

Fig.3.10: Food web in a grassland ecosystem.

### Significance of Food Web

Food webs are very important in maintaining the **stability** of an ecosystem. For example, the deleterious growth of grasses is controlled by the herbivores. When one type of herbivore becomes extinct, the other types of herbivores increase in number and control the vegetation.

Similarly, when one type of herbivorous animal becomes extinct, the carnivore predated on this type may eat another type of herbivore. This prevents **extinction**.

### 6. Trophic Levels

Each food chain contains many steps like producers, herbivores, primary carnivores and so on. Each step of the food chain is called a **trophic level**.

In a food chain, **green plants** form the **first trophic level**, **herbivorous animals** form the **second trophic level** and **carnivores** form the **third trophic level**. The number of trophic levels in a food chain is always restricted to 4 or 5. But very often the chains are very much complicated with many trophic levels.

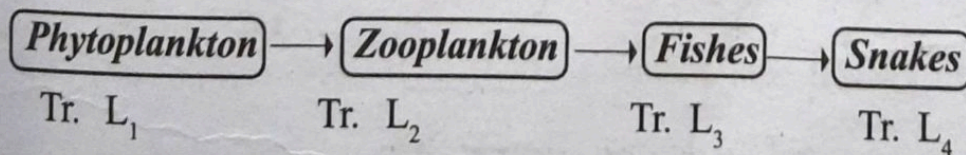


Fig.3.11: Trophic levels of a food chain in a pond ecosystem.

### 7. Energy Flow

The transfer of energy from one trophic level to another trophic level is called **energy flow**.

The producers synthesize and store energy in their body by **photosynthesis**.

When the consumers eat the producers, the energy is transferred to the body of consumers.

The flow of energy in an ecosystem is **unidirectional**. That is, it flows from the producer



level to the consumer level and never in the reverse direction. Hence energy can be used only once in the ecosystem.

When the herbivores eat the producers the energy is transferred to the body of herbivores, but only **10%** is stored. The remaining **90%** is lost through faeces, respiration and unused energy.

A large amount of energy is lost at each trophic level. It is estimated that **90%** of the energy is lost when it is transferred from one trophic level to another. Hence the amount of energy available *decreases* from step to step.

When the food chain is short, the final consumers may get a large amount of energy. But when the food chain is long, the final consumer may get a lesser amount of energy.

Let us assume that the total amount of energy stored in the producers is **15 calories**. When the producers are eaten by herbivores only **10%** is transferred to the body of carnivores. Only about **1.5 calories (10%)** is incorporated into the body of herbivores.

When the herbivore is eaten by the carnivore, again only **10%** i.e., **0.15 calories** is incorporated into the body of carnivores. The remaining **90%** is lost as heat.

The energy flow in the ecosystem follows the two laws of **thermodynamics**.

The **first law** states that 'energy can neither be created nor destroyed; it can simply change in form'.

The **light energy** of the Sun is converted into **electrical energy** in the chlorophyll. The electrical energy is converted into **chemical energy** during photosynthesis.

The **chemical energy** is transformed into **heat energy** during metabolism. The heat energy is transformed into **mechanical energy** for doing work. Thus the first law is obeyed.

The **second law** states that 'during energy transfer, large part of energy is degraded into heat and dissipates'. When energy is transferred from producers to herbivores about **90%** of energy is lost as heat.

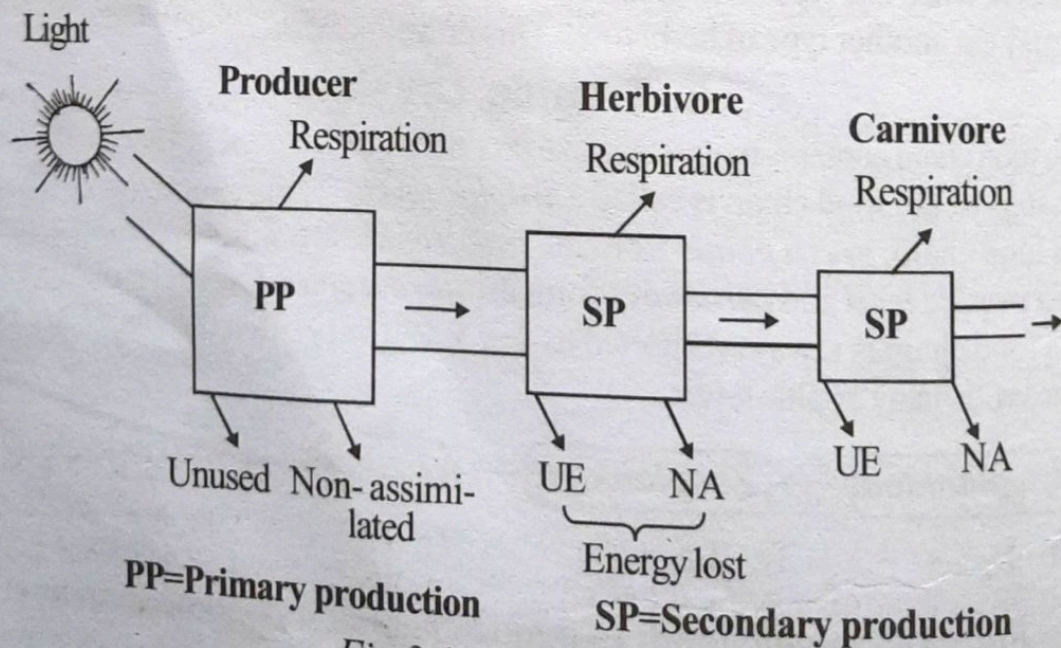


Fig.3.12: Energy flow.

## 8. Ecological Pyramids

**Ecological pyramid** is the graphical representation of the number, biomass and energy of organisms of the successive **trophic levels** of an ecosystem.

- A trophic level is a **step** in a food chain. It explains the **position** of each organism in the food chain.