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MODULE 3. SOIL MANAGEMENT

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GENERAL INFORMATION

Substantive content:

1. Glossary

   Understanding healthy soil; a highly integrated system

1. Teaching materials

   Methods to rehabilitate degraded soil

1. Case studie

   Sepp Holzer: Lifelong innovative soil building in steep terrain

1. Additional materials
2. Imagining & Designing
3. Litterature list

Objectives of the training module:

- Understanding the different component of healthy soil and how it works
- learning about different ways to get soil back to health and fertility
- seeing examples of good practices

Teaching methods:

lectures, case studies, practical exercises, self-study of additional literature

Duration: 3 hours

GLOSSARY

Soil management

which means:

Saving soil & keeping it healthy + functional

- WARNING -

Healthy soil is crucial for us and all ecosystems on land to continue living on this planet

First we need to know what healthy soil is ...

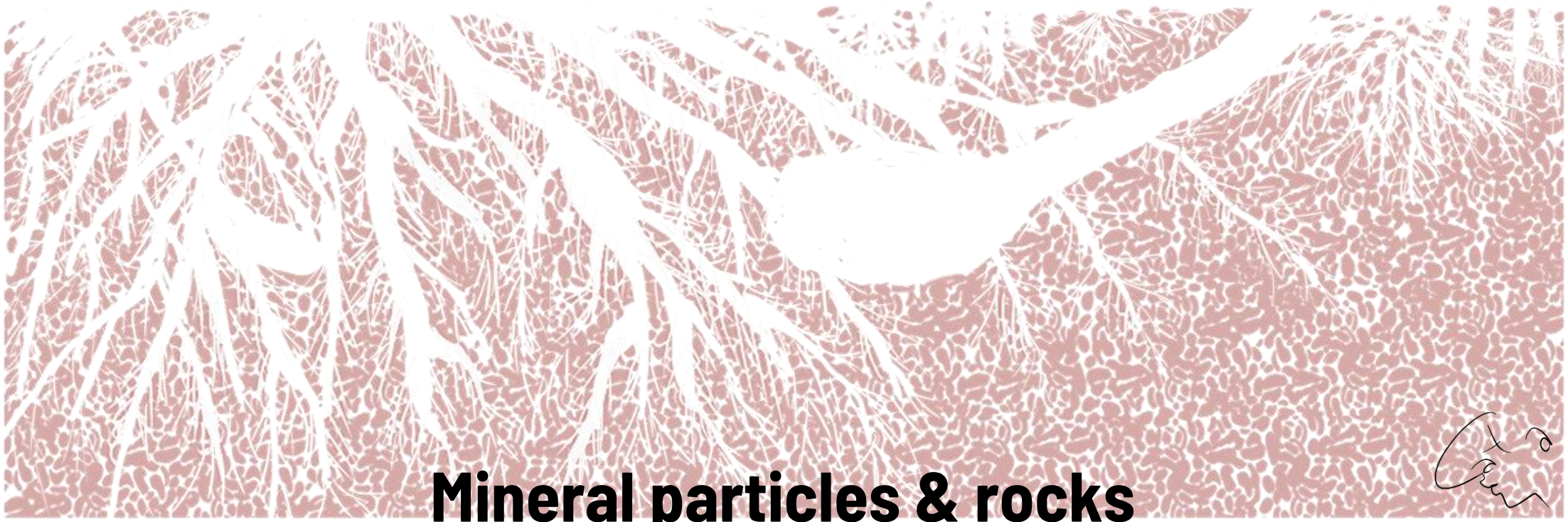
Soil is a highly integrated living system!

- WARNING -

Healthy soil is crucial for us and all ecosystems on land to continue living on this planet

Soil is a highly integrated living system!

Let’s start by investigating the different components >>



Mineral particles & rocks

Functions:

- Soil structure & bearing
- Contains minerals needed for living beings
- Feeds soil microbes

Organic material

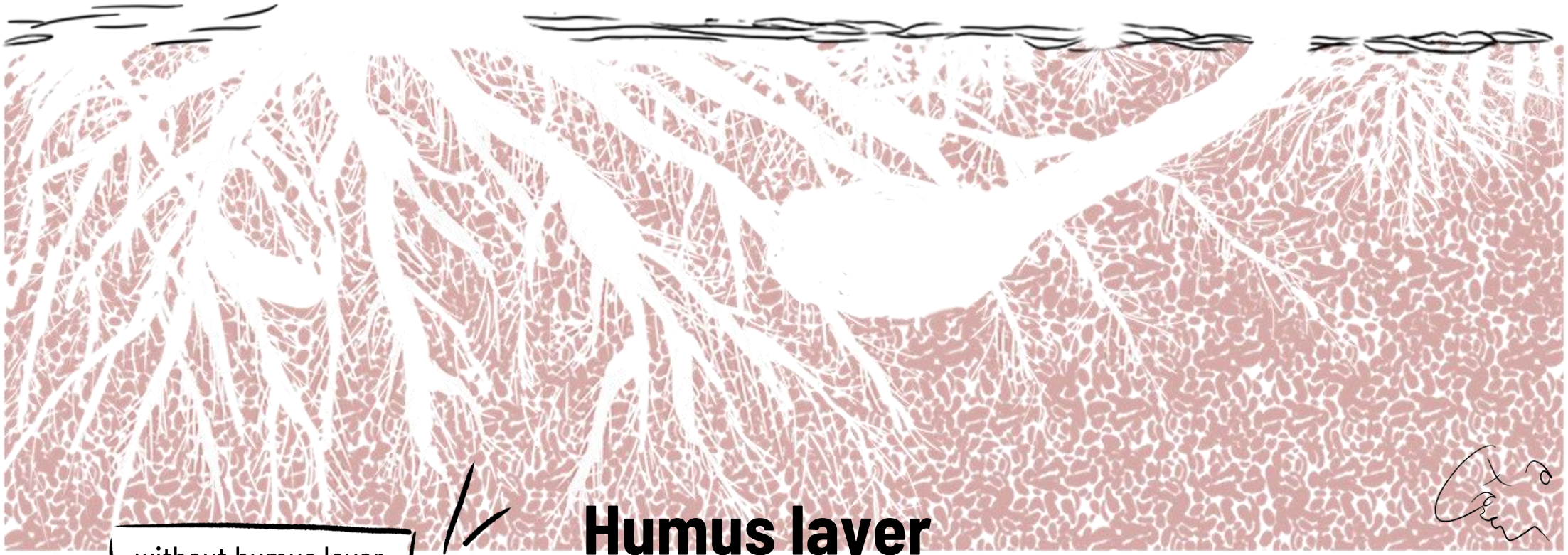
Functions:

- Food for soil life, released slowly when it’s breaking down
- Builds soil structure by gluing mineral particles together into aggregates.
- Holds moisture

Air & Water tunnels

Functions:

- Transport air and water to all parts of the soil, allowing roots and living beings to breathe and drink.
- Nutrients solve in the water and become available to plants
- drain away excess water



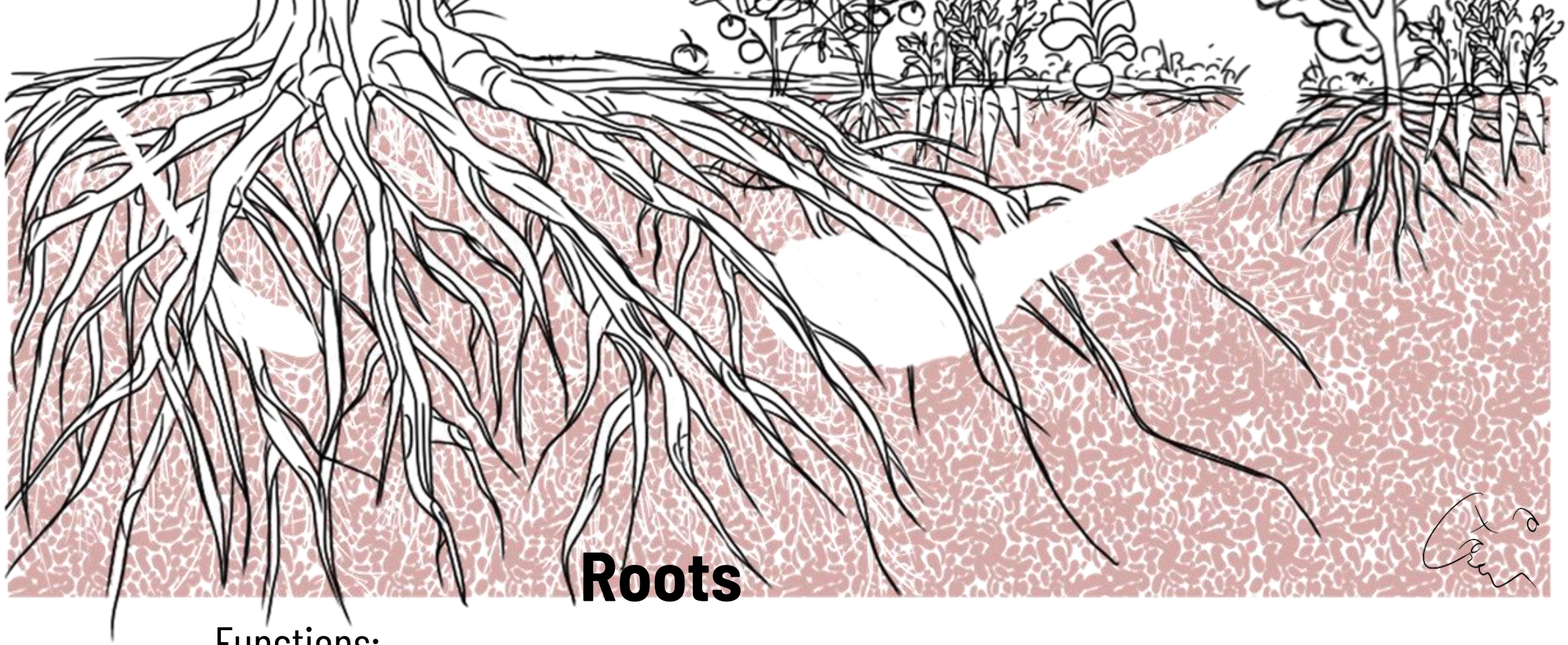
without humus layer

Red alert! The soil ecosystem will activate it's fastest soil saving heroes to sprout immediately & cover the soil fast and efficiently. Some call them "weeds"

Humus layer

Functions:

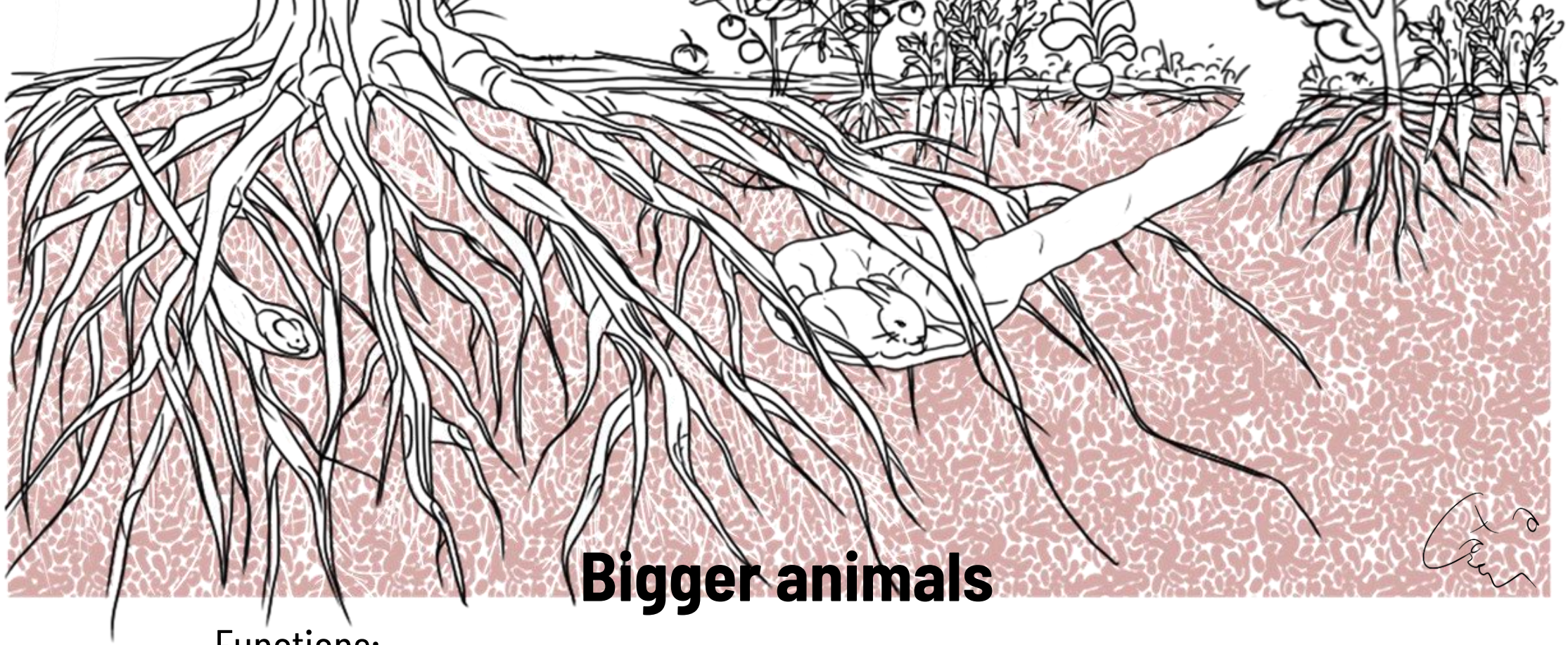
- Keep soil from eroding away
- Sunscreen for the microorganisms (they will die in sun)
- Keep moisture in the soil
- Breaks down (with the help of soil life) and adds fertility to the soil



Roots

Functions:

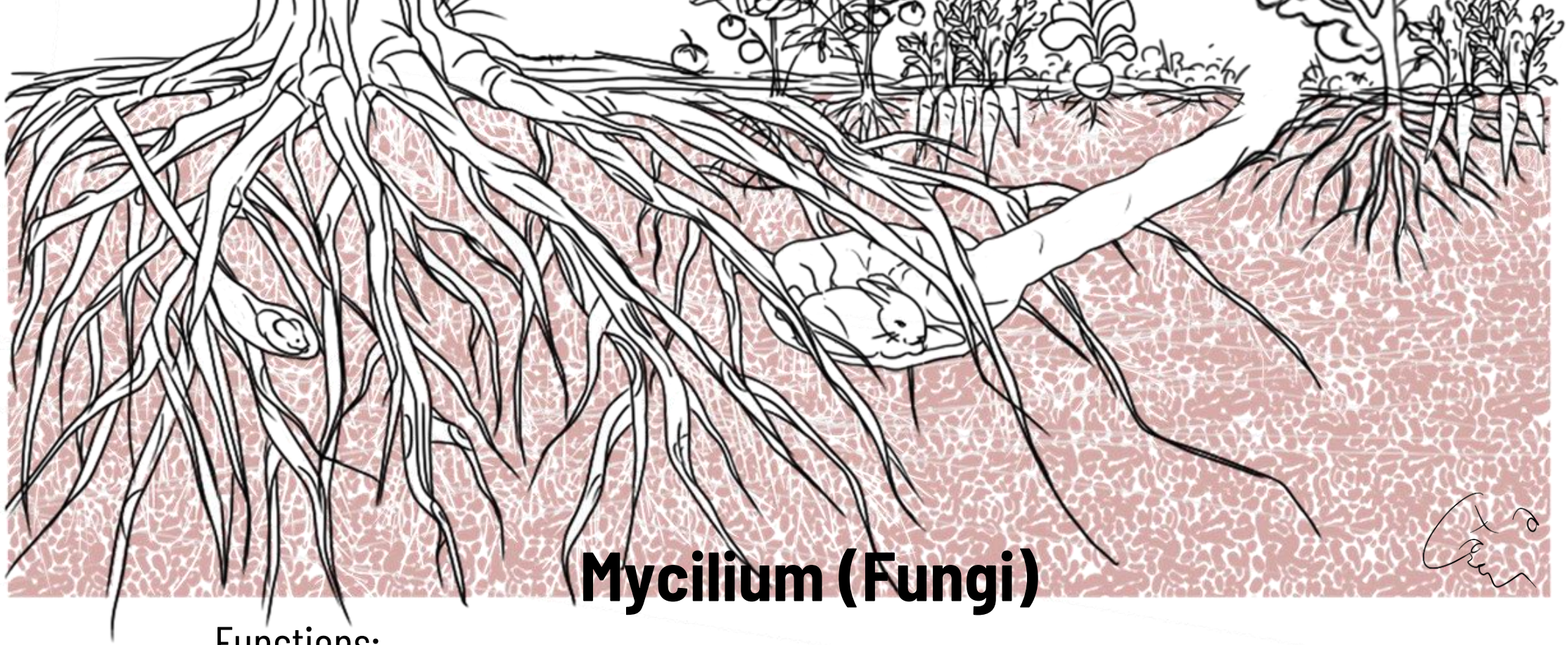
- Keep soil from eroding away
- Make soil structure by constructing tunnels
- Add organic matter & nutrition to the soil when they die / are trimmed / grazed



Bigger animals

Functions:

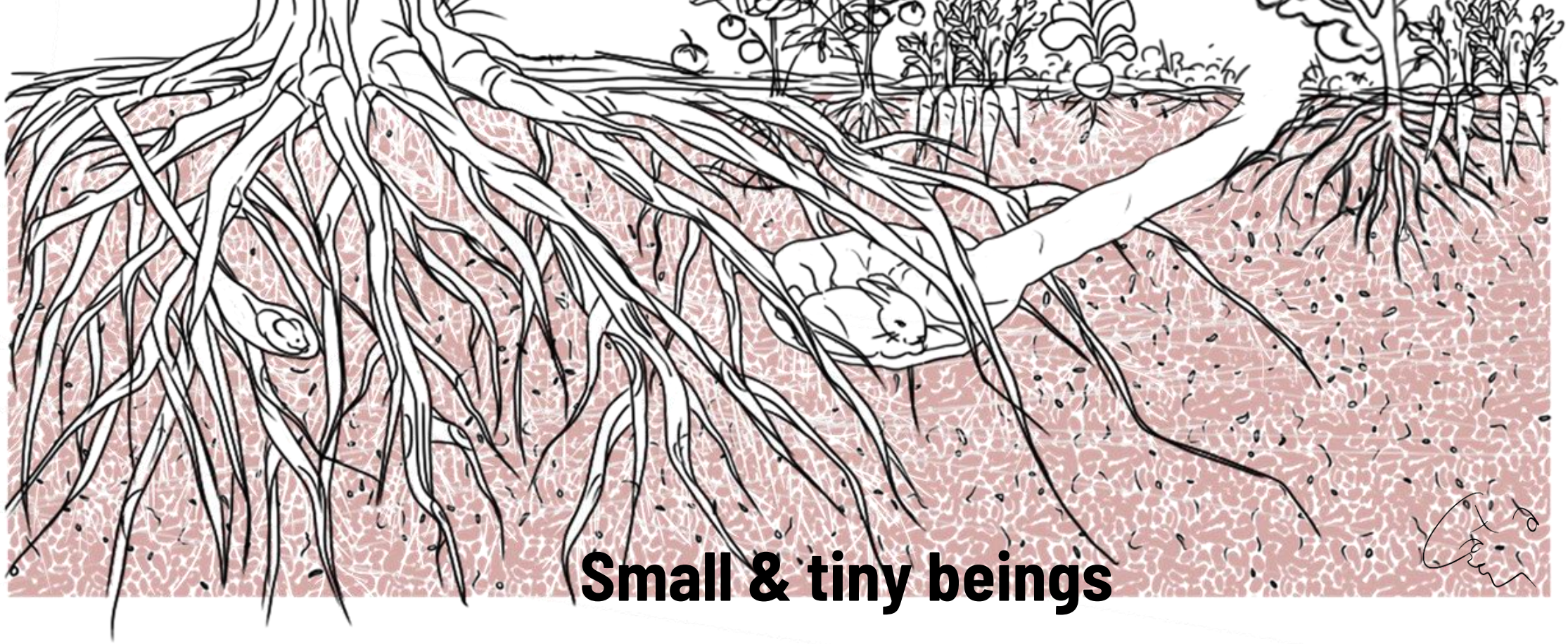
- Mixing soil and moving soil upwards to the surface, making nutrients available to the soil life and roots in the top layer
- Increase moisture
- Carbon storage increase & nutrients contents in general
- Soil bacteria & fungi network density increases



Mycilium (Fungi)

Functions:

- Break down organic matter
- Break carbon & protein into simple sugars - make it accessible to others
- Tight co-operation with plant roots, exchange of “goods”
- Communication network between plants
- Distribute nutrition & sugars between plants - helping those that are in need

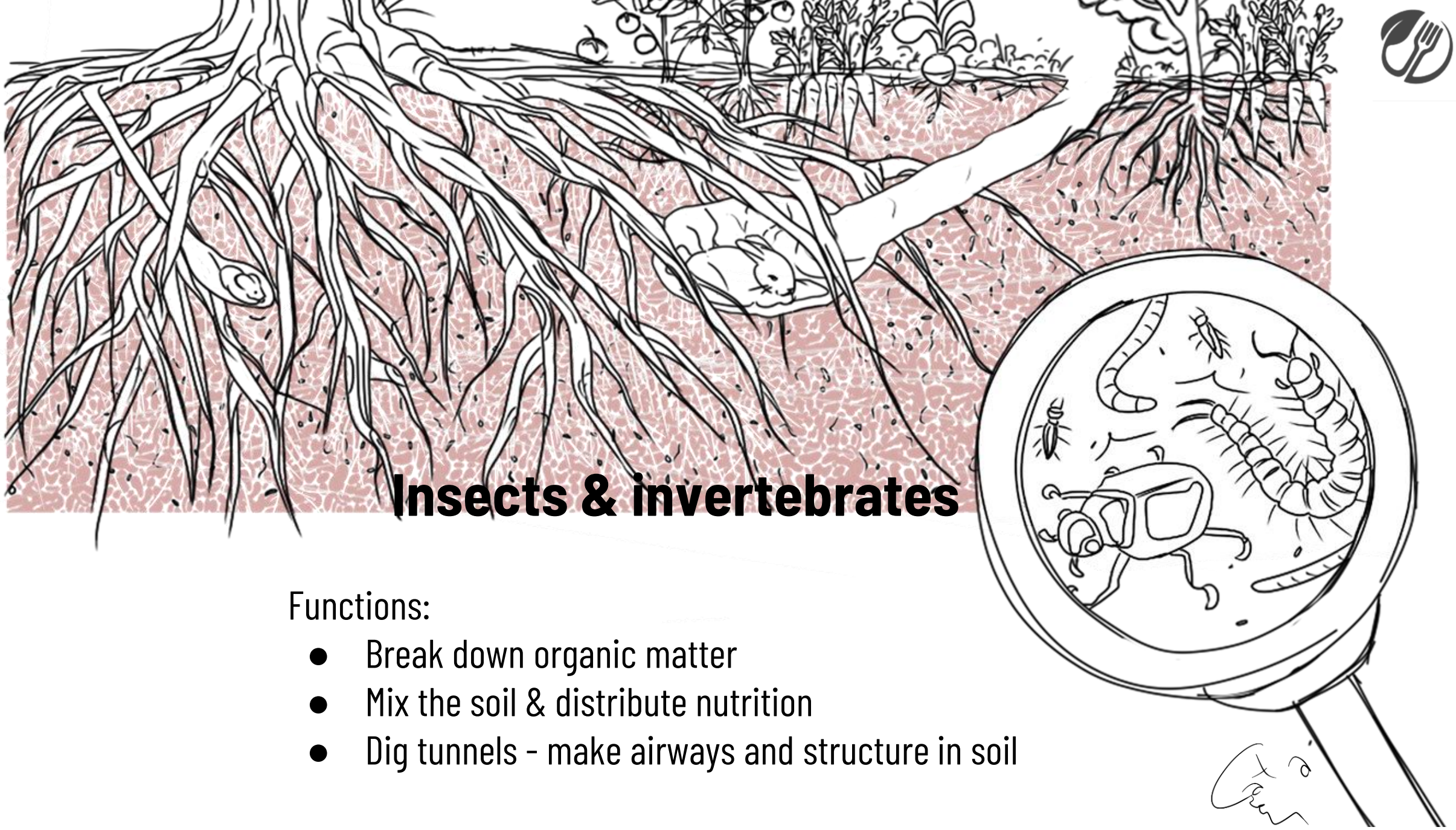


Small & tiny beings

Functions:

- Make the soil functional !

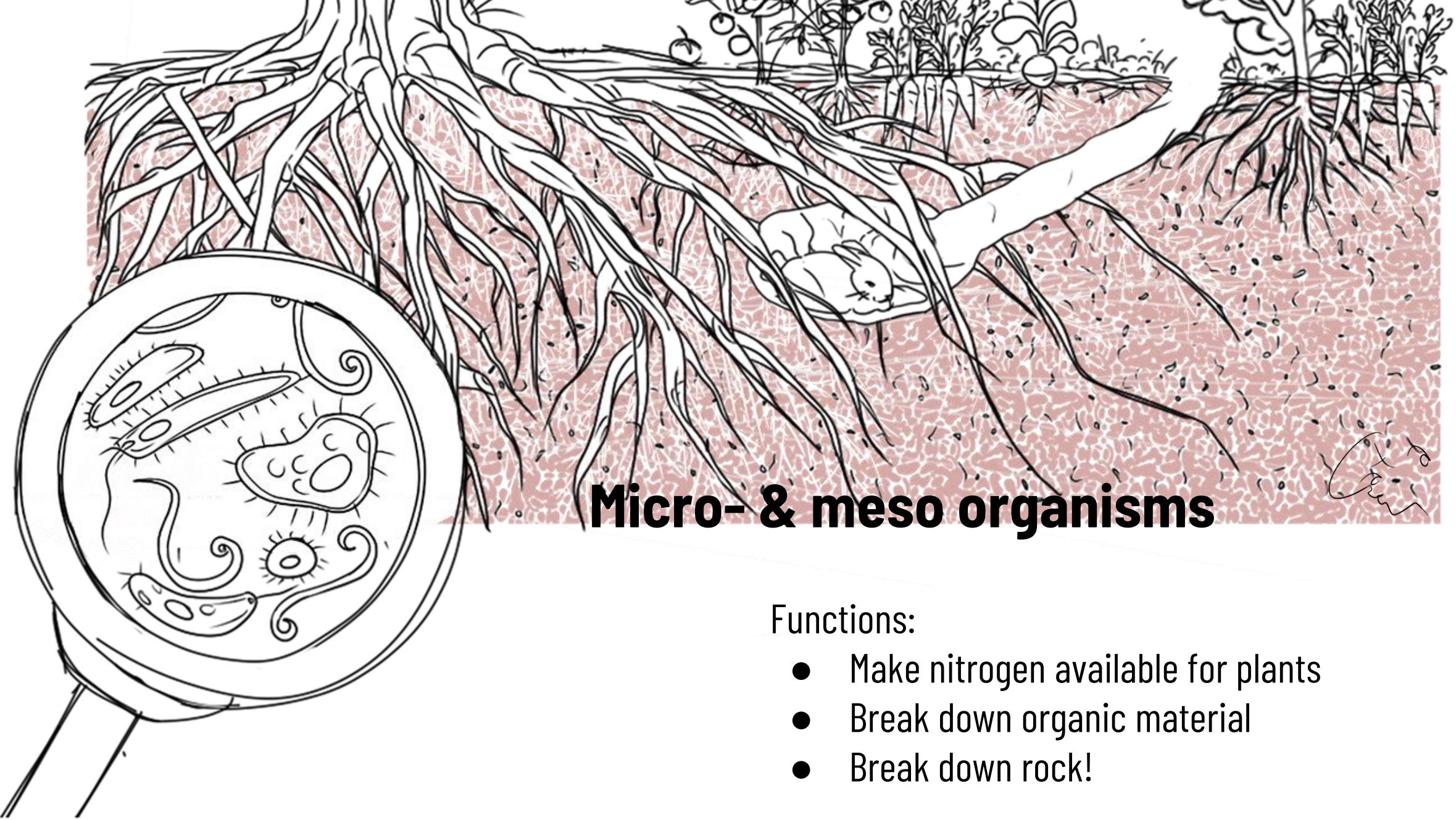
Investigate them further
by looking closer! >>



Insects & invertebrates

Functions:

- Break down organic matter
- Mix the soil & distribute nutrition
- Dig tunnels - make airways and structure in soil



Micro- & meso organisms

Functions:

- Make nitrogen available for plants
- Break down organic material
- Break down rock!

TEACHING MATERIALS

How to save soil that is in trouble?

RED ALERT!

- Bare soil (you can see the soil without digging)
- Artificial fertilizer
- Biocides (chemicals to kill insects or "weeds")
- Dry & cracking soil
- Compacted soil
- Erosion
- Little or no soil life (worms, insects...)
- Streams & rivers around lacking life
- Plants grow poorly

Soil hero:

"Let's go and save that soil !"

Soil hero

Add more organic material

Anything that was alive and doesn't have any poison in it

For example:

- manure
- compost
- plant parts
- wool
- straw
- grass clippings
- branches
- leaves
- wood shavings
- wood chips
- sawdust

When?

If plants grow slowly / the soil is dry or compacted /when there's little soil life / when quitting artificial fertilizer.

Soil hero

MULCH = add organic material on top

Anything that was alive and doesn't have any poison in it.

For example:

▸ Hay ▸ wool ▸ straw ▸ grass clippings ▸ leaves ▸ wood shavings ▸ sawdust

When?

Always! Soil in nature always has a layer of organic material on top - crucial for water regulation, shading out sunlight for the soil life to thrive etc.

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Soil hero

Landshaping

- Adjusting landforms so that they'll function better. Land chiropractics.
- Water retention techniques also tend to prevent erosion by slowing down the water and build up fertility in the soil.

When?

Flat land ▸ Hugelkultur

Slope ▸ Terraces, swales or terraces with swales

Farm scale ▸ Yeoman's Keyline Water Harvesting, series of smaller dams


https://krameterhof.at/en/


Swales

Hugelkultur

Caleb Larson
hugelkultur forum at permies

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Soil hero

Soil binding

Soil is a scarce resource and much of it is eroding away.

- Keeping soil covered at all times
- Landshaping to slow down the water (terraces, swales, keyline water harvesting)
- Planting plants that hold on to the soil with their roots

When?

Everywhere ▸ keep soil covered with mulch or living mulch

In slopes ▸ landshaping, cover soil, all slopes have to have permanent plants

By waterways ▸ plant perennials, bushes and trees (+ technical adjustments)

Nether Cambushinnie Bank Protection | Forth Rivers Trust

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Nether Cambushinnie Bank Protection | Forth Rivers Trust

Soil hero

Fermented! Reintroduce fungi & micro organisms

- Brewing a liquid full of microorganisms to bring that soil back to life!
- Plant matter, compost and/ or animal manure fermented in water
- Worm castings are considered especially rich in the good microorganisms.
- Irrigate the area with the brew
- This needs to be combined with adding organic matter to the soil, so that the microorganisms have a place to live.

When?

If plants grow poorly / little or no soil life / artificial fertilizer has been used


eduNUT
MAKE
COMPOST TEA
EASY!
Unlocking Garden Success: Biodynamic
Compost Tea and Dynamization Practice
World Permaculture Association

Soil hero

Green Manure, Cover Crops, Legumes

- Seeding beneficial plants that will cover the soil, make soil structure and/or increase available nutrition
- Green manure will usually be cut and left on the surface, in a period where the soil is “resting” from agriculture
- Cover crops can grow under other crops that will be harvested
- Legumes are popular for both green manure & cover crops - bind nitrogen

When?

Wind erosion, big area with poor soil, compacted soil

Regenerative farmer Marina O'Connell

Photo: Karen Robinson/The Observer

Soil hero

Intensive care & rest

Some years of work to rehabilitate the soil and then run tests, before agricultural use.

- deep rooted green manuring & adding lots of organic material
- inoculating the soil with fungi, bacteria and other microorganisms again
- combined with water retention landshaping or keyline ploughing
- planting trees

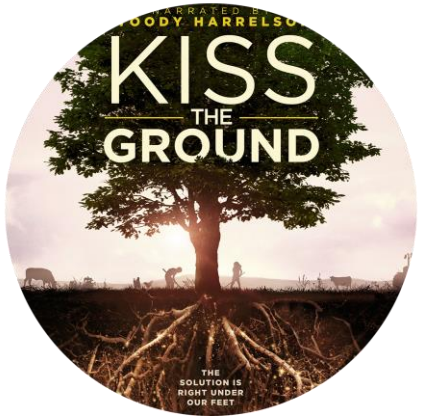
When?

After extensive harm in the form of intensive monoculture agriculture with chemicals and even biocides (pesticides, fungicides, herbicides) that poison the soil life.

ADDITIONAL MATERIALS AND SOURCES OF INFORMATION

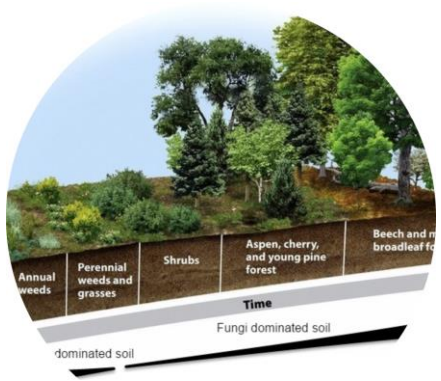
[Farming with Soil Life: A Handbook for Supporting Soil Invertebrates and Soil Health on Farms]

[Who Feeds The Plants? Microbes! · Frontiers for Young Minds]



[Kiss The Ground - videos]

Find the film too!



[Soil Building – How to Make Deep Rich Soils by Imitating Nature - Permaculture Apprentice]

CASE STUDY

Sepp Holzer

Born & raised in Krameterhof
Fascinated by nature

https://seppholzer.at/en/

Krameterhof in Austria

https://krameterhof.at/en/


Holzer
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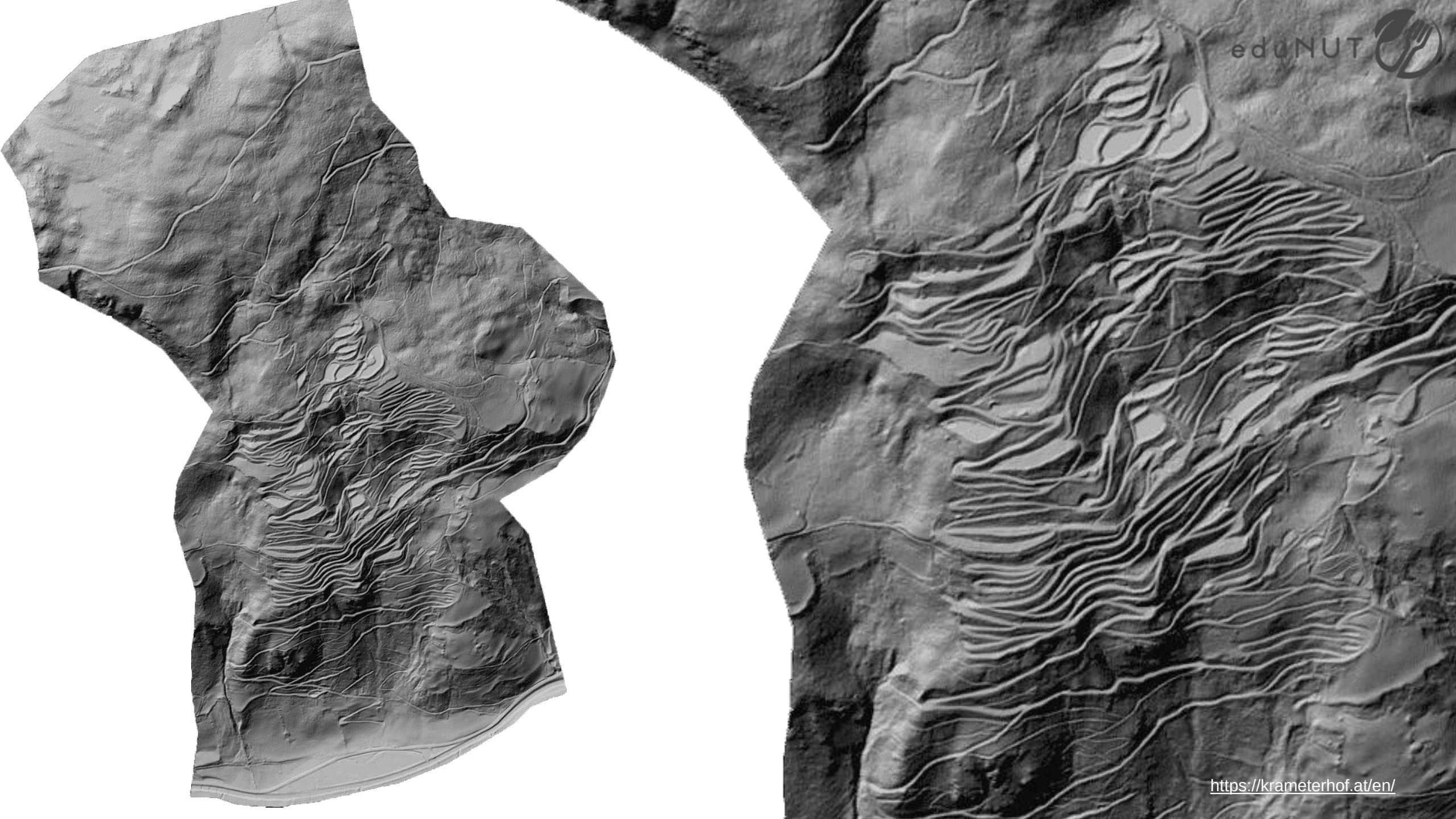

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IMAGINING AND DESIGNING

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Make an action plan

for how to save the soil in these

three locations

Photo by vikush on Freeimages.com

Photo Frank Smith www.geograph.org.uk

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KORA
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TAL TECH
NARVA GÜMNAASIUM
BIALYSTOK UNIVERSITY OF TECHNOLOGY
STIMMULI
for social change

- Dry & cracking soil
- No life visible
- **How can you bring this soil back to life?**

- Few plants that are small and struggling
- Almost no organic material, small stones visible on the surface
- **How can this soil be fertile again?**

- Active erosion from the river
- Soil crumbles down into the river, nothing keeping it stuck
- **How can you get this soil healthy and keep it from eroding away?**

LITERATURE

- Earth User's guide to Permaculture by Rosemary Morrow
- Farming with Soil Life: A Handbook for Supporting Soil Invertebrates and Soil Health on Farms
- Burrowing-mammal-induced enhanced soil multifunctionality is associated with higher microbial network complexity in alpine meadows - ScienceDirect
- The role of burrowing animals in the transport of mineral substances in the soil - ScienceDirect
- https://www.apricotcentre.co.uk/