Plants in Their Environment

How the outside world affects plants

Things that Affect the Plant Environment

Soil

Beneficial and harmful insects
Beneficial and harmful bacteria
Carbon Dioxide a, Oxygen
Earthworms
Nutrients
Organic matter
pH
Pathogens
Structure and texture
Temperature
Water

Climate

Cloud cover
CO2 concentration
Humidity
Light
Nitrogen
Oxygen
Pollution
Precipitation
Temperature
Wind

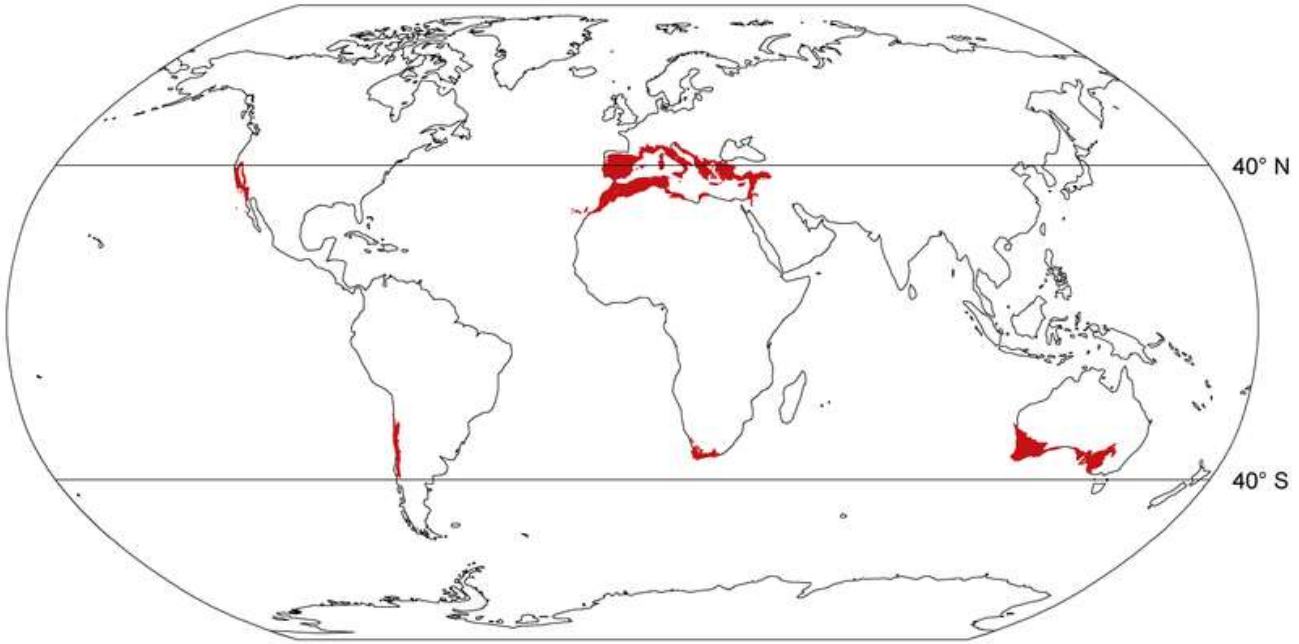
Climate

Climate is predicted from history

Climate vs. Weather

Mediterranean Climates

Regions with a Mediterranean climate



The 5 Mediterranean Climates

- Area surrounding the Mediterranean Sea
- South Africa
- Chile
- Australia
- Southern CA

What Mediterranean Climates have in Common?

- Similar distances from the Equator in both Northern and southern hemispheres
- Long, hot dry Summers and Cool moist short Winters
- Proximity to a large body of water (Oceans)

Variations within Climate Caused by Topography

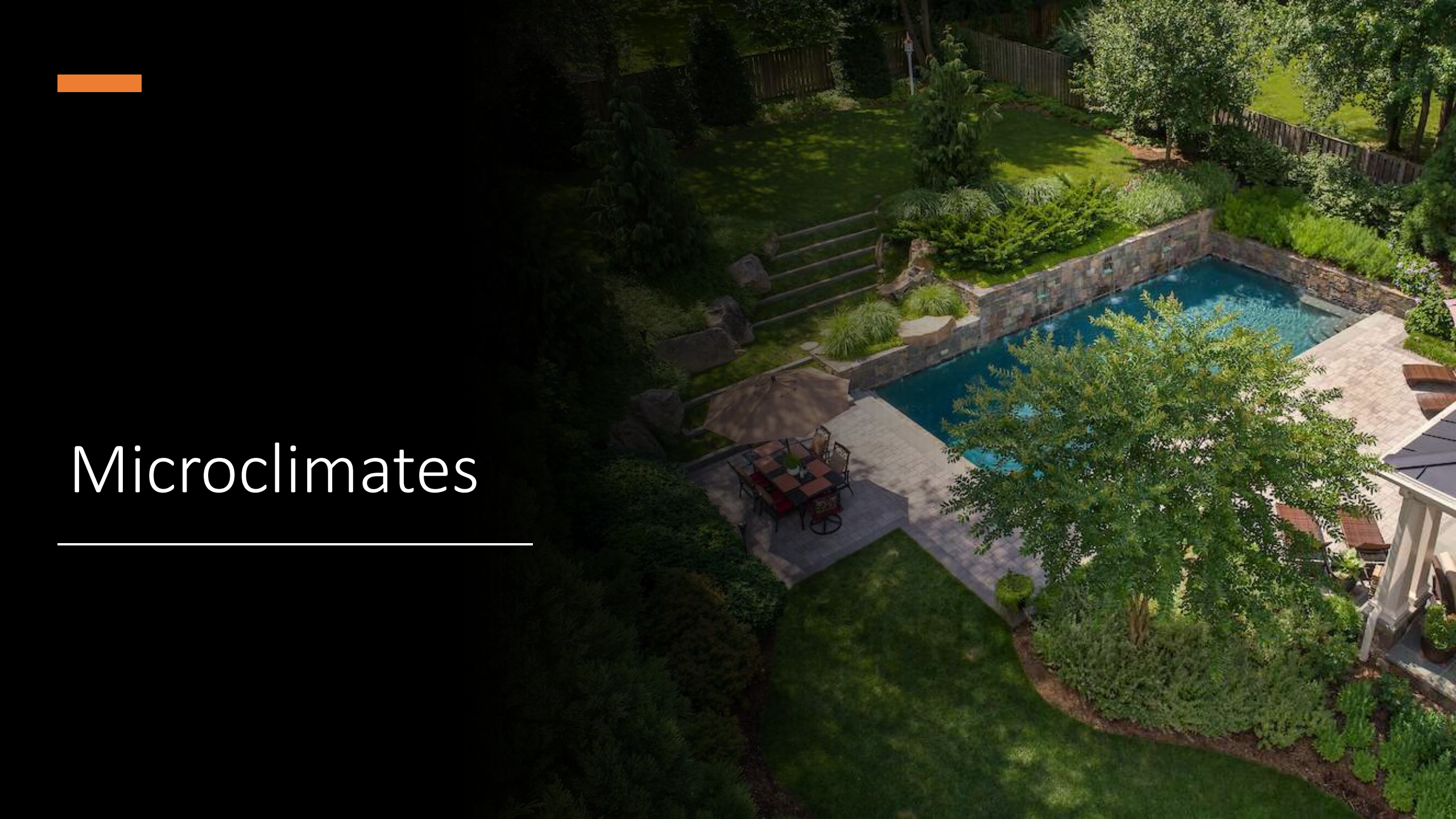
Sunset Western Garden Climate Zones

Straight line from the Coast Inland

California Friendly Landscaping

Using plants from different Mediterranean **climates** to save water as well as look attractive all year long

Microclimates



Things that create microclimates

- Shade caused by trees
- Shade caused by structures
- Topography/ Slopes
- Soil differences
- Prevailing winds
- Downspouts from rain gutters
- Sun exposure

Landscape Designers and Microclimates

- Draw an example in class

Microclimates inside your home

What you need to know

- The 5 Mediterranean climates
- What are the characteristics of a Mediterranean climate
- How does topography affect our local climate
- What is a microclimate, and can you give a couple examples?
- What is *California Friendly Landscaping?*

Things that affect plants
What will you Have to Know?

CLIMATE

WATER

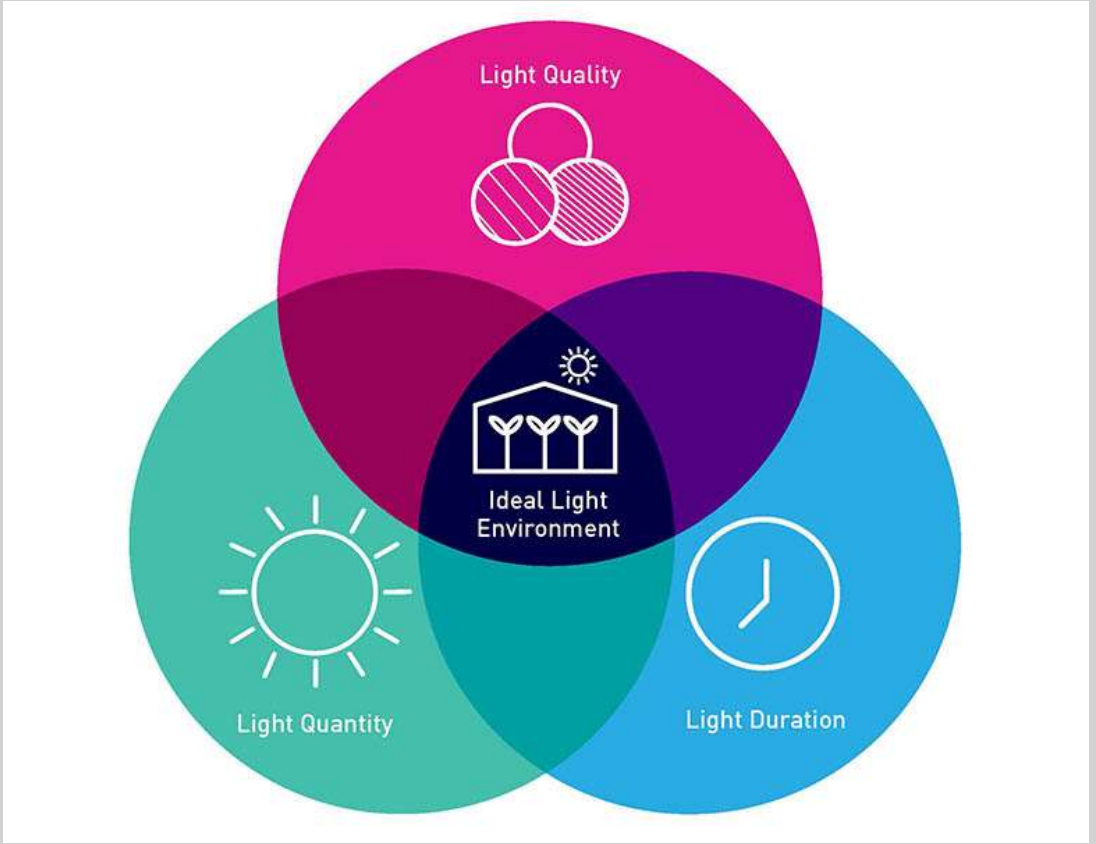
TEMPERATURE

LIGHT

SOIL

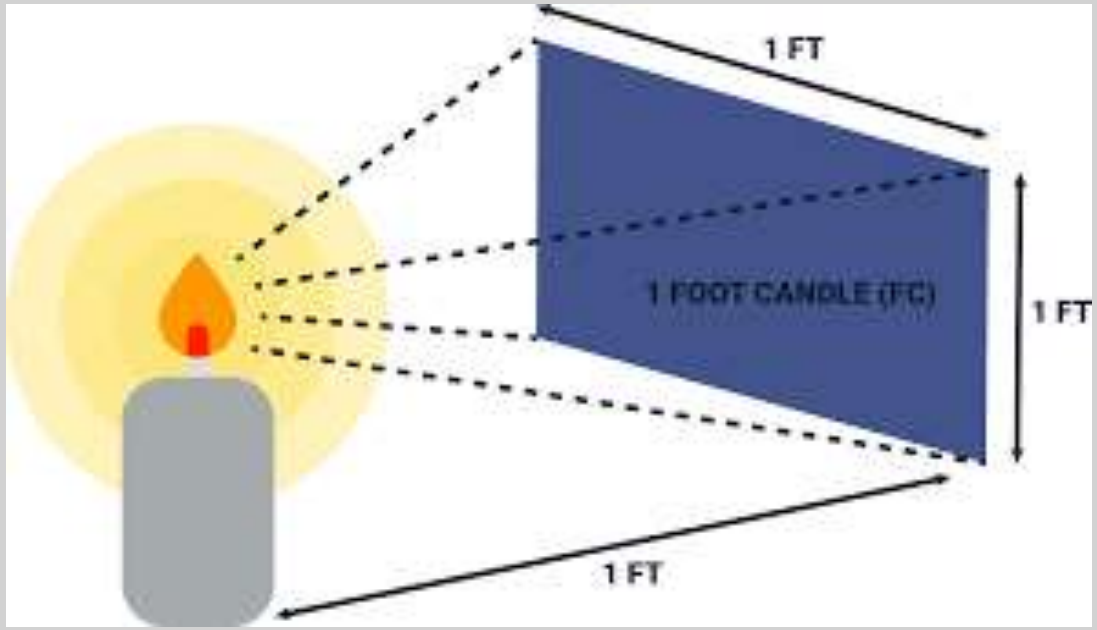
Light

- Duration
- Quantity / Intensity
- Quality



Quantity / Intensity - Foot candles

- Full sun = 10,000 ftc’s
- Shade plants = 1,500 ftc’s
- Indoor task lighting / desktops = 50 ftc’s



Duration

Sometimes duration can make up for intensity of light

Indoor plants in this office building survive because the lights are on up to 16 hours in a 24-hour day

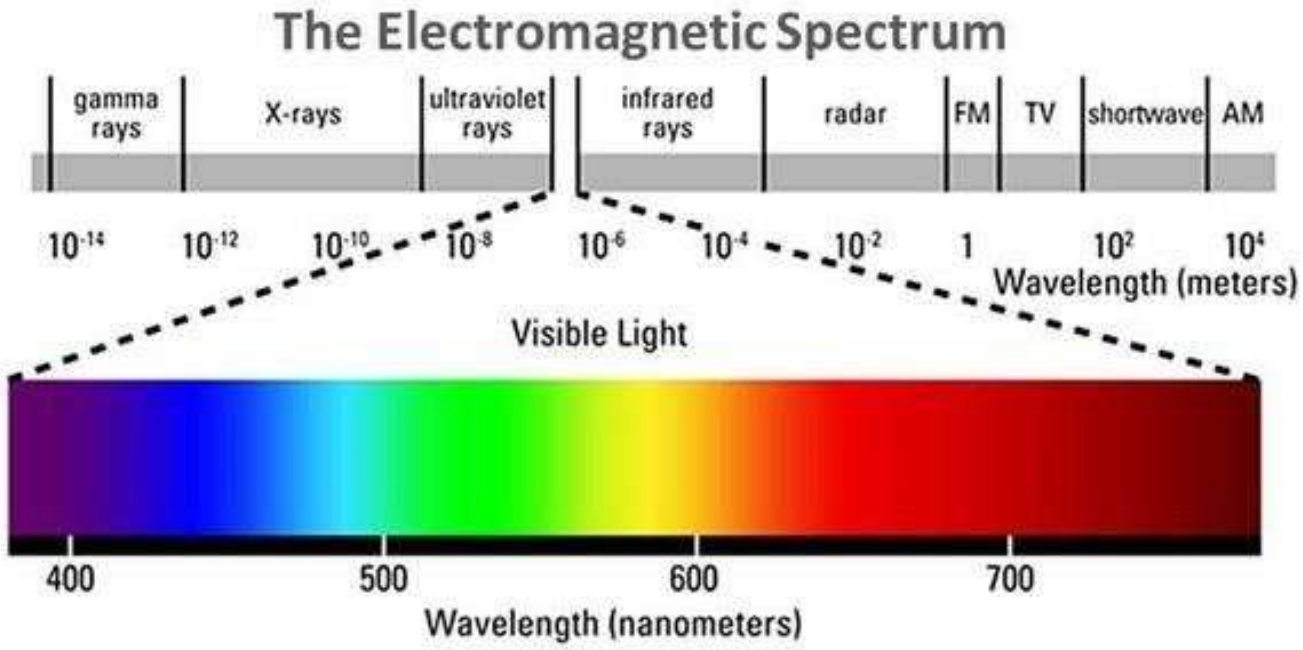
Duration and Photoperiodism

Some plants require hours of sunlight or darkness to initiate flowering. This is called photoperiodism

Poinsettias require a minimum 12 hours of uninterrupted darkness to initiate flowering

Light Quality

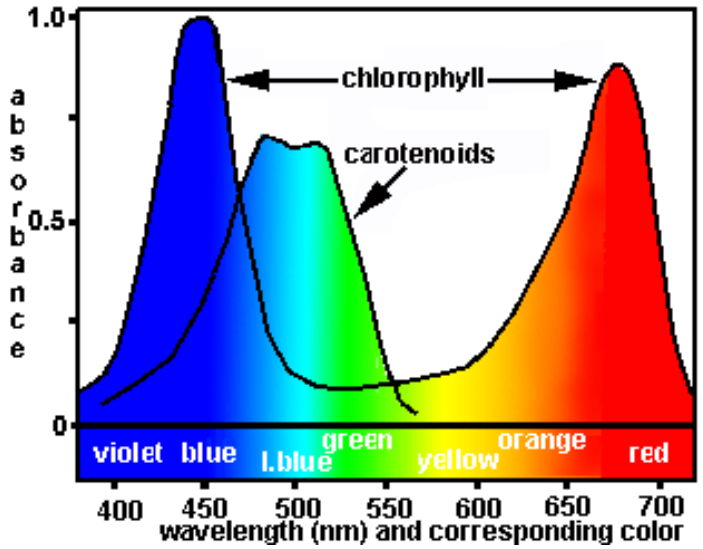
Plants use light from the visible spectrum for photosynthesis



Light Quality

- Light quality considerations are mostly for duplicating sunlight artificially for indoor growing conditions

- LED technology has made huge advancements in being able to provide the right balance of light for growing plants indoors.



Light adsorbed by plants for photosynthesis

What you need to know

- How we measure light (for this class)
- How much light is in Full sun?, shade plants, indoor living spaces
- How much light do we lose as we move in from a window?
- How light duration helps keep plants alive in indoor spaces
- What is photoperiodism and an example of plants that rely on this
- What spectrum of the electromagnetic spectrum do plants use for photosynthesis
- What technology is allowing us to grow better indoors

Temperature

The Sweet Spot (best temperature) for most plants

Between 75 and **86** degrees

Between 75-86 degrees

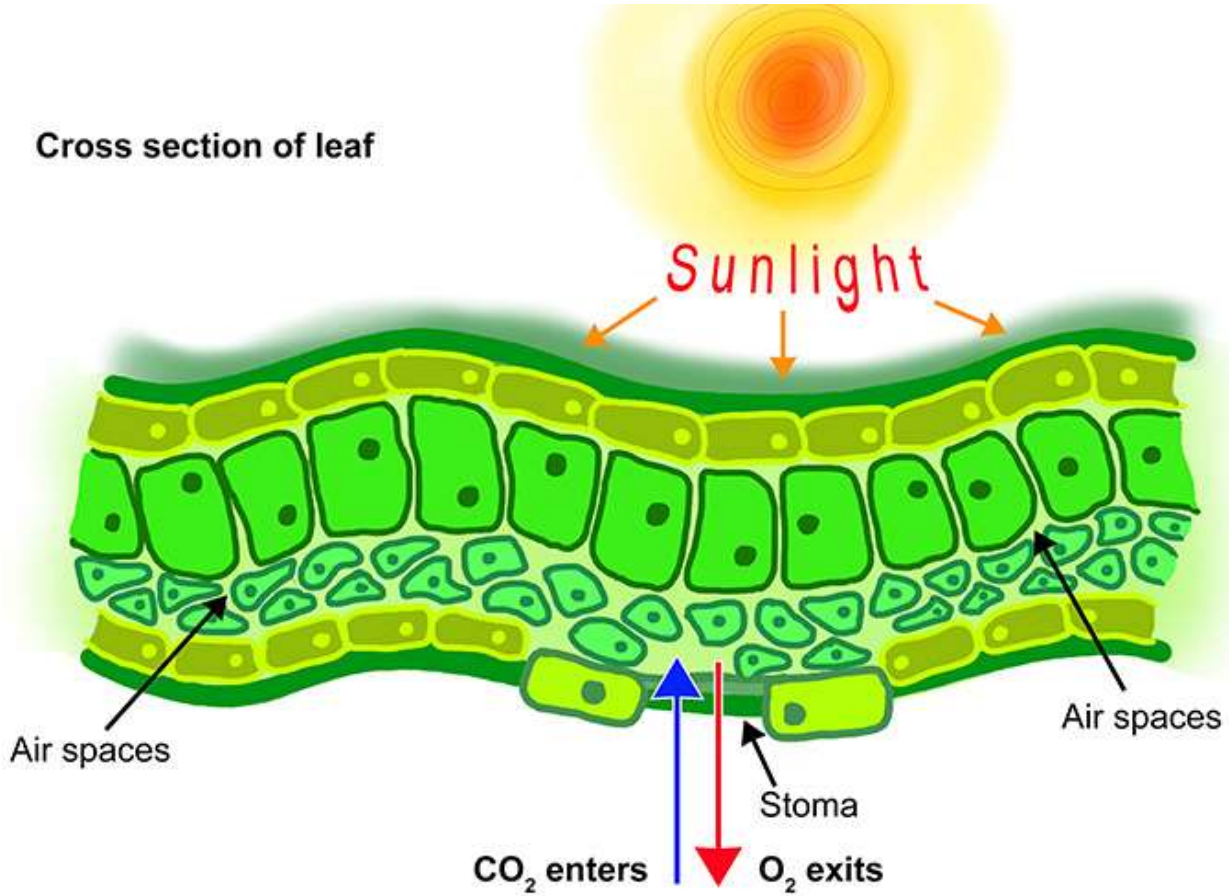
MAXIMUM PHOTOSYNTHESIS AND ROOT GROWTH

PLANT STILL ABLE TO TRANSPIRE TO KEEP ITSELF COOL

Air Movement

Exchanging gasses through the leaf

Photosynthesis



Photosynthesis and air movement

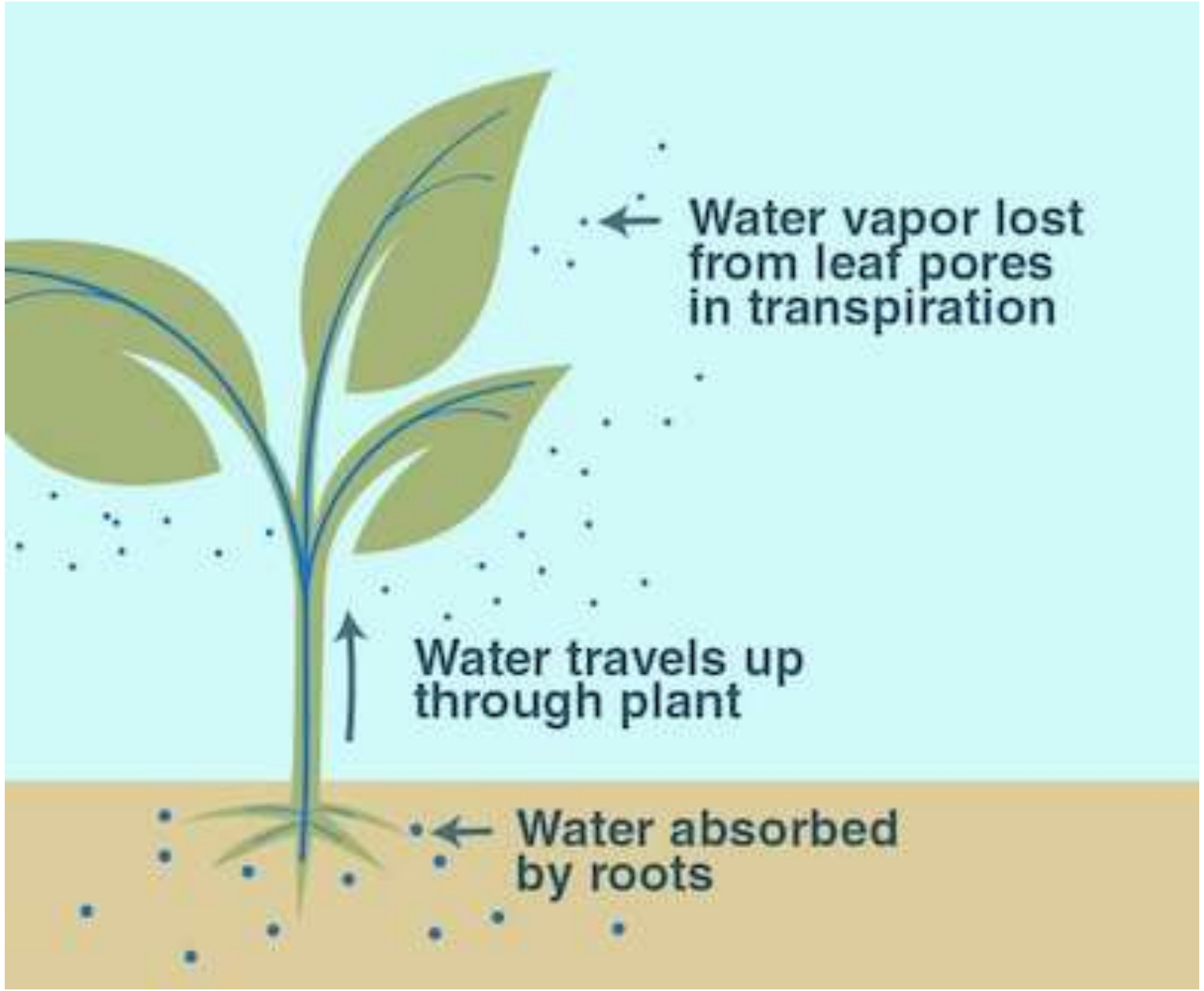
CO_2 is needed for photosynthesis and is taken in through the open stomata at the bottom of the leaf

Air has to flow into the stomata which works well with a little air movement.

Stagnant air means that CO_2 supply can be used up without air movement replenishing the supply

Exchanging Gasses through the stomata

Transpiration



High winds

- Remove water vapor from around leaves (from transpiration) which can severely dry out plants

- When winds get higher, they can even damage the plant's vascular system by severely shaking he stem

Take away message:

A little air flow = Good
A lot of airflow = Bad

What you need to know

- What is the best temperature for plant growth
- Why is a little air movement good and a lot of air movement bad?

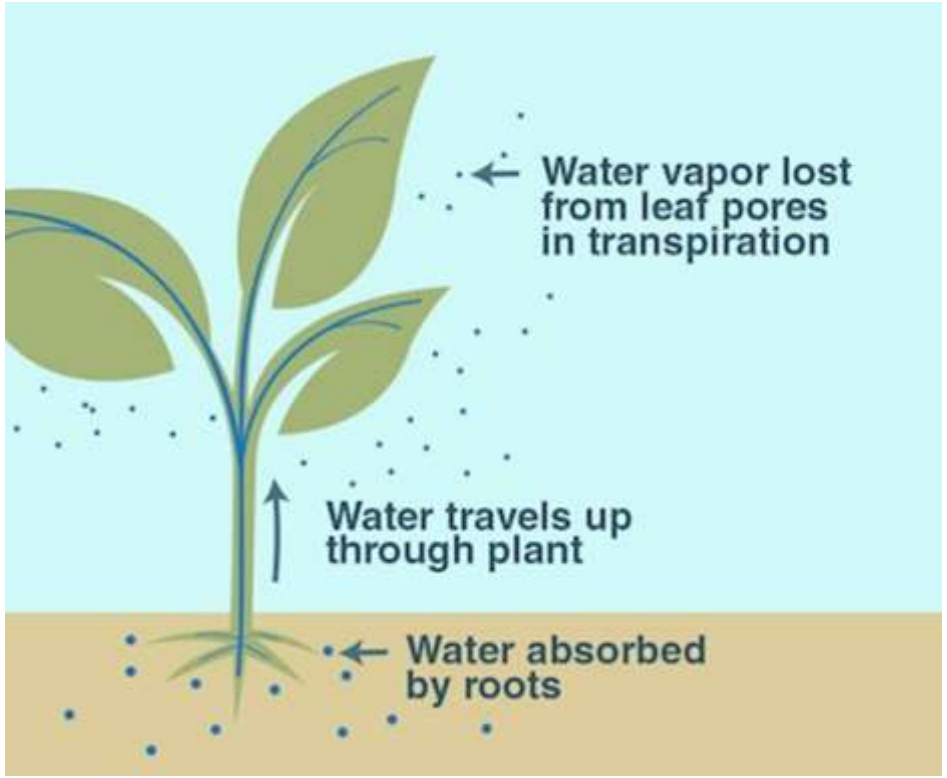

Water

Water is used in plants for

Photosynthesis

- $CO_2 = H_2O \longrightarrow C_6 H_{12} O_6$

Transpiration



What happens when Water is in short supply?

- **<u>3 Levels of water Depravation</u>**

- Water stress
- Temporary wilting point
- Permanent wilting point

Water Stress

Water stress is where water is not available for both systems (Photosynthesis and Transpiration) and Transpiration dominates the demand for water

Plants don’t really look different to the untrained eye, but if it is a plant you are familiar with you may notice a dulling in color or and leaf sheen

When using available water exclusively for transpiration and no more photosynthesis, growth stops

Temporary wilting point

- At the temporary wilting point the vacuoles inside the cells give up their water to the system and turgor pressure is lost
- The plant wilts

- At this point there are things you can do to reverse the temporary wilting point
  1. Water the plant (Obvious)
  2. Shelter plant from wind
  3. Shade plant
  4. increase humidity around the plant

Permanent Wilting Point

- At the permanent wilting point the vacuoles have given up much of their water and water must come from other parts of the plant
- Water is removed from the columns of the vascular xylem stopping the siphon action of those tubes by introducing air bubbles
- At this point even if the plant was now watered the siphon action of the vascular columns will not work and the plant dies

What you need to know

- What 2 processes do plants use water for?
- Which one of the 2 uses the most water
- When a plant is in the temporary wilting point, besides watering the plant, what 3 other things could you do to help reverse that condition?

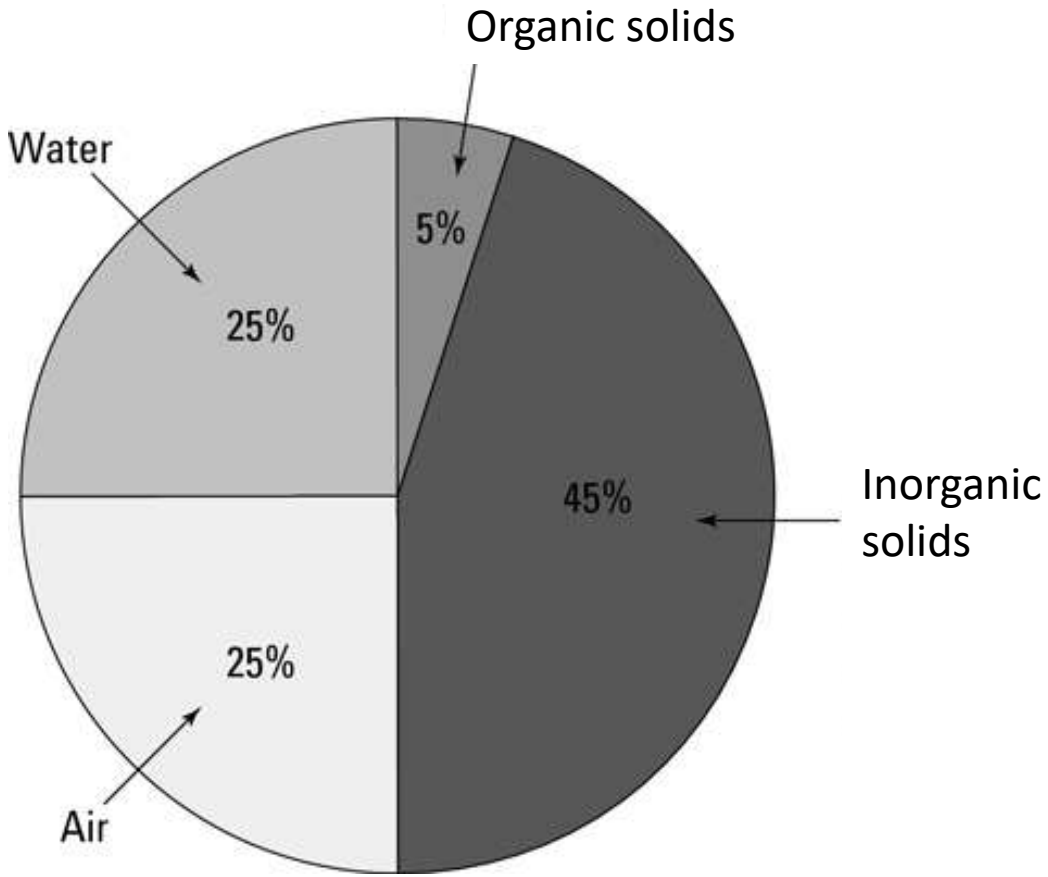
Soils

½ the story of plants, often overlooked

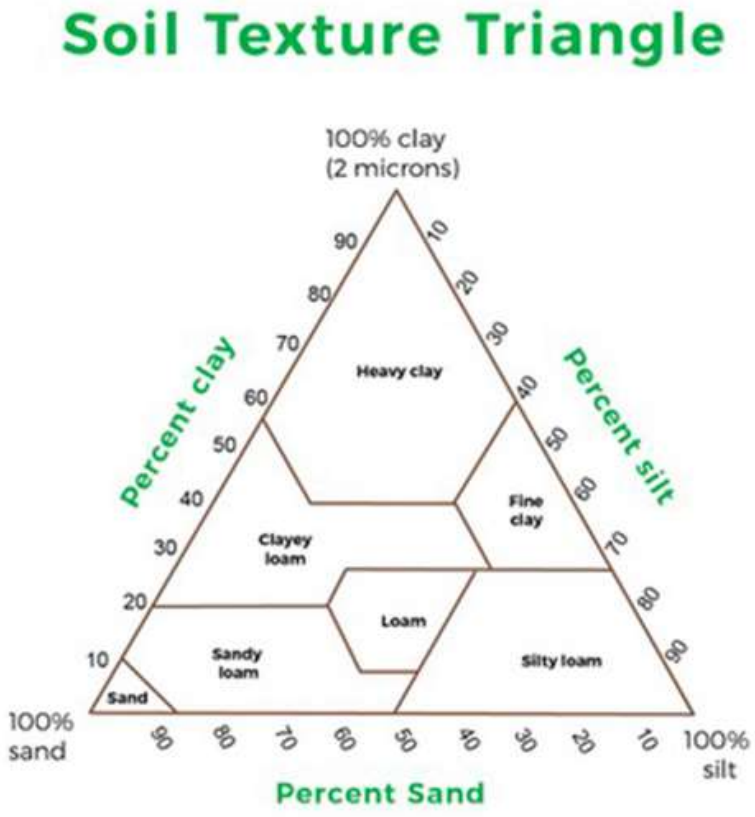
The components of an ideal soil

- Inorganic solids
- Organic solids
- Air
- Water

Components of an ideal soil for plant growth

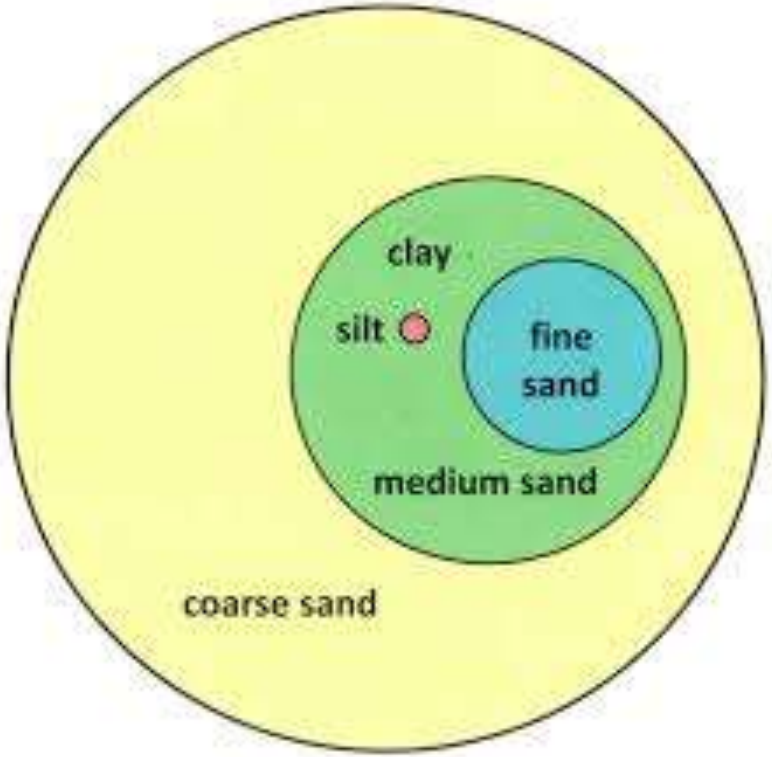


Soil Texture



Soil texture is the relative percentages of the t basic soil particles, sand silt and clay

The differences in particle size



Soil Texture

Soil texture is what you have on the site

It will always be that texture unless you haul it all away and bring in something different

Each if the 3 soil texture types have their own characteristics

Sandy soils

Fast draining

Usually low in nutrients

Require frequent watering since they dry our quickly

Lots of air spaces

Easy to dig , feels gritty to the touch

Silty soils

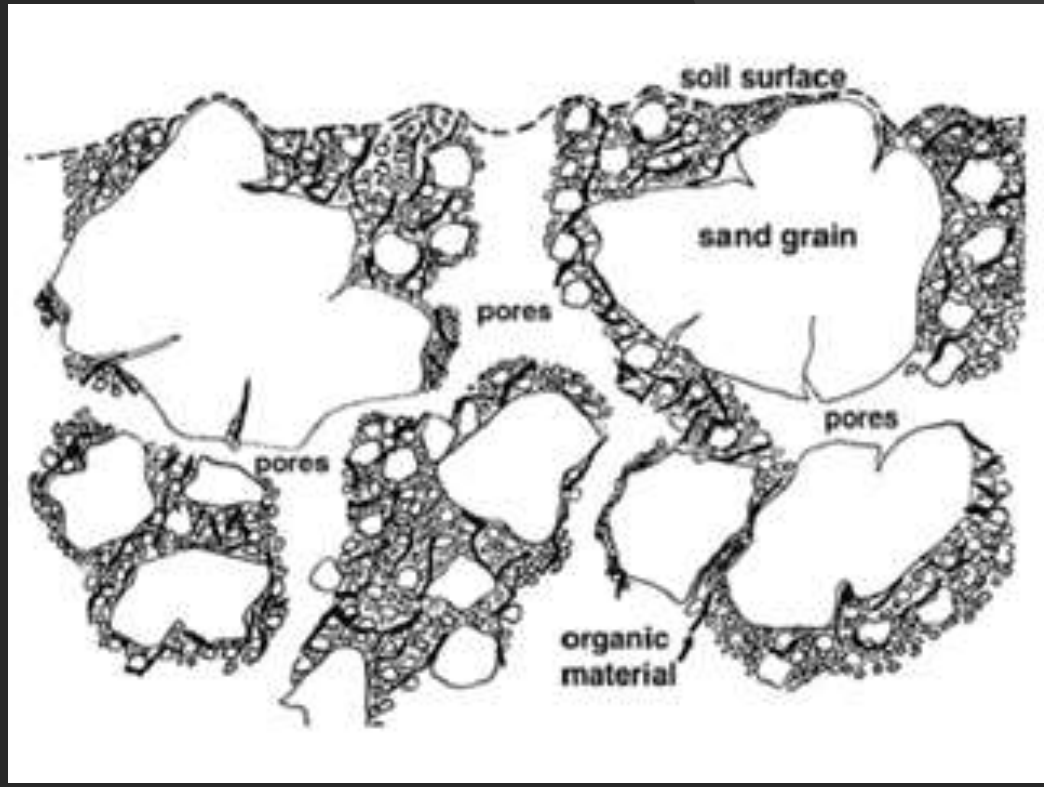
- Hold on to water longer than sandy soils
- Hold more nutrients but still need additional nutrients added over time
- Silt is often collected and sold as a screened topsoil or garden soil
- Feels smooth and silky to the touch when moist

Clay soils

- Very slow draining
- High in fertility (nutrients)
- Holds water much longer
- Hard to dig (costs to trench or plant)
- When it does dry out, it can pull water from plants
- Only need to have 20% clay to have a “Clay soil”
- Feels sticky to the touch when moist

Soil Structure

- Soil structure is the aggregation of soil particles together to improve qualities of the soil
- It is usually the result of adding of organic material to an existing soil
- Soil structure is dynamic
- It can be improved
- Once soil structure is improved, it will slowly revert to its original soil texture characteristics



Soil Texture Vs. Structure

Texture

- Is what you have at your location based on how much sand, silt and clay
- Unless completely replaced it is what you will always have
- Can be identified by feeling a moist sample
- Each texture has distinctive characteristics

Structure

- The dynamic behavior of soil as it interacts with organic material
- Forming aggregates creating good drainage and water holding capacity
- Changes as organic matter breaks down
- Is an on-going process and can be helped by adding organic material

Why is the West Brown?

Facts About Soil to Know

- It takes 500 years to build 1” of topsoil
- We are losing soil at a rate 14 times faster than it is being built naturally
- If not for soil everything that had ever died over the years would still laying around on top of the ground
- There are more living organisms in a teaspoon of soil than there are people living on the earth
- All farmable land is currently being farmed
- Soil erosion is one of the most important ecological problems facing life on earth

What to know about Soil

- Can you draw the soil diagram and fill in the spaces?
- What is soil texture?
- What are the 3 different soil particle types?
- What is soil structure?
- What can we do to improve soil structure?
- What are the characteristics of Western soils ?
- How long does it take for nature to make 1” of topsoil?