Soil Your Ultimate Water Reservoir

Tapping The Potential

by

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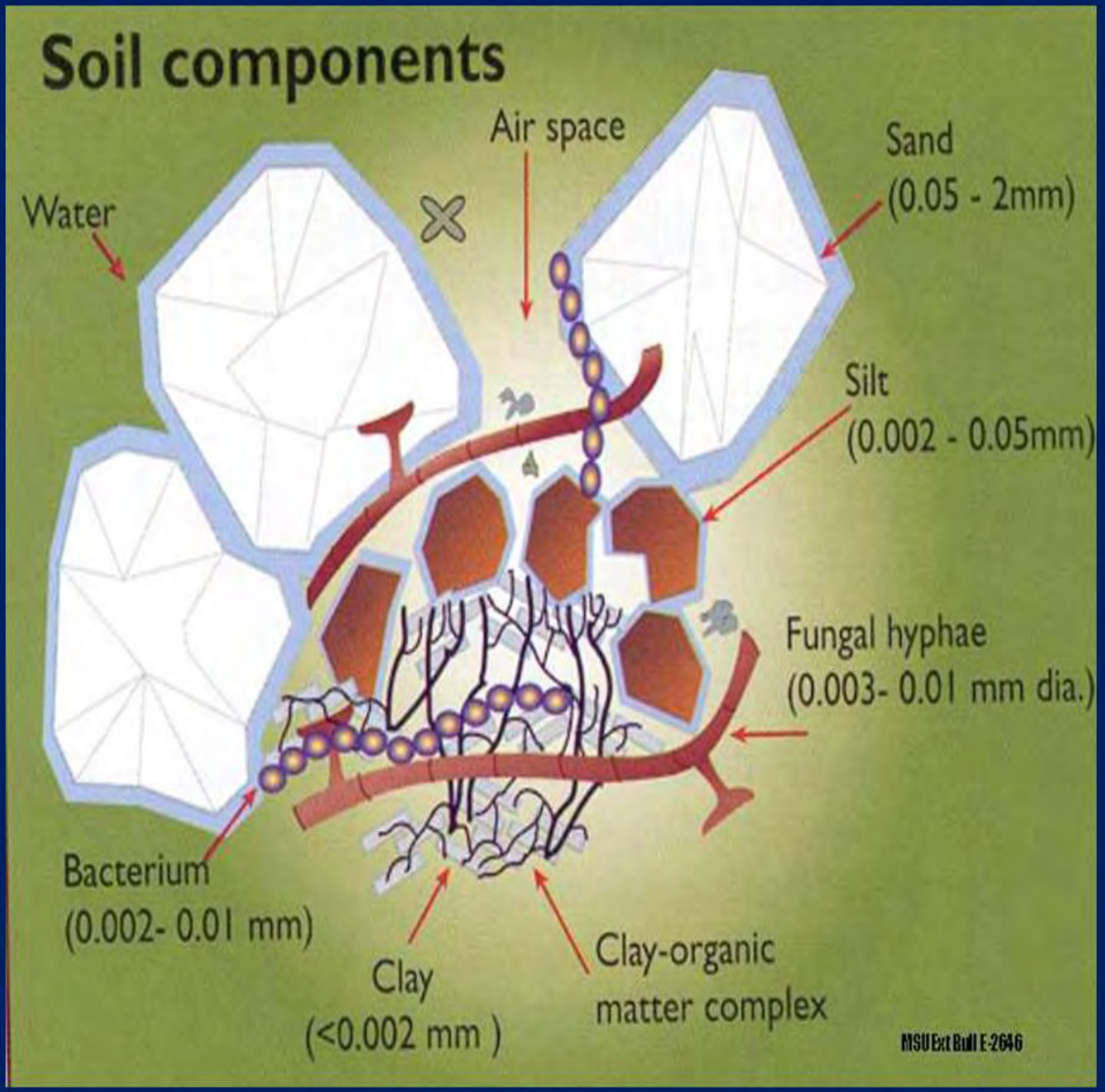
- 4,000,000 acre feet of water used on lawns in Texas
- On average, 50% of that is wasted = 2,000,000 acre feet gone, never to be recovered.
- During peak months, wastage could go as high as 80%.

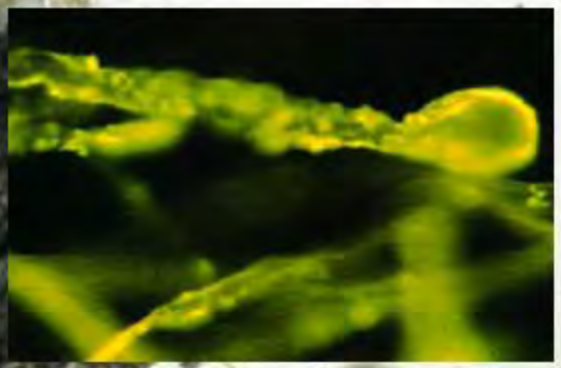
Several studies have shown that 50% of the water usage in the Houston area is for landscaping uses.

What if we could reduce this amount by ½ in less than a year by using biological based landscape techniques and get even better results?


Dad is
this soil
or dirt?


Soil components
Air space
Sand
(0.05 - 2mm)
Water
Silt
(0.002 - 0.05mm)
Fungal hyphae
(0.003- 0.01 mm dia.)
Bacterium
(0.002- 0.01 mm)
Clay
(<0.002 mm)
Clay-organic
matter complex
MSU Ext Bull E-2646

GLOMALIN



A GLYCOPROTEIN
THAT CONTAINS UP TO
5% IRON

Developing good soil structure is the most important part of water conservation in our landscapes.

It is also the *most cost effective* tool we have.

The benefits are many times greater than irrigation systems, rain water harvesting, and water reuse combined.

A topsoil with a 3% organic matter content by weight can have a 60% porosity. If filled with 35% air and 25% water it can hold over 120,000 gallons of water in the top 18” per acre and the subsoil can hold even more!

A great topsoil can have over 8% by weight (25% by volume) in organic matter.

The things we do determine a landscapes resistance to drought.

1) the care we give the soil
2) the products we apply
3) type of plants we landscape with

So how do we get there?

1) Quit applying products that destroy soil structure.

2) Quit applying products that kill soil microorganisms.

3) Use only products that feed the soil, the microbes and other life.

Human/Soil Interdependence

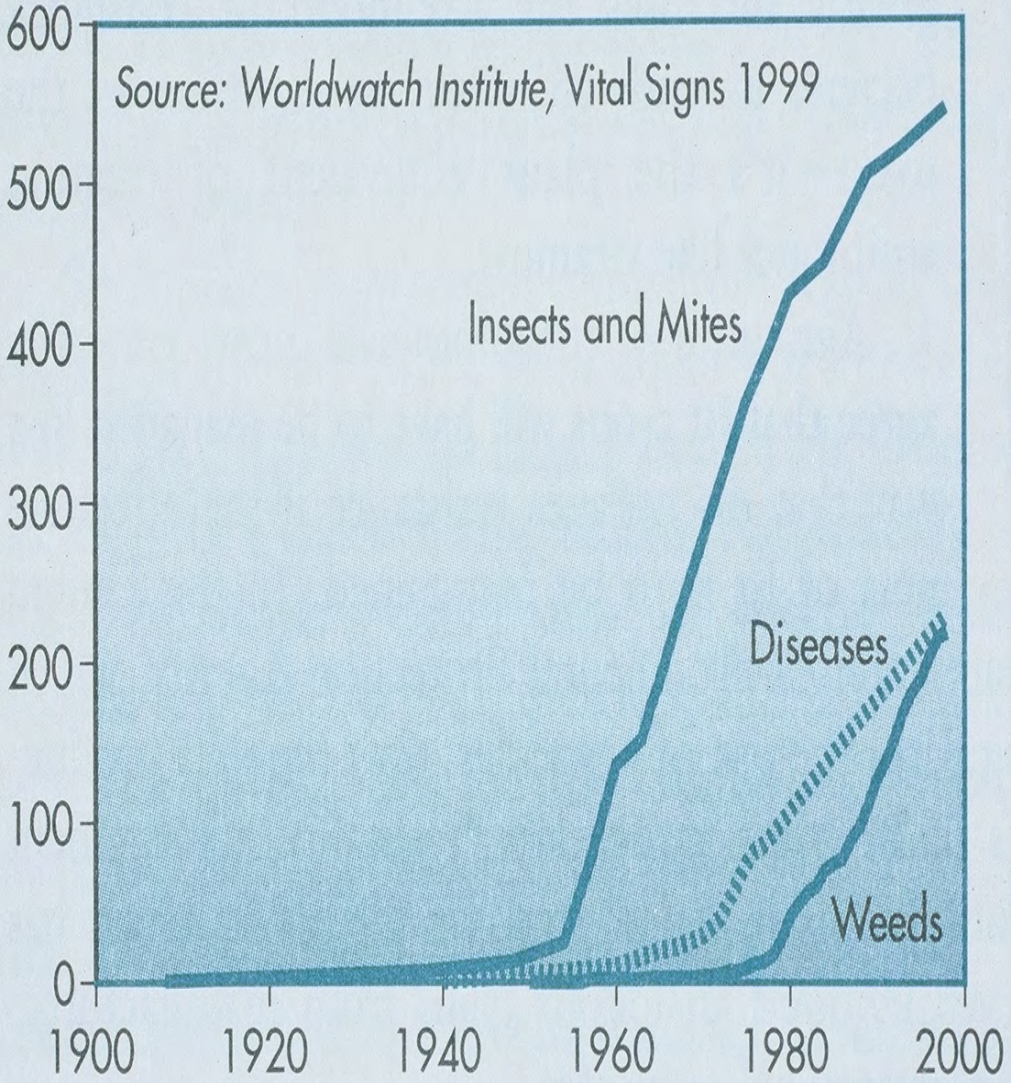
- Fungicides
- Herbicides
- Pesticides
- Acid-treated phosphates
- Potassium chloride
- ++ Magnesium
- Nitrogen application
- When will we kill the microbes
- We drive out the air
- Accelerate chemical reactions , we compact the soil, and we remove the soils ability to retain water

Civilizations have, can and do fail because they ignored their stewardship responsibilities to the soil

COMPARISONS OF SOILS IN NATURAL & MAN-MADE LANDSCAPES

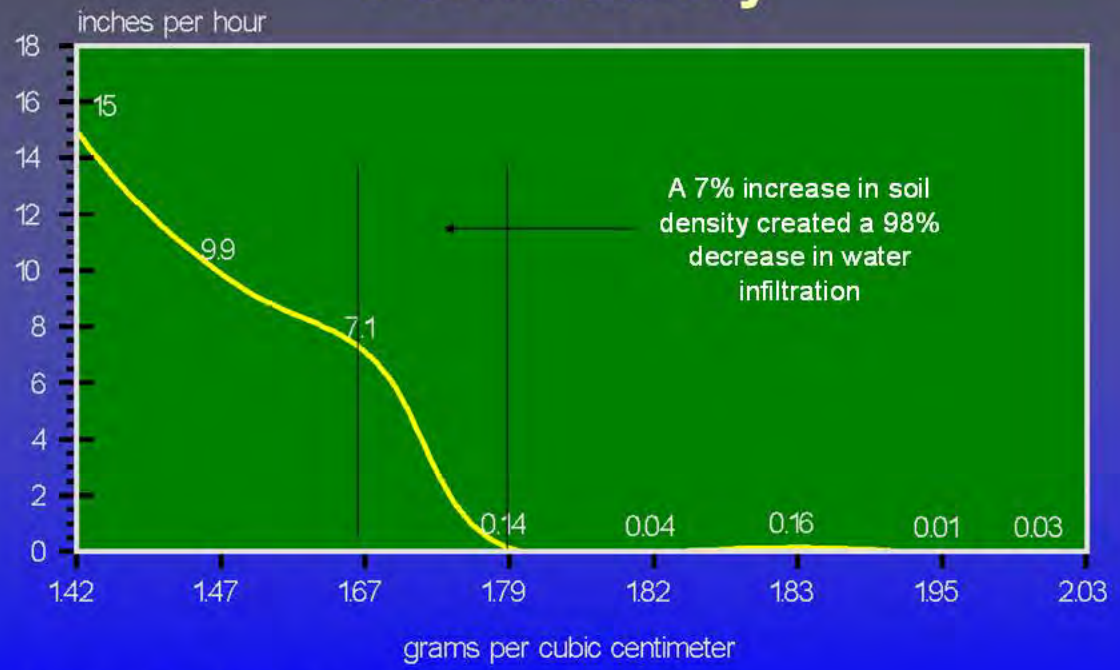
	Natural	Man-Made
Organic matter	High	Low
Soil Water Storage	High	Low
Available minerals (total)	High	Low
Recycled minerals	High	Low
Buffered pH	High	Low
Root Fiberosity	High	Low
Rooting Depth	High	Low
Rooting volume	High	Low
Old root channels	Many	Few
Earthworm tunnels	Many	Few
Mixed soil	None	Much
Soil compaction	Low	High
Bacteria	High	Low
Mycorrhizal fungi	High	Low
Fauna	High	Low
Pathogenic microbes	Low	High
Pest problems	Low	High

After PHC Royalty Corp. 1999 & Soil Food Web Inc.



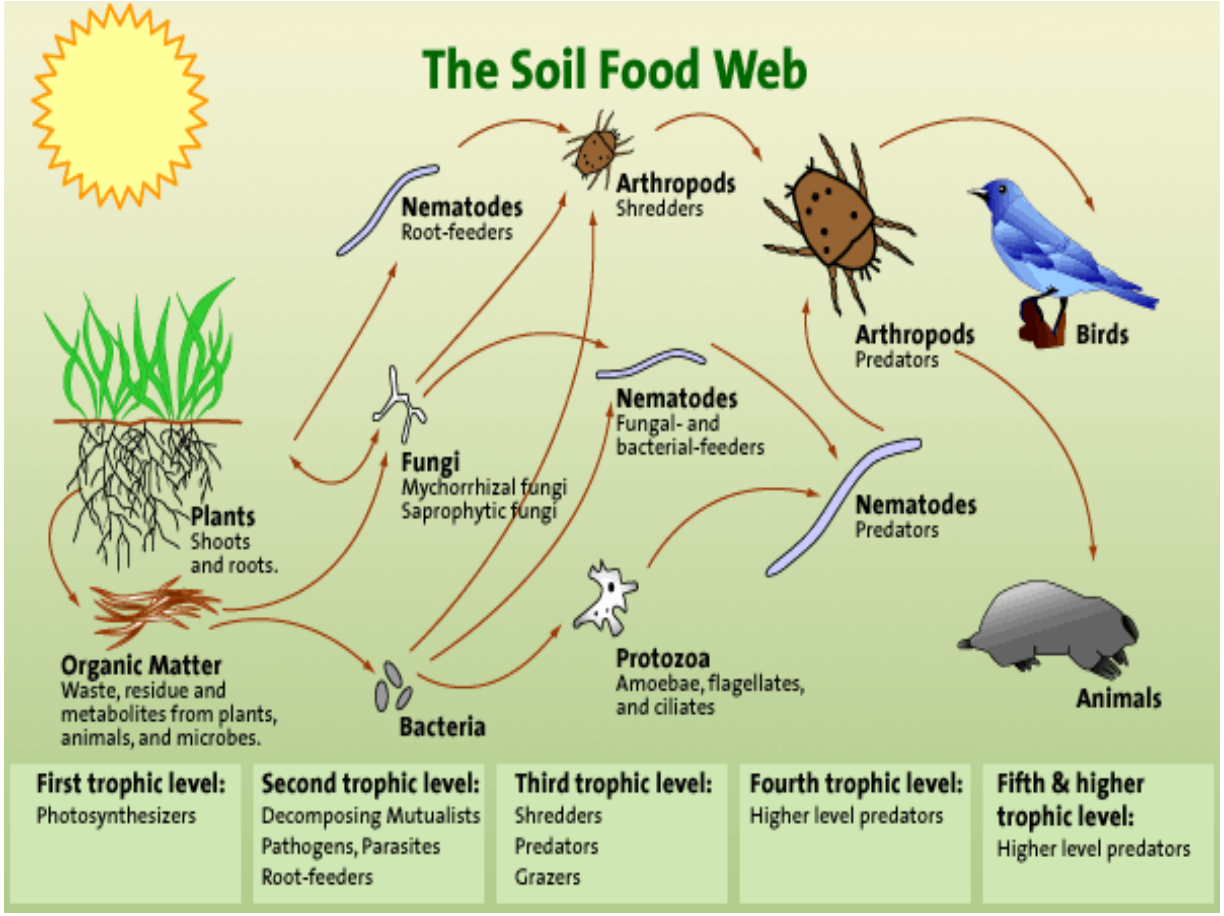
Reported Numbers of Pesticide-Resistant Species, 1908–98

Influence of Soil Density on Water Permeability

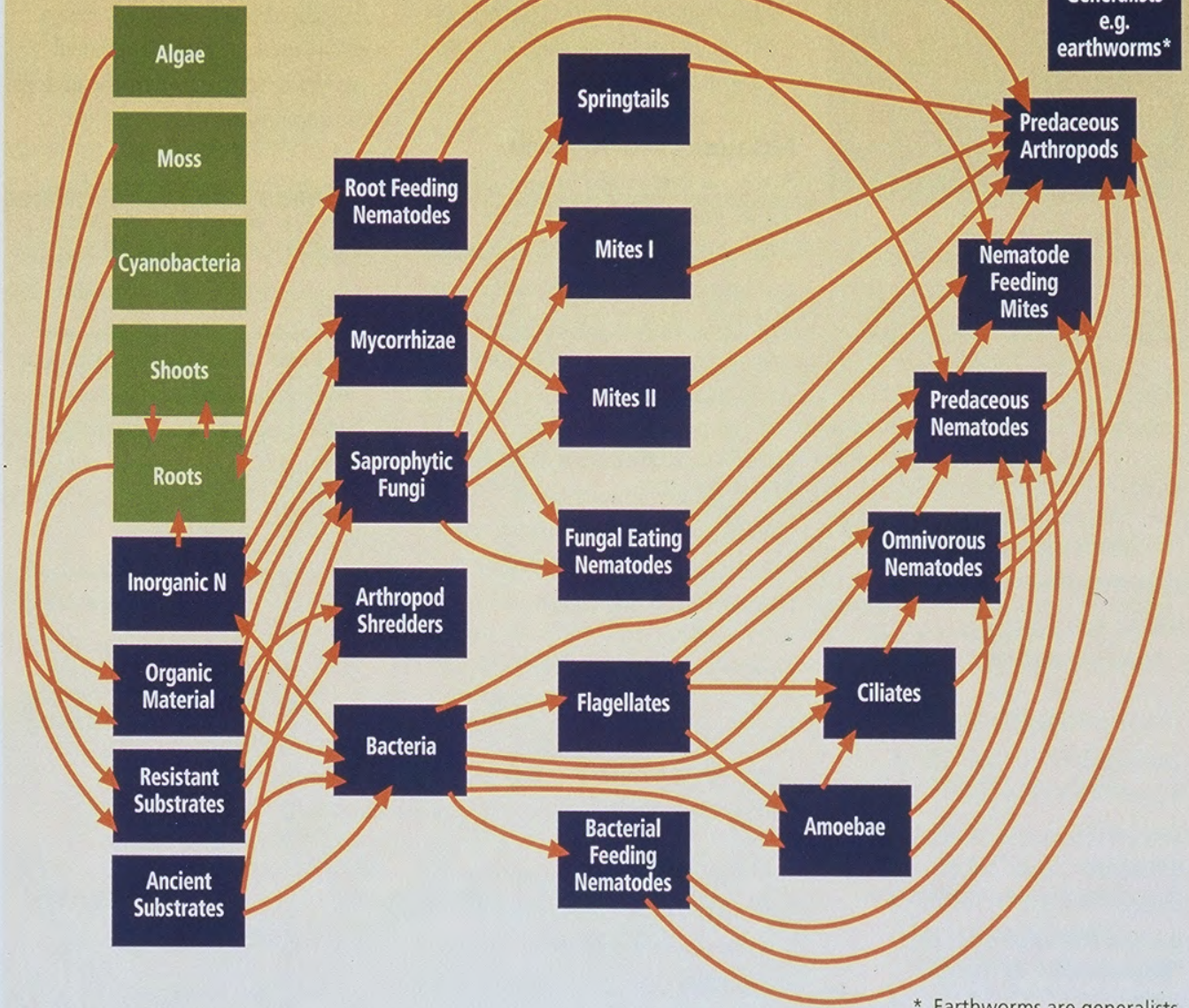


Adapted from Ocean County Soil Conservation District

Understanding What the Plant Needs



A Complex Food Web



* Earthworms are generalists that feed on many smaller soil organisms.

7 BENEFITS OF A HEALTHY SOIL FOOD WEB

1) Disease suppression (competition, inhibit, consume)

2) Improve nutrient retention in soil

3) Mineralize nutrients and make them available to plants

4) Improve soil structure (more water and oxygen)

5) Decomposition of toxic materials (phenols, tannins, pesticides)

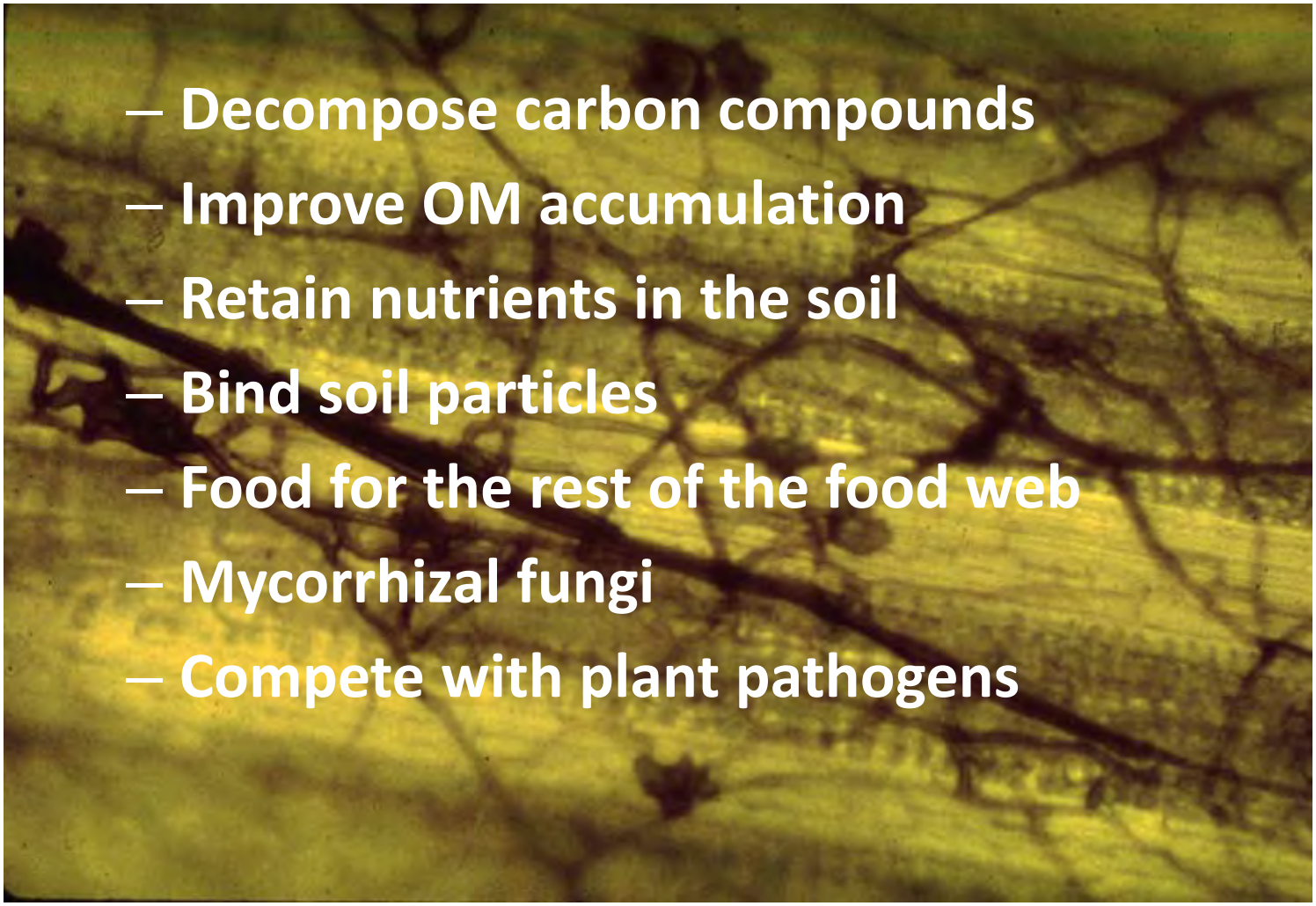
6) Produce plant growth promoting compounds

7) Improve crop quality (flavor, nutrients, yield)


Pisolithus tinctorius
ECTOMYCORRHIZAE
NONMYCORRHIZAL

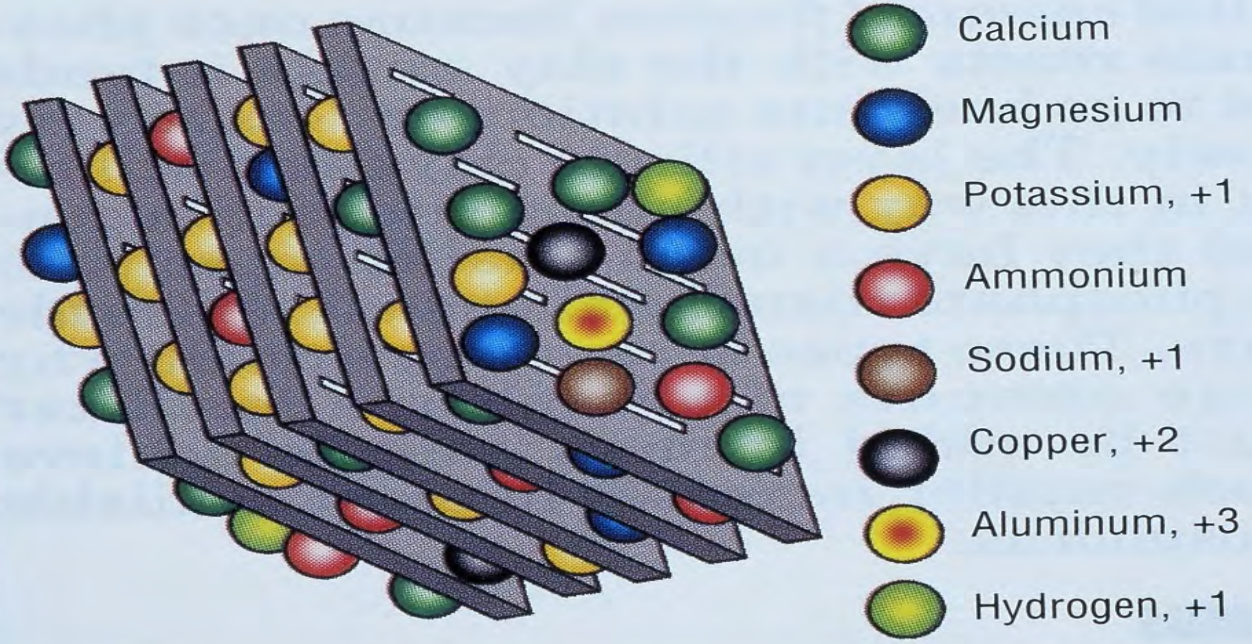
3-year Citrus trial

Fungi and Soil Quality

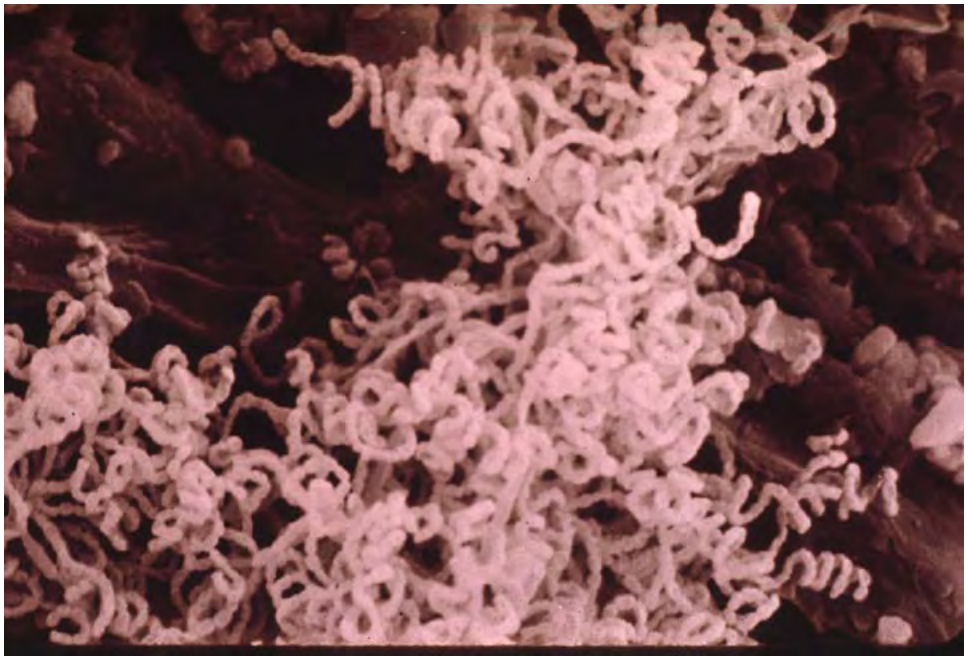


- Decompose carbon compounds
- Improve OM accumulation
- Retain nutrients in the soil
- Bind soil particles
- Food for the rest of the food web
- Mycorrhizal fungi
- Compete with plant pathogens

Figure 2. Diagram of a soil clay with cations held on negative charges on the clay surfaces. These cations are not chemically bonded to the clay and can readily be exchanged by other cations in the soil solution.

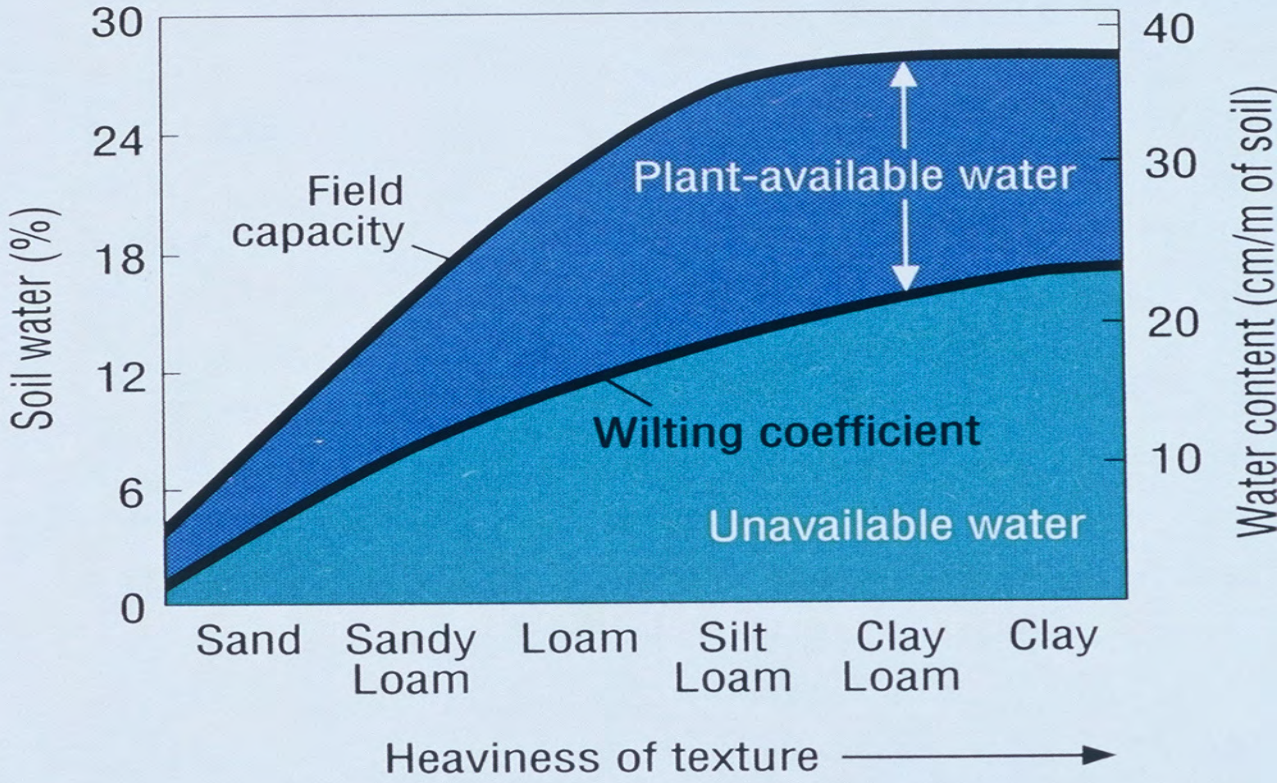


Actinomycetes



– Bacterial cells
– Grow like fungal hyphae

Figure 1. Total and available water holding capacity of soils



From *The Nature and Properties of Soils,* N.C. Brady, 9th ed., 1984, McMillan Publishing Co.

The Drought Difference: Organics vs. Synthetics

Because the soil is treated organically, by adding compost and compost teas, it retains moisture far better.

Chemical vs. Organic Maintenance

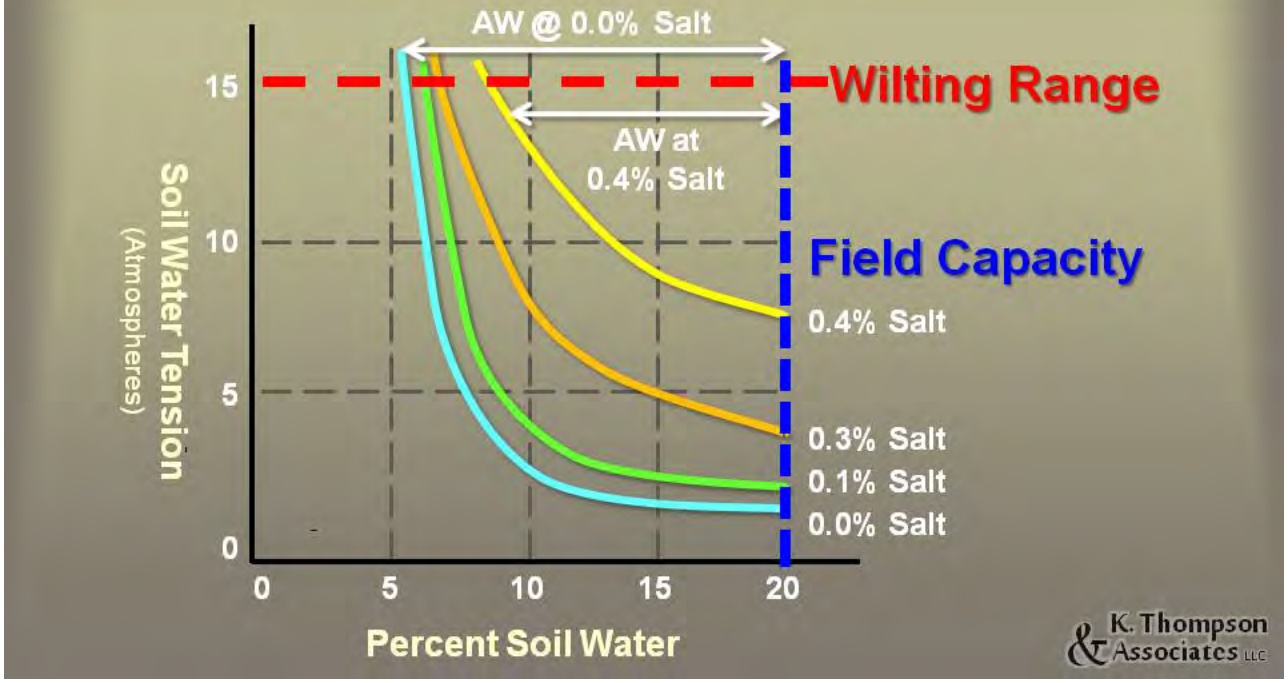
3 apps. chemical fertilizer $31
2 apps. Herbicide $16
water costs $548
Cost to re-sod lawn $2,750.00
Total = $ 3,345

3 apps. Microlife Organic $120
1 app. leaf mold compost $270
water costs $383

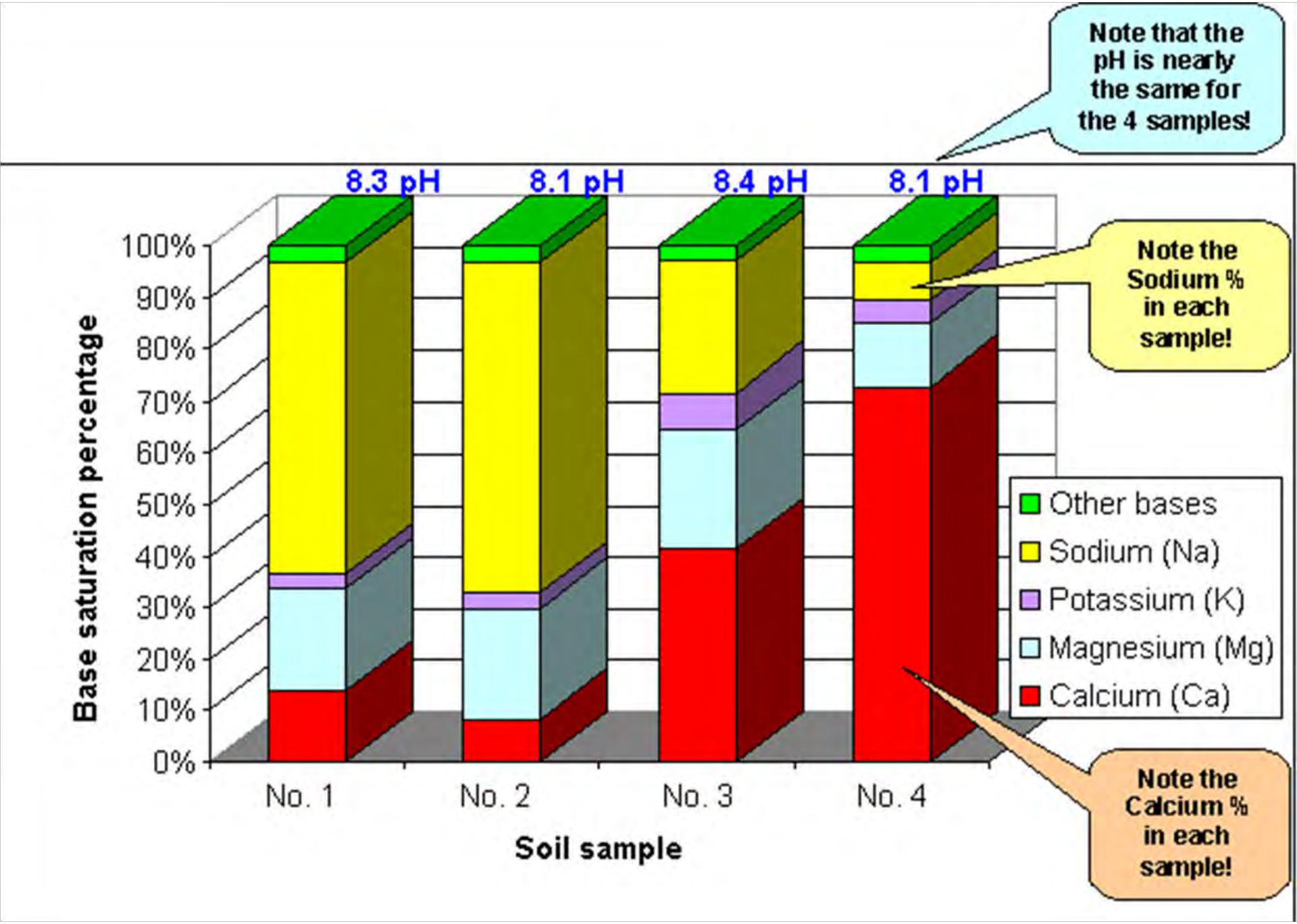
Total = $ 773

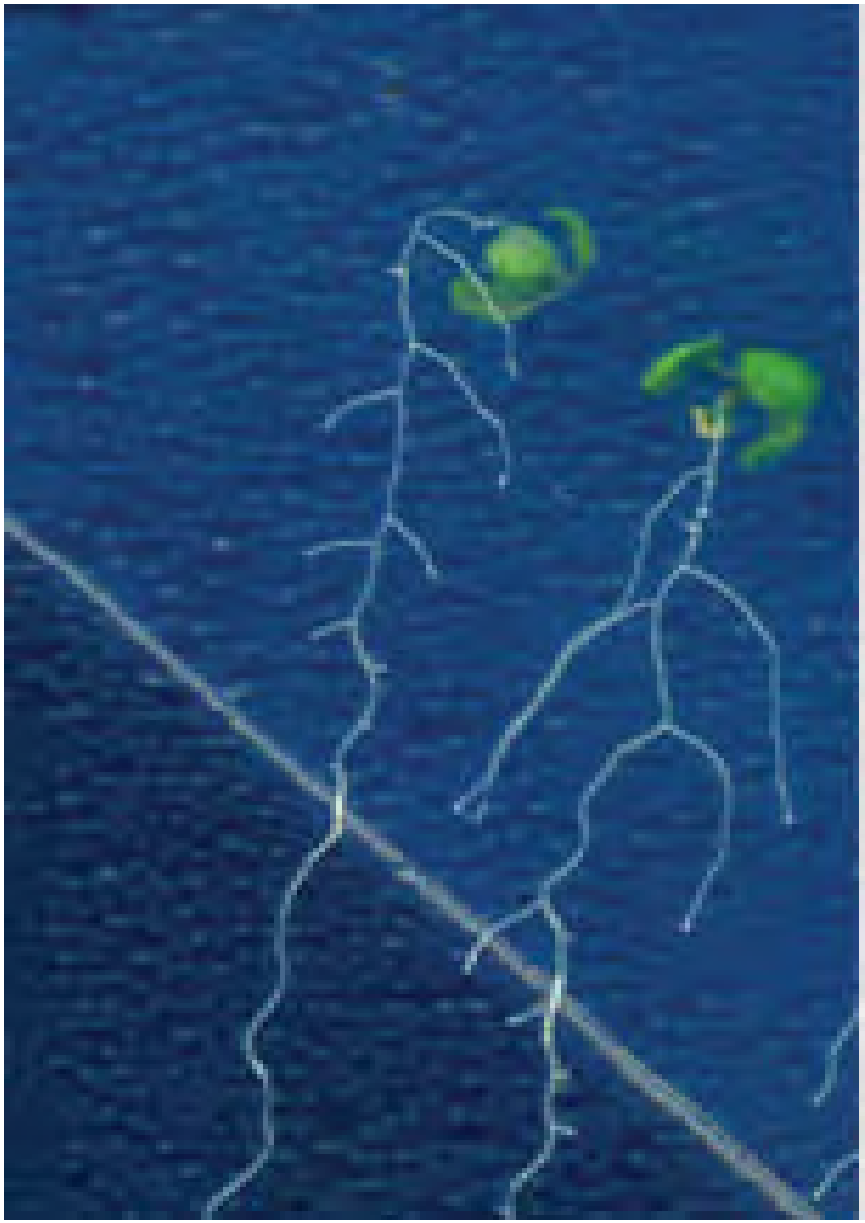
Plants Water Soil

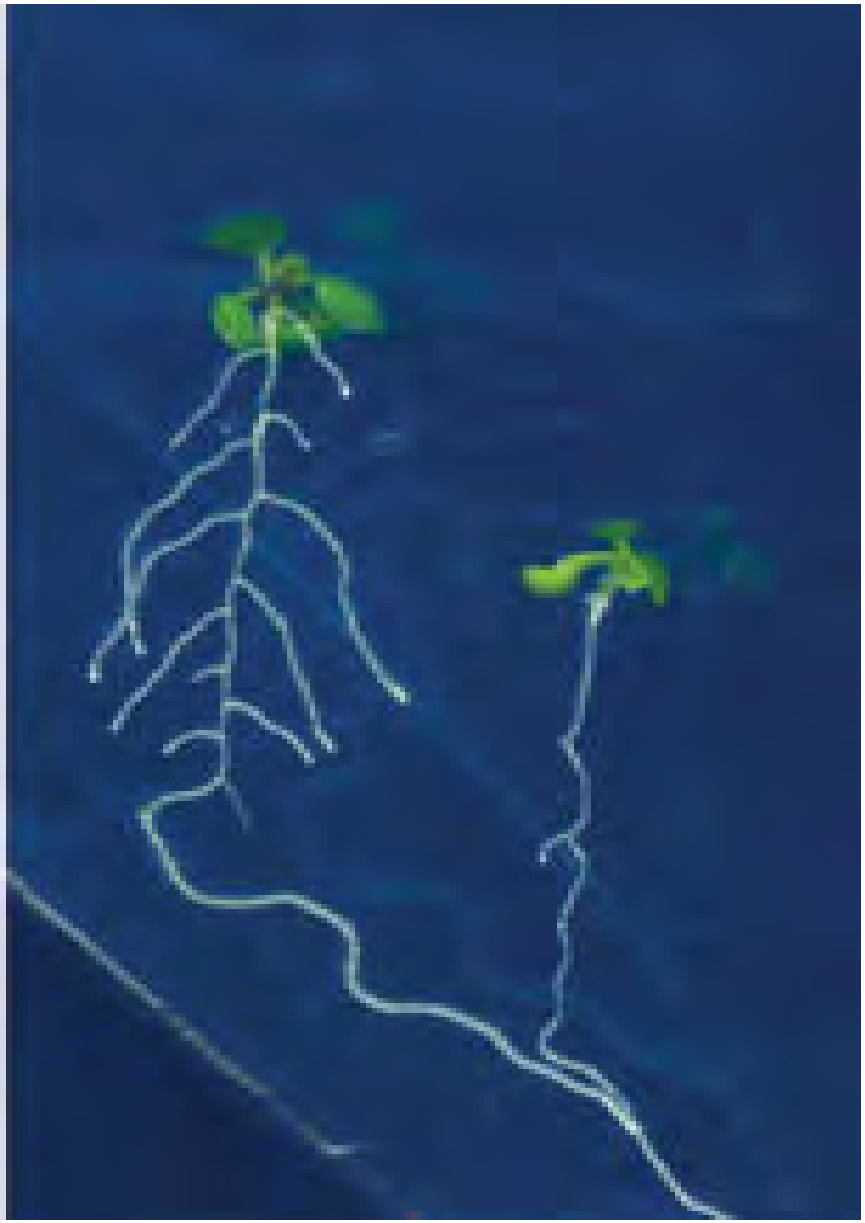
Salts in Water



K. Thompson & Associates LLC


Note that the pH is nearly the same for the 4 samples!
8.3 pH
8.1 pH
8.4 pH
8.1 pH
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Base saturation percentage
Note the Sodium % in each sample!
Other bases
Sodium (Na)
Potassium (K)
Magnesium (Mg)
Calcium (Ca)
Note the Calcium % in each sample!
No. 1
No. 2
No. 3
No. 4
Soil sample





Why are salts so bad for turf?

- First consider that they can accumulate in the soil, where they cause serious damage to seeds, roots, and plant tissue
- They can kill off and alter soil biology and fertility
- They cause water to move out of (instead of into) the plant's root cells. The effect of this is a reduction in the amount of water available to the plant, which almost always leads to burning

Rooting Depth

- In a toxic chemical landscape roots only go down 1-2” due to compaction and hardpan which are related to **“salts”.**

- *In a organic lawn roots can grow to over 3 feet depth even in heavy clay over time.*


06/07/2007


06/07/2007

Most of our sod is grown on clay soils so it can be sliced up to sell.

This clay layer must be broken down so water can enter the soil.

This is done by mechanical aeration and by microbes.

Did you remember roots??

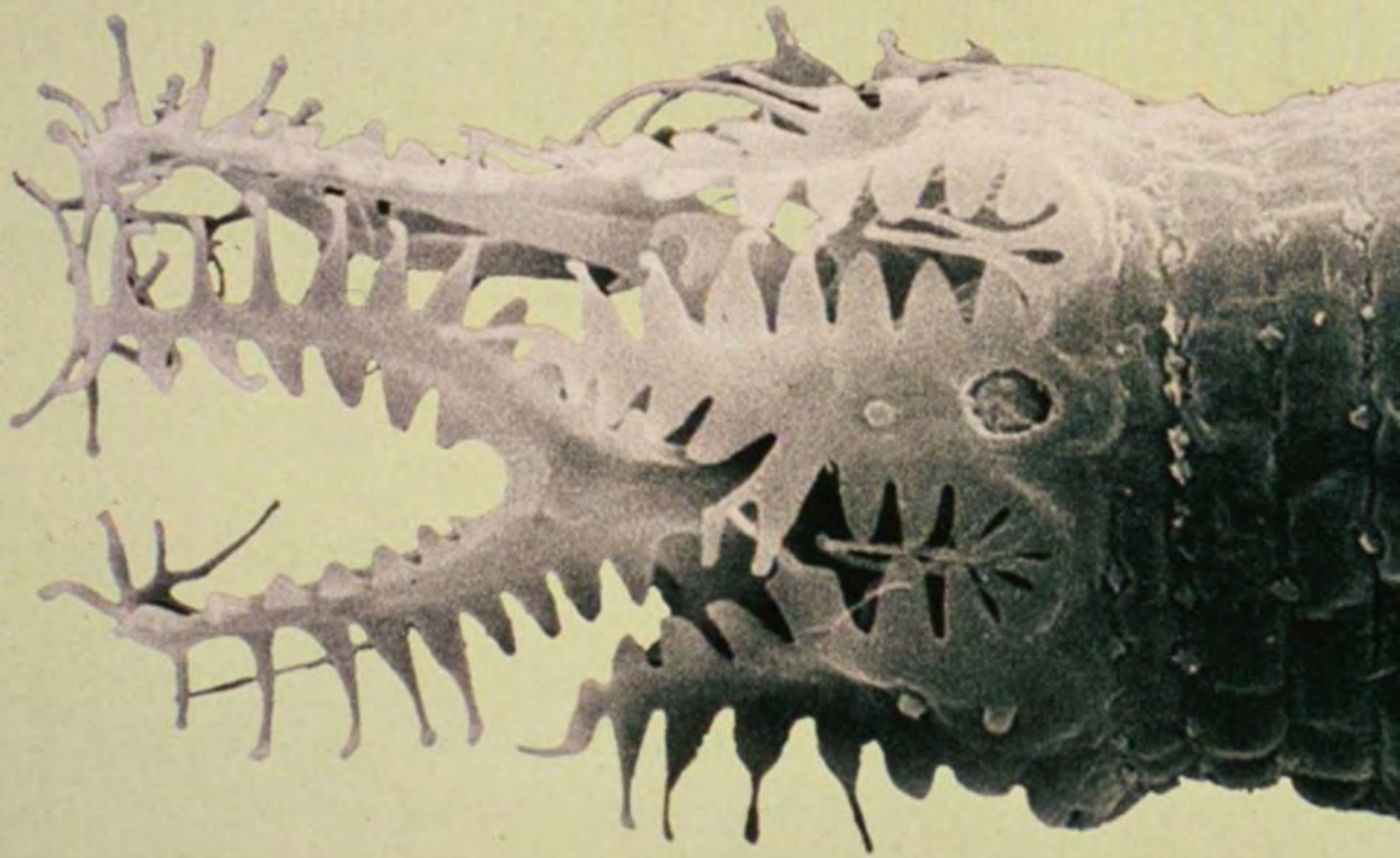
Hendrikus Schraven holding ryegrass planted July 15, 2002

Harvested Nov 6, 2002
Mowed twice to ½ inch

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

No weeds, no disease

www.soildynamics.com



Profile of the Tama Soil Series, Kenedy

Photo courtesy Morton Arboretum

Compared to tree roots growing in the presence of turf, tree roots under mulch are fibrous and able to spread out in every direction. Turf roots out-compete tree roots for water and minerals and produce chemical inhibitors that stunt normal tree root development.


14203


1:1 ROCK SLOPE - BARTON CREEK DEVELOPMENT
AUSTIN, TEXAS
AUGUST 17, 2002

TWO MONTHS - BARTON CREEK DEVELOPMENT
AUSTIN, TEXAS

FIVE MONTHS - BARTON CREEK DEVELOPMENT
AUSTIN, TEXAS

8 MONTHS - BARTON CREEK DEVELOPMENT
AUSTIN, TEXAS

VERTICAL SLOPE / ROCK FACE

BARTON CREEK DEVELOPMENT-AUSTIN, TEXAS


SEP 4 2003

Tips:

- **Avoid bark mulches as they repel water**
- **Use Native mulches as they break down clay (Laval University, Canada)**
- **Carbon sequestration**
- **Humus in compost can hold up to 15X its weight in water**

- **Healthy soils prevents erosion, flooding, and brings cleaner air. Plus it is highly productive.**

- **Our challenge is to *build healthy soils* so that every drop of rain goes to good use.**

Teaming with Microbes 2nd edition, A Gardener's Guide to the Soil Food Web, by Jeff Lowenfels & Wayne Lewis, Timber Press, 2006, ISBN-13:978-0-88192-777-1 *Highly Recommended*

Organic Management for the Professional
Howard Garrett, John Ferguson, and Mike Amaranthus, University of Texas Press
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