

Medina Estuary – Water Quality (nutrients - nitrogen)

In the Medina Estuary, nutrients (mainly nitrogen in the form of nitrates) are a significant water quality issue. They enter the catchment as a result of runoff from farmland and urban areas or as discharges from the sewerage system. They affect the ecology and amenity of the estuary.

1.1 What does Nitrogen effect?

Nitrogen is a plant nutrient but too much of it in estuaries can lead to excessive growth of opportunistic green seaweed (also called macroalgae). This effect can be seen at low water as thick green seaweed mats covering the intertidal mudflats (Figure 1). This looks unsightly, affects amenity (eg clogging boat propellers or washing up on slipways) and can adversely affect the birds that feed there (because their bills cannot penetrate the weed to feed or because the weed changes the availability of their mud-dwelling prey items). When the seaweed breaks down either after a period of rough weather or at the end of the growing season it can give off unpleasant smells typically that of rotten eggs or vegetables, which can sometimes incorrectly be attributed to sewage pollution.

This problem isn't confined to the Medina estuary; it occurs in many sheltered, muddy estuaries within the Solent area and elsewhere where conditions are suitable. It is referred to as 'eutrophication' which is the process by which nutrient enrichment causes excessive algal growth which then causes ecological disturbance. In most Solent estuaries, the problem nutrient is usually nitrate (a type of nitrogen) whereas in freshwaters the problem nutrient is usually phosphate (a type of phosphorus). In the Medina estuary both nitrate and phosphate may contribute to excessive algal growth.

Figure 1 Green macroalgae in the Medina estuary



Relevant Designations and Classification

The Medina estuary is of high nature conservation value and is protected under several EU Directives and environmental designations. The nitrogen issue is recognised within several of these designations, for example, the Medina estuary is designated a 'Sensitive Area (Eutrophic)' under the terms of the EU Urban Waste Water Treatment Directive and a 'Polluted Water (Eutrophic)' under the terms of the EU Nitrates Directive.

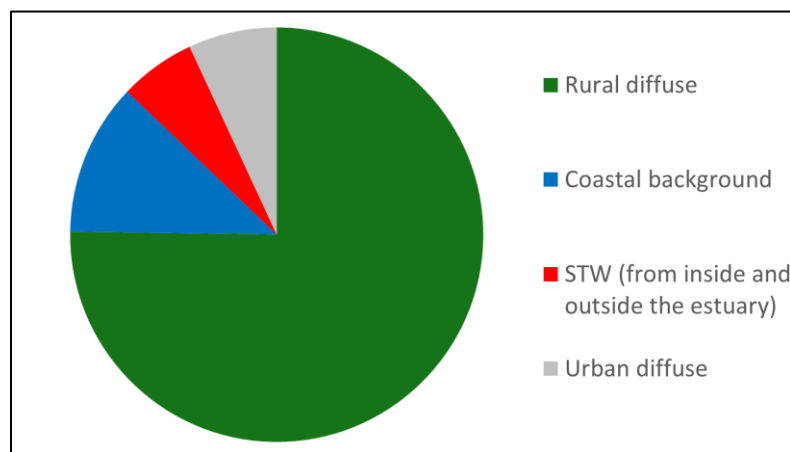
The EU Water Framework Directive (WFD) requires all water bodies to achieve 'good' status. The Medina Estuary currently only achieves Moderate status for dissolved inorganic Nitrogen and opportunistic Macroalgae.

1.2 What are the sources?

The main sources of nitrogen in most south coast estuaries, including the Medina estuary, are diffuse (as opposed to point sources like discharges). We undertook source apportionment work for the Medina estuary (see Figure 2) which shows that the main source of nitrogen is **rural diffuse nitrogen** which comes from agriculture in the catchment, and enters the estuary mainly via rivers. There is a much smaller proportion of 'coastal background' nitrogen that enters the estuary on each tide from the sea. Small amounts of nitrogen also come from sewage treatment works (STW) which discharge into the estuary and the Solent, and from urban diffuse sources.

There is a groundwater contribution to the Medina estuary although, in general, the groundwater is relatively low in nitrate. Groundwater is an important source of nitrate in several Solent estuaries in which the inflowing rivers contain a high proportion of nitrate-rich groundwater; this groundwater is often very old and its nitrate is a legacy of historic farming practices. Groundwater nitrate is less important in the Medina estuary because the groundwater baseflow in the catchment is only around 35% and groundwater nitrate concentrations are generally low.

Figure 2 Sources of nitrogen into The Medina Estuary



1.3 What can we do about it?

Actions to reduce nitrogen pollution into the Medina estuary have been ongoing for many years and include the following.

Regulatory actions - Rural Diffuse Pollution and Improvements to Discharges

In 2008 most of the land draining to the estuary was designated a 'Nitrate Vulnerable Zone' (NVZ) under the terms of the EU Nitrates Directive, thereby requiring farmers to adopt a variety of Good Agricultural Practices to reduce nitrate pollution entering water courses in the NVZ. Similarly there have been improvements to sewage discharges: under the terms of two other EU Directives the main Southern Water sewage discharge into the estuary (Fairlee STW) was diverted in 2010 to discharge offshore from Sandown STW, which reduced both nitrogen and phosphorus inputs to the Medina estuary. Figure 3 illustrates the regulatory actions that have been taken to reduce nitrogen inputs to the Medina estuary and the wider Solent area. These actions have improved water quality in the estuary but there may be a time lag before green seaweed reduces due to factors including the influence of nutrients in the sediment.

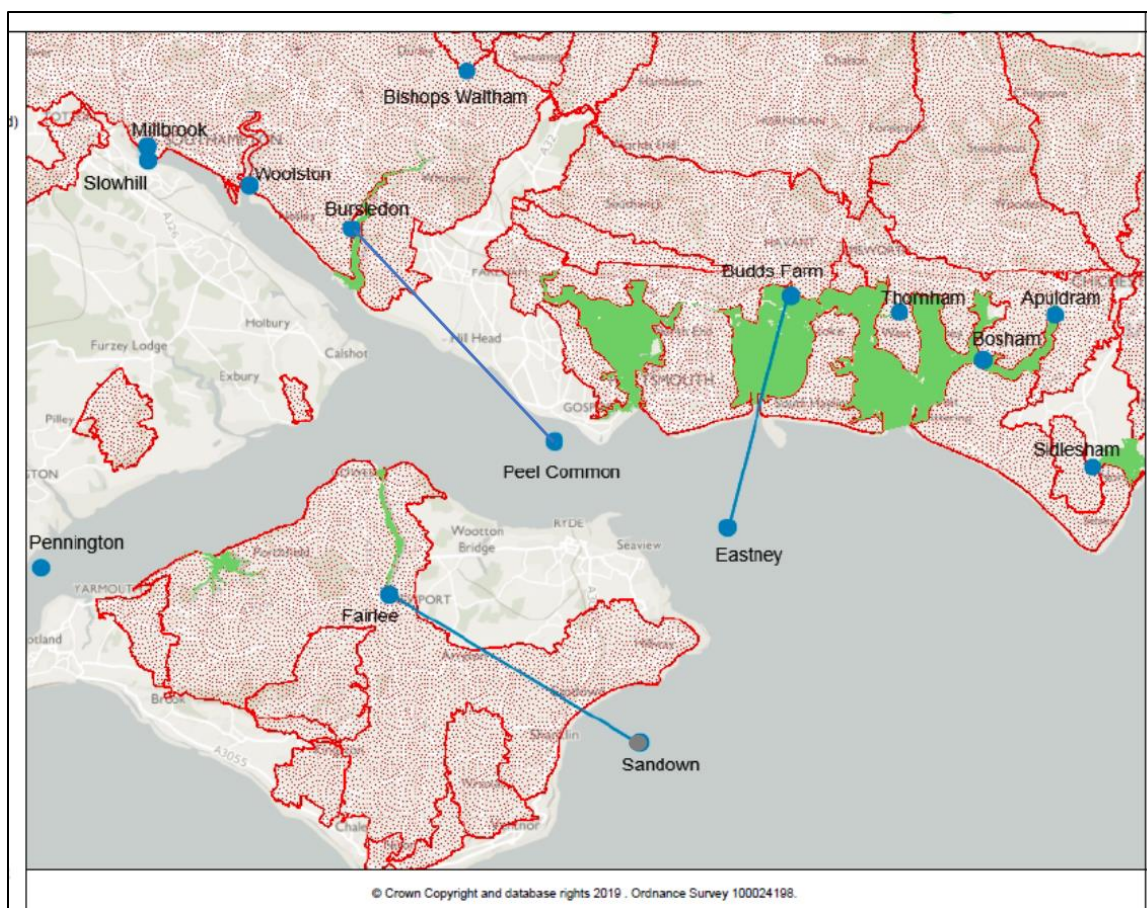
Non-regulatory Actions - Rural Diffuse Pollution

In order to further reduce nitrogen inputs, we are currently working closely with Natural England and other partners to target and deliver voluntary land management initiatives. These include Catchment Sensitive Farming projects in which farmers are advised on how they can reduce the impact of their farming practices on the environment. For example, measures to reduce the amount of fertilizer applied or to reduce runoff of soils from fields, during rainfall events, save farmers money and reduce inputs of nitrates into the catchment. One measure that seems to have particular potential for additional nitrogen reductions is the use of winter cover crops that help reduce erosion and nitrate leaching.

Continued monitoring

We continue to monitor the extent of green seaweed growth in the Medina and other estuaries by a variety of methods including aerial and local survey work. There may be a time lag before green seaweed reduces significantly, depending on the influence of factors including nutrients stored in the sediment and, to a lesser extent, groundwater.

Figure 3 Regulatory actions taken to reduce nutrient inputs to the Medina estuary and the wider Solent area



Legend

- Sewage discharge that has had nitrogen reduction
(Note that Bursledon, Fairlee and Budds Farm STWs have been diverted and now discharge into the sea where shown)
- Sensitive Area (Eutrophic)
- ▨ Nitrate Vulnerable Zone (NVZ)

1.4 Key nitrogen (nitrate) messages, Medina Estuary

- We have already tackled point and diffuse sources using EU directives
- The predominant source is diffuse rural (from agriculture)
- It will take time before we see the ecological benefit of our actions
- We need to continue to tackle diffuse nitrogen sources through regulatory and advisory measures, working with partners and to deliver appropriate land management initiatives

What can stakeholders do to help reduce nitrates?

Stakeholders can help us and our partners pursue further improvements in the water quality of the Medina estuary by:

Supporting and encouraging the use of a variety of environmental Good Practices within both the estuary and the catchment to help reduce nitrates.

Reporting any pollution or environmental incidents on our Incident hotline: 0800 80 70 60 (24-hour service)

Getting involved by joining a group such as the Island Rivers Catchment Partnership – see <http://www.islandrivers.org.uk> for further information.