteria cells try to communicate and coordinate with each other to improve survival.
- ▶ QS signaling proteins are up to 10X higher in healthy soils than in stressed soils, which improves plant growth and nutrient density, while increasing soil carbon use efficiencies.



Vibrio fischeri bacteria inside the squid. By Noémie Matthey.

Holistically Planned Grazing

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- ▶ Animal Units
- ▶ Stocking rate
- ▶ Stocking density
- ▶ Carrying capacity
- ▶ PastureMap App



Holistically Planned Grazing

- ▶ Quantify the time the livestock are in one place and the time until they return.
- ▶ Plan 6 months ahead knowing that unexpected things are going to happen and you will adapt as you move through the season.
- ▶ Move animals to the right place, at the right time, for the right reasons.



Regeneration & Resiliency

- ▶ Adaptive multi-paddock grazing
- ▶ Cover and pasture cropping
- ▶ Conservation tillage
- ▶ Biodiversity cultivation with mob grazing or crop rotation
- ▶ Reduce or eliminate harmful chemical inputs



Keep the soil covered



Increase Biodiversity



Minimize soil disturbance



Continual Live Plant/Live Root



Integrate Livestock

Nutrient Deficiencies and Farming Practices

- ▶ Soil characteristics are a significant indicator nutrient density in foods.
- ▶ Soil organic matter can increase available trace nutrients.
- ▶ Tillage has profound effects on plant nutrient availability.
- ▶ Soil ecology plays an active role in improving nutrient bioavailability and plant tolerance of heavy metals.
- ▶ Species and cultivar-specific differences effect nutrient density.
- ▶ High rates of fertilizer and irrigation can cause a decline in some nutrients due to a dilution effect.
- ▶ Organic practices can result in in foods with greater concentrations of PSC.
- ▶ Chickens on organic feed showed an enhanced immune reactivity and a stronger reaction to an immune challenge than chickens on conventional feed.

Resources

- ▶ ATTRA Publications
 - www.attra.ncat.org
 - ATTRA Grazing Planning Manual and Workbook

- ▶ Farm as Ecosystem – Jerry Brunetti

- ▶ Nourishment – Fred Provenza

- ▶ Natural Cattle Care – Pat Coleby

- ▶ [Filling in a holistically planned grazing chart](#) -YouTube

- ▶ [Bionutrient Meter](#)

Thank You!



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Sweet Grass Meats

Questions?

Please type into the chat bar on the left!

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Upcoming webinars

- 🐔 **January 26:** Grazing to Avoid Trouble
- 🐔 **February 11:** Solar Grazing for Sheep
- 🐔 **February 25:** Pasture-Based Livestock: Advancing Ecological, Economic, and Emotional Resilience

Grants, Scholarships, Mentorship & More!

- 🐔 **Handouts on nutritional benefits of pasture-raised animals**
- 🐔 **Scholarships – ongoing**
- 🐔 Sign up for emails @ foodanimalconcernstrust.org/farmer/

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