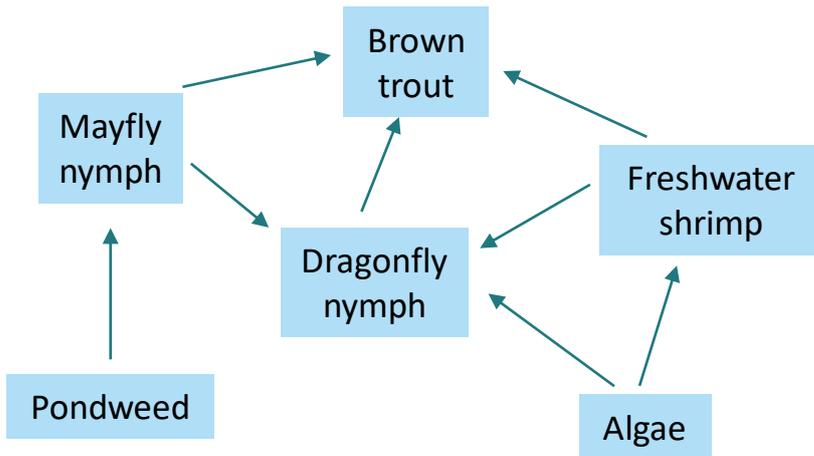


# Biomass and ecosystems



The ultimate source of energy in an ecosystem comes from sunlight. This energy is converted to an organic form using photosynthesis which is then passed between organisms. Food chains describe the energy transfer between organisms, with each stage of the chain referred to as a 'trophic level'. However, most animals do not rely on just one source of food. Within a habitat, there may be many food chains linked together to form a food web.



Study this freshwater food web.

How many producers are there?

Which organisms are primary, secondary and tertiary consumers?

What effects might drought, over-fishing or climate change have on this ecosystem?

## What is biomass?

Most of the sugars synthesised by plants are used as substrates for respiration and the rest are used to make other groups of biological molecules, which form the plant's biomass. Biomass is the **total mass of living material in a specific area at a given time**. Dry biomass shows the chemical energy store in an organism and can be measured by calorimetry.

## Primary production by plants

**Gross primary production (GPP)** is the chemical energy store in plant biomass.

**Net primary production (NPP)** is the chemical energy store in plant biomass after respiratory losses (R).

$$NPP = GPP - R$$

## Biomass transfer to consumers

When animals eat plants, their biomass is increased but there are losses due to respiration, urine and faeces. The net 'production' (N) by consumers at this stage can be shown like this:

$$N = I - (F + R)$$

Where I = chemical energy ingested

F = chemical energy lost to the environment in faeces and urine

R = respiratory losses

Can you explain why a food chain rarely longer than four trophic levels?

Can you think of any human interventions that manipulate transfer of biomass between trophic levels? Why is this done?

For more information, go to the [BioTopics website](#).

