

Soil is a Sponge with



Build Soil Structure to Conserve Water

WHY CONSERVE WATER?

In the summer months, water use **TRIPLES** due to outdoor watering.

If you live in the city, your water is piped in from the Nanaimo / Englishman River

In many cases the water that people irrigate with is wasted.....



EVAPORATION

RUN OFF

POOLING



HYDROPHOBIC SOIL.... Repels water



OVERSATURATED SOILS... Too much water can suffocate soil life



ANAEROBIC ENVIRONMENT

Start with the soil.

Soil with high organic matter content can hold up to 90% of its weight in water.

In this way, soil is like a sponge, it's a storage facility for water... we can use this to be water smart in our gardens.





Kathleen Millar, Soil Biologist

The answer is soil structure!

Soil Texture

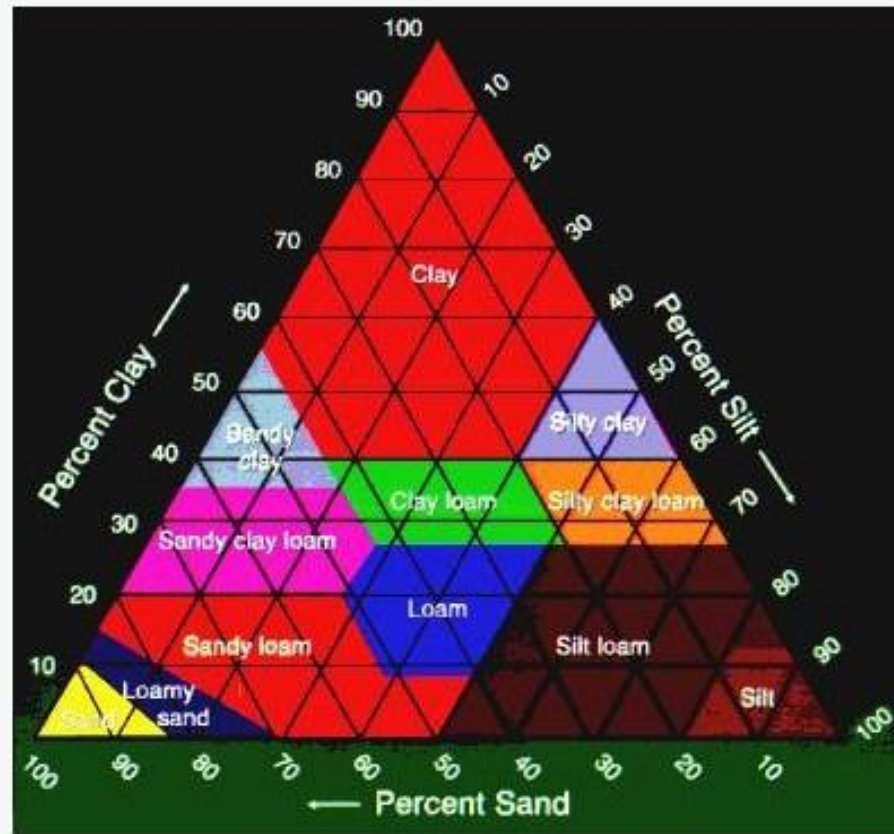
The first thing people think about when describing soil...

- Is it clayey, sandy, rocky?
- Only part of the story of soil!
- Sedimentation/Jar Test description



Source: Royal Horticultural Society, 2011

Soil Texture Triangle



Soil Texture

Can we manipulate soil texture to
increase water retention?



Think Soil STRUCTURE...

CASE IN POINT :

The Harvard Trial

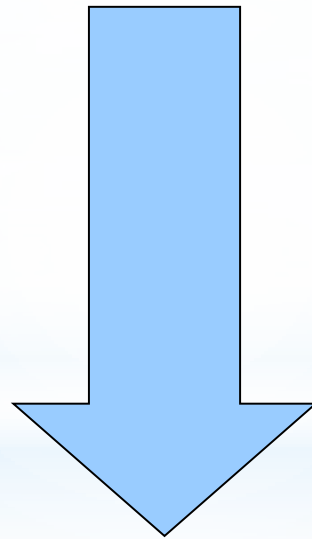
Results:

- Irrigation in the Test Plot was reduced by over 30% .
 - How?
 - Improved moisture retention capacity of the deeper root structures.


Projected irrigation reduction of 50% will result in the Yard saving more than 2 million gallons of water annually!

Why so successful?

Created Soil Structure



Root Growth in the Test Plot increased by 3 to 5" over Control Plot. Enhanced root system created without use of any synthetic fertilizers.



Control Plot Sample
3" Root Growth

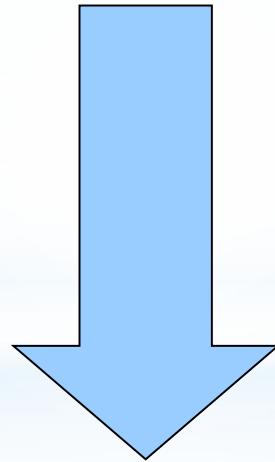
Advantages of Deeper Root Growth:

- Improved Moisture Retention
- Less Irrigation Required

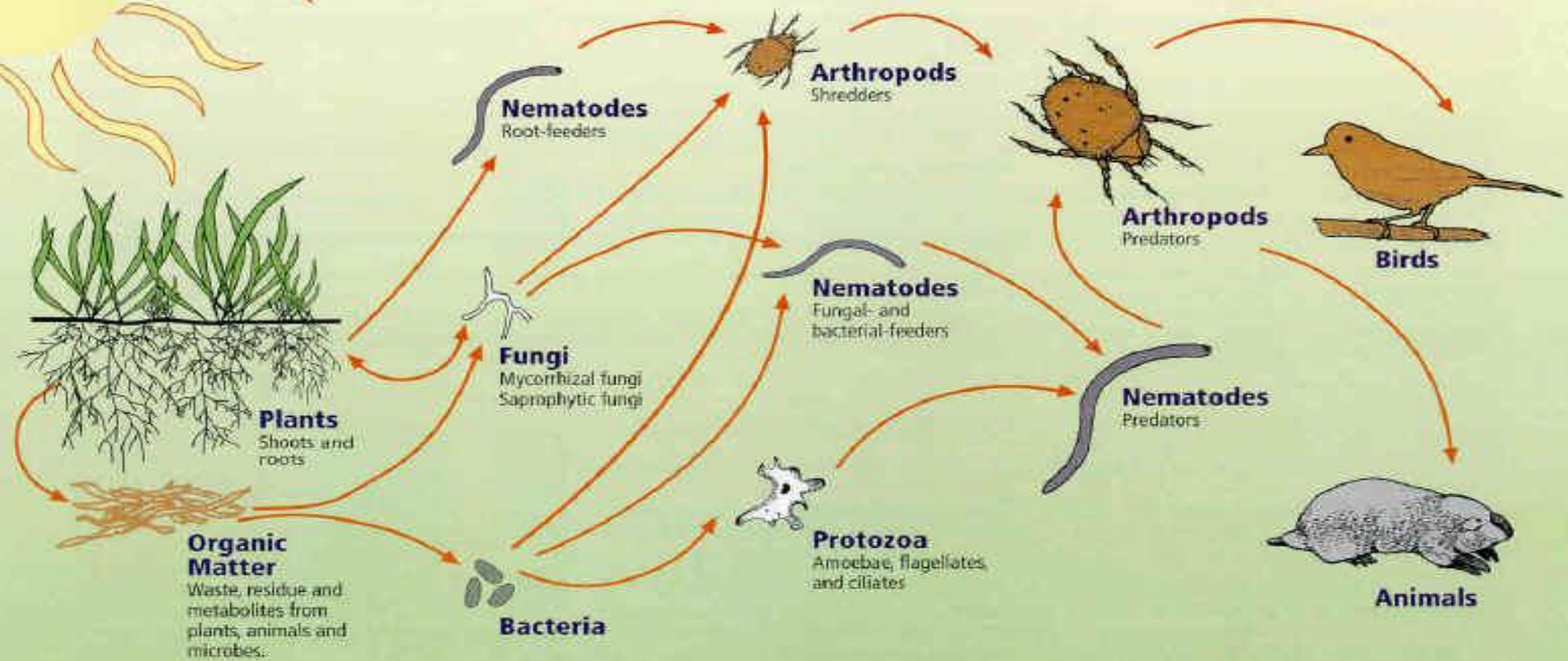
Organic Test Plot Sample
7" Root Growth

How to build soil structure?

Re-create and support Soil Food Web



The Soil Food Web



First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, parasites
Root-feeders

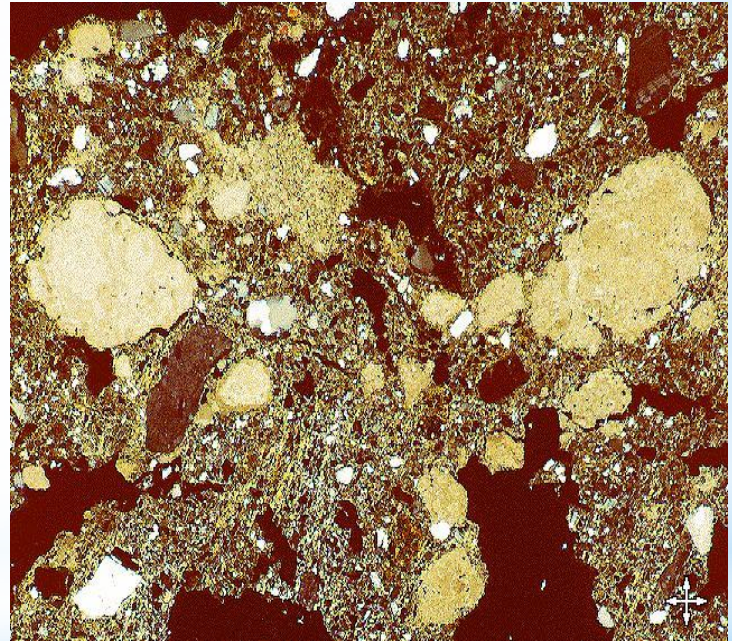
Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

Soil Structure

- What is it?
- Who creates it?
- How is it constructed?



Bacteria create the bricks

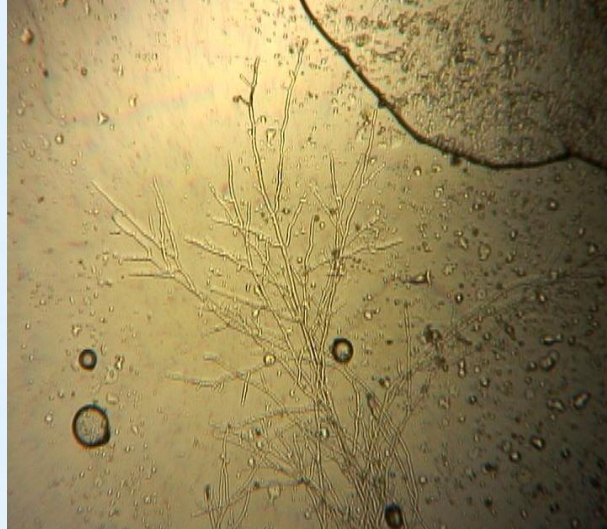


Form a glue that binds smallest particles

- Hold organic matter on sand, silt and clay
- Form micro-aggregates – the bricks!



Fungi build the walls



- Create strands that bind micro aggregates together
- Put mortar into the structure, creating macro-aggregates



Aggregates = Clumps

Walls become hallways



Micro and Macro-arthropods



Build living and dining rooms



Earthworms build swimming pools



Their slime creates sealed pores that hold water against the flow of gravity.



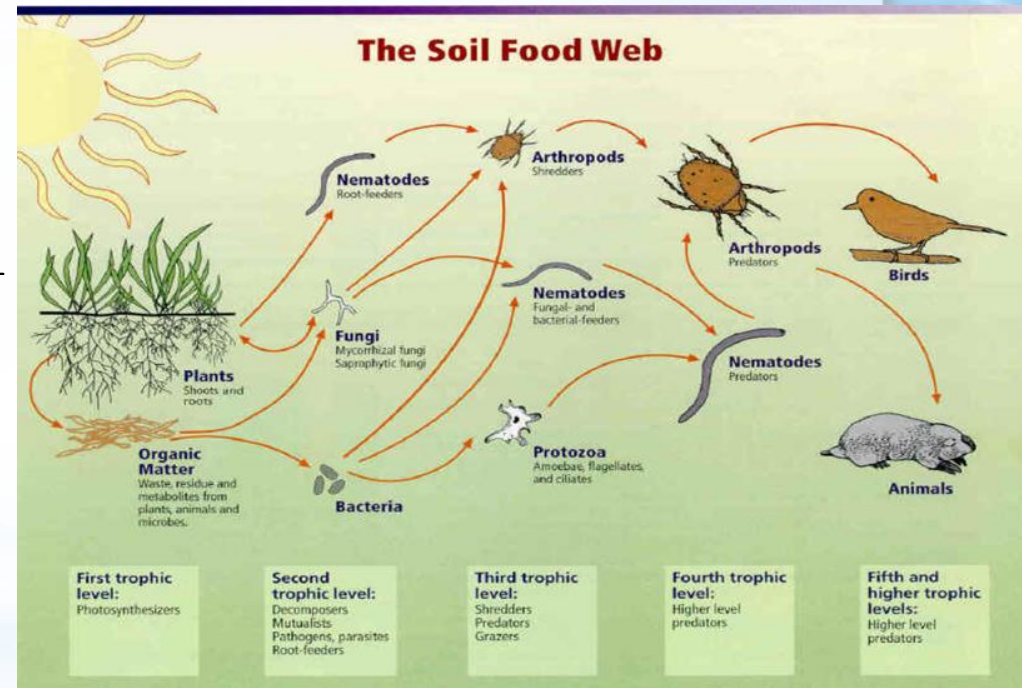
These are the spaces where water is stored in the soil!



Soil Structure

How we can affect it:

- Create/support
- Feed
- Water



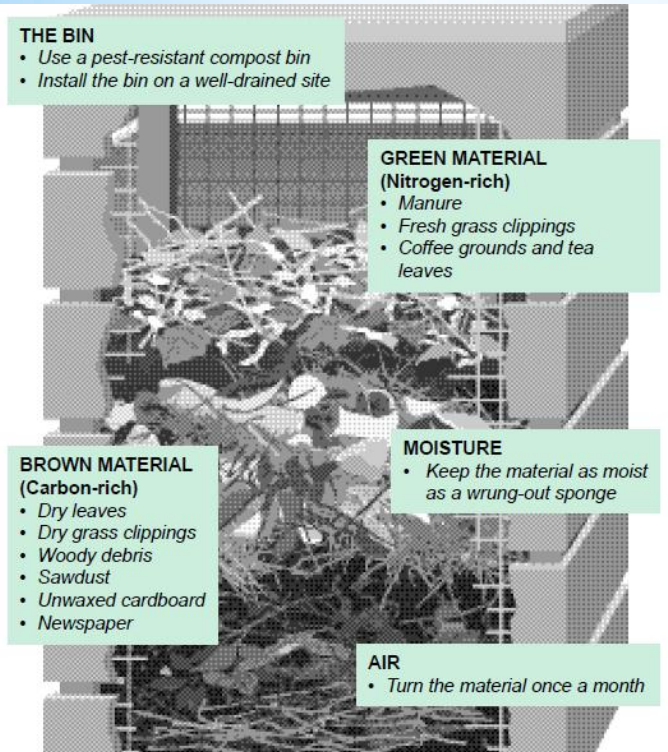
Create/support SFW

Compost

- More than nutrients for plants
- Source of microbes!



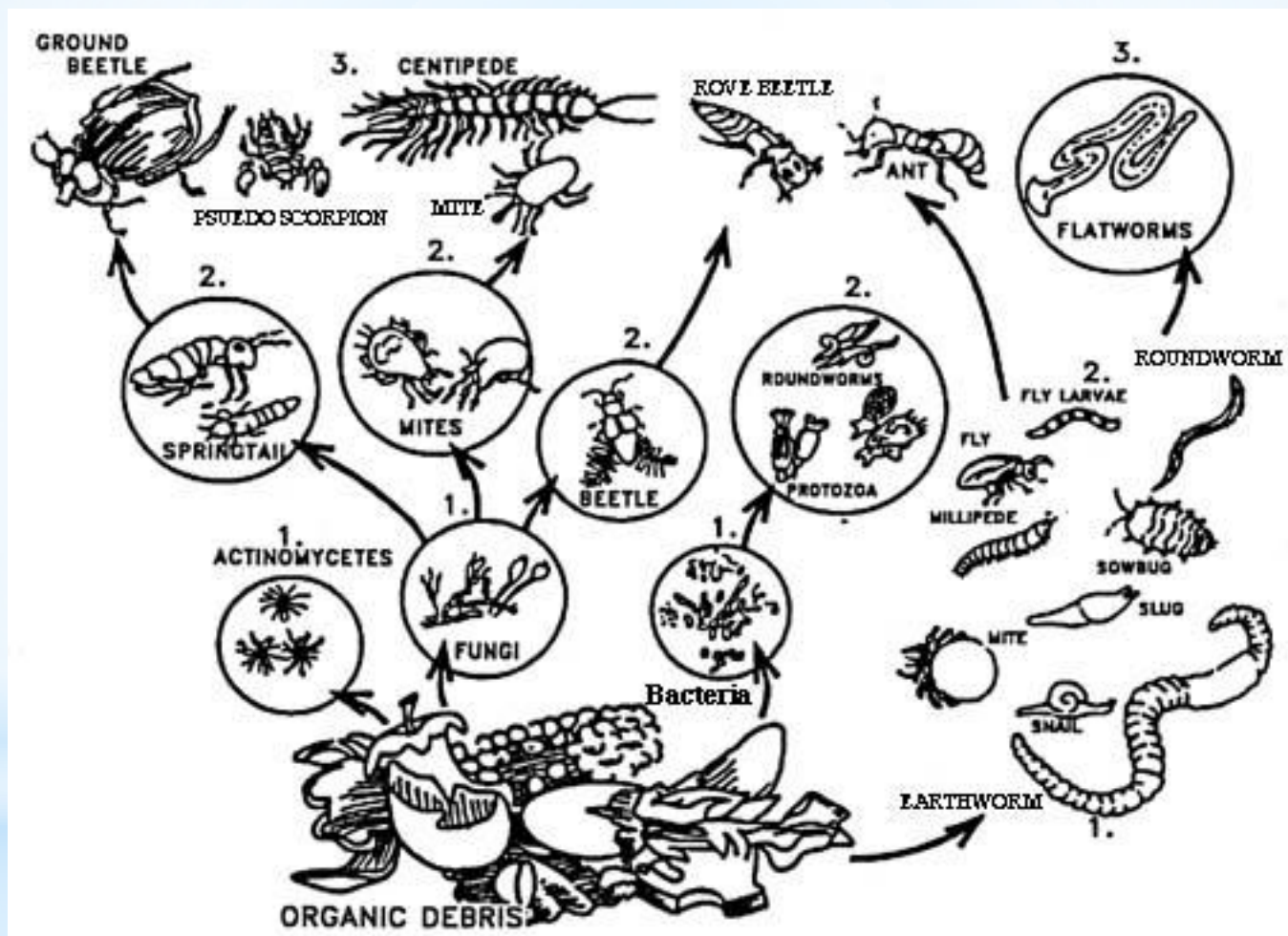
*Compost Crash Course



Source: Compost Education Centre (Victoria)

- ✓ **Greens & Browns** → must have the proper balance of both
- ✓ **Moisture** → must be wet but not soggy
- ✓ **Air** → must have oxygen flow; particle size must vary; chopped materials have more surface area;
- ✓ **Heat** → pile must be big enough to generate lots of heat
- ✓ **Proper Materials** → Give meat, bones, bread, oil waste etc. to the Green Bin

Greens = fresh grass clippings, food scraps, manure
Browns = dry leaves, newspaper, wood chips, branches



Create/support SFW

Compost Tea

- Actively aerated version
- Source of microbes
- Demonstration



Source: www.compostsoup.com



Source: www.instructables.com

Create/support SFW

Microbes

- Microscope demonstration
- DVD of microbes



Source: www.permaculture.org.au



Source: www.soil-net.com

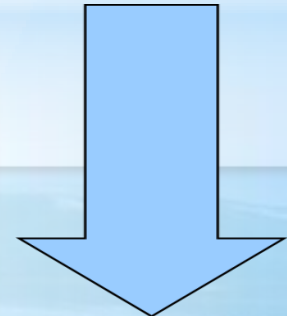
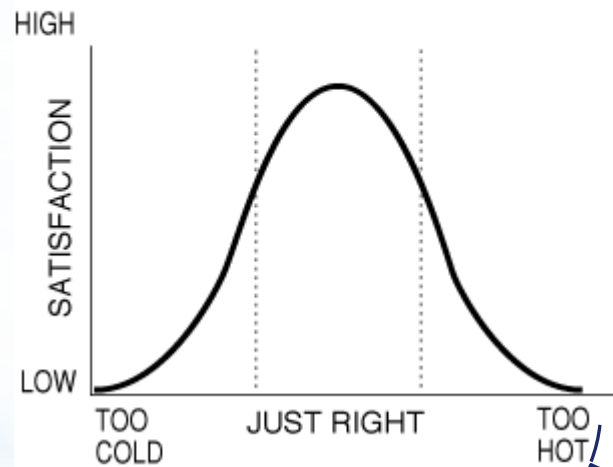
Provide Food to SFW

Mulch → Multi-purpose

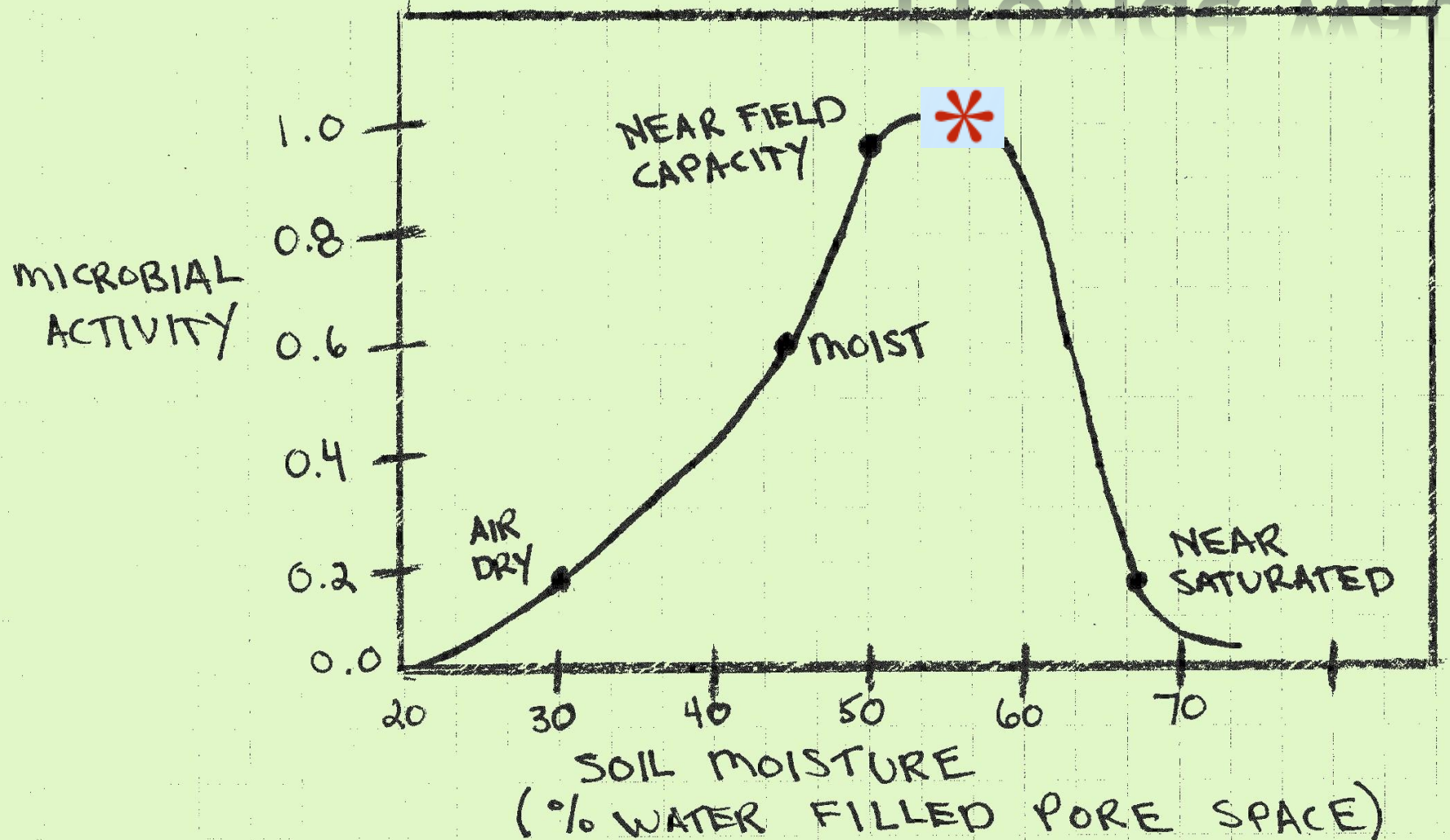
- Food for microbes
- Weed suppression
- Water retention (reduce evapotranspiration)

Provide Water

Goldilocks Principle



Provide Water



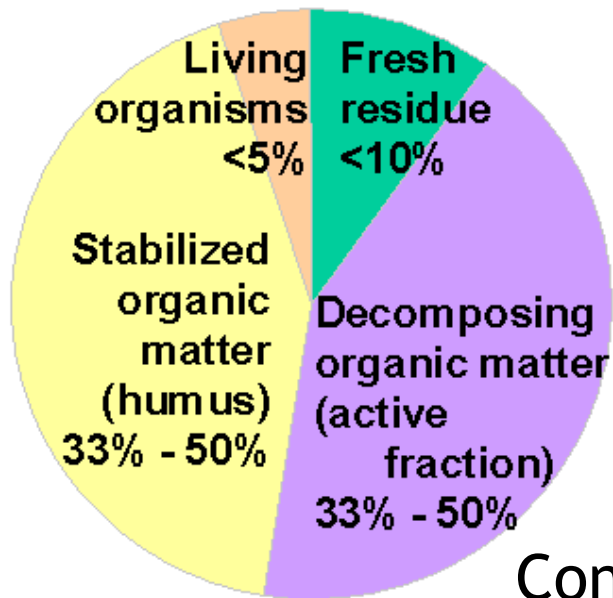
“just right” for microbial life

SOIL STRUCTURE & WATER RETENTION



Organic Matter

What is it?



Consider Soil Stratification in nature
...what is found on a forest floor

OM & Water Retention

% Organic Matter	Water Holding Capacity
1% Organic Matter	~ 10,000 gallons/acre
6% Organic Matter	~ 60,000 gallons/acre
1" Rain	~ 28,000 gallons/acre



microbes

+

food

+

water

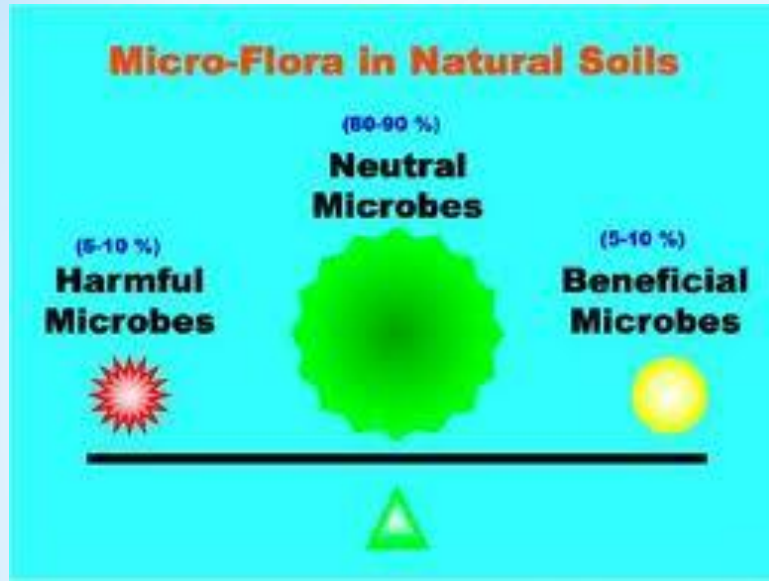
nutrients from
om & each
other

available to
plants

plants take up

plant
returns to
soil





Is your soil's "see-saw" out of balance?
EM adds beneficials



* **Effective
Microorganisms**



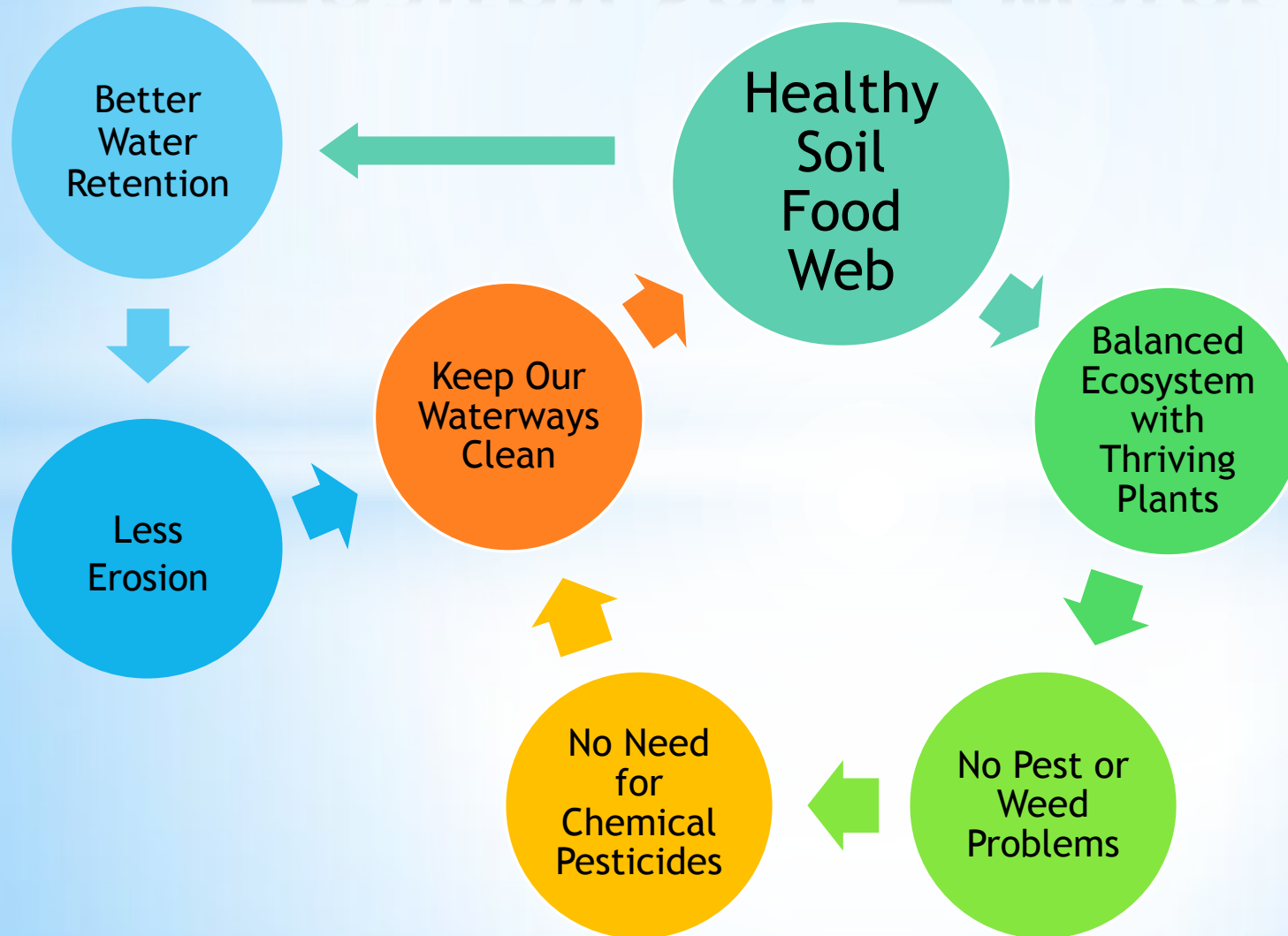
Some call it
“extendo-root”!

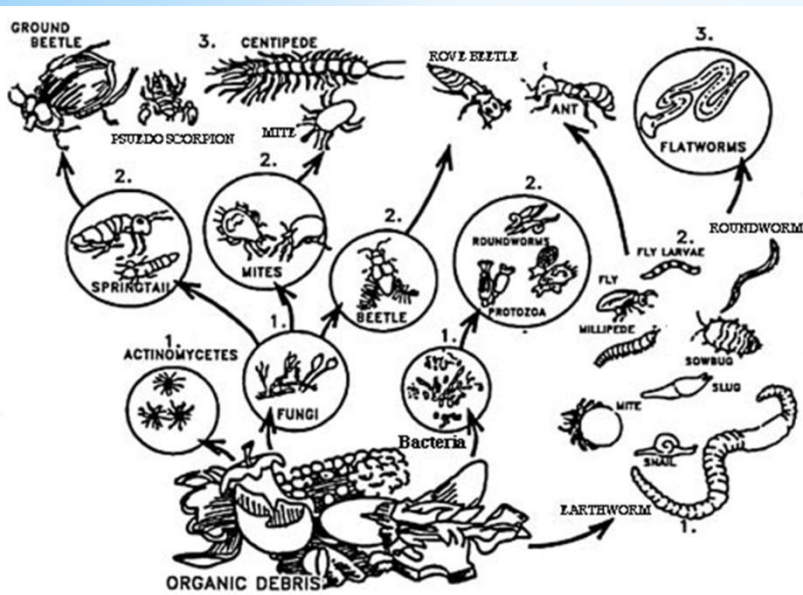


www.gardensonthego.net

*Mycorrhizal Fungi

*Healthy Soil & Water Quality





* CONCLUDING THOUGHTS

* With any gardening practice/intervention always ask yourself:
“HOW WILL THIS AFFECT THE MICROBES?”

* Happy microbes = happy soil = happy plants =
optimum water usage & reduction of pesticide use!





HAPPY WATER SMART GARDENING!

