

THE 2009
LANDSCAPE
DESIGN • BUILD • MAINTAIN EXPO

COMPOSTING WORKSHOP:

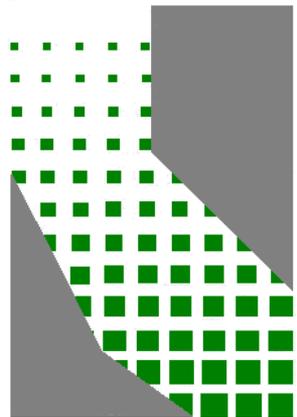
***Next Generation Sustainable Landscapes ...
It's about the Organic Carbon in the Soils!***

November 5, 2009

Dan Noble

Executive Director

Association of Compost Producers



INTEGRATED
WASTE
MANAGEMENT
BOARD



Topic Outline

- **ACP: *We Build Healthy Soils ... and Compost Customers!***
- **SOILS & COMPOST:**
 - *Foundation of the Watershed Ecosystem*
 - *From Dead Dirt, to Living Soil*
 - *Organic carbon and the soil critters*
 - *Testing: USCC Seal of Testing Assurance Program*
- **COMPOST USES**
 - **Water Efficient Landscapes**
 - **Low Impact Development & Stormwater Runoff**
 - **Sustainable Landscapes**
- **SERVING CUSTOMERS: *The What, Why and Who***
- **Take Home Messages**



What is ACP?

- **A Public/Private Association - 501(C)3 - Composed of:**

- Public and Private Organics Residual Generators
 - Green Waste, Food Waste
 - Manure, Biosolids
- Public and Private Compost Producers
- Public and Private Compost Marketer/Distributors

- **Our Vision:**

Supporting beneficial reuse of organics in California, with compost playing a central role to build and maintain sustainable healthy soils, keeping our state's lands productive, green and biologically diverse for generations to come.



What is ACP?

- **Our Mission:**

- *Dedicated to increasing the quality, value and amount of compost being used in California. We do this by promoting activities and regulations that build healthy soil, benefiting people and protecting air, water and soil.*
- ACP members work and **invest** together to **increase compost markets** and **improve compost product & manufacturing standards**. The association provides **education & communication** on compost **benefits & proper use** through **support of scientific research & legislation** aligned with developing and expanding quality compost markets.



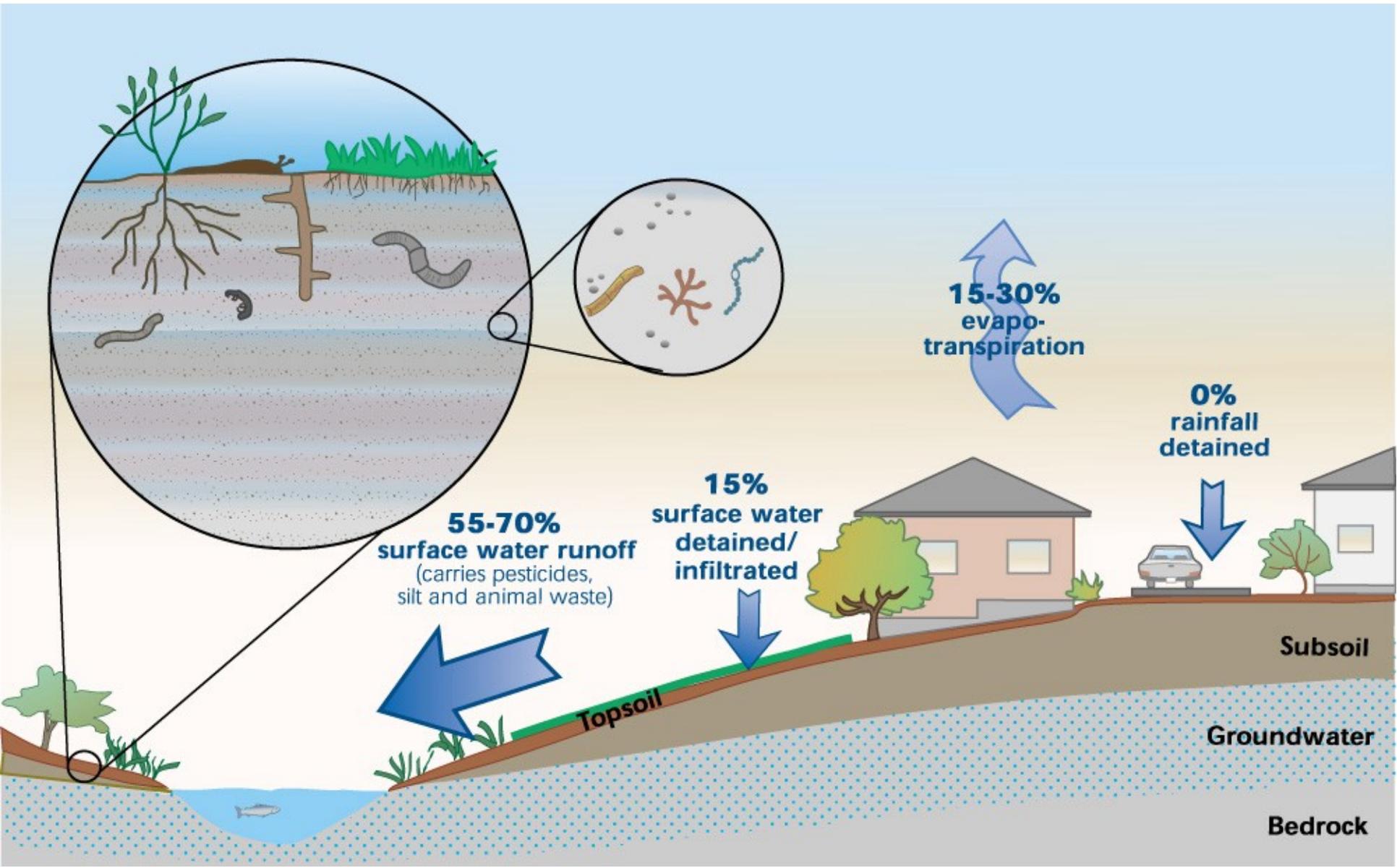
Who is ACP?

- City of Los Angeles
- County of San Bernardino
- Encina Wastewater Authority
- Engel and Gray
- Inland Empire Utilities Agency
- Kellogg Garden Products
- Los Angeles County Sanitation Districts
- P.F. Ryan and Associates
- Rainbow Disposal
- Serrano Creek Soil Amendments
- South Orange County Wastewater Authority
- Synagro



SOILS: Foundation of the Watershed Ecosystem

Urban Watershed: Runoff from increased Impervious Surfaces - Stormwater 101



The previous slide shows a schematic illustration of the runoff from increased impervious surfaces such as in an urban watershed.

The subsurface shows topsoil, subsoil, groundwater, and bedrock with houses, trees/plants, a car, and creek on the surface.

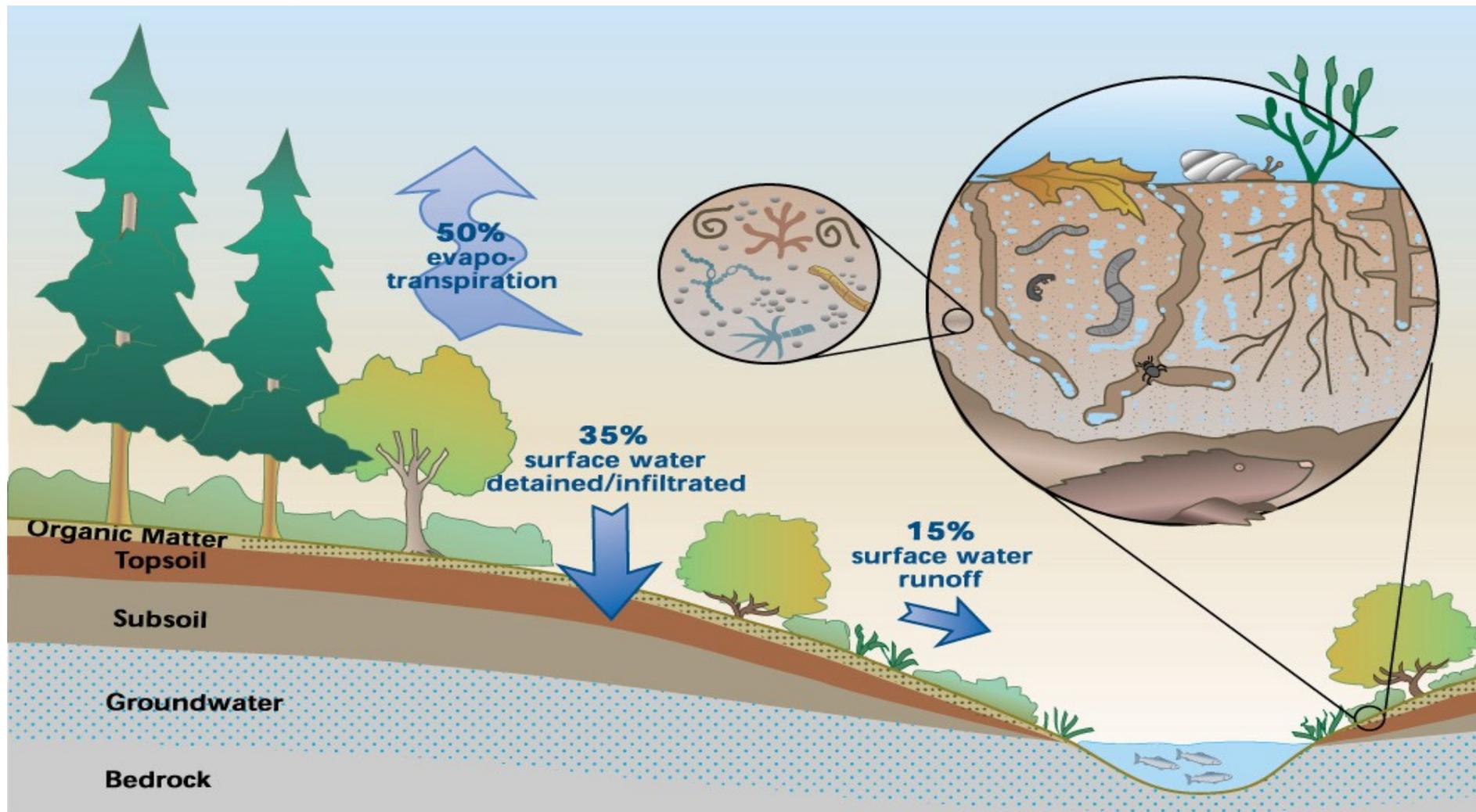
Microbial action and plant roots are illustrated at the soil surface.

The breakdown of water fate is given as:

- 0% rainfall detained at top of slope with a paved area
- 15-30% evapo-transpiration
- 15% surface water detained/infiltrated along slope
- 55-70% surface water runoff (carries pesticides, silt and animal waste)



Native Soil Environment Stormwater 201: Healthy Soil + Plants = Best Stormwater BMP



Low Impact Development (LID) approach –
new hydrologic pattern mimics predevelopment patterns

The previous slide shows a schematic illustration of stormwater runoff from a native soil environment (healthy soil and plants equals best stormwater Best Management Practices).

The subsurface shows organic matter, topsoil, subsoil, groundwater, and bedrock with lots of trees and vegetation and a creek on the surface.

Microbial action and plant roots are illustrated at the soil surface.

The breakdown of water fate is given as:

- 35% surface water detained/infiltrated along slope
- 50% evapo-transpiration
- 15% surface water runoff

Low Impact Development approach –
new hydrologic pattern mimics
predevelopment patterns



COMPOST: *From Dead Dirt, to Living Soil*

Main Applications

- Landscape
- Erosion Control and Restoration
- Agriculture

Specifications are Key

- User Driven Specifications
- Landscape Specifications (Manual)
- Compost Use Index



Compost Benefits

The benefits of healthy soil, made with compost, include:

- **Healthy Soil Delivers Water Abundance and Productivity**
- **Compost Helps Turn Marginal Soil into Healthy Soil**
- **Compost Controls Pests and Weeds**
- **Healthy Soil Increases Water Purity & Abundance**
- **Healthy Soil Makes Cleaner Groundwater Basins**
- **Composted Organics Saves Landfill Space**



ASSOCIATION OF
COMPOST
PRODUCERS

"We Build Healthy Soil"

Controlled Compost Production



Compost: Landscape Applications



Compost: Environmental Applications

- “Ecological Engineering” - *transcends but includes biological, chemical and civil (physical) engineering*
- Build soil, enhance both soil protection *and* infiltration, grow plants, control run off , *if any!* → →

Eliminate runoff, stop erosion before it starts!

- **Specific tools:**

- Compost blankets
- Filter socks
- Ditch checks
- Living walls

- **Compost Blankets (mulch!) Designed to:**

- Dissipate energy of rain impact
- Hold, infiltrate & evaporate water
- Slow down/disperse energy of sheet flow
- Provide for optimum vegetation growth



Compost: Agricultural Applications

(Green Leaf Lettuce)



Organic Carbon & Soil Organisms



- **Compost Contains ~50% Organic Matter by Weight**
- **Organic Matter is made of Carbon Compounds so it:**
 - **Provides food (energy) to the soil organisms**
 - **Provides tilth for water infiltration, holding and oxygen penetration**
 - **Sequesters carbon**
- **Must keep adding to the soil as it is eaten (degraded) by the soil organisms**

Dirt vs. Soil: Key Points

1. Dirt is NOT Soil – Dirt is inorganic *only*
2. Soil is a Living Ecosystem – carbon + life
3. Nutrients are delivered to plants by other living organisms ... in nature, naturally!
4. Soil organisms need food (carbon), and get it from organic matter.



#1

This is dirt



Dirt is minerals
of varying sizes:
rock, gravel,
sand, silt, and
clays.

#2



Soil is a living ecosystem that contains minerals (dirt), water, air, organic matter, and living organisms.



#3

In nature, plants don't consume dirt, organic matter, or atmospheric nitrogen directly.

These must first pass through some life form to make the nutrients available.

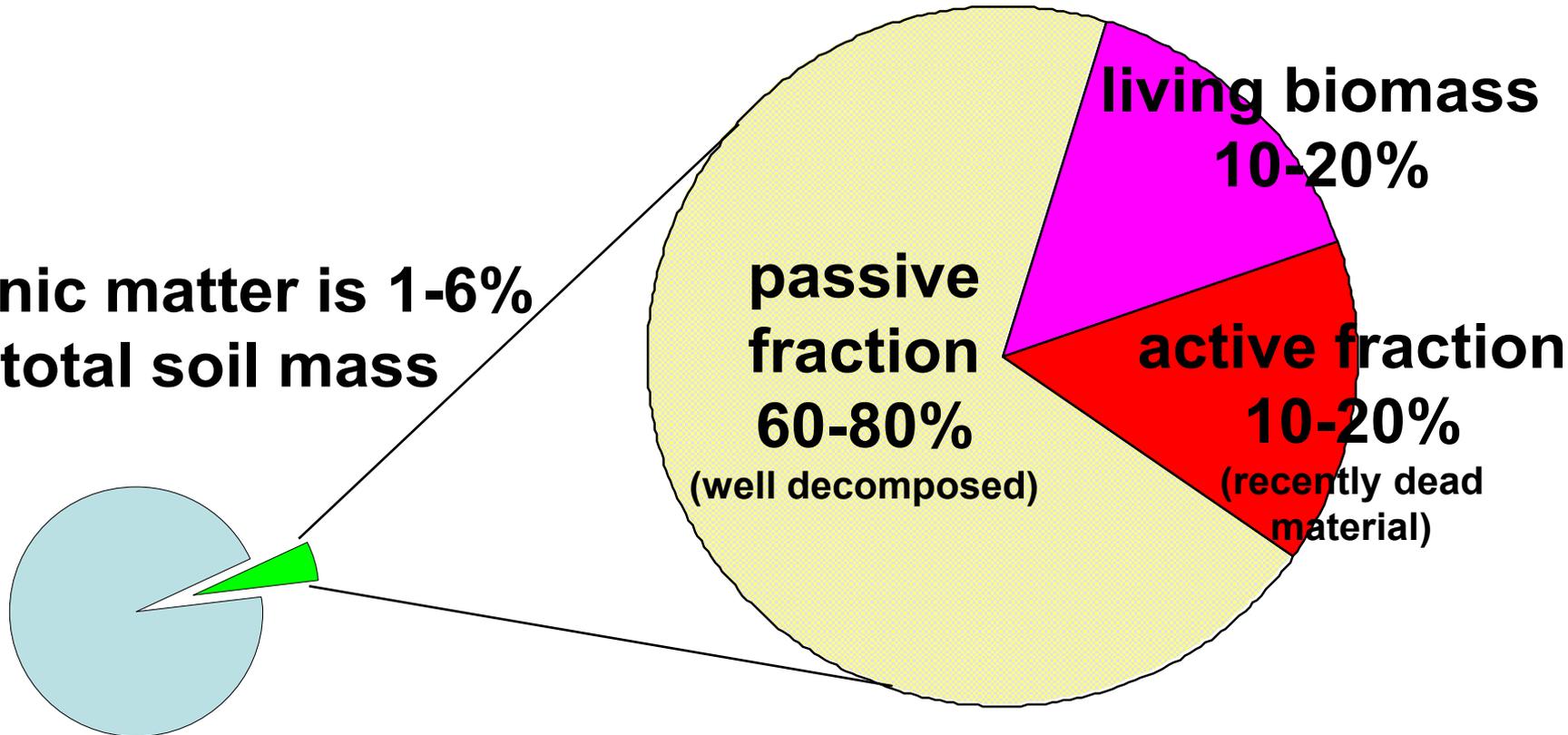
#4

- Every organism must consume energy to survive.
- In soil that energy comes from carbon.
 - From plant material.
 - Waste from organisms that eat plant material.
 - Or dead organisms.

Organic Carbon management is the key to healthy soils.

Soil Organic Matter (OM)

**Organic matter is 1-6%
of total soil mass**



- Think about the carbon cycle***
- All organic matter is not the same***

The previous slide is titled “Soil Organic Matter (OM) and shows a pie chart with a very small section separated and the title “Organic matter is 1-6 % of total soil mass”

This small section is then projected to a much larger pie chart with three sections; one taking up approximately 2/3rds of the pie and the other two each encompassing approximately 1/6th of the pie chart.

Within the largest section is written, “passive fraction 60-80% (well decomposed)”

Within one of the smaller sections is written, “living biomass 10-20%”

Within the last smaller section is written, “active fraction, 10-20% (recently dead material)”



Comparing Active and Passive OM

Active	Passive
Rapid turnover smaller % of OM causes <u>INDIRECT</u> effects	Slow turnover larger % of OM causes <u>DIRECT</u> effects

Newer OM

Older OM

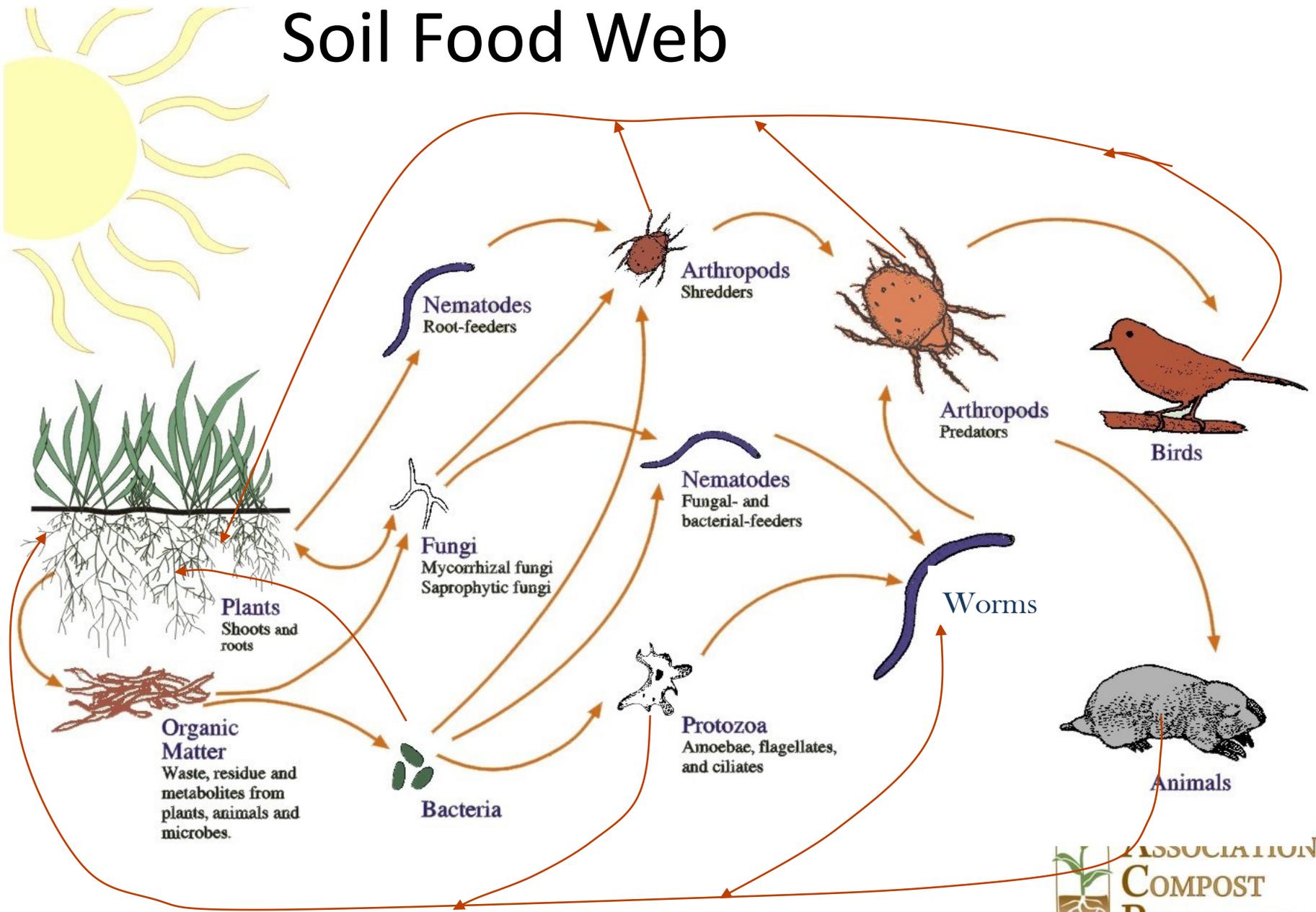
Role of Soil Organic Matter

Two Major Components:

- **Direct effects** of the organic matter itself
 - soil structure, chelation of micronutrients, pH buffering capacity
- **Indirect effects** of decomposition of organic residues
 - aggregation, nutrient release, biological activity, disease suppression



Soil Food Web



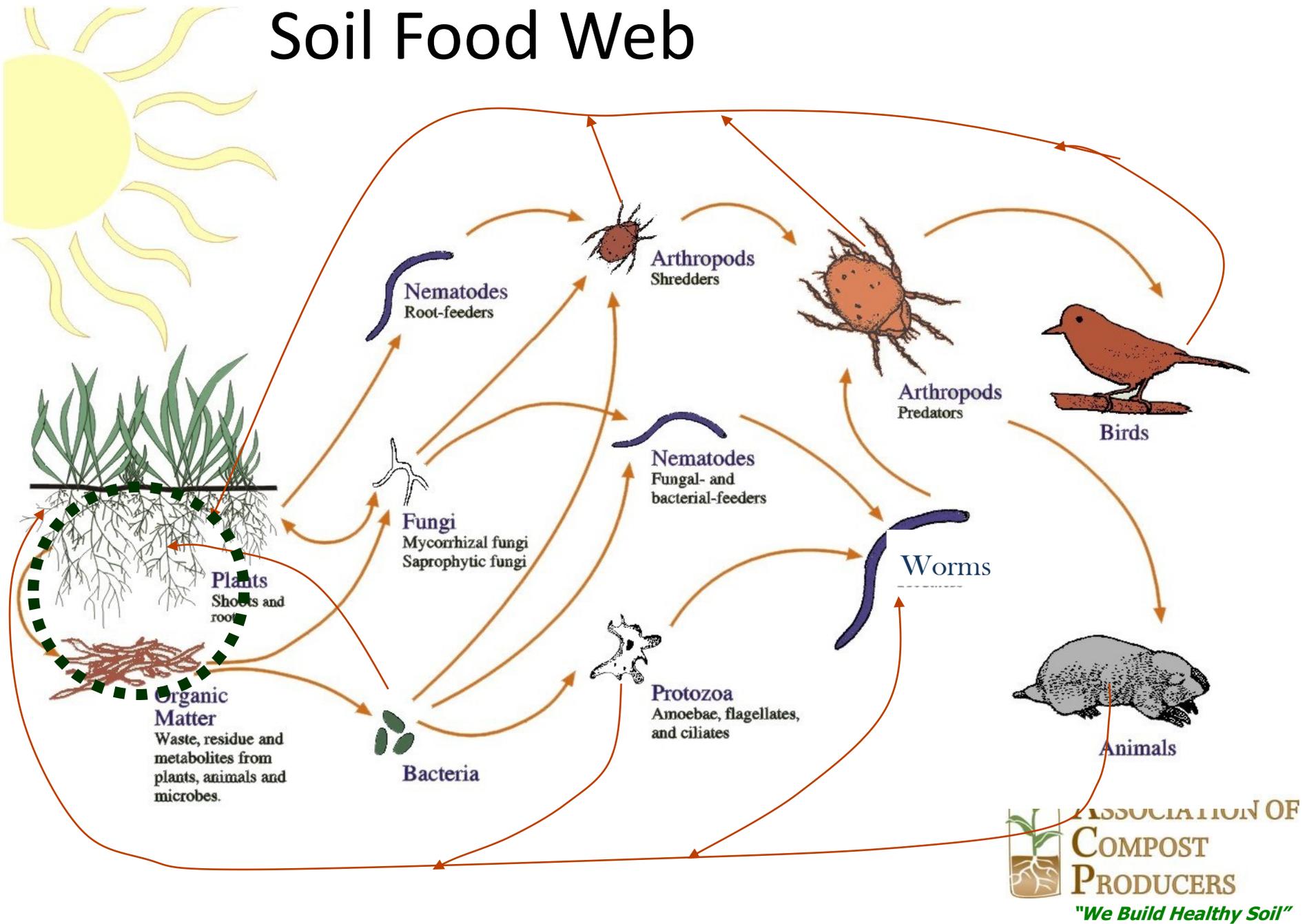
The previous slide presents an illustration of soil fauna components

- Plants – shoots and roots
- Organic matter – waste, residue and metabolites from plants, animals and microbes.
- Fungi – Mycorrhizal and Saprophytic fungi
- Bacteria
- Protozoa – amoebae, flagellates, and ciliates
- Nematodes – root feeders
- Arthropods – shredders
- Nematodes – fungal and bacterial feeders
- Nematodes – predators
- Arthropods – predators
- Birds
- Animals

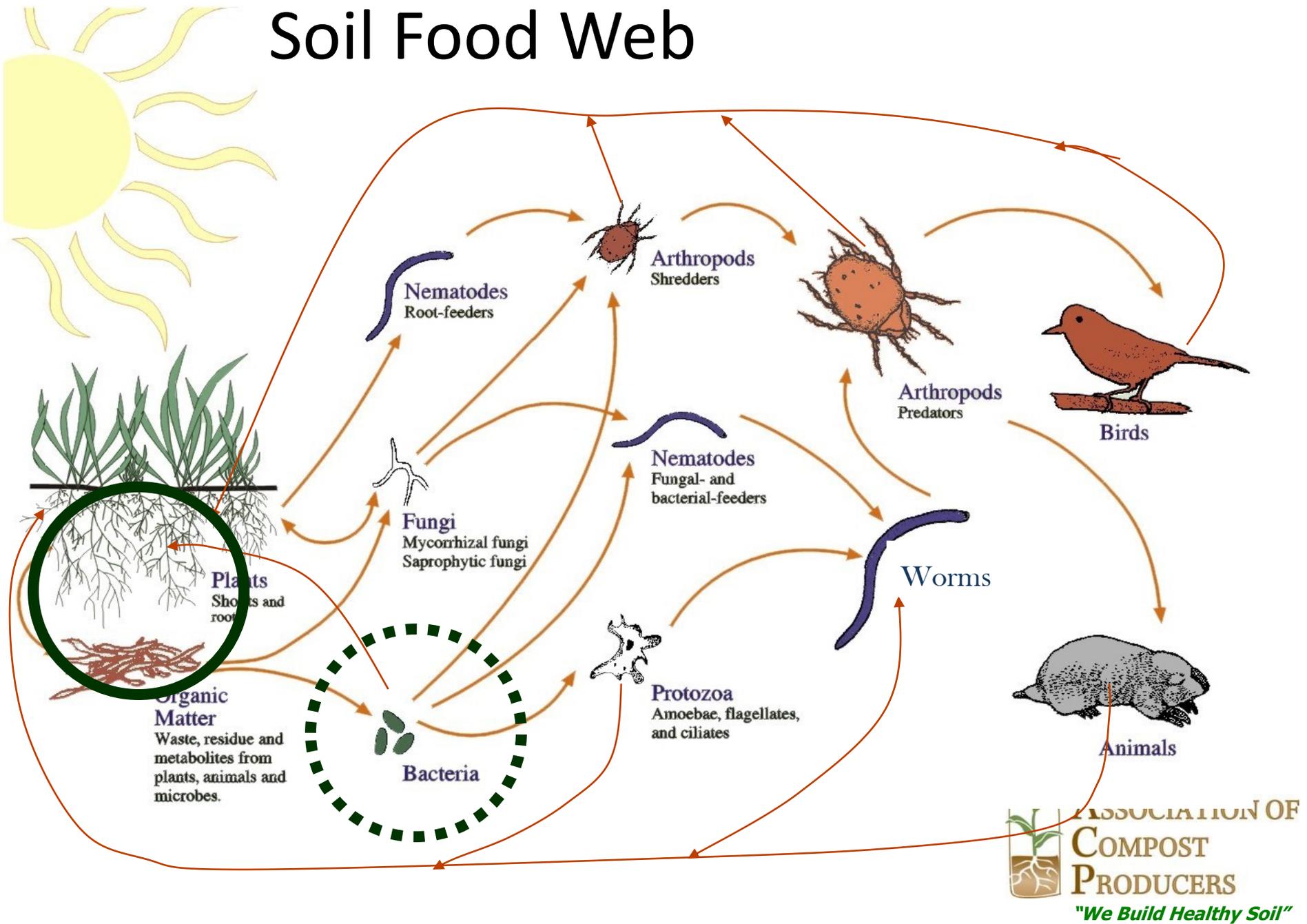
Illustration – Ingham, 2000



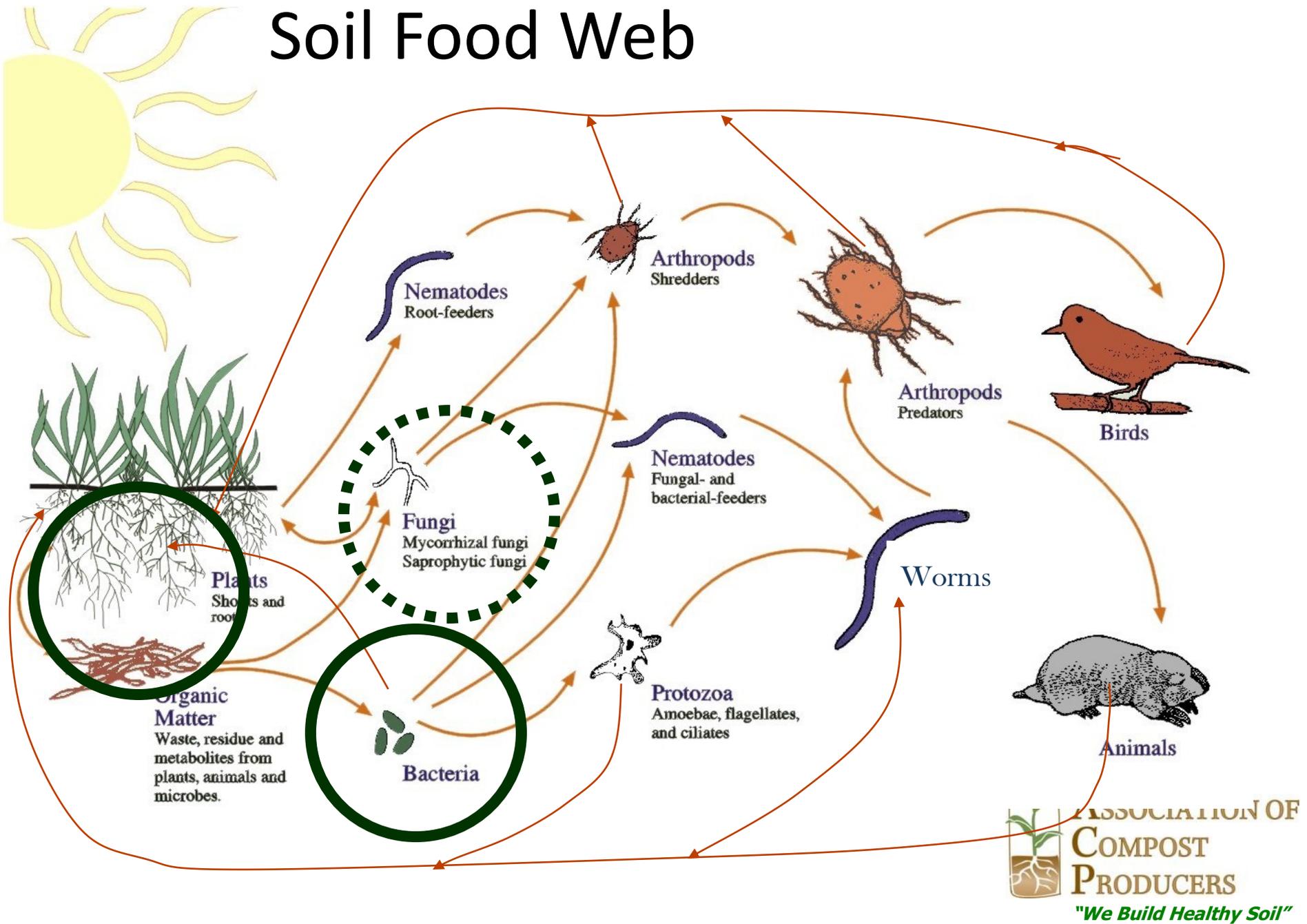
Soil Food Web



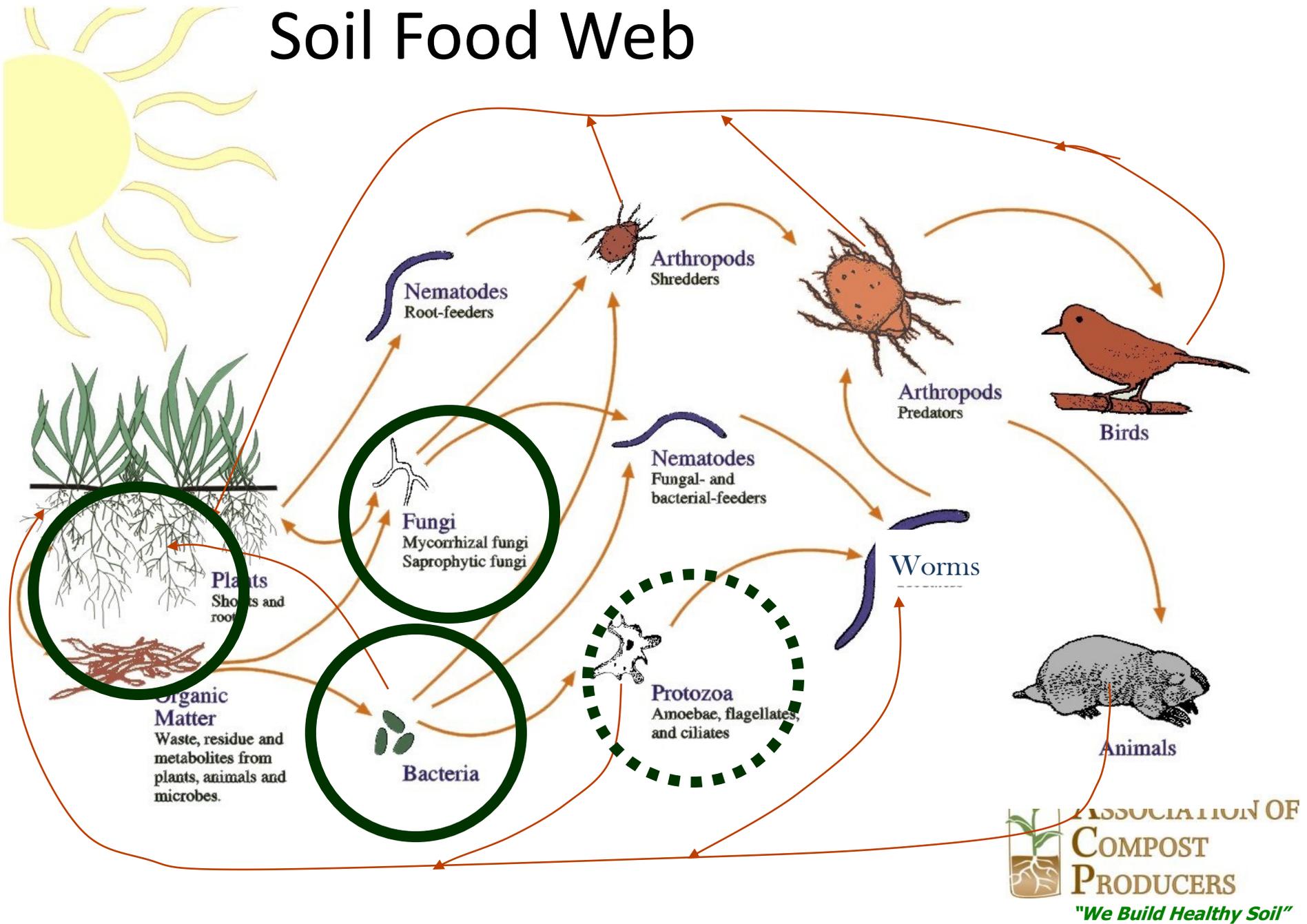
Soil Food Web



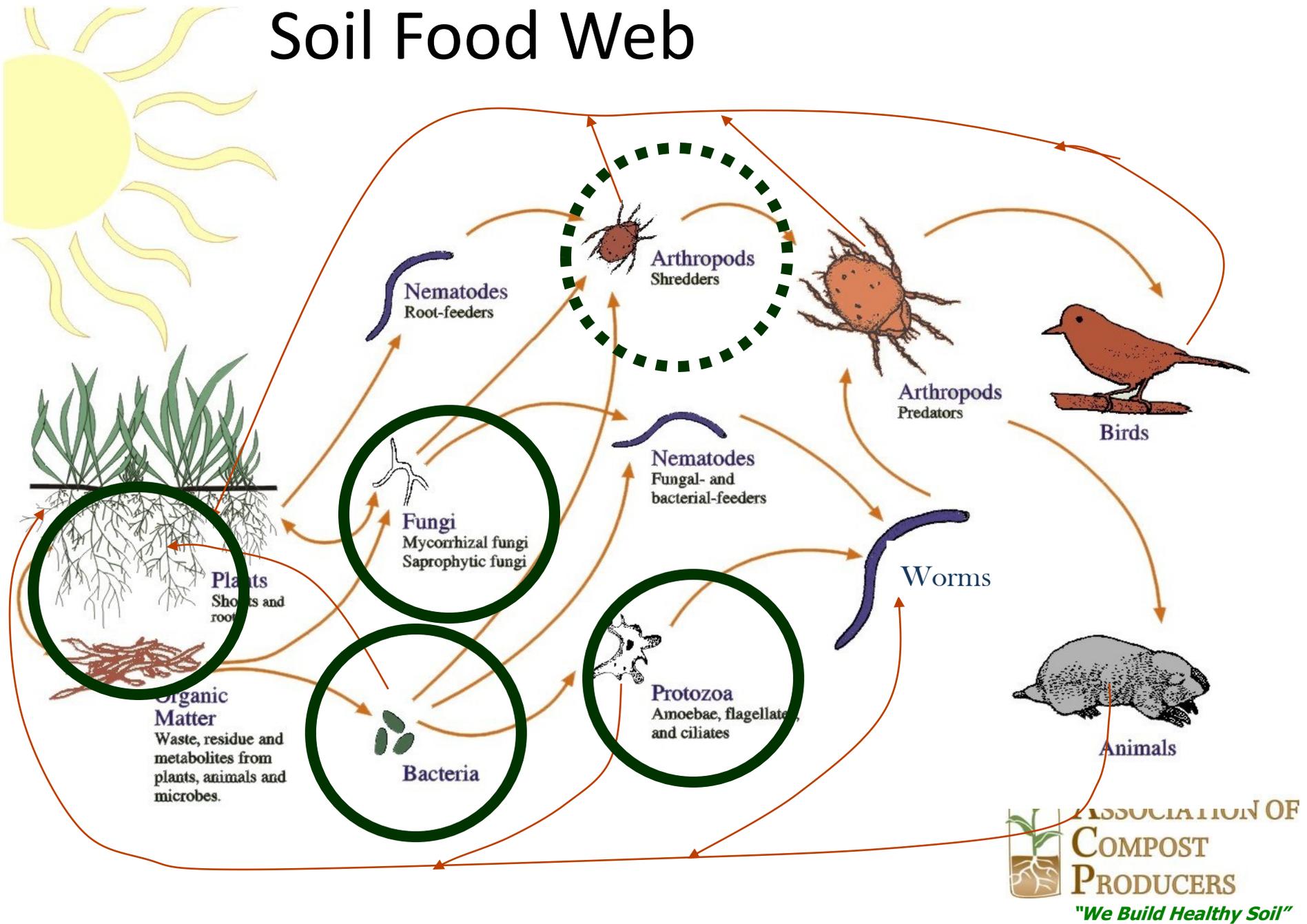
Soil Food Web



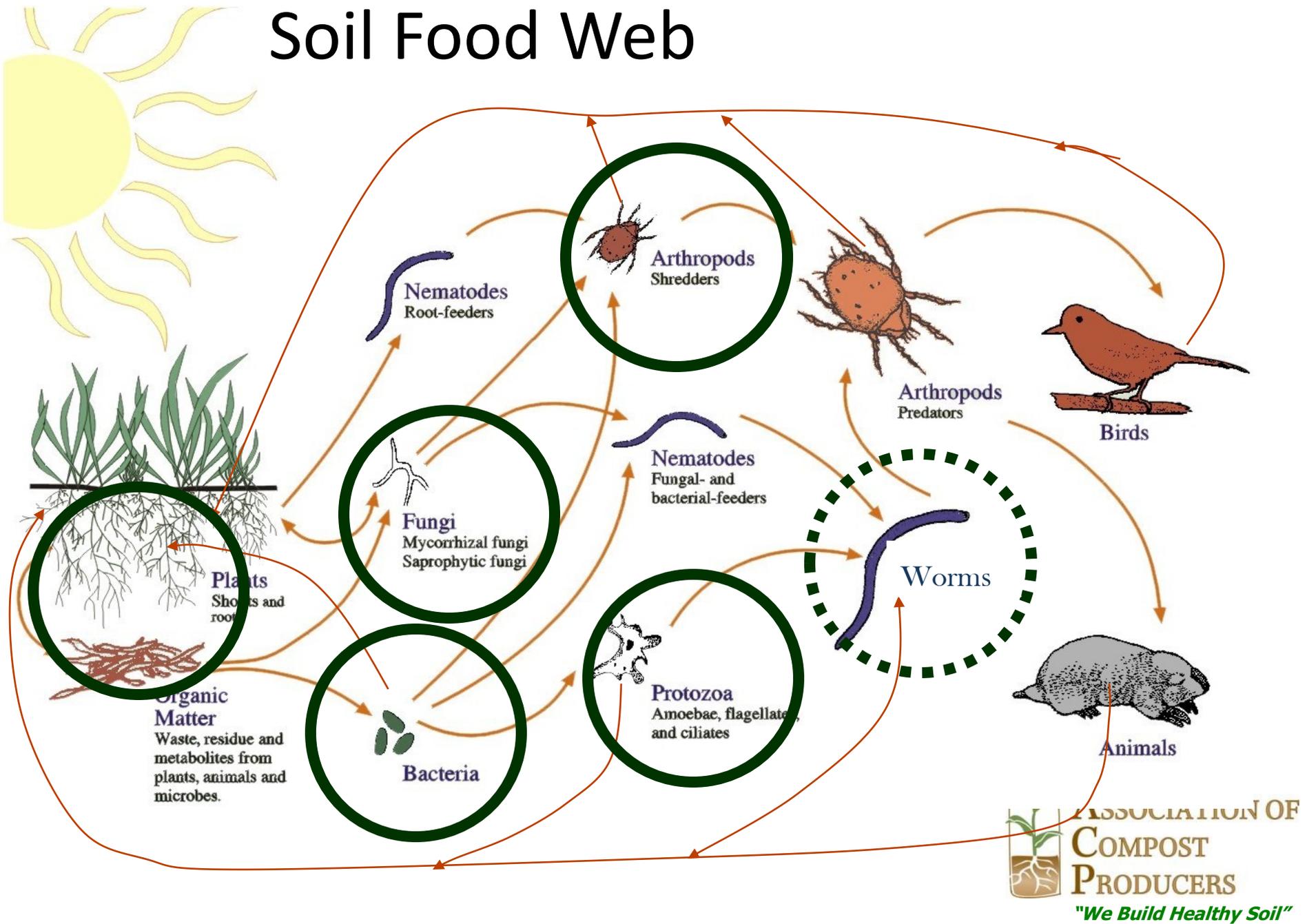
Soil Food Web



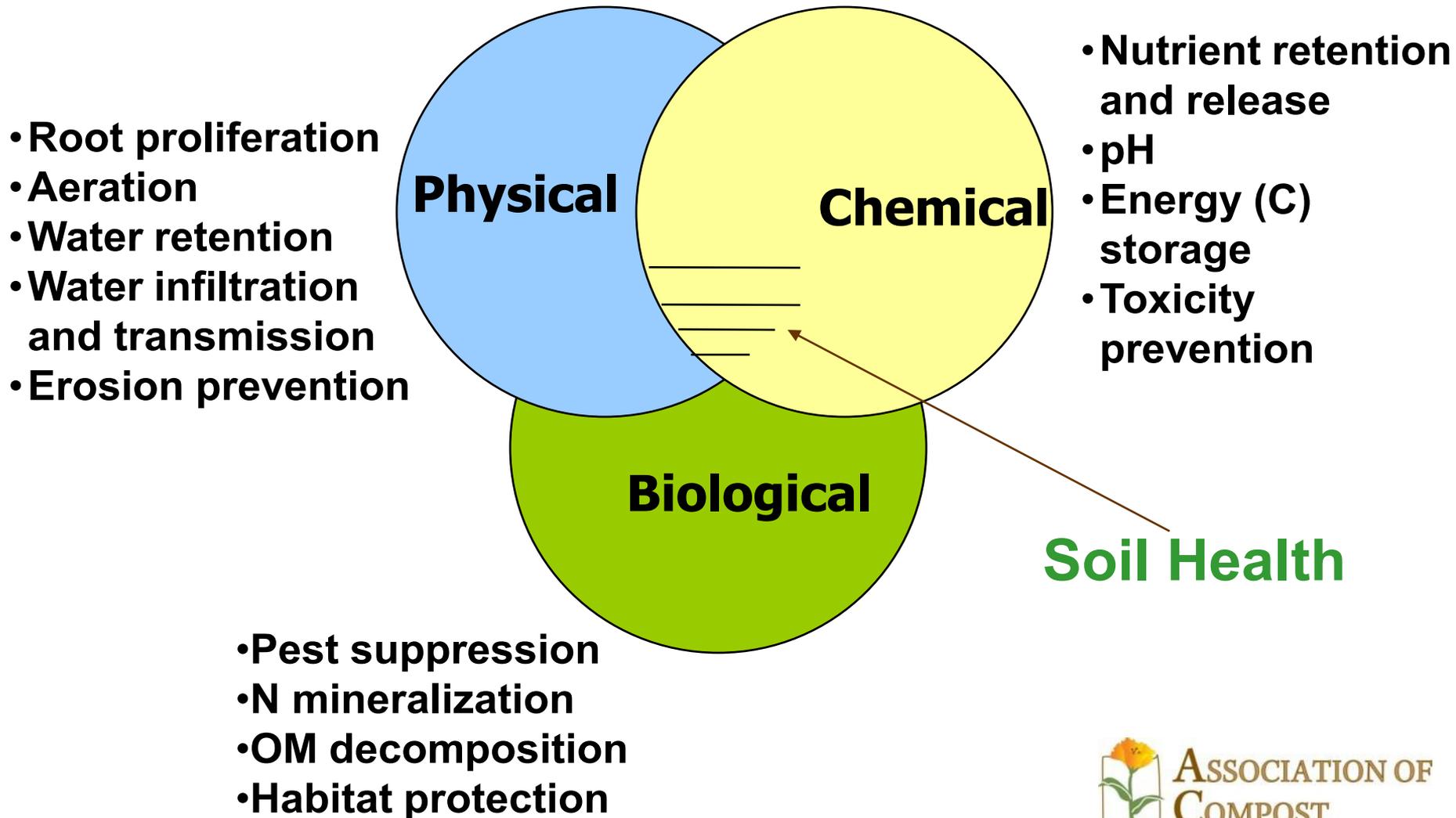
Soil Food Web



Soil Food Web



Soil Health



TESTING:

USCC Seal of Testing Assurance Program

Why Test Compost?

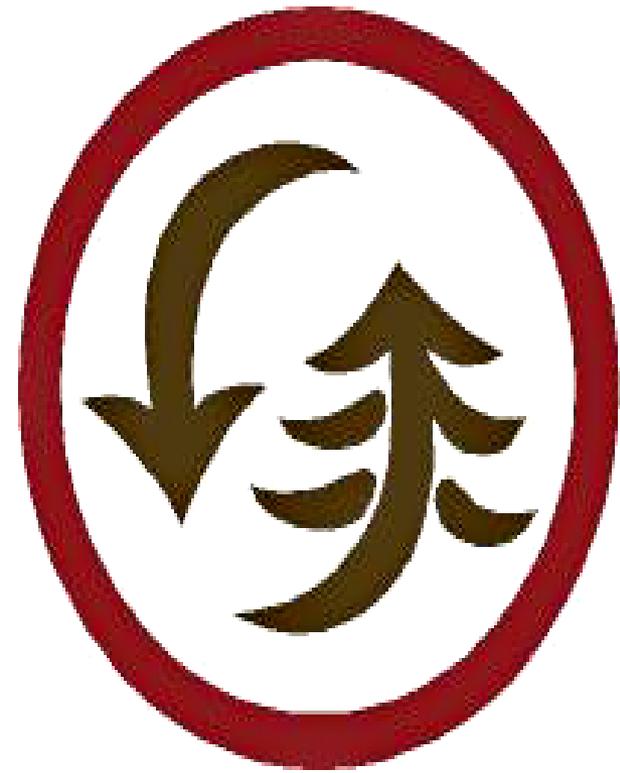


It looks good, smells OK ... *but
what's in it?*



N OF

Soil"



**US COMPOSTING
COUNCIL**

*Seal of Testing
Assurance*

If it isn't STA Compost..... What is it?

(see entire program explained at:
<http://www.compostingcouncil.org/programs/sta>)



STA Program Elements

STA (Seal of Testing Assurance) method is developed, implemented and updated regularly by the US Composting Council (<http://www.compostingcouncil.org/programs/sta>).

The STA system is composed of three interdependent elements or programs of:

- **Seal of Testing Assurance (STA)** – Assures that your compost has been testing using established and agreed upon compost testing methods, and provides a detailed test report of the parameters
- **Test Methods for the Evaluation of Compost and Composting (TMECC)** – which provide detailed protocols for the composting industry to verify the physical, chemical, and biological condition of composting feedstocks, material in process and compost products at the point of sale.
- **Compost Analysis Proficiency (CAP) program** – a laboratory quality assurance program which is conducted as tri-annual exchanges of three [3] compost materials, each submitted in blind triplicate ($3 \times 3 \times 3 = 27$) for each of two testing tiers. Tier I. Inorganic; and Tier II. Inorganic plus Biological.



California STA Labs

<http://www.compostingcouncil.org/programs/sta/labs.php>

<p>A&L Western Laboratories, Inc. 1311 Woodland Ave. Suite 1 Modesto, CA 95351</p>	<p>Robert Butterfield, Laboratory Director T 209.529.4080 Rbutterf@AL-Labs-West.com</p>
<p>Soil and Plant Laboratory, Inc. - <i>Operations temporarily suspended until further notice</i> 325 Matthews St. Santa Clara CA 95050</p>	<p>Jim West T 408.727.0467 F 408.727.5125</p>
<p>Soil Control Lab 42 Hangar Way Watsonville, CA 95076</p>	<p>Frank Shields T 831.724.5422 F 831.724.3188 frank@controllabs.com</p>





US COMPOSTING COUNCIL

Seal of Testing Assurance

Barnes – Regional Composting
3511 West Cleveland Ave.
Huron, OH 44839
Telephone: 800-421-8722
Fax: 419-433-3555

Sample Date: 8/14/02

COMPOST TECHNICAL DATA SHEET

Compost Parameters	Reported as (units of measure)	Test Results	Test Results
<i>Plant Nutrients:</i>	%, weight basis	% wet weight basis	% dry weight basis
Nitrogen	Total N (TN or TKN+NO ₃ -N)	.72	1.12
Phosphorus	P ₂ O ₅	.13	.21
Potassium	K ₂ O	.32	.50
Calcium	Ca	2.34	3.64
Magnesium	Mg	.57	.89
Moisture Content	%, wet weight basis	42	
Organic Matter Content	%, dry weight basis	31.31	
pH	unitless	7.4	
Soluble Salts <i>(electrical conductivity)</i>	dS/m (mmhos/cm)	3.49	
Particle Size	screen size passing through	½"	
Stability Indicator <i>(respirometry)</i>	mg CO ₂ -C/g TS/day, AND	.14	
CO ₂ Evolution	mg CO ₂ -C/g OM/day	.5	
Maturity Indicator <i>(bioassay)</i>			
Percent Emergence, AND Relative Seedling Vigor	average % of control, AND	92	
	average % of control	86	
Select Pathogens	PASS/FAIL: per US EPA Class A standard, 40 CFR § 503.32(a)	Pass	
Trace Metals	PASS/FAIL: per US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3.	Pass	

Participants in the US Composting Council's Seal of Testing Assurance Program have shown the commitment to test their compost products on a prescribed basis and provide this data, along with compost end use instructions, as a means to better serve the needs of their compost customers.

Directions for Product Use:

New Lawns: Apply a 1-2" layer to soil and incorporate to a depth of 5-7", apply seed, then rake and water.

Flower Beds: Apply a 1-2" layer to soil and incorporate to a 6-8" depth. Condition soil this way every year to 2 years. Plant flowers and water.

Trees & Shrubs: Dig a hole 2/3 the depth of the root ball and at least twice as wide. Mix 1 part compost with 2 parts soil obtained from the planting hole. Place the tree or shrub in the planting hole and apply amended soil around the root ball. Firm soil occasionally and water.

Topsoil Manufacturing/Upgrading: Mix 1 part compost with 2 parts existing or purchased soil and blend uniformly.

Growing Mixes: Planter box or raised bed mixes can be produced by mixing 1 part compost to 1 part pine bark and 1 part soil, sand or expanded shale. Potting mixes should contain 1 part compost, 1 part peat moss or pine bark, and 1 part perlite, vermiculite, styrofoam, or other aggregate.

Mulching: Spread a 2-3" layer around trees, shrubs, and flowers. Always avoid placing mulches against plant trucks and stems.

Garden Beds (food crops): Apply a 1-2" layer to soil and till to a 6-8" depth. Reapply each year, or as per soil test recommendations.

NOTE: The USCC does not assess whether or not, or to what extent, these directions are sound, sufficient or otherwise appropriate. It is the participant's responsibility alone to ensure that they are.

Compost Ingredients:

Yard trimming, food by-products

This compost product has been sampled and tested as required by the Seal of Testing Assurance Program of the United States Composting Council (USCC), using certain methods from the "Test Methods for the Examination of Compost and Composting" manual. Test results are available upon request by calling Barnes Nursery at 800-421-8722. The USCC makes no warranties regarding this product or its contents, quality, or suitability for any particular use.

For additional information pertaining to compost use, the specific compost parameters tested for within the Seal of Testing Assurance Program, or the program in general, log on to the US Composting Council's TMECC web-site at <http://www.tmecc.org>.

STA Compost Producers in CA

To find an STA composter near you, go to:

<http://www.compostingcouncil.org/programs/sta/>:

(See handout for a list of 22 in California).

Some in SoCal:

- **Agromin**, Ventura, CA 93003
- **American Soil Amendment Products**, Simi Valley, CA 93065
- **Baker Canyon Green Recycling**, Silverado, CA 92676
- **Community Recycling & Resource Recovery, Inc.**, Lamont, CA 93241
- **Inland Empire Regional Composting Authority (IERCA)**, Rancho Cucamonga, CA 91739
- **Engel & Gray, Inc.**, Santa Maria, CA 93456-5020
- **Las Virgenes Municipal Water District**, Calabasas, CA 91302
- **Liberty Compost/San Joaquin Composting, Inc.**, Bakersfield, CA 93380
- **Synagro Composting Company of California, Inc.**, Bakersfield, CA

Some in NorCal:

- **BFI of Northern California**, Milpitas, CA 95035
- **CCL Organics LLC**, Benicia, CA 94510
- **Grover Environmental**, Modesto, CA 95356
- **City of Modesto**, Modesto, CA 95358
- **NAPA Recycling & Waste Services**, Napa, CA 94559
- **Recology - The Compost Store**, Dixon, CA 95620
- **Nortech Waste, LLC**, Roseville, CA 95747
- **Sun-Land Garden Products**, Watsonville, CA 95076
- **Vision Recycling**, Fremont, CA 94538
- **Z-Best Products**, Gilroy, CA 95020



"We Build Healthy Soil"

Compost Uses in Landscape

- Creates healthy, organic landscapes & gardens
 - ***Beautiful plants, delicious fresh food!***

“But, wait, there’s more!”

- Water Efficient Landscapes
- Functional Landscapes
 - Low Impact Development
 - Low Stormwater Runoff
 - Erosion Control
- Sustainable Landscapes
 - Low energy *and* water
 - Watershed Friendly
 - Wildlife friendly

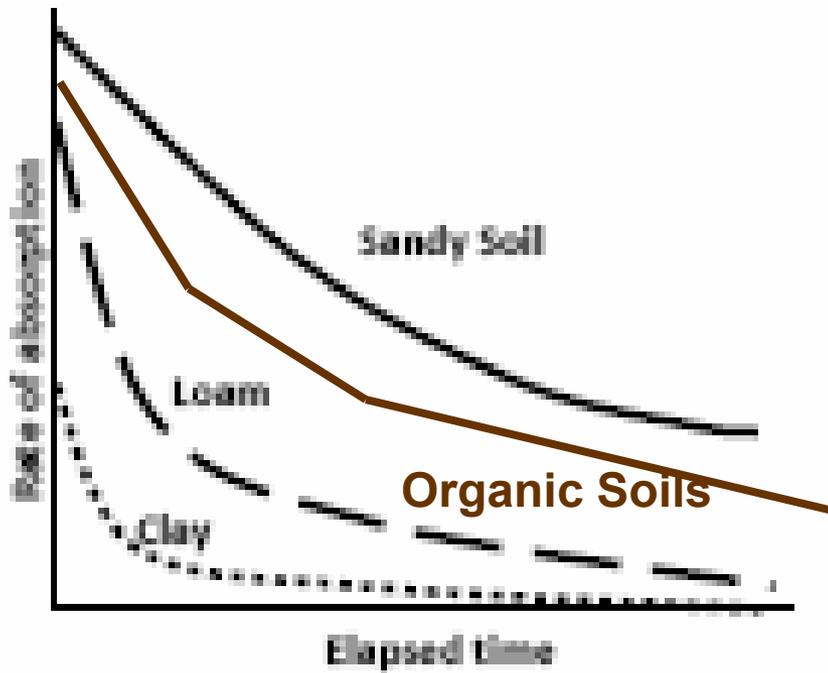


Water Efficient Landscapes

- Key to Water Efficient Soil with Organic Matter
 - Better Water Infiltration
 - Enhanced Water Holding Capacity
- Results
 - The water content of compost amended soils is consistently 40% higher than “Naked Soil.”
 - Water conserved can be 15-75%, depending on starting conditions!



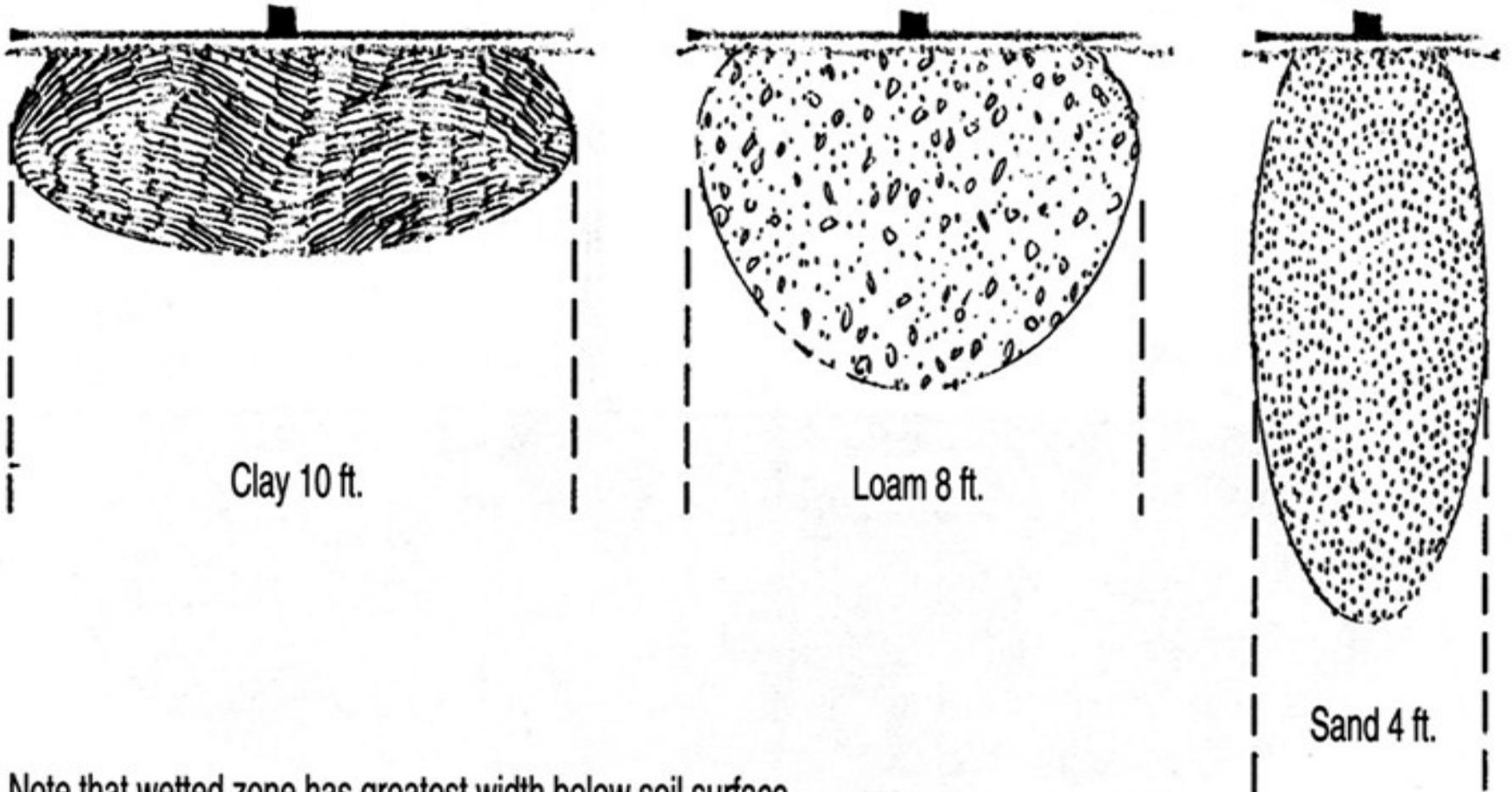
Water Infiltration of Clay, Loam, Sandy Soil vs. Soil with Organic Matter



Infiltration Rate of Different Soil Types

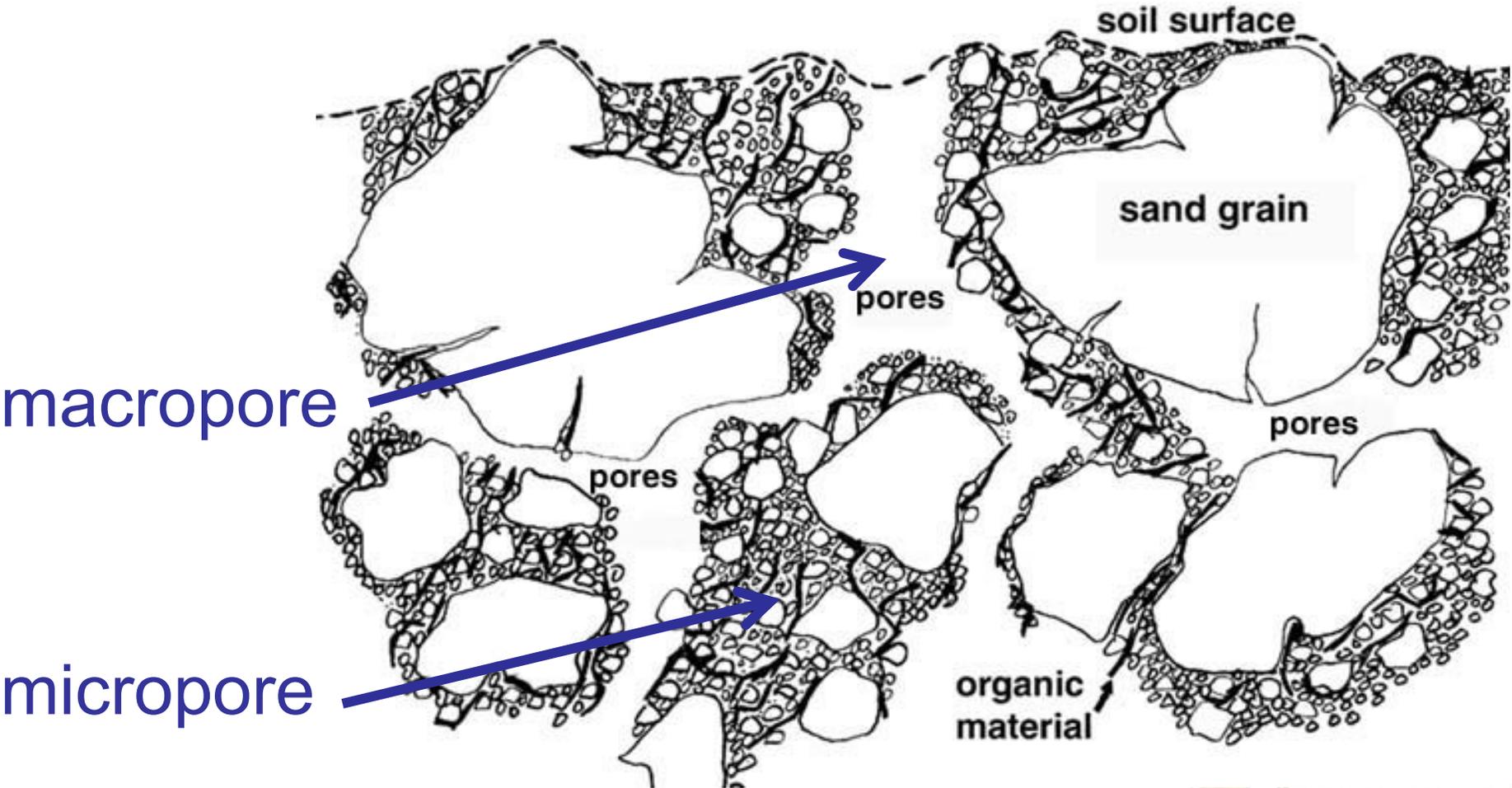
- Organic matter plays a unique role in creating “super loam” from either clay or sand
- However, organic matter (with compost) creates a “living soil” loam, not a “dead dirt” loam
- THIS IS CRITICALLY IMPORTANT!!!

Emitter



Note that wetted zone has greatest width below soil surface.

Infiltration and Holding – Pore Size



Water Holding Capacity of Organic Matter in various soil types

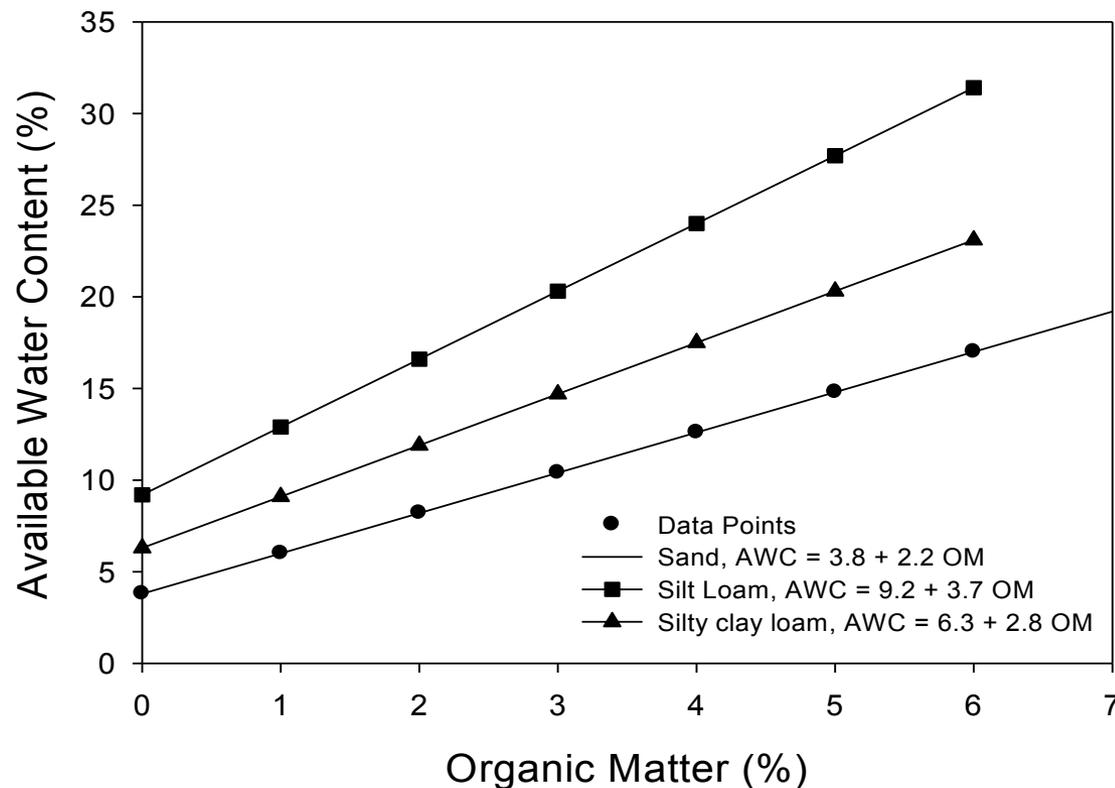
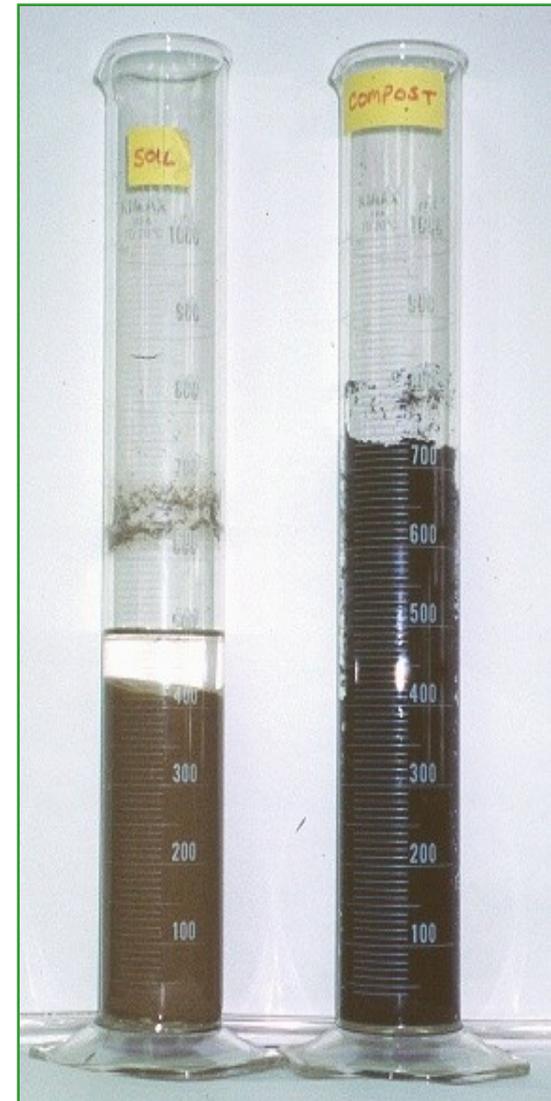
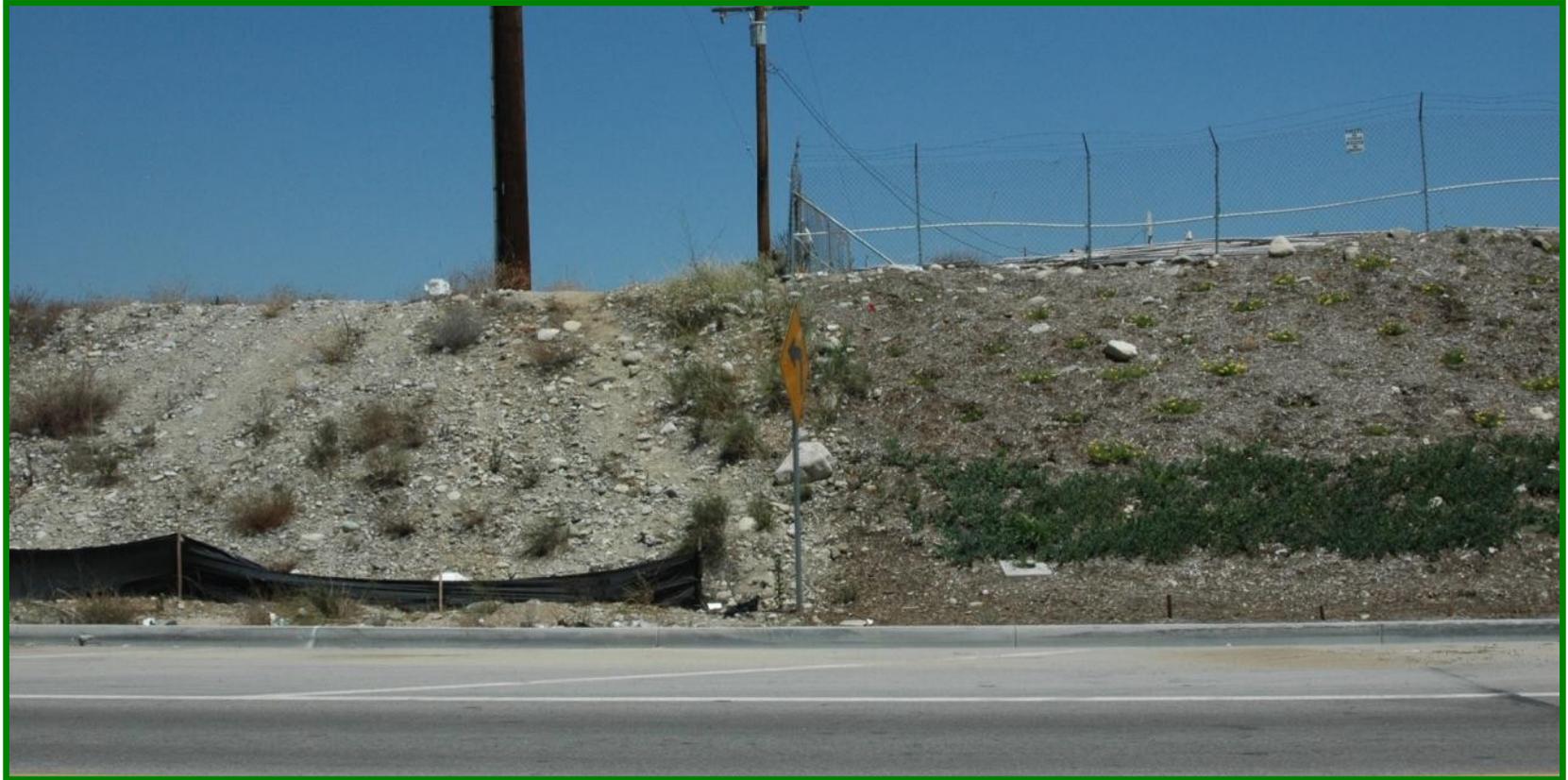


Figure 3. Available soil water content in a sand, silt loam, and silty clay loam soils relative to organic matter content. (Adapted from Hudson, 1994).



- The previous slide shows a chart of Organic Matter (%) vs. Available Water Content (%) for Sand, Silty Clay Loam and Silt Loam
 - All soils show an approximately parallel increase in available water content with increasing organic matter
 - Silt loam has the greatest available water content and sand has the least for all levels of organic matter.
- The second picture shows two beakers; one holding water from soil and one from compost
 - The soil beaker is holding approximately 400 ml and the compost beaker is holding approximately 750 ml, showing that compost improves water holding capacity.

Low Impact Development & Low Stormwater Runoff





Erosion Control - 'Prevention'

VS

Sediment Control – 'Treatment'



Filter Media = Sediment Control



Designed for Optimum
Filtration & Hydraulic-flow

Growing Media = Erosion Control



Designed for Optimum
Water Absorption &
Plant Growth

Blowing on Compost with Blower Truck



EC/Slope Stabilization

Compost Erosion Control Blanket



Designed to:

- 1) Dissipate energy of rain impact;
- 2) Hold, infiltrate & evaporate water;
- 3) Slow down/disperse energy of sheet flow;
- 4) Provide for optimum vegetation growth

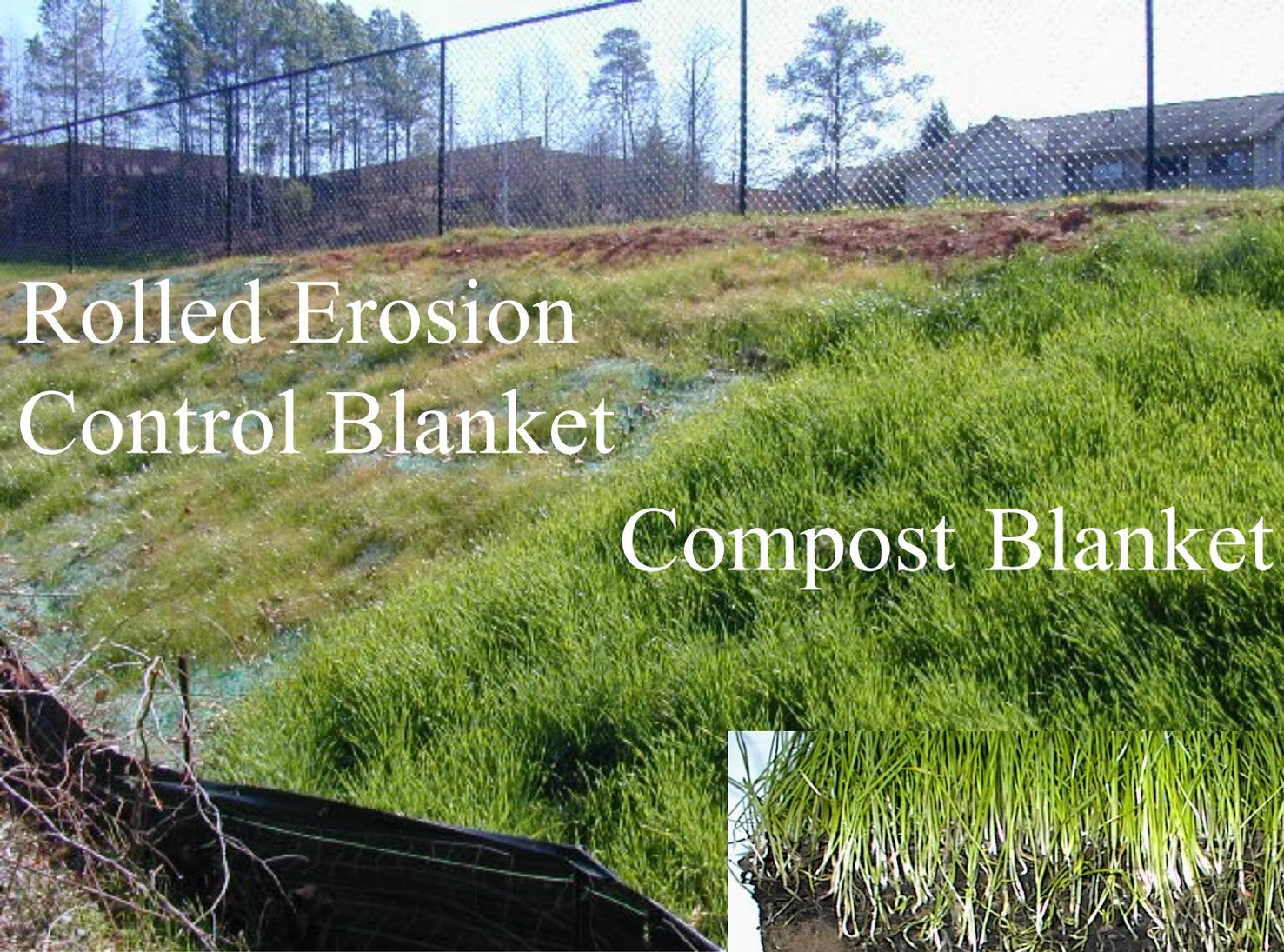
Compost EC BMP Examples

EcoBlanket® –
Hydroseeding



EcoBerm® – Silt Fence
Alternative





Rolled Erosion Control Blanket

Compost Blanket

CECBs Fill Low Points in Soil Surface





Main Street Materials – 1:1 slope, 4" compost
Project near Lompoc

Filling Socks w/ Blower Truck



Compost EC BMP Examples

Siltsoxx™ – Silt Fence
Alternative



Inletsoxx™ – Inlet and
Culvert Protection



Compost EC BMP Examples

Ditch Chexx™ – Straw Bale Alternative

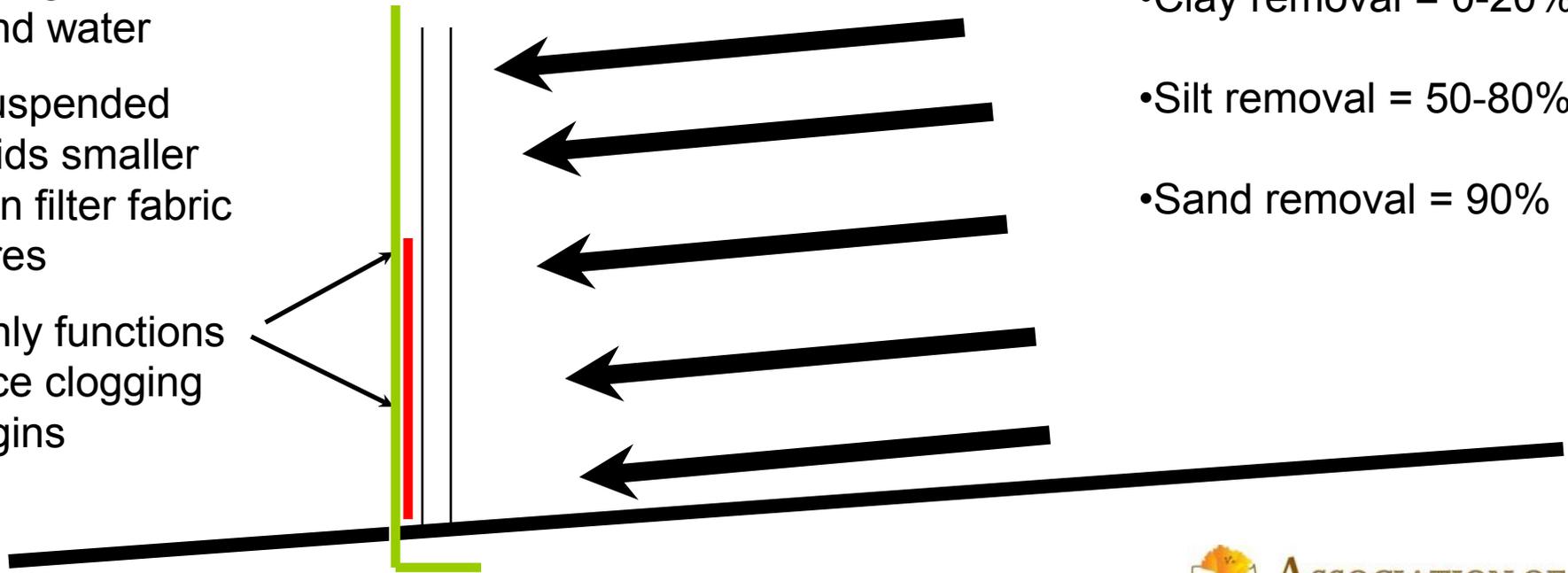


Living Wall™ – Block Wall and Cellular



Silt Fence Is a Single Membrane and Functions as Mini *Sediment Detention Pond*

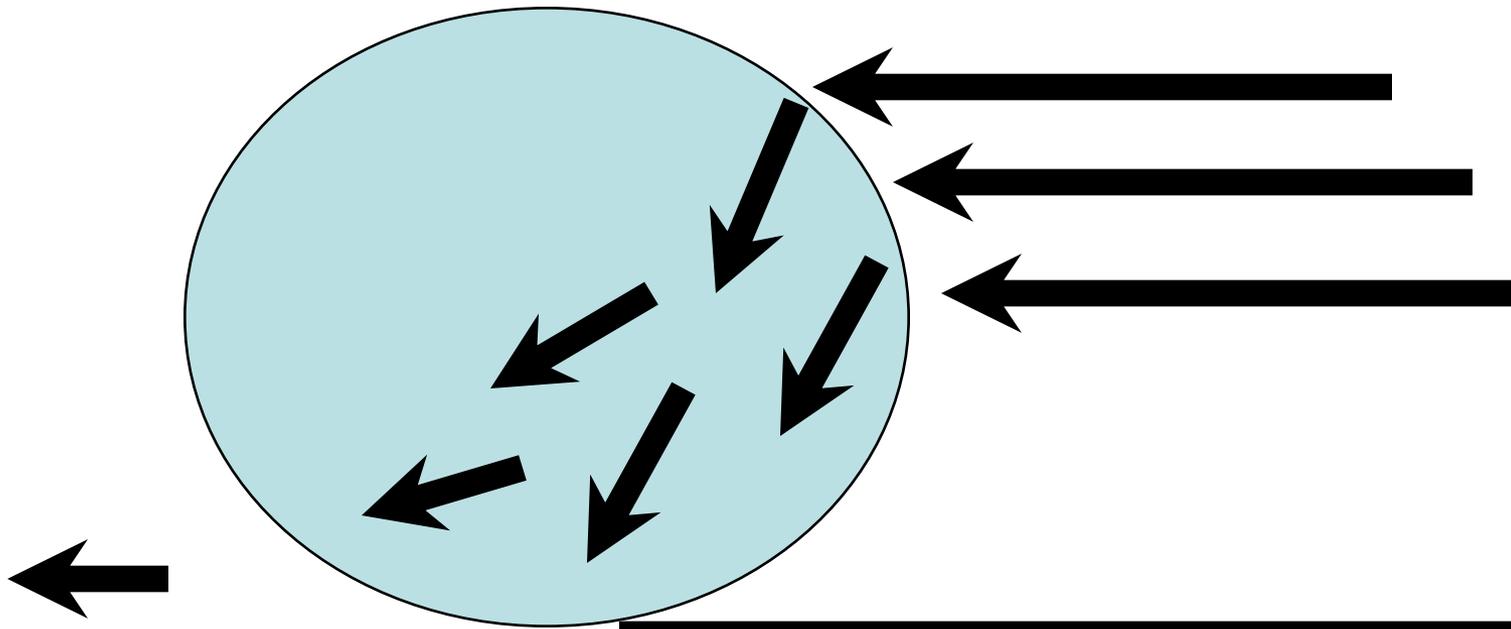
- Designed to pond water
- Suspended solids smaller than filter fabric pores
- Only functions once clogging begins



US EPA/NPDES

- Clay removal = 0-20%
- Silt removal = 50-80%
- Sand removal = 90%

Filter Socks Act as a 3 Dimensional *Filter*



- Designed to flow water faster
- Mix of particle sizes (SPECS!) = micro & macro pores
- Humus = adsorption of soluble pollutants (+ charged)

Filtrex Products 2004

Sustainable Landscapes

- Natural, Organic, Recycled Inputs
 - Dead Dirt to Living Soil
 - Landscape maintenance
- Lower labor, energy *and* water ... costs!
- Watershed Friendly
- Wildlife Friendly



Rain gardens



Source: SOCCRA

Turf Topdressing

- Turf Maintenance
- Partial Renovation



- Aerate turf area
- Apply 1/4-1/2" layer of compost
- Rake into core holes





Seeding





Topdressings

- **Example**

- **Topdressing (sand-based)**

- 1/4" application rate = 33 CY/A
 - \$30.00 ton (del'd) = \$1,020.00

- **Compost**

- 1/4" application rate = 33 CY/A
 - \$15.00 CY (del'd) = \$502.50/A



That's over \$500 cost saving for the topdressing alone!

Economic Comparison

COSTS

(Per 1,000SF)

Sand-Based Topdressing

Compost Topdressing

	Sand-Based Topdressing	Compost Topdressing
Topdressing	\$23.42	\$11.54
Fertilizer	\$5.61	\$0
Fungicide	\$6.07	\$0
TOTAL COST	\$35.09	\$11.54



ASSOCIATION OF
COMPOST
PRODUCERS

"We Build Healthy Soil"

Compost Benefits

The benefits of healthy soil, made with compost, include:

- **Compost Helps Turn Marginal Soil into Healthy Soil**
- **Healthy Soil Delivers Water Purity and Abundance**
- **Healthy Soil Delivers Beautiful & Productive Plants**
- **Compost Controls Pests and Weeds**
- **Healthy Soil Makes Cleaner Groundwater Basins**
- **Composted Organics Saves Landfill Space**



ASSOCIATION OF
COMPOST
PRODUCERS

"We Build Healthy Soil"

Take Home Messages

- We're all on a Journey toward a Sustainable/Green Economy!
- ACP a California collaborative to build compost markets (collaboration!)
- Healthy Soils are the Foundation of creating a healthy planet
 - Compost helps build healthy, living soils, for healthy plants
 - Less fertilizer, less disease & pesticides, less water & cleaner water
- Test Compost, and soils, to use properly (knowledge, standards!)
- Landscapes with Compost:
 - Reduce Water
 - Lower Environmental Impact
 - Build Sustainable Landscapes
- Continue to update yourself ongoing on our journey together!
 - **Consider Joining Us in ACP!**



Questions?
Comments?
Discussion...

Association of Compost Producers

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www.healthysoil.org

