

## Energy Flow in Ecosystems

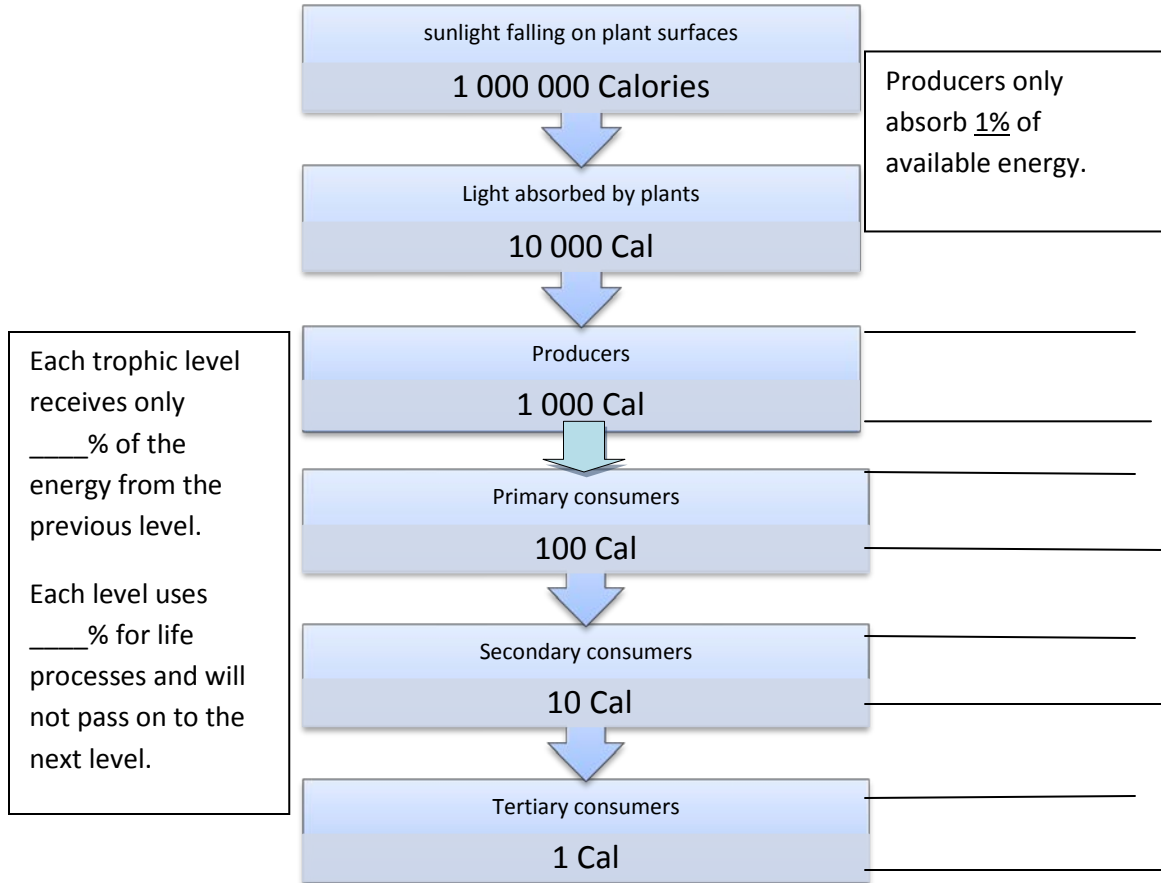
The flow of energy through an ecosystem provides some idea as to the energy trapped and passed on at each trophic level. Each trophic level in a food chain or web contains a certain amount of biomass: the dry weight of all organic matter contained in its organisms. Energy stored in biomass is transferred from one trophic level to another (for example, by eating or defecation), with some being lost as low-grade heat energy to the environment in each transfer.

The percentage of energy transferred from one trophic level to the next varies between 5% and 20% and is called the ecological efficiency (efficiency of energy transfer). An average figure of 10% is often used. The ten percent law states that the total energy content of a trophic level in an ecosystem is only about one-tenth (or 10%) that of the preceding level.

The trophic levels of any ecosystem can be arranged in a pyramid shape to show the amount of energy available to support one trophic level to the next. The first trophic level is placed at the bottom and subsequent trophic levels are stacked on top in their "feeding sequence." Since the producer level has the most energy it is therefore at the bottom of the pyramid (largest part). As producers are consumed, roughly 10% of the energy at the producer level is passed on to the next level (primary consumers). The other 90% is used for life processes, such as photosynthesis, respiration, reproduction, digestion; and ultimately transformed into heat energy before the organism is ever consumed. This pattern of energy transfer continues with each successive level of the pyramid. Secondary consumers receive 10% of the energy available at the primary consumer level (1% of the original energy). Tertiary consumers receive 10% of the energy available at the secondary level (0.1% of the original energy). As a result, tertiary consumers have the least amount of energy and are therefore at the top of the pyramid (the smallest part).

Ecological pyramids can illustrate changes in the numbers, biomass, or energy content of organisms at each level. Each of these three kinds of pyramids tell us something different about the flow of energy and materials between one trophic level and the next.

- On the lines on the right, list organisms that belong to that trophic level. Try to select organisms that feed on the level above it and are eaten by the one below it. On the left, fill in the correct percentages based on the reading. Then use this information and the information given in the diagram to construct an energy pyramid.



- Examine your energy pyramid. Explain why grain is the logical choice for food aid.

Adapted from BioZone 2007.

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