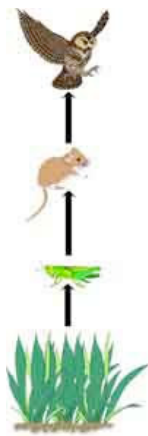




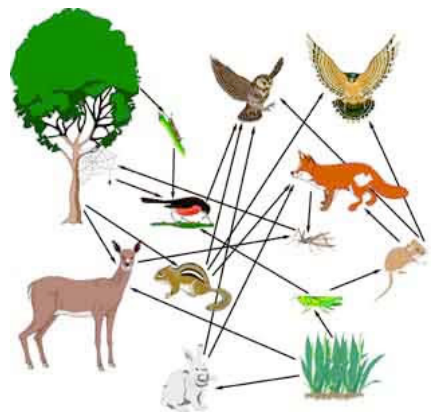
Toxic and Harmful Algal Blooms *“Fitting Algae into the Food Web”*

Food chains and food webs show the flow of energy through an ecosystem. Food chains are linear depictions of energy flow, while food webs show the multiple interactions among the different types of organisms. Food webs are generally a more realistic portrayal of the energy flow in the system. After all, most organisms eat more than one type of food and can be eaten by more than one type of predator.

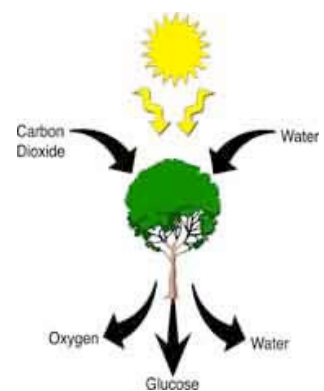


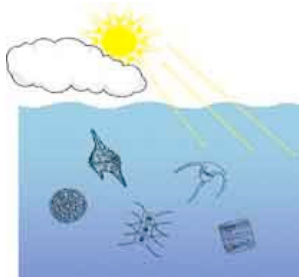
To the left is a typical food chain in a deciduous forest. Grasshoppers eat the grass; grasshopper mice eat the grasshoppers; and owls eat the grasshopper mice.

To the right is a more complex portrayal of the same system as a food web. Despite the visual complexity of the diagram, many species and many links between species are not shown. In both images above, the arrows indicate the direction of energy flow.



So where does energy come from? The fundamental energy source for most of the environment is the sun. Photoautotrophs capture the sun's energy and convert it into organic compounds through photosynthesis. The process of photosynthesis transforms carbon dioxide and water into simple carbohydrates. The photoautotrophs then use the simple carbohydrates to build other more complex organic molecules (proteins, lipids and starches) that are either used as building blocks for their cells or are stored for later use. Photoautotrophs are often also called primary producers because they establish the basis for most other production; they create organic material from inorganic, or non-living, sources.





How do algae fit into the marine food web? The photoautotrophs with which we are most familiar are the trees and flowers that we see everyday on land. However, there are a substantial number of photoautotrophs in the marine environment as well – most of which we can't see without a microscope! Despite their small size, these microscopic primary producers, marine algae and cyanobacteria, are vital to our planet's productivity since they are at the base of the marine food web.

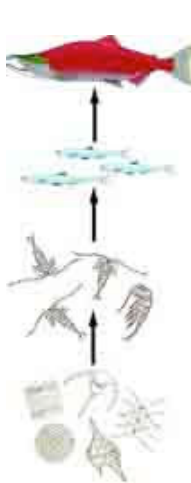
What happens further up the food web?

Each level of a food web or a food chain is called a trophic or feeding level, and the organisms in the food web are classified by whether they are primary producers or consumers. The consumers in food webs are called heterotrophs and they consume the organic material made by the autotrophs. Heterotrophs cannot make their own food so they are dependent on the autotrophs for survival.

What do we mean by "photoautotroph" and "heterotroph"?

Organisms are given these names according to their mode of nutrition:

- + **Photo** refers to how photoautotrophs get their energy - from the sun.
- + **Auto** means "self" and **troph** means "feeding." Autotrophs do not require the help of other life forms to get their carbon source (carbon dioxide) since there is plenty of carbon dioxide freely available in the environment.
- + **Hetero** means "other" so heterotrophs feed on other organisms. They cannot produce their own food.



A simple marine food chain might look like the one to the left. The salmon is the top consumer; the herring are the secondary consumers; and the copepods are the primary consumers. The phytoplankton are the producers.



A more complex marine food web might look like the one to the right. Despite the visual complexity of the diagram, many species and many links between species are not shown. Organisms may have more than one trophic role because they eat a variety of food types.

