Soil is a Sponge

with

cultivating soil solutions

Team Water Smart
because every drop counts
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!
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
Can we manipulate soil texture to increase water retention?

Think Soil STRUCTURE...
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

**Organic Test Plot Sample**
7” Root Growth

**Advantages of Deeper Root Growth:**
- Improved Moisture Retention
- Less Irrigation Required
Re-create and support Soil Food Web
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!
How we can affect it:

- Create/support
- Feed
- Water
Compost

- More than nutrients for plants
- Source of microbes!
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
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.soil-net.com

Source: www.permaculture.org.au
Provide Food to SFW

Mulch ➔ Multi-purpose

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

Goldilocks Principle

SATISFACTION

HIGH

LOW

TOO COLD  |  JUST RIGHT  |  TOO HOT
“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

<table>
<thead>
<tr>
<th>% Organic Matter</th>
<th>Water Holding Capacity</th>
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</thead>
<tbody>
<tr>
<td>1% Organic Matter</td>
<td>~ 10,000 gallons/acre</td>
</tr>
<tr>
<td>6% Organic Matter</td>
<td>~ 60,000 gallons/acre</td>
</tr>
<tr>
<td>1“ Rain</td>
<td>~ 28,000 gallons/acre</td>
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</tbody>
</table>
Microbes + Food + Water

nutrients from om & each other

available to plants

plants take up

plant returns to soil
microbes + food + water

nutrients from om & each other

plants take up

plant returns to soil

available to plants

chemical fertilizers (salts) kills microbes
Is your soil’s “see-saw” out of balance?
EM adds beneficials

*Effective Microorganisms*
Some call it “extendo-root”!

*Mycorrhizal Fungi*
Healthy Soil & Water Quality

- Better Water Retention
- Keep Our Waterways Clean
- No Need for Chemical Pesticides
- Balanced Ecosystem with Thriving Plants
- No Pest or Weed Problems
- Less Erosion

Keep Our Waterways Clean → Balanced Ecosystem with Thriving Plants
Balanced Ecosystem with Thriving Plants → No Pest or Weed Problems
No Pest or Weed Problems → No Need for Chemical Pesticides
No Need for Chemical Pesticides → Keep Our Waterways Clean
Keep Our Waterways Clean → Better Water Retention
Better Water Retention → Healthy Soil Food Web
Healthy Soil Food Web → Balanced Ecosystem with Thriving Plants
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!