



## **Nitrate Vulnerable Zone (NVZ) designation, 2017 Eutrophication (lakes)**

Publication Date: June 2016

**NVZ Name:** Slade Lower Reservoir

**NVZ ID:** EL120

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# Evidence of eutrophication 2017

This document provides a summary of the evidence used in proposing an area of land as one which should be, or should continue to be, designated as a Nitrate Vulnerable Zone (NVZ) for the purposes of the Nitrate Pollution Prevention Regulations 2015.

A full description of the methods used in developing the NVZ proposals is set out in the detailed methodology for eutrophication-related NVZs, available via <http://apps.environment-agency.gov.uk/wiyby/141443.aspx>. These methods were developed under the guidance of a review group convened by the Defra for the last NVZ review (2011-2013), which included representatives from the farming and water industries as well as independent academic experts. Minor refinements to the methods have been made for the current review.

NVZs are areas of land that drain to polluted waters and which contribute to the pollution of those waters. Polluted waters include those which are eutrophic or may in the near future become so if the Regulations were not to apply there.

Eutrophication is defined as *“the enrichment of water by nitrogen compounds, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned”*.

For both freshwaters and saline waters, a weight-of-evidence based approach to assessing the risks and impacts of eutrophication was employed. The evidence for individual water bodies was assessed against a national suite of criteria for eutrophication in the different categories/ types of water for review. The criteria are both quantitative and qualitative and reflect scientific understanding of the process and effects of eutrophication. They are broken down in the same way for each water category as follows:-

- Nutrients
- Plants/algae
- Secondary and other effects

For each designated or candidate water body which might meet the criteria for eutrophication, a datasheet such as this one was completed, bringing together information about the water body, its catchment, its uses, evidence of eutrophication and the sources of nitrogen input.

This document is a record of the evidence used in the designation process, including results from national monitoring and assessment programmes, and further information supplied by Area staff. The proposals for NVZ designation are made as a result of close working between Area and national Environment Agency teams, with further quality assurance for the eutrophication designations through the use of a national expert panel.

An accompanying guide to these datasheets is available, which provides an explanation of the contents, acronyms and technical terms.

Some features of the maps within this report are based on digital spatial data licensed from the Centre for Ecology and Hydrology, ©.

Please note that any maps shown here have not used detailed field boundaries and therefore represent the indicative 'soft' boundary only. The definitive NVZ area can be seen on the “What’s in Your Backyard” (WIYBY) website (<http://apps.environment-agency.gov.uk/wiyby/141443.aspx>).

## Section 1. Lake and catchment characteristics

WB ID: 43764

2013 NVZ status: Precautionary designation

### Lake attributes

EA Area	Devon and Cornwall		
Lake grid co-ordinates (Easting/Northing)	250580	/	145597
Lake waterbody area (ha)	2.2		
WFD Lake Typology	Moderate alkalinity,shallow,very small,lowland		
Lake Alkalinity (ueq/L)	746		
Mean lake depth (m)	5.6		
Is the lake heavily modified according to WFD?	Yes		
Does stratification occur?	Not known		
Is this waterbody a reservoir?	Yes		

#### Natural or artificial lake:

--- Higher and Lower Slade Reservoirs impounded for potable water supply in the past but no longer used and can be considered natural.

#### Type of artificial lake:

#### Lake perimeter (% artificial)

<20% (Impoundment dam likely to be only artificial element.)

#### Significant changes in lake level due to seasonal drawdown:

--- Local knowledge suggests this reservoir is not in regular public water supply.

#### Pumped storage or other reservoir:

0

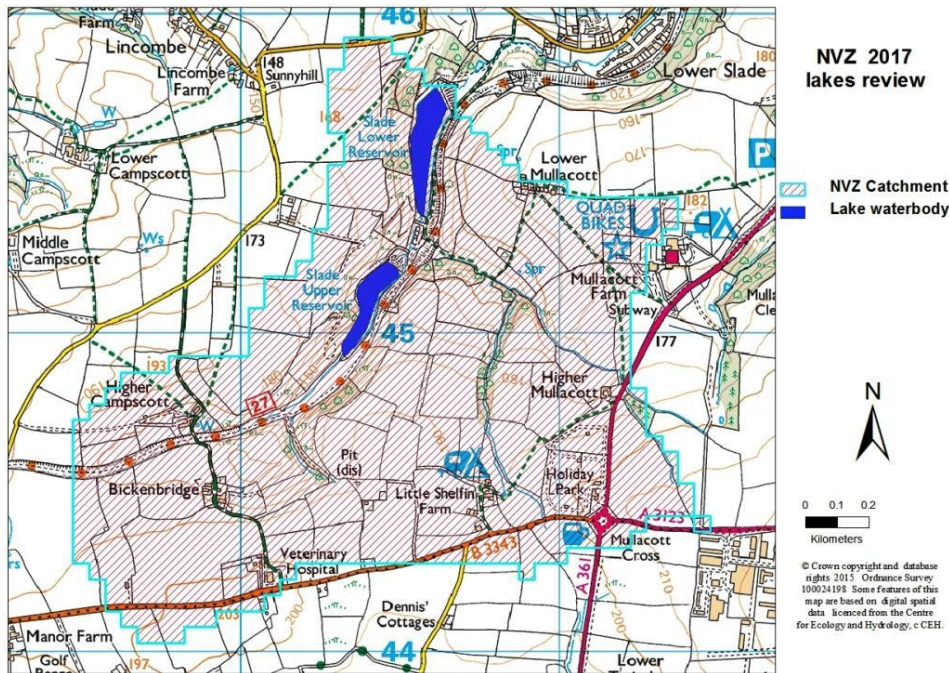
#### Information on abstraction (if available)

## Lake catchment attributes

Lake catchment area (ha)	204
If pumped, pumped catchment area (ha)	

### Hydrological character

n/k



Please note that the map above has not used the detailed field boundaries and is the indicative 'soft' boundary. The definitive NVZ area can be seen on the Environment Agency website ([www.environment-agency.gov.uk](http://www.environment-agency.gov.uk))

### Comments on accuracy of lake catchment:

Is the map representative of the natural catchment?

Yes

Is the map representative of the artificial catchment?

**Water Supply:**

**Controlled water (Section 104 of Water Resources Act):**

**Public Water Supply:**

**Drinking Water Protected Area:**

Yes

**UWWTD designation**

No

**Used for hydropower or flow regulation:**

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**Recreational use:**

**Accessibility to public:**

--- Frequency of visits and number of visits not known but close to Ilfracombe.

**Recreational fishing:**

--- Coarse fishery managed by SW Lakes Trust. 6 acre mixed fishery (carp, bream, tench, perch, roach & pike).

**Contact watersports**

**Nature of watersports (if applicable):**

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**Other public benefit visits:**

- Footpath runs alongside reservoirs. Lake is leased from SWW for fishing so this predominates.

**Conservation status:**

**Conservation value of lake:**

Local --- Not SSSI. The 'Cairn and old railway' county wildlife site on the eastern shore of both reservoirs is designated for unimproved neutral & acid grassland, bracken, scrub & semi-natural broadleaved woodland. No knowledge of any management of reservoir for ecology and aquatic species. The reservoir, western shore and wider valley is mapped as unconfirmed wildlife site, indicating the possible presence of valuable local habitat for a wide variety of species (flora and fauna) but with no survey information. Also located with North Devon Biosphere Reserve.

**Habitats Directive site:**

**SPA or SAC for aquatic interest features**

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**SSSI or local conservation designation:**

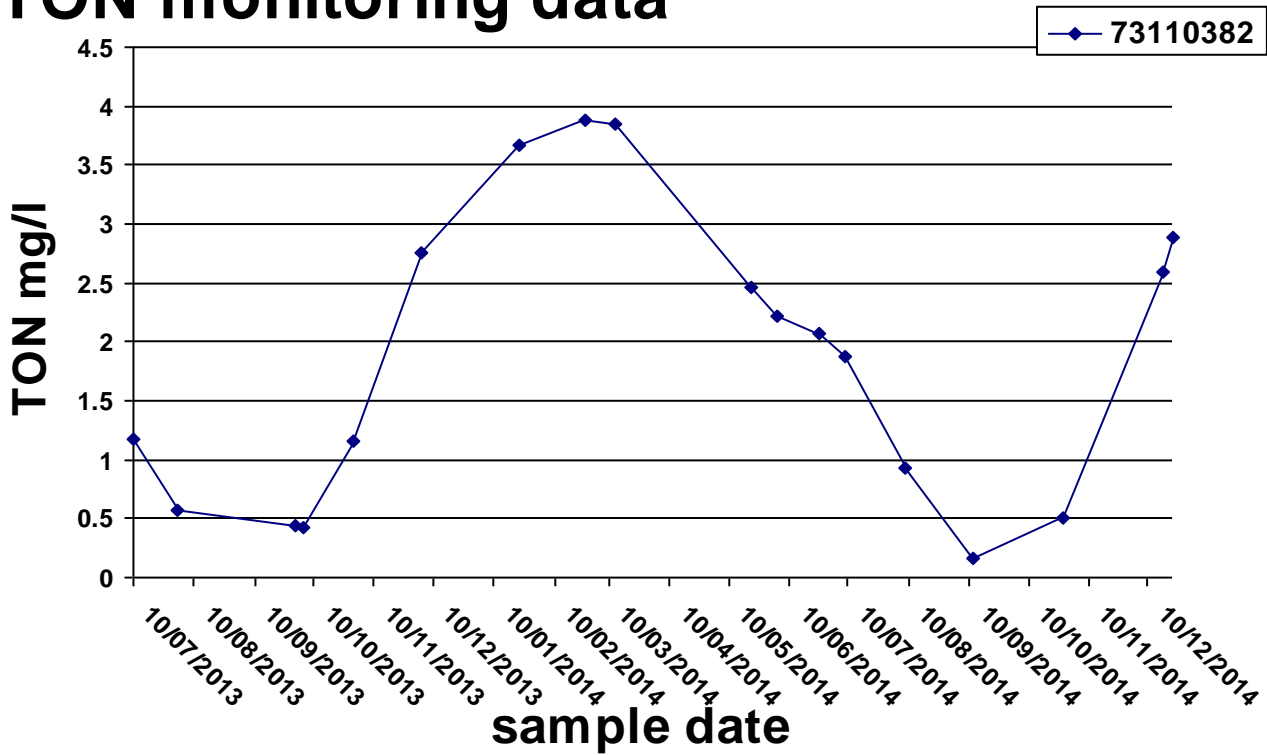
**Description of Aquatic interest features:**

## Section III - Causes - Nutrients

### Total oxidised nitrogen (TON) data

Mean summer TON (mg/l)	1.3
Total number of summer TON samples	9
75th percentile annual TON (mg/l)	2.8
Total number of TON samples	18
Confidence of annual 75th %ile TON exceeding 1 mg/l	High
Confidence of annual 75th %ile TON exceeding 2 mg/l	High
Date range of TON samples	2013 - 2014

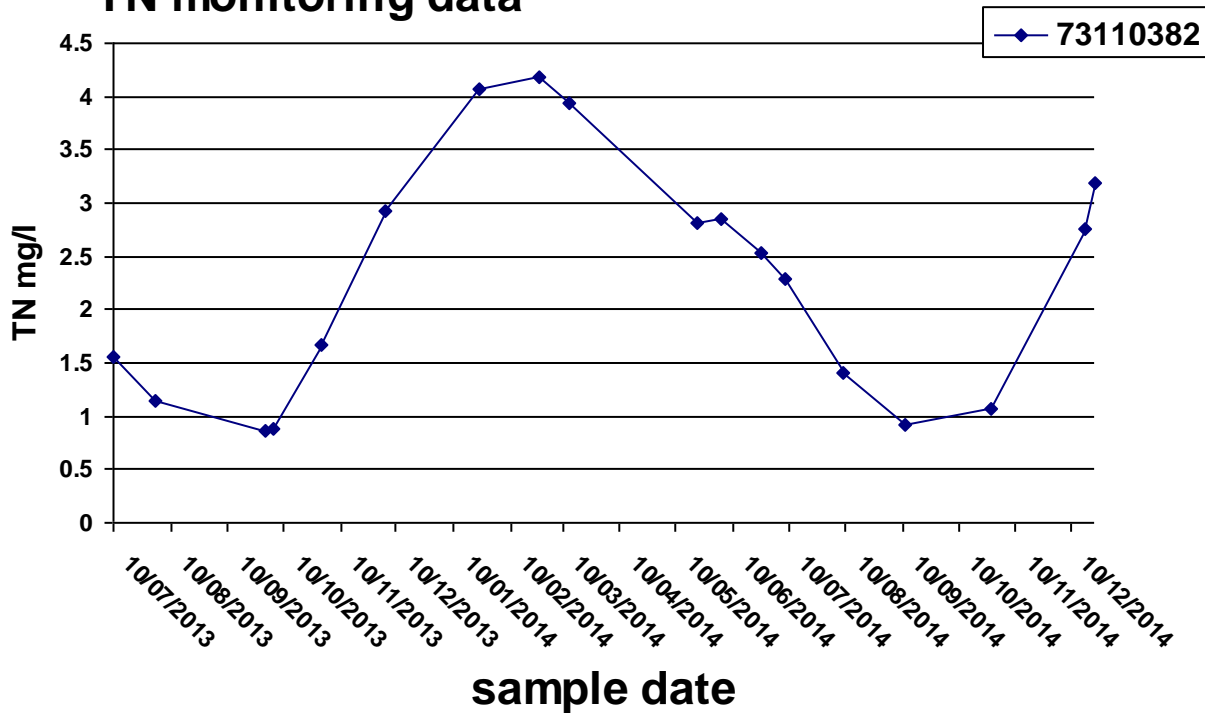
### TON monitoring data



# Total nitrogen (TN) data

Mean annual TN (mg/l)	2.3
Total number of TN samples	18
Confidence of annual mean TN exceeding 1 mg/l	High
Confidence of annual mean TN exceeding 2 mg/l	Moderate
Date range of TN samples	2013 - 2014

## TN monitoring data

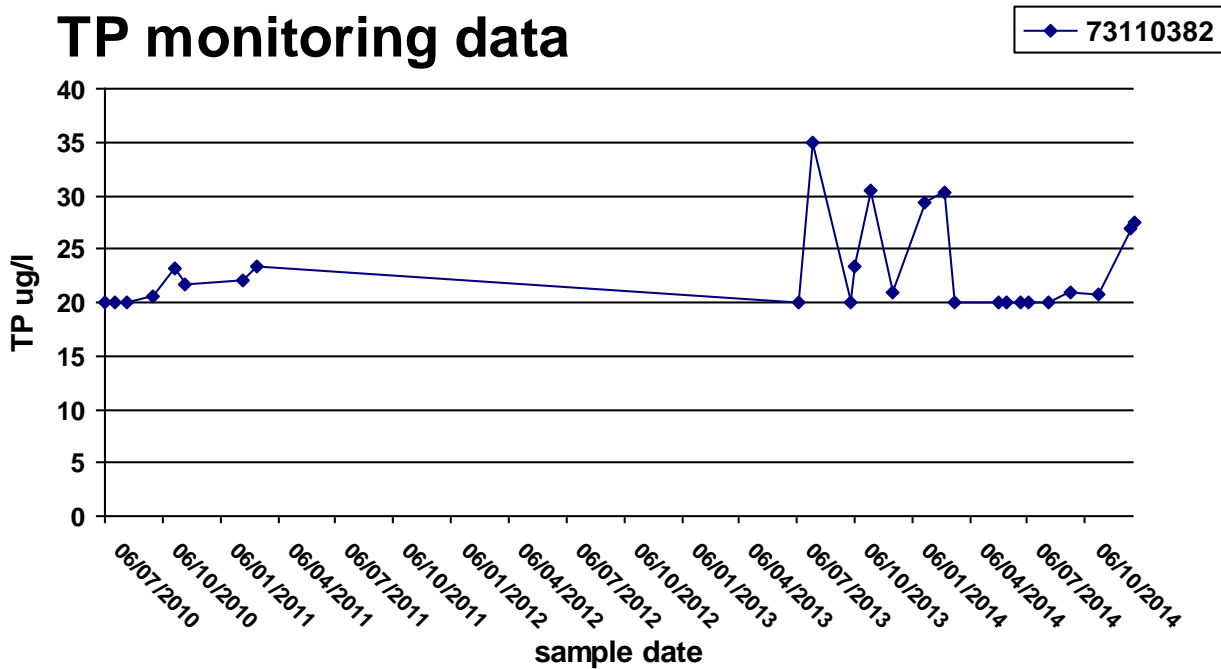


Does any other(e.g. EA non-WFD, or third party) monitoring data for the lake provide improved evidence of significantly elevated nutrient nitrogen?

# Total phosphorus (TP) data

Annual geometric mean TP (ug/l)	23
WFD face value TP class	No data
Confidence of moderate or worse TP status	No data
Date range of TP samples	2010 - 2014

## TP monitoring data



Does any other (e.g. EA non-WFD, or third party) monitoring data for the lake provide improved evidence of significantly elevated nutrient phosphorus?



## Nitrogen loading estimates based on catchment map area

NEAP - N assessment 2014	Leached N (kgN/yr)	Conc. (mg/l)
<b>From all agricultural sources</b>	7123	5.6
<b>From agricultural sources minus atmospheric deposition</b>	6977	5.5
<b>From urban sources</b>	18	0
<b>From all sources</b>	7141	5.6
<b>From all sources (minus atmospheric deposition)</b>	6995	5.5
<b>Ranking based on nitrogen loading from agricultural sources</b>		130

## Local assessment 2015

### Significance of loading from agricultural sources to the catchment of the lake

--- Local knowledge does not suggest a major agricultural input - steep valley / sheep farming. Only three small farms in upstream catchment.

### Significance of loading from human habitation to the catchment of the lake

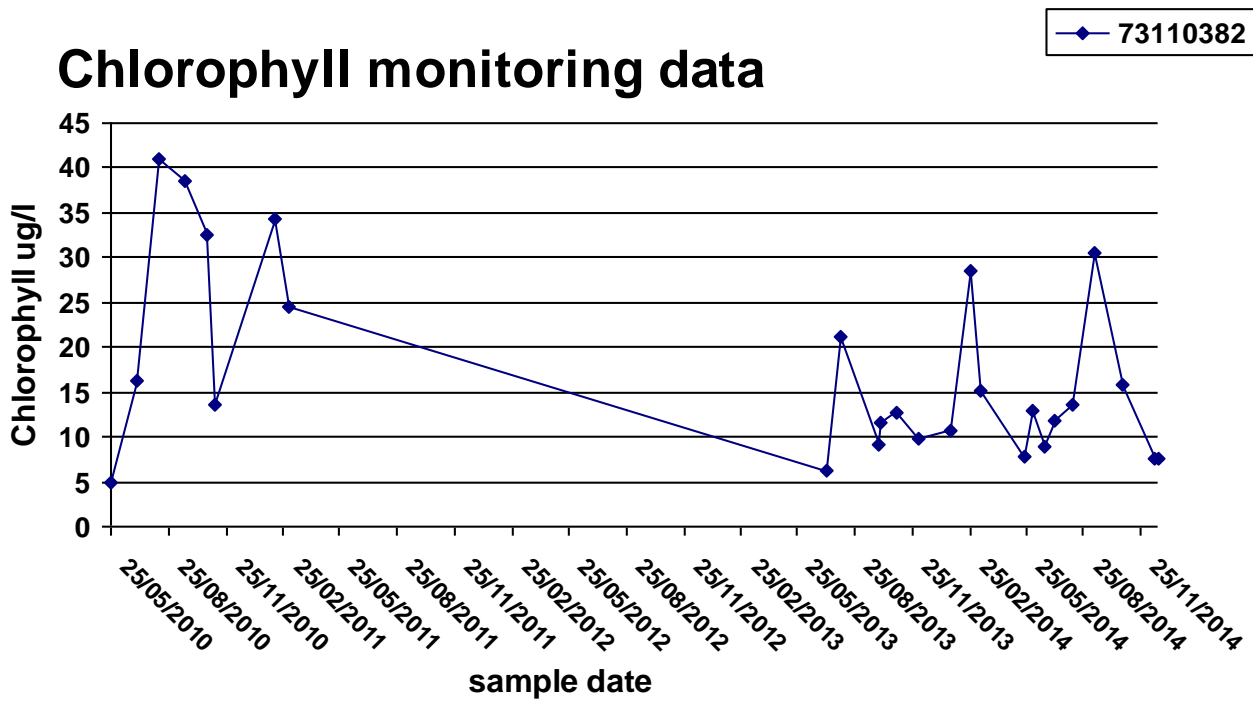
--- Holiday park in catchment. Possible potential for nutrient increase due to sewage system failures.

### Significance of any other sources of nutrient loading to the lake or its catchment

# Section IV - Response - Plants/Algae

## Chlorophyll data

Annual mean Chlorophyll (ug/l)	15
total number of Chlorophyll samples	25
WFD face value Chlorophyll class	Moderate
Confidence of moderate or worse status	100%
Chlorophyll Good/Moderate boundary value	9
Date range of Chlorophyll samples	2010-2014



## Other responses

	Phytoplankton (Pluto EQR)	Macrophytes (EQR)	Diatoms (EQR)
<b>EQR</b>	0.42	0	No data
<b>Total number of samples/surveys</b>	15	1	No data
<b>WFD face value class</b>	Moderate	Bad	No data
<b>Confidence of moderate or worse status</b>	100%	100%	No data
<b>Date range of samples</b>	2013 - 2014	2012 - 2012	-
<b>Number of years when algal blooms were observed based on reactive monitoring 2010-2015:</b>			0

**Does any other (e.g. EA non - WFD, or third party monitoring data for the lake provide improved evidence of eutrophication? (local judgement)**

--- Data available but not analysed Continuing algal blooms suggest there are some potential eutrophication issues.

**To which biological element(s) does it relate?**

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### Palaeolimnology

<b>Change as Square Chord Distance</b>	No data
<b>Change in Diatom community</b>	No data

**Evidence that designated aquatic interest features associated with the lake show evidence of eutrophic disturbance? (local judgement)**

**Strength of evidence (local judgement)**

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**Local judgement on the evidence of eutrophic disturbance**

## Comments and decisions

### WFD Weight of evidence for eutrophication:

Certainty of eutrophication problem based on core WFD tools: Quite certain eutrophication problem

Certainty of eutrophication problem based on overall weight of evidence: Quite certain eutrophication problem

WFD overall ecological status : Poor

Confidence in WFD status : Uncertain

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## Current assessment of weight of evidence supporting designation in 2017

### First national panel

Recommended action : Existing designation - check needed

### Comments from first panel:

Existing designation - N remains >2 mg/l and there is evidence of ecological impact for eutrophication. Recommend continued designation.

### Second national panel

#### Comments from second national panel :

Agreed with provisional decision to continue designation

Recommendation: Continued designation

### Local summary and recommendation:

Levels of nitrogen continue to be elevated; there is high confidence that TON exceeds 2mg/l as a 75th %ile, and high confidence that annual mean total nitrogen exceeds 1mg/l. Algal blooms were reported in the past and macrophytes were classed as Bad in 2012; there is no recent evidence to show whether or not algal blooms/macrophytes have improved. Therefore recommend continued NVZ designation.

# Final summary (2017)

<b>2017 Recommendation:</b>	Continued designation
<b>2013 Decision:</b>	Precautionary designation
<b>2008 Decision:</b>	Precautionary designation

## Lake Description:

Higher and Lower Slade Reservoirs were originally impounded for potable water supply but local knowledge suggests this reservoir is no longer used and it can be considered natural, high alkalinity shallow lake system. The reservoir has a 6 acre mixed fishery (carp, bream, tench, perch, roach & pike) managed by SW Lakes Trust. It's not a SSSI. Local knowledge suggests it is not an intensively farmed area – it is steep valley catchment with sheep farming containing only three small farms. There is also a large holiday park but it's not thought that this is adding nutrients to the reservoirs (i.e. No direct discharge of sewage effluent).

## Why the lake should be designated as a Polluted Water (eutrophic):

The Slade reservoirs are an existing eutrophic waters NVZ designation. Nitrogen is present at concentrations above the threshold range of 1-2 mg/l, and submerged plants are being affected by high nutrient levels. Continued designation is proposed..

## Nitrogen:

75th%ile TON concentration is 2.8 mg/l, mean annual TN 2.3 mg/l, thus above the upper end of the 1-2 mg/l threshold range.

## Phosphorus:

Total phosphorus classification is not currently available. Measured mean total phosphorus concentration is 23 ug/l, which is indicative of Moderate status for a shallow moderate alkalinity lake.

## Ecological response:

Phytoplankton status is Moderate and macrophyte class using the WFD method is Bad status. The ecology is impacted by eutrophication.

## Supplementary evidence:

Environment Agency Area staff have noted continuing algal blooms, although these were not formally recorded.

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