

Nutrients in our waterways



Nutrients are an essential ingredient

Plants need nutrients to grow. In particular they need carbon, nitrogen and phosphorus. Plants in both aquatic ecosystems as well as plants on land need the same nutrients. When plants use carbon dioxide (CO₂) for photosynthesis they produce chemical compounds for growth including carbon (C). Nitrogen (N) is produced when plants, animals and bacteria decompose. Phosphorus (P) is created through the natural weathering of rocks and soil and rainfall runoff transports it from the land into waterways.

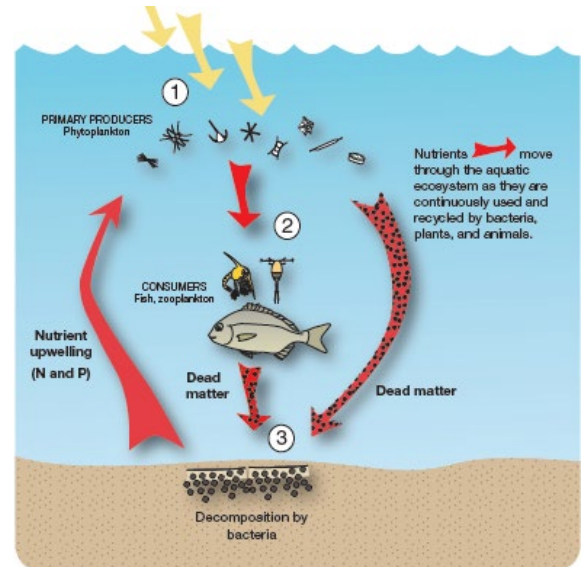
For healthy waterways, the complex and important process of nutrient cycling is vital. Nutrients in waterways are absorbed by aquatic microorganisms (e.g. bacteria) and algae (e.g. phytoplankton). When these organisms die, they decompose and the nutrients are released back into the water where they can be absorbed by other organisms. This is nutrient cycling. Cycling of nutrients may repeat many times until the nutrients are buried in the stream sediment or nitrogen is released to the atmosphere in the form of gas.

Nutrients in waterways also move through the food chain. Phytoplankton absorb the nutrients and are then consumed by slightly larger microscopic animals called 'zooplankton'. Zooplankton may then be eaten by small fish, which are eaten by larger fish, and so the nutrient uptake continues through the food chain.

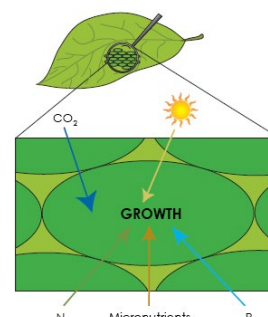
When nutrients become a problem

Light, nitrogen and phosphorus are the main factors that control the growth of aquatic plants. Nitrogen and phosphorus are often found in fertilisers because they stimulate plant growth. These nutrients may become an environmental problem and a form of pollution when they enter waterways at a faster rate than they can be used in the food chain and cycled through the system.

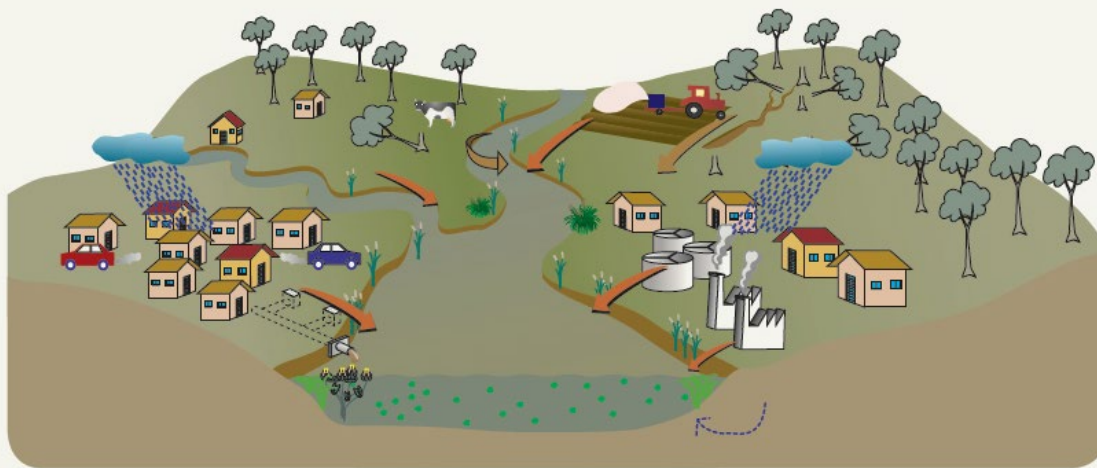
High nutrient levels can lead to excessive plant growth and algal blooms. Too much nitrogen in the water appears to be the main cause of algal blooms, particularly in South East Queensland's marine and estuarine waters. After a bloom of excessive growth, the plants die and as they decompose, the level of dissolved oxygen in the water can be depleted – this is called 'eutrophication'. Eutrophication can cause fish kills and other problems because aquatic animals and plants need a certain level of dissolved oxygen in the water to survive.










- 1) Phytoplankton use sunlight and nutrients to grow.
- 2) Nutrients in phytoplankton pass up the food chain into the fish and zooplankton that graze on the phytoplankton.
- 3) When phytoplankton, zooplankton or fish die, they fall to the bottom, and are decomposed by bacteria. This process of decomposition releases the nutrients back into the water column to begin the cycle again.



Energy from sunlight is converted into chemical energy via photosynthesis. Carbon dioxide (CO₂) from the atmosphere is converted into chemical compounds which are used as building blocks for plants to grow. Nitrogen (N), phosphorus (P) and other micronutrients must be obtained from the surrounding environment.



-  Point sources (e.g. sewage effluent and industrial waste) contribute a large proportion of nutrients, particularly during the 'dry' season.
-  Addition of fertiliser and soil disturbance increases sediment and nutrient in waterways.
-  Catchment clearing increases the speed that water moves through the landscape, increasing hillside and stream bank erosion, and delivering more nutrients into waterways.
-  Gaseous (atmospheric) nutrients dissolve in raindrops and enter waterways as rain.
-  Dissolved and particulate organic and inorganic nitrogen enters waterways as diffuse runoff from the catchment and urban areas.
-  Nutrient transfer to waterways can be via groundwater flow.
-  Excessive nutrients can lead to algal blooms.

Sources of nutrients in waterways

Nutrients in waterways come from two sources: 'point' sources and 'diffuse' sources. Point source pollution comes from a single point such as from a pipe. Diffuse sources of pollution come from many places within a wide area. Diffuse sources of pollution can include sediment or nutrients from catchment runoff, groundwater, rain, or when airborne pollutants fall to the ground.

Point source pollution

Water from wastewater treatment plants and industrial facilities are point sources of pollution and can contain high levels of nutrients. Recent commitments to improve wastewater treatment by local councils and industries in South East Queensland are dramatically reducing the amounts of nutrients being emptied into waterways.

Diffuse source pollution

Stormwater flowing over the ground picks up loose soil, animal droppings, leaves, litter, and other sources of nutrients and transports them into waterways. This diffuse pollution source is called 'stormwater pollution'.

Clearing vegetation within a catchment also influence the nutrient cycle, as it exposes soil and increases the speed water can move over a landscape. This can lead to both hillslope and gully erosion of soil that contains nutrients.

Many landscape practices such as crop farming and gardening add nutrients to the land as fertiliser. This increases the concentration and quantity of nutrients that can get into aquatic ecosystems following heavy rainfall.

Industrial emissions and exhaust emissions from cars increase atmospheric nutrients, particularly in developed catchments. These airborne nutrients can then enter aquatic ecosystems when they settle out of the air (dry fall) or become dissolved in raindrops.



Eutrophication can cause waterways to smell and have brown or green scum, fish kills and water treatment problems.



Sediment from building sites is a form of pollution that can deliver sediment and nutrients to waterways.