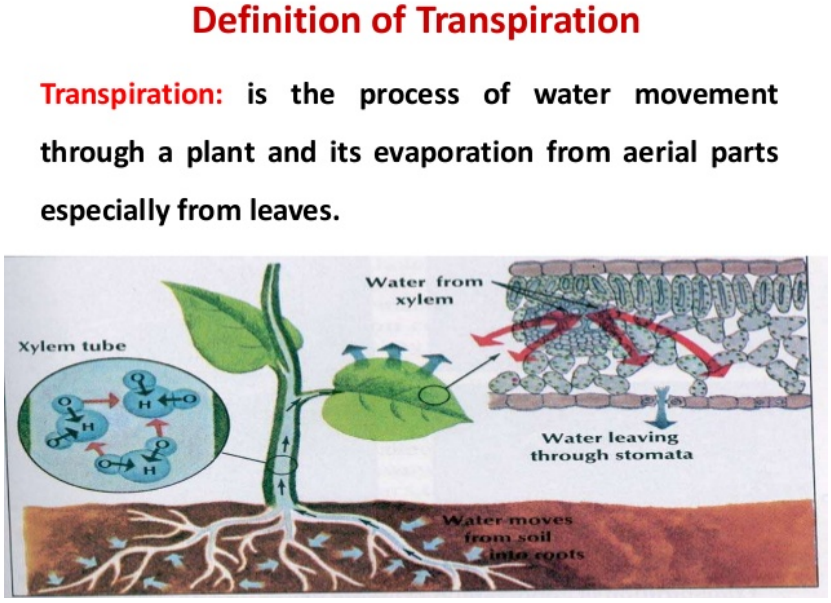
Plant Life and Evapotranspiration

- Learn about evapotranspiration from Brittany Beggs, meteorologist (watch from 0:06-3:01) https://www.youtube.com/watch?v=4765Sg2mKco

The biosphere directly affects the distribution of solar energy around Earth through "transpiration." Plants take in water through their roots, then release it through small pores on the underside of their leaves. When water at the leaf surface evaporates, it goes into the atmosphere. This pulls more water into the plant from the soil. Plants need transpiration to be able to take up water through the roots.

Why does transpiration distribute solar energy? It requires energy to convert water from liquid form to water vapor on the leaf surface. The energy is needed to pull apart the individual water molecules. This means that plants at Earth's surface use a lot of solar energy. In fact, they use 15% of the solar radiation that strikes Earth's surface. You can feel this effect if you walk into a forest. It is not only cooler because of the shade. It is also cooler because the heat used in transpiration comes from the air.



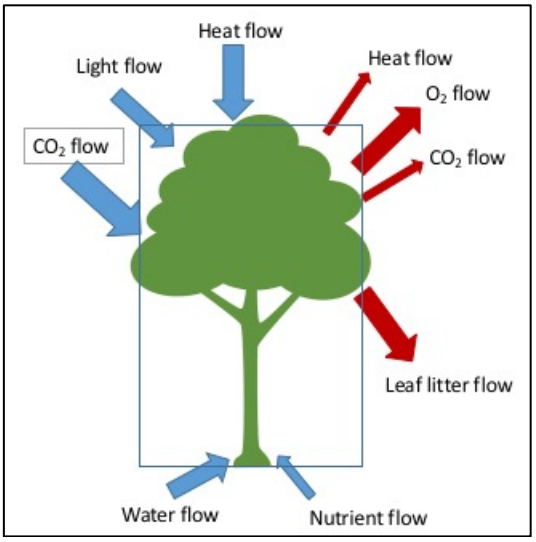
Credit: Halala Rahman

Higher levels of solar energy generally mean higher levels of transpiration (up to a point). The more there is, the more water moves from the soil through plants into the air. For example, a cornfield 1 acre in size can transpire as much as 4,000 gallons of water every day.

Vast evergreen forests circle the globe below the Arctic circle. They absorb plenty of solar energy, especially in the summer during photosynthesis and transpiration. Global warming has decreased the number of trees because of drought, wildfires and insect outbreaks. Because these forests are one of Earth's largest biomes, this has changed the energy balance in this region. Fewer trees mean that less energy is absorbed during photosynthesis and transpiration. This has a heating effect. On the other hand, the lack of trees has increased the albedo across this region due to higher reflection from snow. This contributes to a cooling effect.

The amount of solar energy that plants **reflect** also affects the distribution of solar energy. Dark leaves absorb more solar radiation than pale ones. We say they have low "albedo" (see Feedback section in the Learning Library).

In systems terms. If you consider a tree as a system, the tree trunk, roots and leaves are a reservoir both of matter and of energy. Input flows are light, CO_2 and heat, while output flows are oxygen, CO_2 (from tree respiration) and heat (from tree respiration). In the diagram on the next page, **note which outflows are smaller than inflows (as indicated by the thickness of the arrows)!**



A tree as a system.

More information

http://authoring.concord.org/sequences/47/activities/279

This 45-min inquiry-based interactive uses a molecular model to help you explore interactions between Earth's atmosphere and land surface:

Pages in This Activity:

1. Solar radiation
2. Carbon dioxide in the atmosphere
3. Radiation-gas interactions
4. Earth systems & greenhouse gases
5. Atmospheric carbon dioxide levels over time
6. Historical carbon dioxide levels