Nitrate vulnerable zone designation (NVZ) 2017 Eutrophic waters (Lakes)

There are multiple waterbodies in this NVZ, please use the bookmarks on the left toolbar to navigate between waterbodies
Nitrate Vulnerable Zone (NVZ) designation, 2017 Eutrophication (lakes)

Publication Date: June 2016

NVZ Name: Clumber Lake and Welbeck Great Lake NVZ (Clumber Lake)
NVZ ID: EL125
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:** 33056  
**2013 NVZ status:** Not Designated

### Lake attributes

<table>
<thead>
<tr>
<th>EA Area</th>
<th>Derbyshire Nottinghamshire and Leicestershire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake grid co-ordinates</td>
<td>463035 / 374668</td>
</tr>
<tr>
<td>Lake waterbody area (ha)</td>
<td>34.5</td>
</tr>
<tr>
<td>WFD Lake Typology</td>
<td>High alkalinity, shallow, small, lowland</td>
</tr>
<tr>
<td>Lake Alkalinity (ueq/L)</td>
<td>3948</td>
</tr>
<tr>
<td>Mean lake depth (m)</td>
<td>4.2</td>
</tr>
<tr>
<td>Is the lake heavily modified according to WFD?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does stratification occur?</td>
<td>Not known</td>
</tr>
<tr>
<td>Is this waterbody a reservoir?</td>
<td>No</td>
</tr>
</tbody>
</table>

**Natural or artificial lake:**  
Natural --- Constructed as an ornamental lake for the property. It is dammed and due to algal blooms the National Trust do monitor water quality and have installed planted reedbeds to treat the incoming flow.

**Type of artificial lake:**  
n/a

**Lake perimeter (% artificial)**  
<20%

**Significant changes in lake level due to seasonal drawdown:**  
N

**Pumped storage or other reservoir:**  
n/a

**Information on abstraction (if available)**

---

**NVZ Name:** Clumber Lake and Welbeck Great Lake NVZ (Clumber Lake)  
**NVZ ID:** EL125
Lake catchment attributes

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake catchment area (ha)</td>
<td>1248</td>
</tr>
<tr>
<td>If pumped, pumped catchment area (ha)</td>
<td></td>
</tr>
</tbody>
</table>

Hydrological character

Ground and surface water --- High nitrate in shallowest groundwater moving from west to east in groundwater body (local evidence - borehole water quality)

Comments on accuracy of lake catchment:

Is the map representative of the natural catchment?
No --- Since this comment was made the catchment of Welbeck Great Lake has been added to that of Clumber, it should now be more representative.

Is the map representative of the artificial catchment?
n/a
Water Supply:
Controlled water (Section 104 of Water Resources Act):
Yes

Public Water Supply:
No

Drinking Water Protected Area:
No

UWWTD designation
No

Used for hydropower or flow regulation:
\(\text{n/a}\)

Recreational use:
Accessiblity to public:
Easily accessible, many visits

Recreational fishing:
Little activity

Contact watersports
No activity

Nature of watersports (if applicable):
---

Other public benefit visits:
Significant benefit- Walkers, cyclists, bird watchers

Conservation status:
Conservation value of lake:
Local

Habitats Directive site:
Not SPA or SAC

SPA or SAC for aquatic interest features
\(\text{n/a}\) ---

SSSI or local conservation designation:
SSSI --- Local Wildlife Site

Description of Aquatic interest features:
--- Notifiable Features of the SSSI as a Whole:  - Assemblages of breeding birds - Lowland open waters and their margins  - Assemblages of breeding birds - Woodland - H9 - Calluna vulgaris - Deschampsia flexuosa heath  
Invertebrate Assemblage  - MG5 - Cynosurus cristatus - Centaurea nigra grassland  - S12 - Typha latifolia swamp  - U1 b,c,d,f - Festuca Ovina - Agrostis Capillaris - Rumex Acetosella Grassland  - U1e - Festuca ovina - Agrostis capillaris - Rumex acetosella lowland acid grassland  - U4 - Festuca ovina - Agrostis capillaris - Galium saxatil grassland  - W5 - Alnus glutinosa - Carex paniculata woodland  
Habitat Types Represented:  - Lowland acid grassland  - Dwarf shrub heath  - Broadleaved mixed and yew woodland  - Lowland wood-pasture and parkland  
Wet woodland  - Standing water  - Fen marsh and swamp  - Lowland neutral grassland
The Lake Unit Features :  Clumber Lake East Assemblages of breeding birds - Lowland open waters and their margins Waterfringe fen (lowland) Clumber Lake West Assemblages of breeding birds - Lowland open waters and their margins Assemblages of breeding birds - Woodland Waterfringe fen (lowland) Wet Woodland

NVZ Name:  Clumber Lake and Welbeck Great Lake NVZ (Clumber Lake)
NVZ ID:  EL125
Total oxidised nitrogen (TON) data

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean summer TON (mg/l)</td>
<td>4.2</td>
</tr>
<tr>
<td>Total number of summer TON samples</td>
<td>11</td>
</tr>
<tr>
<td>75th percentile annual TON (mg/l)</td>
<td>9.3</td>
</tr>
<tr>
<td>Total number of TON samples</td>
<td>20</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 1 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 2 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Date range of TON samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

**TON monitoring data**

```
 Mean summer TON (mg/l)  | 4.2    |
 Total number of summer TON samples | 11     |
 75th percentile annual TON (mg/l) | 9.3    |
 Total number of TON samples | 20     |
 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 | 2010 - 2014 |
```
Total nitrogen (TN) data

<table>
<thead>
<tr>
<th>Mean annual TN (mg/l)</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of TN samples</td>
<td>20</td>
</tr>
<tr>
<td>Confidence of annual mean TN exceeding 1 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Confidence of annual mean TN exceeding 2 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Date range of TN samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

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

Strengthens --- National Trust monitoring program of the lake. Sampling undertaken monthly (currently 16 months worth of data). Reports produced by ECUS and Sheffield University looking at the sources of nutrients in the catchment upstream of the lake and works that can be taken within the lake to improve it. (YR)
Total phosphorus (TP) data

<table>
<thead>
<tr>
<th>Annual geometric mean TP (ug/l)</th>
<th>113</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFD face value TP class</td>
<td>Poor</td>
</tr>
<tr>
<td>Confidence of moderate or worse TP status</td>
<td>100%</td>
</tr>
<tr>
<td>Date range of TP samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

TP monitoring data

![TP Monitoring Data Graph]

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

Strengthens
Nutrient sources

Nitrogen loading estimates based on catchment map area

<table>
<thead>
<tr>
<th>Source</th>
<th>Leached N (kgN/yr)</th>
<th>Conc. (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From all agricultural sources</td>
<td>15486</td>
<td>8.8</td>
</tr>
<tr>
<td>From agricultural sources minus atmospheric deposition</td>
<td>11952</td>
<td>No data</td>
</tr>
<tr>
<td>From urban sources</td>
<td>803</td>
<td>0.5</td>
</tr>
<tr>
<td>From all sources</td>
<td>16288</td>
<td>9.3</td>
</tr>
<tr>
<td>From all sources (minus atmospheric deposition)</td>
<td>12754</td>
<td>7.2</td>
</tr>
<tr>
<td>Ranking based on nitrogen loading from agricultural sources</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

Local assessment 2015

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

Principal source

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

n/k

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

NVZ Name: Clumber Lake and Welbeck Great Lake NVZ (Clumber Lake)
NVZ ID: EL125
Section IV - Response - Plants/Algae

Chlorophyll data

<table>
<thead>
<tr>
<th>Annual mean Chlorophyll (ug/l)</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>total number of Chlorophyll samples</td>
<td>20</td>
</tr>
<tr>
<td>WFD face value Chlorophyll class</td>
<td>Moderate</td>
</tr>
<tr>
<td>Confidence of moderate or worse status</td>
<td>95%</td>
</tr>
<tr>
<td>Chlorophyll Good/Moderate boundary value</td>
<td>10</td>
</tr>
<tr>
<td>Date range of Chlorophyll samples</td>
<td>2010-2014</td>
</tr>
</tbody>
</table>

Chlorophyll monitoring data

![Chlorophyll monitoring data graph](image)

NVZ Name: Clumber Lake and Welbeck Great Lake NVZ (Clumber Lake)
NVZ ID: EL125
<table>
<thead>
<tr>
<th></th>
<th>Phytoplankton (Pluto EQR)</th>
<th>Macrophytes (EQR)</th>
<th>Diatoms (EQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQR</td>
<td>0.18</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Total number of samples/surveys</td>
<td>13</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>WFD face value class</td>
<td>Poor</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Confidence of moderate or worse status</td>
<td>100%</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Date range of samples</td>
<td>2011 - 2013</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Number of years when algal blooms were observed based on reactive monitoring 2010-2015:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Does any other (e.g. EA non-WFD, or third party monitoring data for the lake provide improved evidence of eutrophication? (local judgement)
Strengthens evidence --- Report produced by the National Trust. Elevated pH and dissolved oxygen readings (YF).

To which biological element(s) does it relate?
More than one (describe) ---

**Palaeolimnology**

<table>
<thead>
<tr>
<th></th>
<th>No data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change as Square Chord Distance</td>
<td></td>
</tr>
<tr>
<td>Change in Diatom community</td>
<td>No data</td>
</tr>
</tbody>
</table>

Evidence that designated aquatic interest features associated with the lake show evidence of eutrophic disturbance? (local judgement)
Likely to be affected- Notifiable Features listed above likely to be affected. Overall SSSI status likely to be affected

**Strength of evidence** (local judgement)
Strong evidence ---

Local judgement on the evidence of eutrophic disturbance
Y, definitely
Review of evidence and recommendations

Comments and decisions

WFD Weight of evidence for eutrophication:
Certainty of eutrophication problem based on core WFD tools: Very certain eutrophication problem
Certainty of eutrophication problem based on overall weight of evidence: Very certain eutrophication problem
WFD overall ecological status: Poor
Confidence in WFD status: Uncertain

Current assessment of weight of evidence supporting designation in 2017

First national panel
Recommended action: Needs further investigation

Comments from first panel:
N is very significantly elevated, likely sources need checking. Limited evidence of impact from phytoplankton, further evidence required.

Second national panel
Comments from second national panel:
Check with National Trust regarding blooms and any other evidence.[ National Trust contacted post-meeting, further evidence of eutrophic issues and support designation]. Panel support designation.

Recommendation: Designate

Local summary and recommendation:
Notwithstanding that this lake is already situated within a Nitrate Vulnerable Zone, we feel there is sufficient enough strong and relevant evidence to support the case for having it designated as a Polluted Water (Eutrophic) under the Nitrate Directive.
Final summary (2017)

2017 Recommendation: Designate
2013 Decision: Not Designated
2008 Decision: Not Designated

Lake Description:
Constructed by damming the river Poulter to serve as an ornamental lake for Clumber House this small shallow high alkalinity lake is in the Clumber Park SSSI.

Why the lake should be designated as a Polluted Water (eutrophic):
Clumber Lake and the associated Welbeck Great Lake are within existing ground and surface water NVZs. Although there are a number of discharge consents in the catchment, agriculture is responsible for a significant input of nitrogen. It is in a SSSI, but there are no notified aquatic features.

Nitrogen:
The 75th percentile TON and mean annual TN values are very high at 9.3mg/l and 7 mg/l respectively, significantly above the 2 mg/l threshold.

Phosphorus:
The WFD classification for total phosphorus is Poor status.

Ecological response:
WFD status for chlorophyll is moderate and Poor for overall phytoplankton, indicating a eutrophic impact.

Supplementary evidence:
Additional monitoring by the National Trust supports the EA monitoring results.

NVZ Name: Clumber Lake and Welbeck Great Lake NVZ (Clumber Lake)
NVZ ID: EL125
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03708 506 506 (Monday to Friday, 8am to 6pm)

email
enquiries@environment-agency.gov.uk

or visit our website
www.gov.uk/environment-agency

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floodline 0345 988 1188 / 0845 988 1188 (24 hours)
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Nitrate Vulnerable Zone (NVZ) designation, 2017 Eutrophication (lakes)

Publication Date: June 2016

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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.

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NVZ Name: Clumber Lake and Welbeck Great Lake NVZ (Welbeck Great Lake)
NVZ ID: EL125
**Section 1. Lake and catchment characteristics**

**WB ID:** 33100  
**2013 NVZ status:** Designate (Precautionary)

### Lake attributes

<table>
<thead>
<tr>
<th><strong>EA Area</strong></th>
<th>Derbyshire Nottinghamshire and Leicestershire</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lake grid co-ordinates (Easting/Northing)</strong></td>
<td>457872 / 372994</td>
</tr>
<tr>
<td><strong>Lake waterbody area (ha)</strong></td>
<td>59.2</td>
</tr>
<tr>
<td><strong>WFD Lake Typology</strong></td>
<td>Marl, very shallow, large, lowland</td>
</tr>
<tr>
<td><strong>Lake Alkalinity (ueq/L)</strong></td>
<td>5022</td>
</tr>
<tr>
<td><strong>Mean lake depth (m)</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Is the lake heavily modified according to WFD?</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Does stratification occur?</strong></td>
<td>Well mixed</td>
</tr>
<tr>
<td><strong>Is this waterbody a reservoir?</strong></td>
<td>No</td>
</tr>
</tbody>
</table>

**Natural or artificial lake:**
Natural --- The Great Lake and the Carburton Dams at Welbeck are man-made lakes developed by construction of weirs and dams along the courses of the River Poulter and the Millwood Brook. Although manmade they now function more as natural lakes.

**Type of artificial lake:**
n/a

**Lake perimeter (% artificial)**
<20% (Lake is man made and features a couple of weirs / dams which form artificial boundaries across the narrow width of the lake. The margins of the lake have become more naturalised and are bordered by fields and woodland.)

**Significant changes in lake level due to seasonal drawdown:**
Y --- Only when works are being carried out on the lake under the Reservoirs Act.

**Pumped storage or other reservoir:**
n/a

**Information on abstraction (if available)**
Lake catchment attributes

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake catchment area (ha)</td>
<td>8282</td>
</tr>
<tr>
<td>If pumped, pumped catchment area (ha)</td>
<td></td>
</tr>
</tbody>
</table>

Hydrological character

Ground and surface water --- Surface water, groundwater from permo triassic sandstone, and Eutrophic. High Nitrate in shallowest groundwater moving from west to east in groundwater body (local evidence - borehole water quality)

Comments on accuracy of lake catchment:

Is the map representative of the natural catchment?

No --- The River Poulter does not flow to the Great lake as this discharges into Carburton Forge Dam downstream of the Great Lake. [Welbeck great Lake and Clumber lake have joined to make one NVZ catchment, this includes Carburton Forge Dam]

Is the map representative of the artificial catchment?

n/a
Section II - Waterbody uses

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

**Public Water Supply:**
No

**Drinking Water Protected Area:**
No

**UWWTD designation**
No

**Used for hydropower or flow regulation:**
n/a

**Recreational use:**

**Accessiblity to public:**
Not easily accessible, few visits --- Only on footpaths through the private estate. Anglers have access to the lake as part of the angling club. (YR)

**Recreational fishing:**
Little activity

**Contact watersports**
Little activity --- Access to the lake is restricted and members and visitors must use the authorised route shown on the map. There are security barriers for which Members have keys so please contact the Club to arrange a visit. Some boating does occur.

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

**Other public benefit visits:**
No activity

**Conservation status:**

**Conservation value of lake:**
Local

**Habitats Directive site:**
Not SPA or SAC

**SPA or SAC for aquatic interest features**
n/a ---

**SSSI or local conservation designation:**
SSSI --- & local wildlife site

**Description of Aquatic interest features:**
--- Notifiable Features of the SSSI as a Whole:  - Aggregations of breeding birds - Grey Heron, Ardea cinerea  - Assemblages of breeding birds - Mixed: Lowland open water, Woodland  Habitat Types Represented :- Open Standing Water - Fen, marsh and swamp- Broadleaved, mixed and yew woodland  The Great Lake unit feature :- Assemblages of breeding birds - Mixed: Lowland open water, Woodland  The citation states that the site comprises a complex of habitats centred on the Great Lake and Carburton Dams, Welbeck and is notable for its breeding bird community, which includes a heronry, and for its wintering wildfowl.

**NVZ Name:** Clumber Lake and Welbeck Great Lake NVZ (Welbeck Great Lake)
**NVZ ID:** EL125
Total oxidised nitrogen (TON) data

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean summer TON (mg/l)</td>
<td>4.1</td>
</tr>
<tr>
<td>Total number of summer TON samples</td>
<td>12</td>
</tr>
<tr>
<td>75th percentile annual TON (mg/l)</td>
<td>9.8</td>
</tr>
<tr>
<td>Total number of TON samples</td>
<td>24</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 1 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 2 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Date range of TON samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

**TON monitoring data**

![Graph showing TON monitoring data from 2010 to 2014](image)

**NVZ Name:** Clumber Lake and Welbeck Great Lake NVZ (Welbeck Great Lake)

**NVZ ID:** EL125
Total nitrogen (TN) data

<table>
<thead>
<tr>
<th>Mean annual TN (mg/l)</th>
<th>6.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of TN samples</td>
<td>24</td>
</tr>
<tr>
<td>Confidence of annual mean TN exceeding 1 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Confidence of annual mean TN exceeding 2 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Date range of TN samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

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?

n/k
Total phosphorus (TP) data

<table>
<thead>
<tr>
<th>Annual geometric mean TP (ug/l)</th>
<th>208</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFD face value TP class</td>
<td>Bad</td>
</tr>
<tr>
<td>Confidence of moderate or worse TP status</td>
<td>100%</td>
</tr>
<tr>
<td>Date range of TP samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

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

n/k --- 0

NVZ Name: Clumber Lake and Welbeck Great Lake NVZ (Welbeck Great Lake)
NVZ ID: EL125
### Nutrient sources

#### Nitrogen loading estimates based on catchment map area

<table>
<thead>
<tr>
<th>Source</th>
<th>Leached N (kgN/yr)</th>
<th>Conc. (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From all agricultural sources</td>
<td>234671</td>
<td>13.1</td>
</tr>
<tr>
<td>From agricultural sources minus atmospheric deposition</td>
<td>214537</td>
<td>12.1</td>
</tr>
<tr>
<td>From urban sources</td>
<td>10348</td>
<td>0.6</td>
</tr>
<tr>
<td>From all sources</td>
<td>245019</td>
<td>13.7</td>
</tr>
<tr>
<td>From all sources (minus atmospheric deposition)</td>
<td>224885</td>
<td>12.6</td>
</tr>
</tbody>
</table>

#### Local assessment 2015

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

Minor source --- Lake situated at top end of River Poulter catchment. Land use is agricultural or country park / estate.

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

Principal source --- Urban areas with the catchment.

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

---

**NVZ Name:** Clumber Lake and Welbeck Great Lake NVZ (Welbeck Great Lake)

**NVZ ID:** EL125
**Chlorophyll data**

<table>
<thead>
<tr>
<th>Annual mean Chlorophyll (μg/l)</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>total number of Chlorophyll samples</td>
<td>24</td>
</tr>
<tr>
<td>WFD face value Chlorophyll class</td>
<td>Moderate</td>
</tr>
<tr>
<td>Confidence of moderate or worse status</td>
<td>100%</td>
</tr>
<tr>
<td>Chlorophyll Good/Moderate boundary value</td>
<td>20</td>
</tr>
<tr>
<td>Date range of Chlorophyll samples</td>
<td>2010-2014</td>
</tr>
</tbody>
</table>

**Chlorophyll monitoring data**

![Graph showing chlorophyll monitoring data from 2010 to 2014](image-url)
Other responses

<table>
<thead>
<tr>
<th>EQR</th>
<th>Phytoplankton (Pluto EQR)</th>
<th>Macrophytes (EQR)</th>
<th>Diatoms (EQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No data</td>
<td>0.3</td>
<td>No data</td>
</tr>
<tr>
<td>Total number of samples/surveys</td>
<td>0</td>
<td>1</td>
<td>No data</td>
</tr>
<tr>
<td>WFD face value class</td>
<td>Poor</td>
<td>Poor</td>
<td>No data</td>
</tr>
<tr>
<td>Confidence of moderate or worse status</td>
<td>100%</td>
<td>100%</td>
<td>No data</td>
</tr>
<tr>
<td>Date range of samples</td>
<td>2013 - 2013</td>
<td>2012 - 2012</td>
<td>-</td>
</tr>
<tr>
<td>Number of years when algal blooms were observed based on reactive monitoring 2010-2015:</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

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

Strengthens evidence --- Wet weather monitoring and a lake sampling program. Visual inspections by the estate and the use of an ultrasound to reduce algal growth. The estate have plans to dredge the upper two lakes and introduce planted reedbeds to reduce/mitigate the algal problem. A report has been produced by Oceans ESU.(YR)

To which biological element(s) does it relate?

Other ---

Palaeolimnology

| Change as Square Chord Distance | No data |
| Change in Diatom community | No data |

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

Likely to be affected- Natural England carried out a condition assessment of this SSSI in 2008 and describe 5 of the units to be in favourable condition - this includes the standing open water and canals. Notifiable Features Listed Above neither affected nor likely to be affected. Overall SSSI status likely to be affected

Strength of evidence (local judgement)

Moderately Strong ---

Local judgement on the evidence of eutrophic disturbance

Y, definitely
**Comments and decisions**

WFD Weight of evidence for eutrophication:

<table>
<thead>
<tr>
<th>Certainty of eutrophication problem based on core WFD tools:</th>
<th>Very certain eutrophication problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certainty of eutrophication problem based on overall weight of evidence:</td>
<td>Very certain eutrophication problem</td>
</tr>
<tr>
<td>WFD overall ecological status:</td>
<td>Poor</td>
</tr>
<tr>
<td>Confidence in WFD status:</td>
<td>Very Certain</td>
</tr>
</tbody>
</table>

**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:**
Notwithstanding that this lake is already situated within a Nitrate Vulnerable Zone, we feel there is sufficient enough strong and relevant evidence to support the case for having it designated as a Polluted Water (Eutrophic) under the Nitrate Directive
2017 Recommendation: Continued designation
2013 Decision: Designate (Precautionary)
2008 Decision: Designated

Lake Description:
The Great Lake and the Carburton Dams at Welbeck are man-made lakes developed by construction of weirs and dams along the course of the River Poulter and the Millwood Brook. Although manmade they function as natural lakes. Great Lake Welbeck is well mixed, very shallow marl lake. It is a SSSI. The catchment land use includes agriculture, country estate, and urban.

Why the lake should be designated as a Polluted Water (eutrophic):
Welbeck Great Lake is within an existing eutrophic waters NVZ designation, which as a result of the current review is proposed to be extended downstream to include Clumber Lake and its catchment. Clumber Lake and Welbeck Great Lake are also within existing ground and surface water NVZs. Although there are a number of discharge consents in the catchment, agriculture is responsible for a significant input of nitrogen. It is in a SSSI but there are no notified aquatic features. Reducing the nitrogen input to the lake is likely to improve its condition.

Nitrogen:
75th percentile TON concentrations continue to be very high at 9.8 mg/l. Mean annual TN concentrations are also high at 6.7 mg/l, so remaining significantly above the 2 mg/l threshold value (The concentrations have declined very slightly since the last review). Concentrations show peaks in winter and troughs in summer, with TON dropping close to the limit of detection at times, indicating nitrogen may be limiting phytoplankton growth.

Phosphorus:
The WFD classification for total phosphorus is Bad status.

Ecological response:
WFD status for both phytoplankton and macrophytes is Poor indicating that both biological elements continue to be affected by eutrophication

Supplementary evidence:
The estate have plans to undertake restoration work, including dredging the upper lake and introducing reedbeds in an attempt to reduce the observed algal problem.
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