Unit B: Tree Growth and Development

Lesson 2: Understanding the Growth and Decline of Forest Trees

Terms

- Chloroplasts
- Chlorophyll
- Layering
- Ovules
- Photosynthesis
- Respiration
- Stomata
- Suckering
- Transpiration
- Xylem

What Are Some Of The Most Important Chemical Processes That Take Place Within a Tree?

- Like any other type of plant, trees require several chemical processes to occur within the plant for survival.
- These reactions allow the plant to produce food, expel waste, and regulate plant temperature.
- Three of the most important reactions that occur within a tree are photosynthesis, respiration, and transpiration.

Photosynthesis

- Photosynthesis is a series of complex chemical reactions in which carbon dioxide from the air and water from the soil are converted into carbohydrates (starches and sugars), with oxygen as a by-product.
- Nutrients and water from the roots are carried to the leaves by the xylem.

Photosynthesis

- Inside each leaf are millions of chloroplasts containing chlorophyll.
  - Chlorophyll is the green substance in the chloroplasts that reacts with sunlight.
  - The chloroplasts convert radiant energy (sunlight) into chemical energy.

Photosynthesis

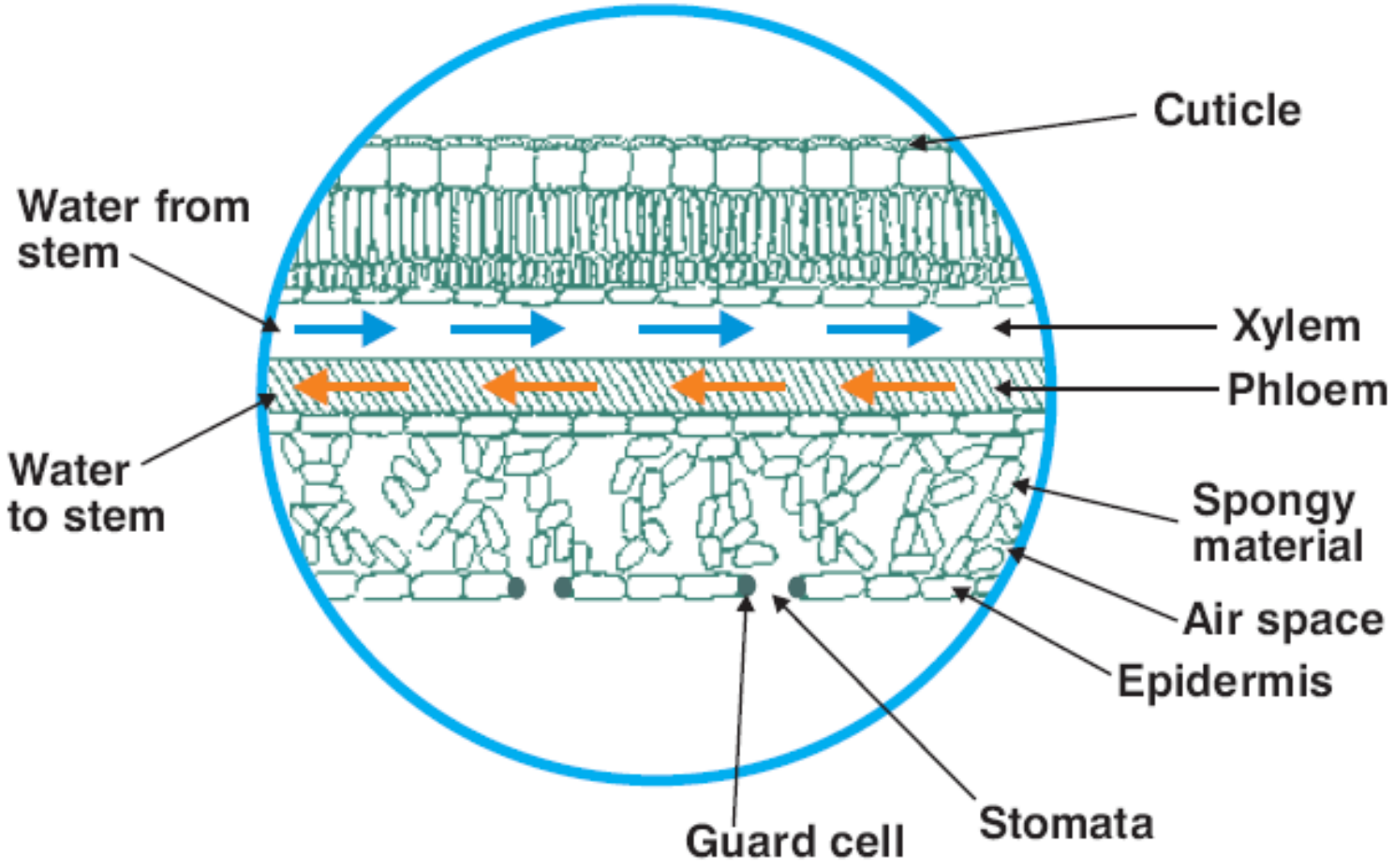
- The carbohydrates manufactured by the leaves are transported and used throughout the tree as the food materials for life support, growth, and reproduction.

Photosynthesis

$$6CO_2 + 6H_2O \xrightarrow[\text{chlorophyll}]{\text{sunlight}} C_6H_{12}O_6 + 6O_2$$

$$\text{(carbon dioxide + water} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{carbohydrates + oxygen)}$$

CROSS SECTION OF A LEAF



Respiration

- The process of consuming carbohydrates and oxygen to obtain energy for the biological processes of life support, growth and reproduction is called respiration.
- Although a growing tree uses oxygen in respiration, the amount of oxygen consumed is much less than the amount of oxygen produced in the separate process of photosynthesis.

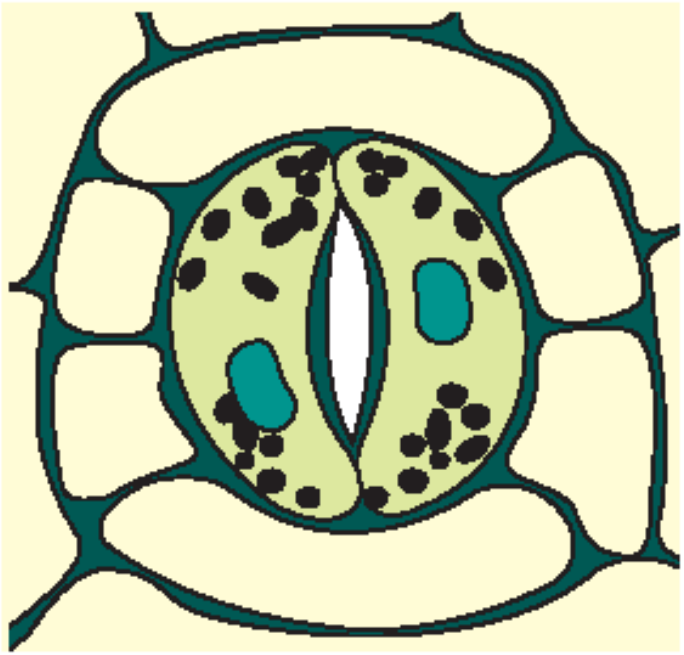
Respiration

Transpiration

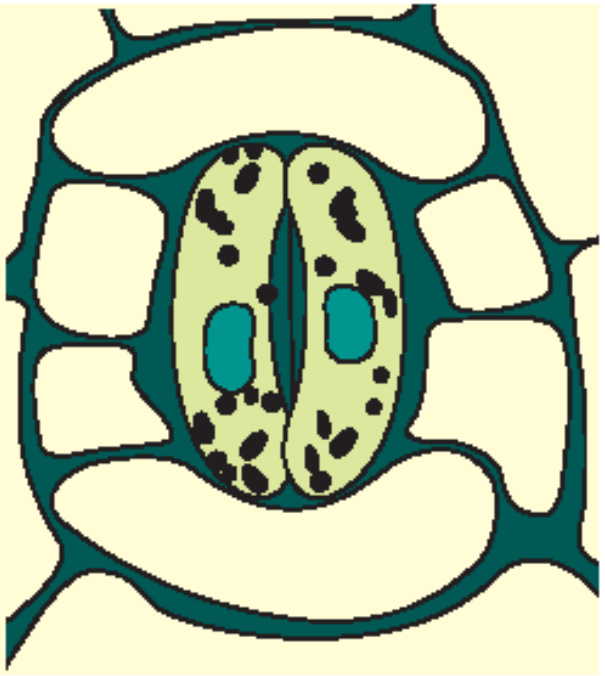
- The loss of water vapor in plants is called transpiration.
- This occurs as a product of the process of respiration.
- Most of the water vapor escapes through structures in the leaf called stomata, which are located on the underside of the leaf.
  - The primary function of the stomata is to regulate the exchange of carbon dioxide and water vapor with the atmosphere.

STOMATA

Stoma open



Stoma closed



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How Do Trees Reproduce?

- There are two methods by which trees reproduce: seed reproduction and vegetative reproduction (sprouting, suckering, and layering).
- Most trees reproduce by seed, but many can also reproduce vegetatively.
- Broad-leaved trees will usually sprout from cut stems, but most needle-leaved trees, or conifers, will not sprout.

Reproduction

- Suckering is the sending up of shoots from underground roots.
- Layering occurs when the lower branches of a tree touch the ground and the branch tips become covered by plant and leaf litter.
- A branch tip then develops roots extending into the soil and eventually a new tree grows from the branch tip.

Seed Reproduction

- Seed reproduction is the most common method of reproduction utilized by trees.
- There is a series of stages that the tree goes through in the development of seeds.
- In broadleaved trees, seeds are produced when the fertilized ovules, which are found in the ovaries of the flower, ripen.
- In most instances, the fruit of broad-leaved trees matures one year from the time it was fertilized.

Seed Reproduction

- Seed production occurs differently in conifers.
- In these needle-leaved trees, the ovules are born naked on cone scales and are not enclosed in an ovary.
- At pollination time the female cone (containing the ovules) scales spread apart for a short period of time.
- At this same time, male cones produce pollen.

Seed Reproduction

- It is hoped that when the scales of the female cone is spread apart that some of the pollen will fertilize the ovule.
- Upon ripening, the cone dries out, the scales come apart, and the winged seeds are dispersed by wind.

Review

- What are some of the most important chemical processes that take place within a tree?
- How do trees reproduce?