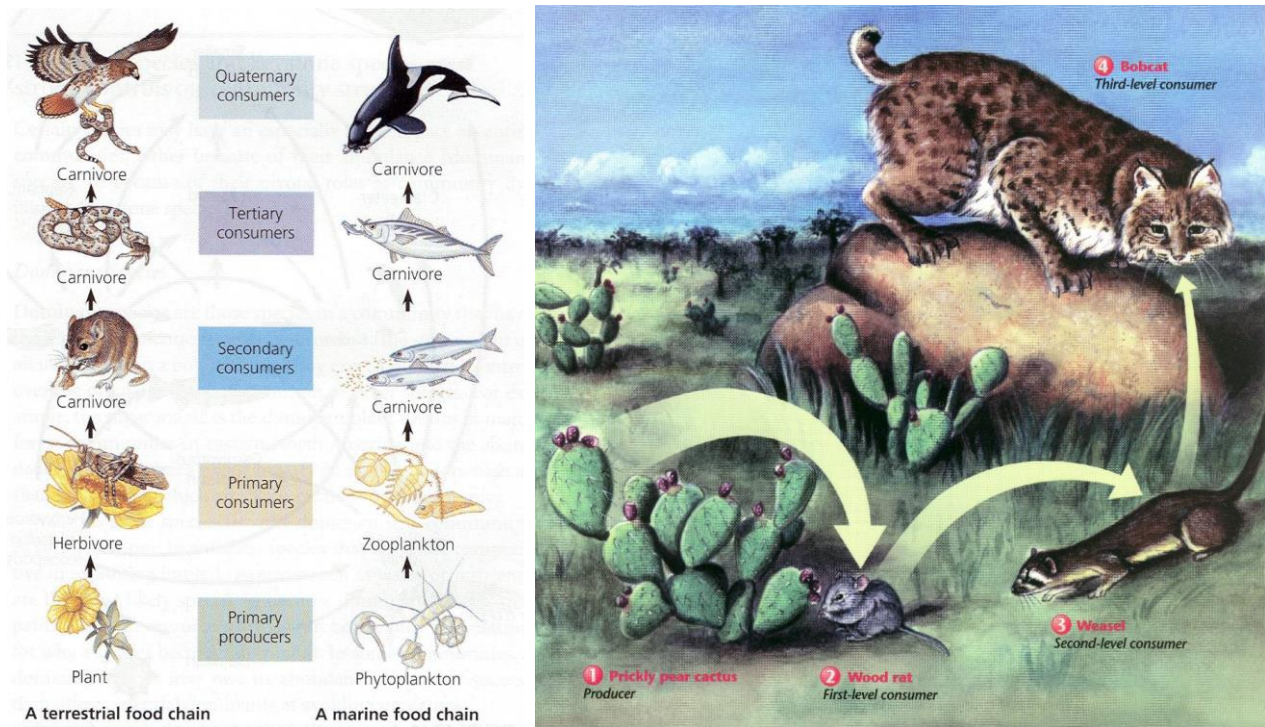


STAAR Science Tutorial 16 **TEK 7.5C: Food Web Energy Flow**

TEK 7.5C: Diagram the flow of energy through living systems, including food chains, food webs, and energy pyramids.

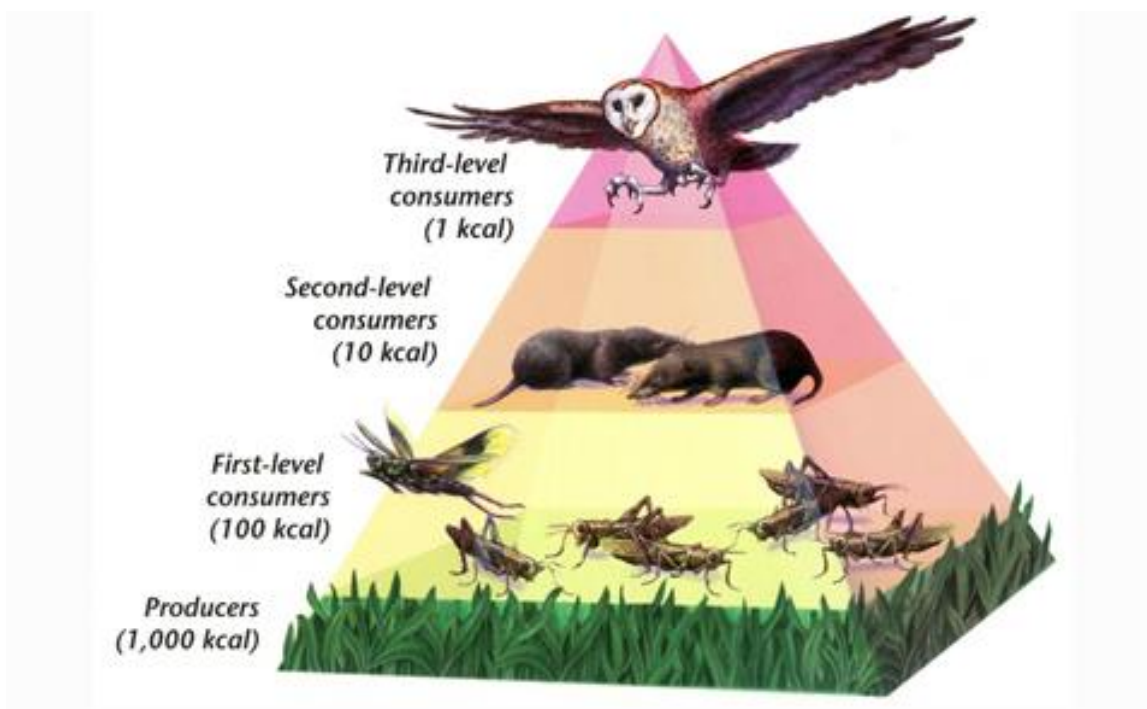
Energy Flow in Ecosystems

- Almost all of the energy that supports life on Earth first came to Earth as **sunlight**, which is radiant or electromagnetic energy.
- Plants use the radiant energy in sunlight to rearrange the bonds in carbon dioxide (CO₂) and water (H₂O) to make sugar (C₆H₁₂O₆). This process is called **photosynthesis**. The full chemical equation for this reaction is:
$$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{radiant energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$$
 This chemical reaction changes radiant or electromagnetic energy into chemical energy.
- The bonds between the carbon, hydrogen and oxygen atoms in sugar store the **chemical** energy.
- Plants are collectively called the **primary producers** in food webs, because they produce all of the food that supports the rest of an ecosystem's life forms, using the photosynthesis energy conversion process.
- Herbivores, animals that eat only plants, get all of their energy from plants. In a food web, they are called **primary consumers**.
- All consumers use the chemical energy stored in plants by converting that energy into mechanical or thermal energy, in a chemical reaction called cellular respiration. The equation for cellular respiration is exactly the reverse of the photosynthesis reaction: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$.
- Animals that eat these herbivores (primary consumers) are carnivores or omnivores called the **secondary consumers**.
- Animals that eat the secondary consumers are called **tertiary** (third-level) **consumers**.
- A **food chain** or **food web** is a diagram that shows the flow of energy from the plants (primary producers) to the herbivores (primary consumers) to the omnivores and carnivores (secondary and tertiary consumers). The **arrows** in a food web show the **direction of energy flow**.
- A food chain shows only one possible sequence of energy flow, while a food web shows more of the alternate paths of energy flow. No food web can show all of the possible energy paths.



Energy Pyramids

- An **energy pyramid** is a diagram that shows the total amount of energy available at each level of a food web. Most of the energy available in an ecosystem is at the lowest producer level. Only **10 %** of the energy available in the lowest, producer level is transferred to the next level, the primary consumers, and only about 10% of that energy can be transferred to the secondary consumers. About 90% of the energy available at any level is used to support life at that level. For this reason, there are relatively few secondary and tertiary consumers in a food web.



Practice Questions

1. Almost all of the energy that supports life on Earth comes from _____.
2. The process that plants use to capture the radiant energy from the sun and turn it into chemical energy is called _____.
3. A _____ is a diagram that shows the flow of energy through an ecosystem in the predator – prey relationships.
4. In a food web, the plants that create all of the food for other organisms are called the _____.
5. The animals that eat the plants (herbivores) are called the _____.
6. The animals that eat the primary consumers are the _____.
7. The animals that eat the secondary consumers are the _____.
8. A diagram that shows the amount of energy that flows from one level of a food to the next is called an _____.
9. Only about _____ of the energy from one level of the energy pyramid is used to support the next level above it.