

Firth of Clyde monitoring buoy, Dunoon

The Scottish Environment Protection Agency (SEPA) established the Firth of Clyde monitoring buoy near Dunoon in 2009. The buoy monitors dissolved oxygen and phytoplankton as part of our obligations under environmental legislation such as the Water Framework Directive.

The water in the Firth of Clyde undergoes seasonal stratification, where oxygen rich freshwater from the River Clyde and other tributaries does not mix fully with the denser, saltier and less oxygenated marine waters, and sits on top of it.

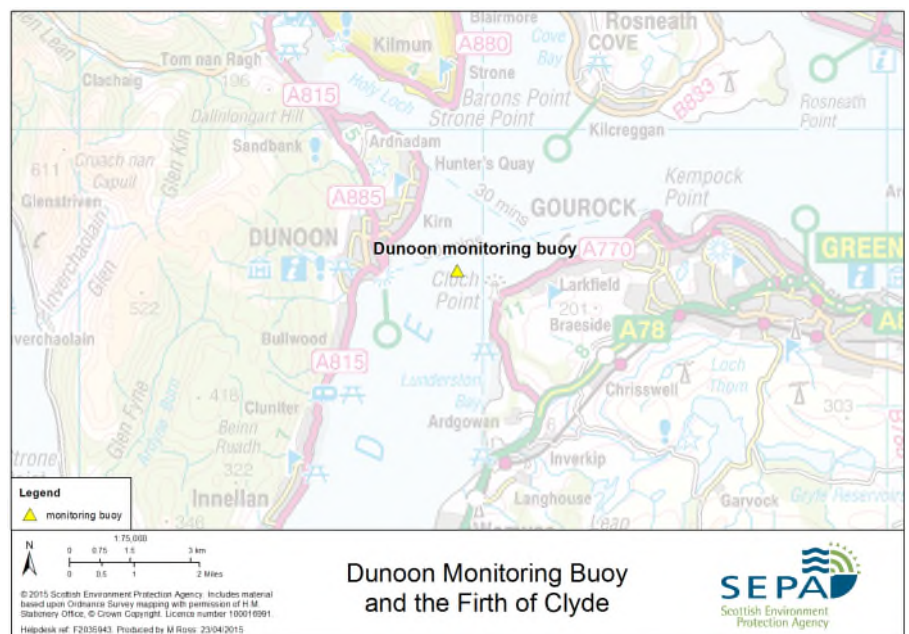
This stratification means that nutrients from wastewater discharges (e.g. sewage treatment) or from agricultural runoff (e.g. animal waste or fertilisers) to these surface fresh waters provide conditions suitable for the growth of microscopic marine plants or phytoplankton.

Over the spring and summer months, when there is increased sunlight for photosynthesis and high nutrient availability (which acts as fertiliser), the phytoplankton can undergo uncontrolled growth called a bloom. However, after the nutrients have been depleted, the phytoplankton begin to die off and sink to deeper water, where they are broken down by oxygen using bacteria. This process can cause oxygen in the deeper waters to fall to even lower potentially harmful levels, especially after very large blooms.



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Stratification is the formation of layers in the water that do not mix. This can happen when lower density freshwaters sits on top the denser, salty marine waters acting as a barrier to mixing. Strong temperature differences can also lead to stratification with warmer, less dense water sitting on top of colder waters.



Location of the monitoring buoy.

References:

<http://www.sepa.org.uk/environment/environmental-data/monitoring-buoys-network/dunoon/>

What are the effects of phytoplankton blooms?

The enrichment of the water body by nutrients and the subsequent promotion of phytoplankton growth is termed eutrophication and can have a negative effect upon the marine environment causing poor water quality through the depletion of oxygen. These blooms can last for weeks and several can be observed each year depending on sunlight and nutrient availability.

Many species of marine life are sensitive to low levels of dissolved oxygen in the water and lower concentrations can cause some important species such as salmon to be absent as they avoid these areas or even be killed in extreme circumstances.

Why use a monitoring buoy in the Firth of Clyde?

The presence of phytoplankton blooms can be monitored by analysing concentrations of chlorophyll present in the water column. The individual phytoplankton species that make up the blooms are identified taxonomically using samples collected each month by boat by our marine ecologists.

We routinely monitor the water quality in the Firth of Clyde by collecting spot samples by boat for nutrients, chlorophyll, turbidity or suspended solids, dissolved oxygen and salinity levels, on a monthly basis. However, the low frequency of sampling may result in short term environmental events, such as a bloom, being missed. This would present a false impression of the overall water quality. For these reasons a continuous monitoring buoy is an important tool for us to use in our environmental monitoring.

The “**Water Framework Directive**” (Directive 2000/60/EC) established a framework for community action in the field of water policy. It aims to achieve good status for biological and chemical quality. In Scotland it is implemented through the Water Environment & Water Services (Scotland) Act 2003.

The term **phytoplankton** refers to the microscopic plants living in the surface waters that also require nutrients for growth. The monitoring buoy does not count phytoplankton directly, but measures the concentration of the green pigmentation found in phytoplankton called chlorophyll.



Water quality spot sampling in the Firth of Clyde from SEPA survey vessel Sir John Murray.

References:

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