# Carbon cycle

## Carbon compounds

All organic compounds are made from carbon atoms, hydrogen atoms and, sometimes, other atoms such as nitrogen, sulfur and phosphorus.

If dead organisms did not decay, essential nutrients would be locked up and unavailable to new generations of plants and animals. In photosynthesis, plants convert the inorganic compounds carbon dioxide and water to carbohydrates.

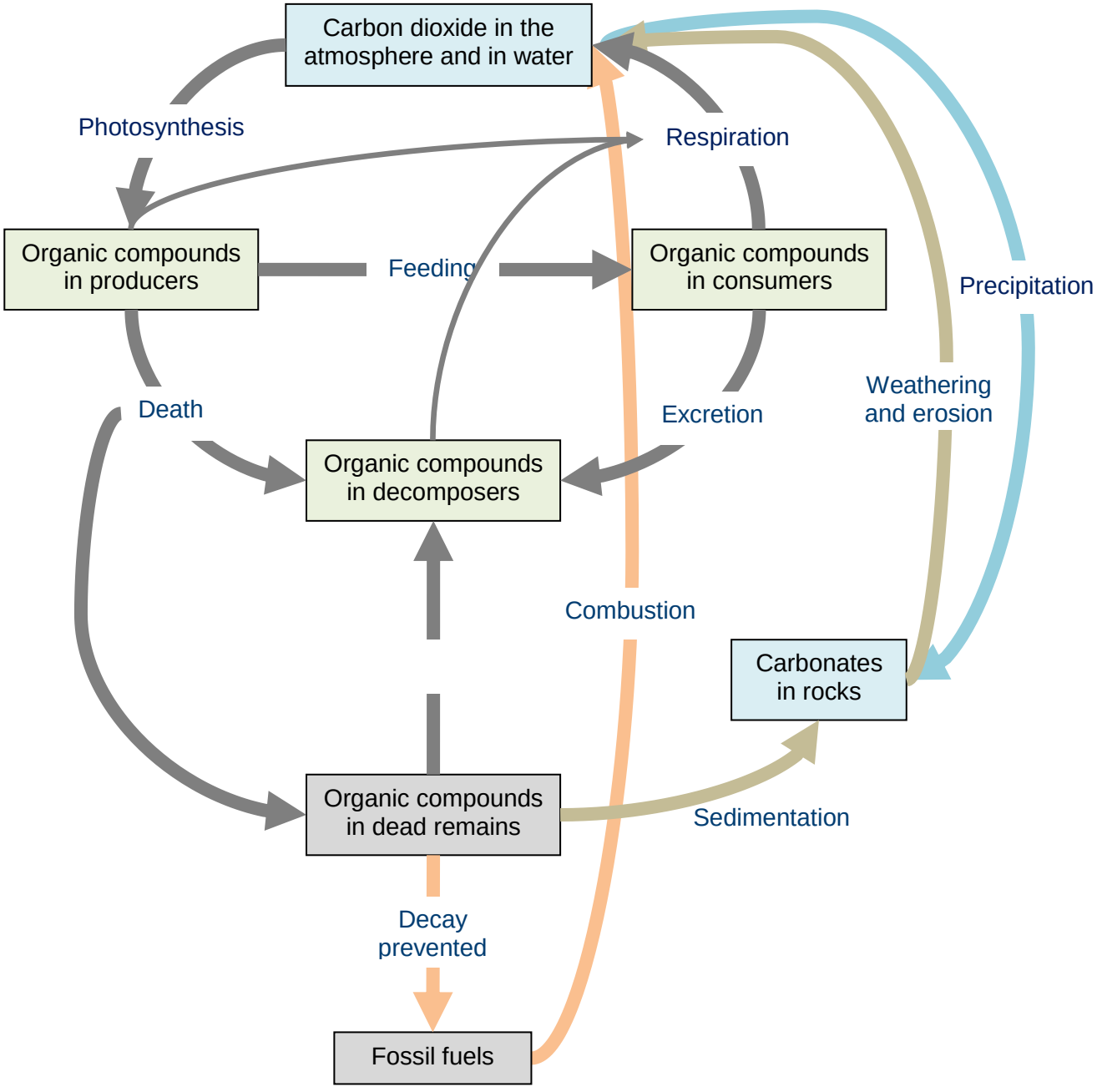


**Figure** The carbon cycle.

## Photosynthesis and respiration

- Autotrophs are organisms which are able to make their own organic molecules. Heterotrophs rely on autotrophs to provide a continuous supply of new organic molecules.
- Photosynthesis provides the means by which carbon in carbon dioxide is fixed by conversion to carbohydrates including sugars such as glucose and sucrose, cellulose and starches such as amylopectin.
- Carbohydrates are interconvertible and may be converted to fatty acids to make lipids. Other elements may be added to synthesise organic compounds such as proteins.
- Carbohydrates, lipids and proteins can all be used as sources of energy in respiration by both autotrophs and heterotrophs, recycling carbon dioxide so that it may again be used in photosynthesis.

## Feeding on dead remains

- Consumers that are scavengers, such as beetles and crows, often feed on dead remains. There are also invertebrates like earthworms and woodlice that feed on partially broken down dead remains – detritus. These are called detrivores.
- Organic molecules in dead organisms are broken down by decomposers such as saprophytic fungi and bacteria. These secrete enzymes onto the remains and absorb the soluble molecules that are released.
- All of these organisms respire to release carbon dioxide for use in photosynthesis.

## Sinks and the greenhouse effect

- Carbon can be removed from the cycle in the formation of rocks, such as limestone (calcium carbonate) and fossil fuels, such as coal, natural gas and oil. Rocks, fossil fuels and forests act as sinks for carbon. Vast quantities of carbon are stored in them.
- Fossil fuels are formed when the normal decay process is interrupted, so that chemical energy remains stored in them. Human activity in the form of extracting and burning fossil fuels may have contributed to the rise in atmospheric carbon dioxide and be a contributing factor to the green house effect and global warming. Around six billion tonnes of carbon dioxide is released each year through the combustion of fossil fuels.
- Deforestation, burning and farming of former forested land may also contribute to the rise in carbon dioxide levels. Not only is the carbon stored by trees released, but also that found in the organic remains (humus) in soil, which decay rapidly as the activity of soil microorganisms is stimulated by ploughing. Rapid deforestation may be releasing two billion tonnes of carbon dioxide to the atmosphere each year.
- Carbon in rocks formed after sedimentation of dead remains or precipitation of carbonates formed from carbon dioxide in water, can be released as carbon dioxide by weathering and erosion.

## Finding out

What is radiocarbon dating (often simply called carbon dating)?

How can it be used at archaeological sites to estimate the age of organic remains?