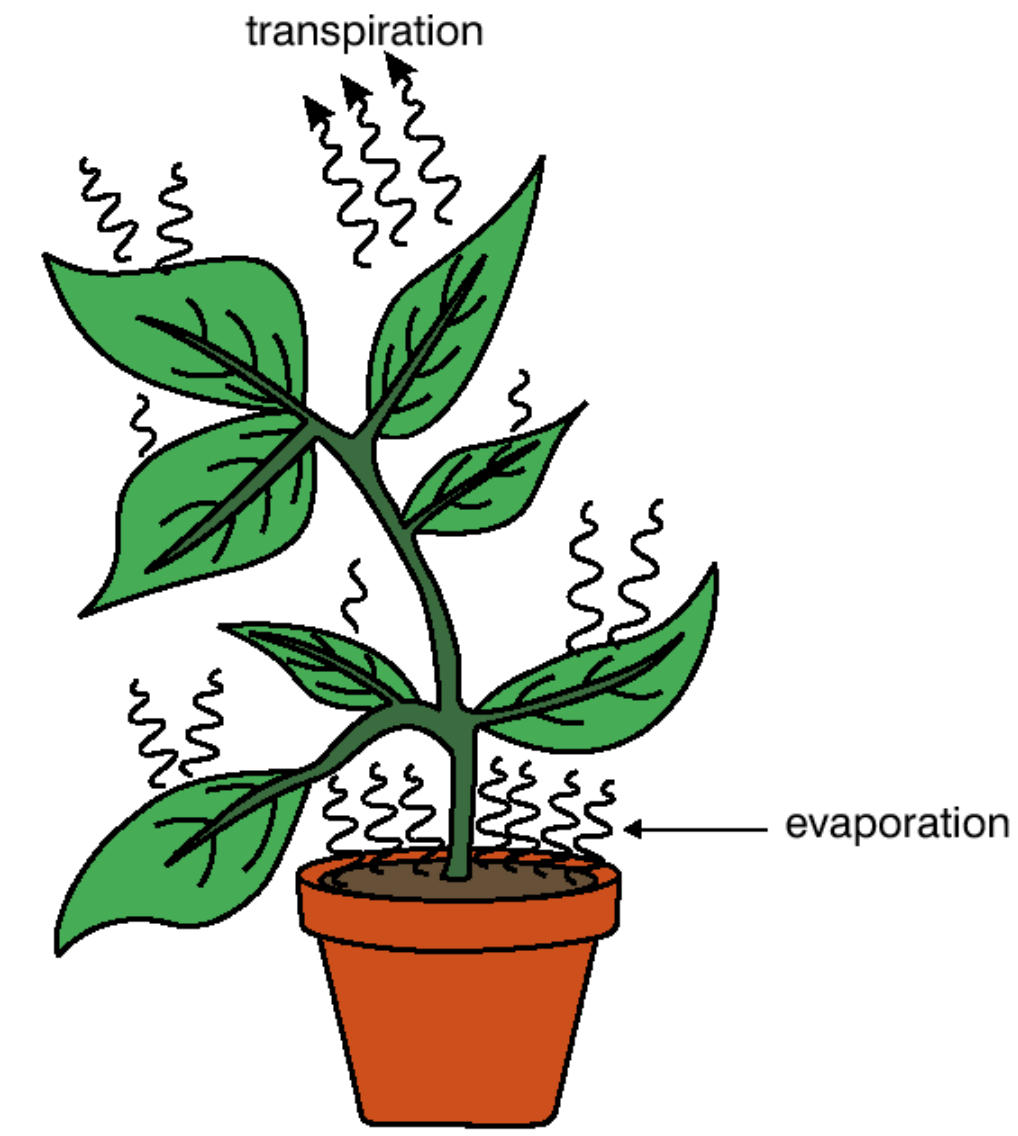
TRANSPIRATION IN PLANTS

CHAPTER VI

WHAT IS TRANSPIRATION?

- Transpiration is the loss of water from a plant in the form of water vapor.
- Water is absorbed by roots from the soil and transported as a liquid to the leaves via **XYLEM.**
- In the leaves, small pores allow water to escape as a vapor. Of all the water absorbed by plants, less than 5% remains in the plant for growth.


transpiration
evaporation

TRANSPIRATION: *Significance…*

❑ EVAPORATIVE COOLING

As water evaporates or converts from a liquid to a gas at the leaf cell and atmosphere interface, energy is released.

❑ ACCESSING NUTRIENTS TO THE CELL

The water that enters the root contains dissolved nutrients vital to plant growth.

TRANSPIRATION: *Significance…*

❑ CARBON DIOXIDE ENTRY

When a plant is transpiring, its stomata are open, allowing gas exchange between the atmosphere and the leaf.

❑ WATER UPTAKE

Although only less than 5% of the water taken up by roots remains in the plant, that water is vital for plant structure and function.

TYPES OF TRANSPIRATION

❑ CUTICULAR TRANSPIRATION

Loss of water through the epidermis which is usually covered with a cuticle. In some temperate plants, about 5-10 % of the water loss from plants maybe lost from these pathway.

TYPES OF TRANSPIRATION

❑ LENTICULAR TRANSPIRATION

Loss of water through numerous pores in the outer layer of a woody plant stem, called lenticels. In decidous species and in some fruits, water loss through lenticels maybe quite substantial.

TYPES OF TRANSPIRATION

- **STOMATAL TRANSPIRATION**

Loss of water through stomata which can account as much as 90% of the water loss from plants.

What factors affect the process of transpiration in plants?

PLANT PARAMETERS

These plant parameters help plants control rates of transpiration by serving as forms of resistance to water movement out of the plant.

ENVIRONMENTAL CONDITION

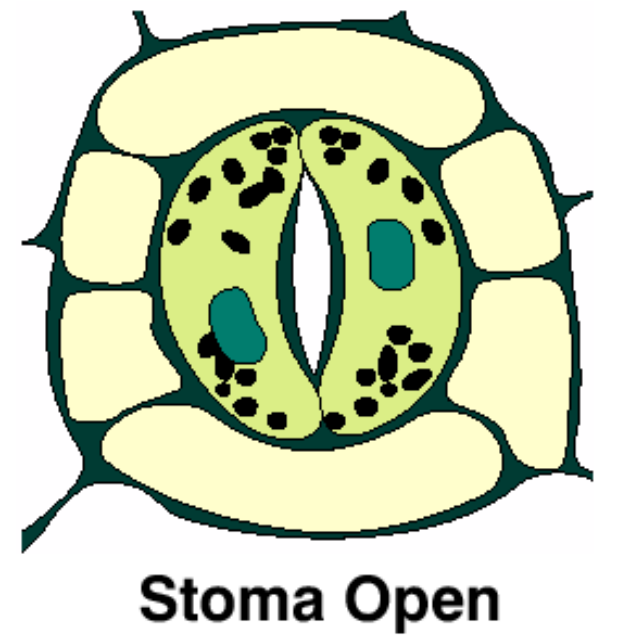
Some environmental conditions create the driving force for movement of water out of the plant. Others alter the plant's ability to control water loss.

What factors affect the process of transpiration in plants?- PLANT PARAMETERS

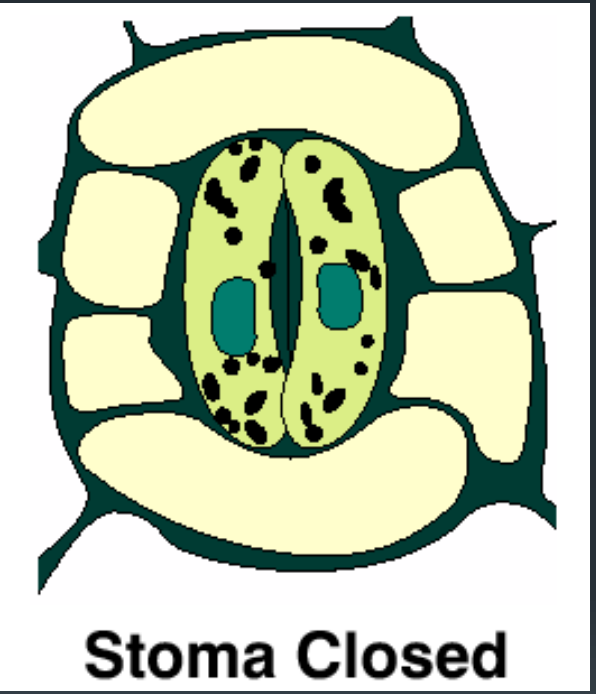
STOMATA

- Stomata are pores in the leaf that allow gas exchange where water vapor leaves the plant and carbon dioxide enters.
- GUARD CELLS- control each pore's opening or closing. When stomata are open, transpiration rates increase; when they are closed, transpiration rates decrease.
- Stomata are the only way plants can control transpiration rates in the short-term.

STOMATA



Stoma Open



Stoma Closed

What factors affect the process of transpiration in plants?- PLANT PARAMETERS

BOUNDARY LAYER

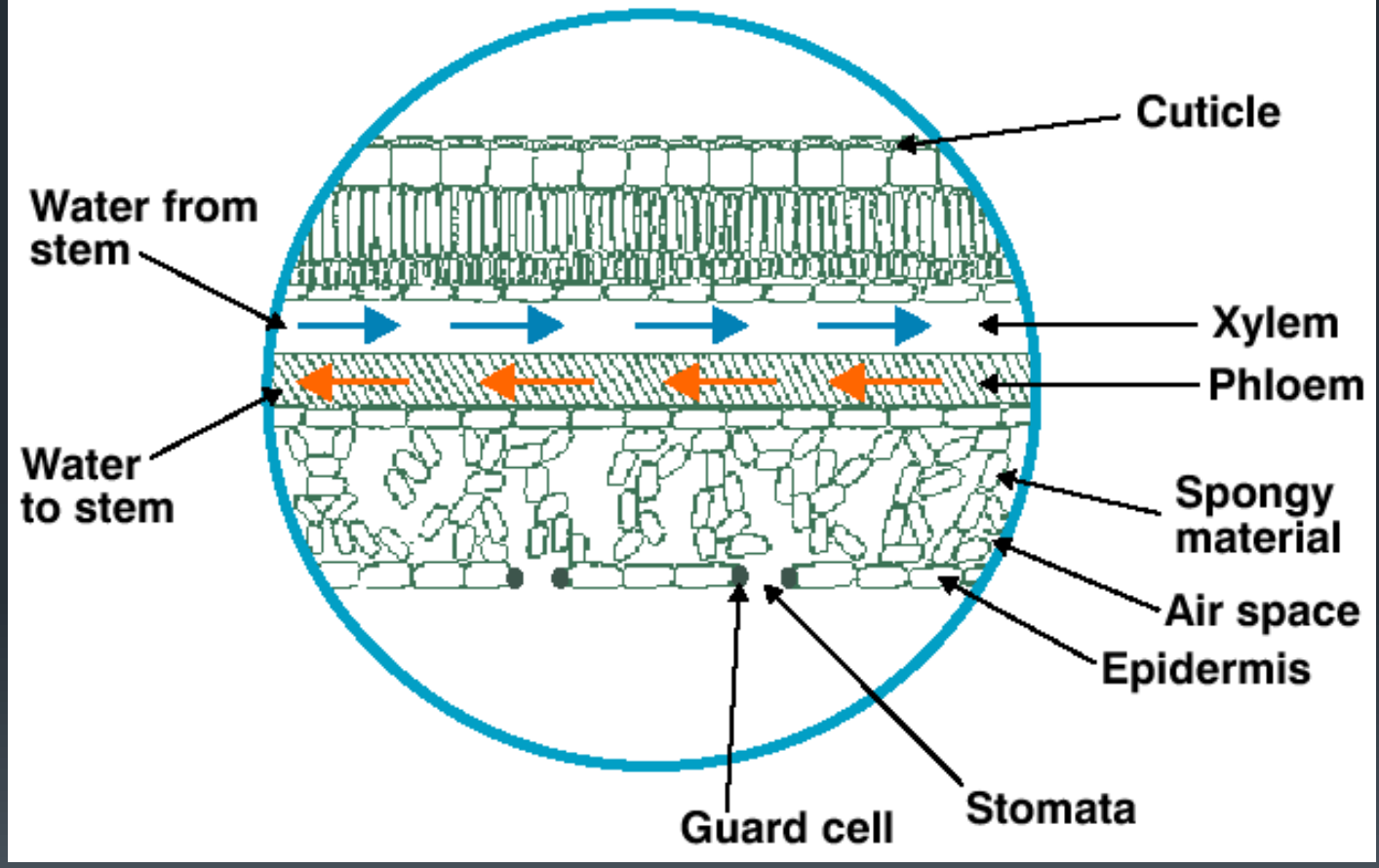
- The boundary layer is a thin layer of still air hugging the surface of the leaf. This layer of air is not moving.
- For transpiration to occur, water vapor leaving the stomata must diffuse through this motionless layer to reach the atmosphere where the water vapor will be removed by moving air.
- More leaf hairs or pubescence will have larger boundary layer- SERVES AS WIND BREAK!

What factors affect the process of transpiration in plants?- PLANT PARAMETERS

CUTICLE

- The cuticle is the waxy layer present on all above-ground tissue of a plant and serves as a barrier to water movement out of a leaf.
- Cuticle is made of wax, it is very hydrophobic or 'water repelling'; therefore, water does not move through it very easily.
- Plants from hot, dry climates and grown under direct sunlight have thicker cuticles.

CROSS SECTION OF A LEAF



What factors affect the process of transpiration in plants? - ENVIRONMENTAL CONDITIONS

RELATIVE HUMIDITY

- Relative humidity (RH) is the amount of water vapor in the air compared to the amount of water vapor that air could hold at a given temperature.
- Lower RH- Higher rate of TRANSPIRATION.

What factors affect the process of transpiration in plants? - ENVIRONMENTAL CONDITIONS

TEMPERATURE

- Temperature greatly influences the magnitude of the driving force for water movement out of a plant.
- As temperature increases, the water holding capacity of that air increases sharply.

What factors affect the process of transpiration in plants? - ENVIRONMENTAL CONDITIONS

SOIL WATER

- The source of water for transpiration comes from the soil.
- Plants cannot continue to transpire without wilting if the soil is very dry because the water in the xylem that moves out through the leaves is not being replaced by the soil water.
- This condition causes the leaf to lose turgor or firmness, and the stomata to close. If this loss of turgor continues throughout the plant, the plant will wilt.

What factors affect the process of transpiration in plants? - ENVIRONMENTAL CONDITIONS

WIND

- Wind can alter rates of transpiration by removing the boundary layer, that still layer of water vapor hugging the surface of leaves.
- Wind increases the movement of water from the leaf surface when it reduces the boundary layer, because the path for water to reach the atmosphere is shorter.
- Windier conditions increase transpiration because the leaf's boundary layer is smaller.

What factors affect the process of transpiration in plants?-

ENVIRONMENTAL CONDITIONS

LIGHT

- Light has a major effect on plants. In a majority of plants, the stomata are open during the day and closed at night. When light intensity is low, transpiration is low.

END OF PRESENTATION!