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What Goes on Underground? Soil is a Functioning Ecosystem! A Healthy Soil is a Living Soil

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Health:

- 1. Not diseased, no pests, no parasites**
- 2. Not nutrient limited**
- 3. Vital, performing their ecological functions**

How is it that soil results in plants being healthy?

- 1. Not diseased, no pests, no parasites**
- 2. Not nutrient limited**
- 3. Vital, performing their ecological functions**

What is soil?

Hans Jenny:

1. Mineral: Sand, silt, clay

P, Ca, K, B, Zn, S,etc

except for... N, C, O, H

2. Organic matter

3. Organisms

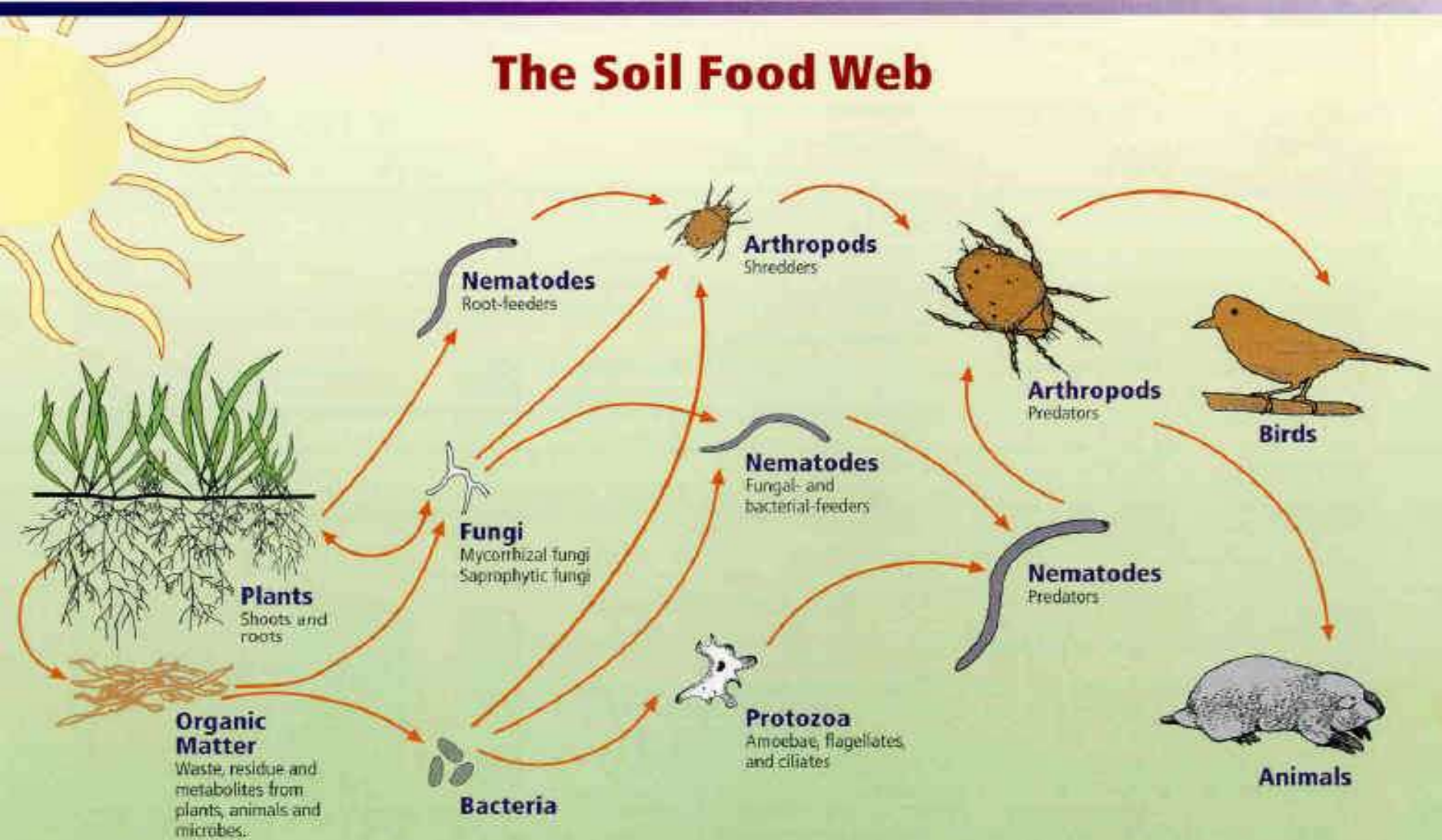
Soil Chemistry tests:

- 1. Ignore 90% or more of the nutrients in mineral soil;**
- 2. Ignore all of the nutrients in organic matter;**
- 3. Only include soluble, inorganic forms, except for information on the exchangeable portion of 4 cations: Ca, Mg, K, Na**

Soil Chemistry tests:

- 1. Aren't these "other" forms of nutrients important?**
- 2. Can they be made available to your plants?**
- 3. Yes, but.....**
- 4. IF and only if soil life is present and functioning: i.e., healthy.**

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

A Healthy Food Web Will:

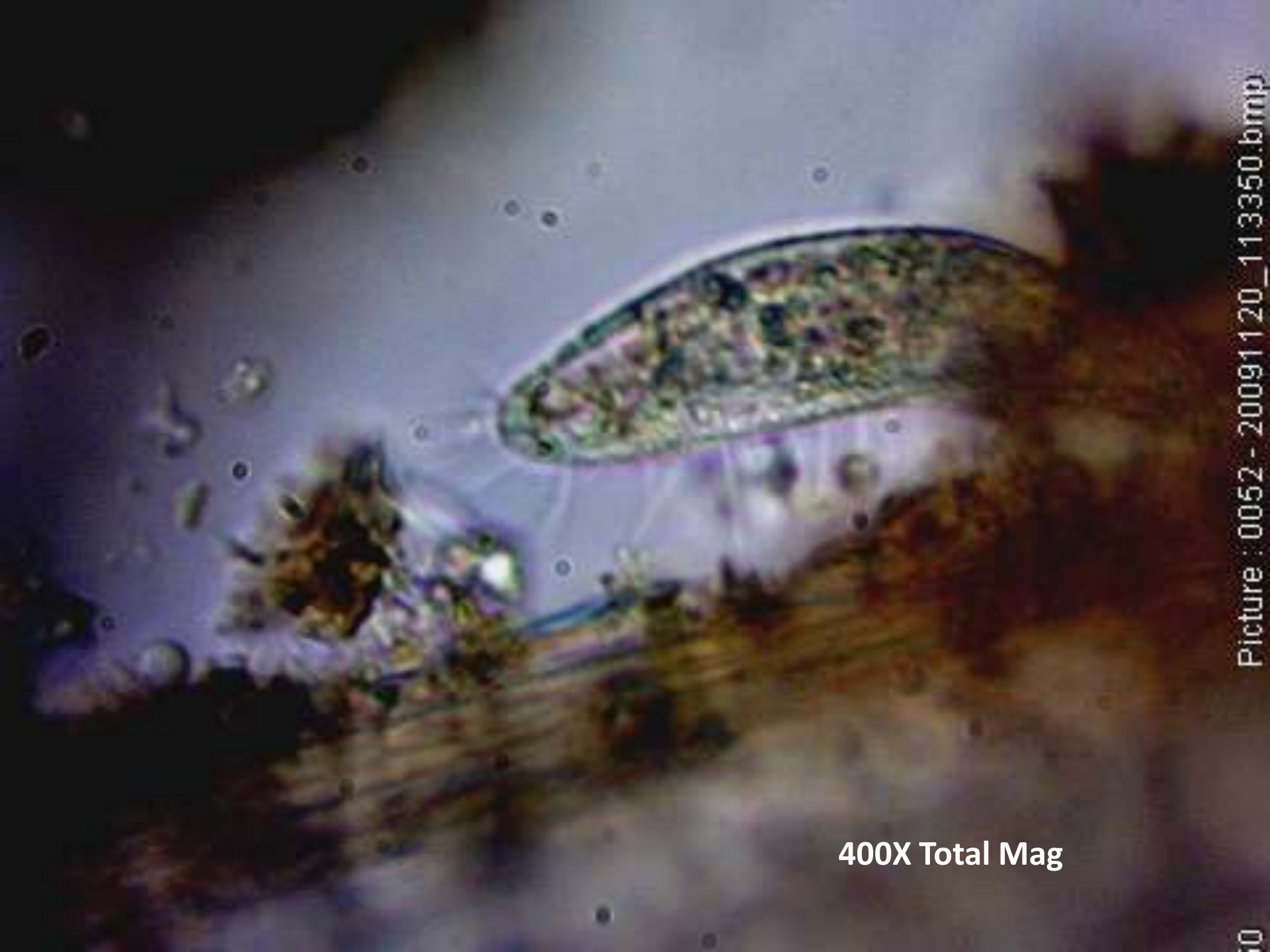
- **Suppress Disease (competition, inhibition, consumption; no more pesticides!)**
- **Retain Nutrients (stop run-off, leaching)**
- **Nutrients Available at rates plants require (eliminate fertilizer) leading to flavor and nutrition for animals and humans**
- **Decompose Toxins**
- **Build Soil Structure –(reduce water use, increase water holding capacity, increase rooting depth)**

Who is in the soil?



Hi! I'm Alaimus!
I'm from the town of
Vegetable Roots!

I eat aerobic bacteria and don't like
bad-tasting anaerobic bacteria at
all. My job is to turn nutrients in
bacteria into plant-available forms.
The job pays well. I have 200
children, and 40,000 grandchildren.



Picture : 0052 - 20091120_113350.bmp

400X Total Mag

50



Bacteria, fungi, humus, aggregates: microscope view

Josh Webber: Portmore Golf Course North Devon, UK



Ian Smith, Mooreville, Tasmania

- Three compost teas applied. 2 x prior to seeding and 1 x post seeding.
- Compost tea greatly reduced weed pressure on paddock 12, when compared with conventional paddock 7
- I am very excited about the progress to date and very impressed with the dedication that the SFI crew show towards their client.



Paddock 7 Onions with Conventional fertiliser and herbicide applications, planted same date as paddock



Close-up showing clean seedbed. Paddock 12



Overall view of paddock 12 low weed pressure



Overall view of paddock 12 low weed pressure



Paddock 7 Onion root system on coventional program. Poorer than Paddock 12.



Well established root system on onion plant. Paddock 12.



Paddock 12 one spray run not treated with compost tea.(Can you spot the difference?)

Soil biological succession causes plant succession



Bacteria ...A few Fungi.....BalancedMore Fungi..... Fungi

Bacteria:	10 µg	100 µg	500	600 µg	500 µg	700 µg
Fungi:	0 µg	10 µg	250	600 µg	800 µg	7000 µg

Forms of nutrients: Critical to understand

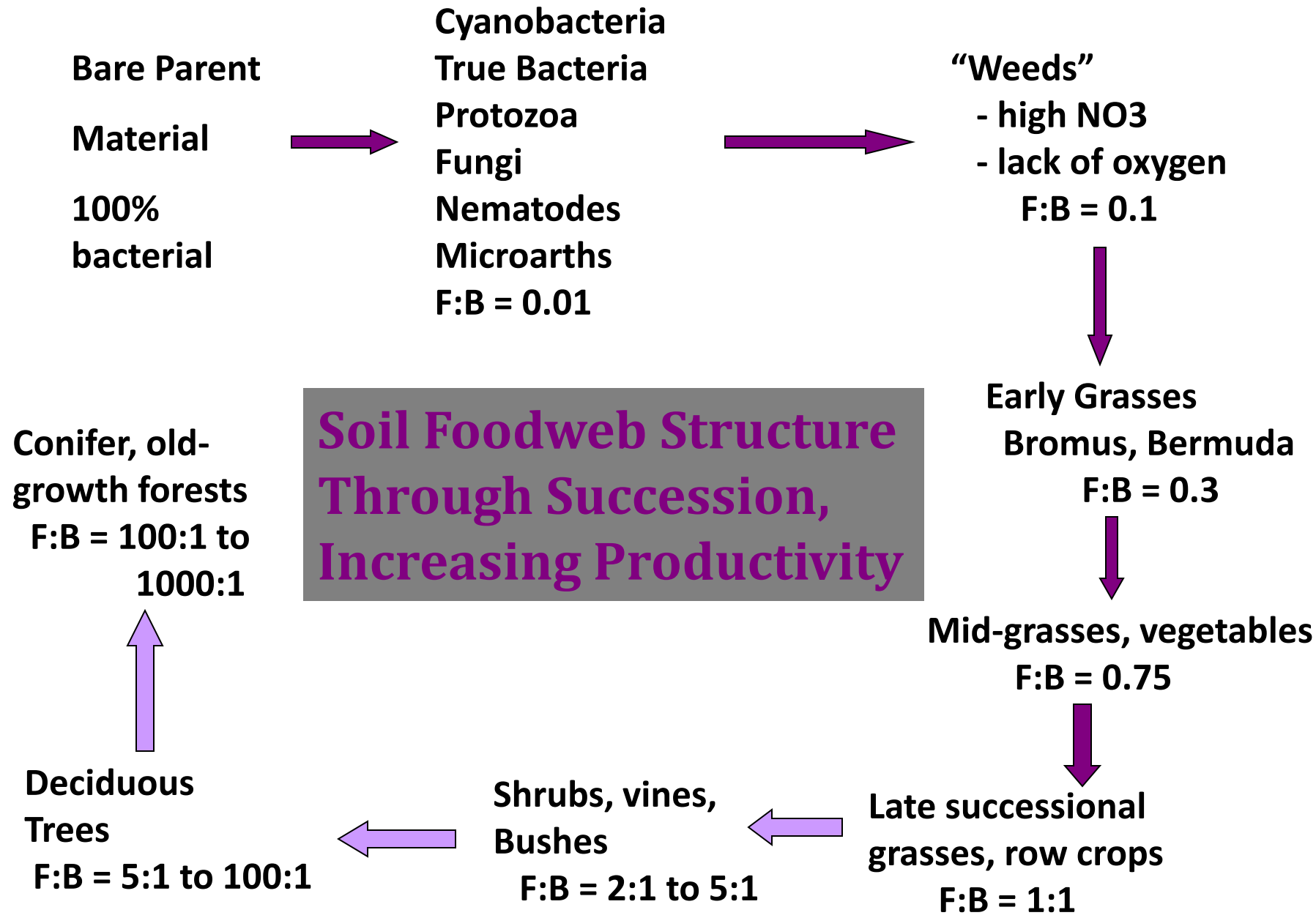


..... NO_3balanced..... NH_4

NO_3 and NH_4

Protozoa.....B-f.....F-f.....Predatory..... Microarthropods

What does your plant need?



Volcano!

**Bare Parent
Material
100%
bacterial**

**Foodweb
Development
F:B = 0.01**

**“Weeds”
F:B 0.1**

**Disturbance Pushes
Systems “Backwards”,
But How Far?
Depends on Intensity,
Frequency**

Insects

**Early Annuals
F:B = 0.3**

**Mid-grass, vegies
F:B = 0.75**

Flood

**Pasture, row crops
F:B = 1:1**

Cattle

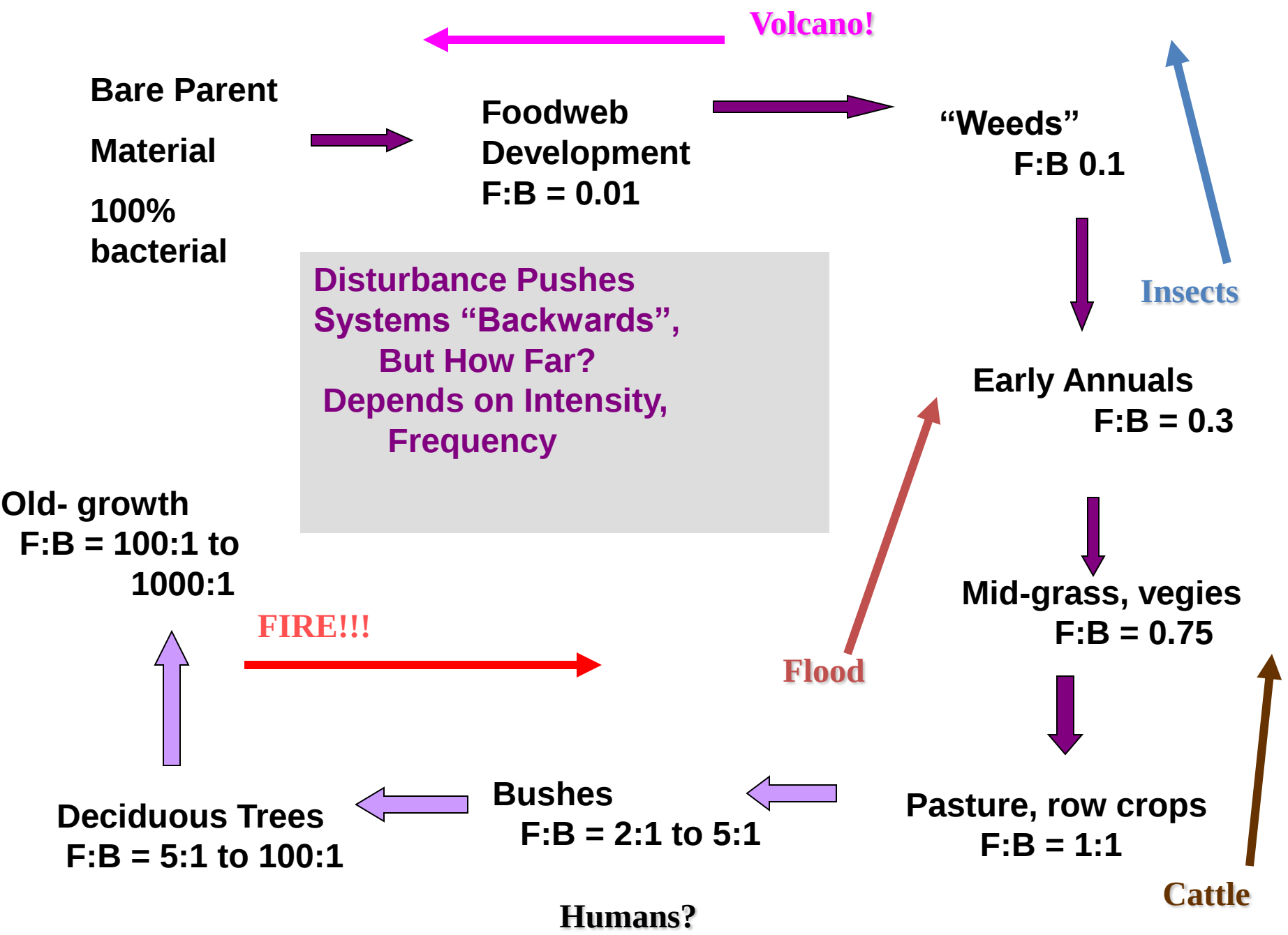
Humans?

**Bushes
F:B = 2:1 to 5:1**

**Deciduous Trees
F:B = 5:1 to 100:1**

FIRE!!!

**Old- growth
F:B = 100:1 to
1000:1**





Lawns , trees, gardens or crops, the story is the same. Soil biology is being destroyed by human management. Roots are not going as deep as they should, and water, fertility and disease protection are lost.



• Peter M. Wild, Boston Tree Preservation

Just because we see this all the time, does it mean this is how plants grow?

Without compaction roots can go deep

**Hendrikus Schraven holding
ryegrass planted July 15, 2002**

Harvested Nov 6, 2002

Mowed through the summer

**70% Essential Soil,
30% Compost/organic fertilizer
Compost tea once**

No weeds, no disease

www.soildynamics.com



The root of the matter is infiltration

Oxygen? Disease? Microbes?



Source: Conservation Research Institute

James Sotillo
Elmsave.com

**Sod with 1 inch
root systems put on
sand, April 2010**

**Apply compost tea
(make sure all the
right organisms are
in the tea!)**



**Three weeks later,
look how much
the roots have
grown**

**This is what
healthy soil life
should do for you
– no disease, no
weeds, organic
fertilizers**



Soil results in clean water; dirt results in a bigger problem

