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

Publication Date: June 2016

NVZ Name: Cromes Broad
NVZ ID: EL106
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](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](http://apps.environment-agency.gov.uk/wiyby/141443.aspx)).
Section 1. Lake and catchment characteristics

WB ID: 35772  2013 NVZ status: Designate

Lake attributes

<table>
<thead>
<tr>
<th>EA Area</th>
<th>Essex Norfolk and Suffolk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake grid co-ordinates (Easting/Northing)</td>
<td>637415 / 319676</td>
</tr>
<tr>
<td>Lake waterbody area (ha)</td>
<td>3.7</td>
</tr>
<tr>
<td>WFD Lake Typology</td>
<td>Organic, very shallow, very small, lowland</td>
</tr>
<tr>
<td>Lake Alkalinity (ueq/L)</td>
<td>3040</td>
</tr>
<tr>
<td>Mean lake depth (m)</td>
<td>0.8</td>
</tr>
<tr>
<td>Is the lake heavily modified according to WFD?</td>
<td>No</td>
</tr>
<tr>
<td>Does stratification occur?</td>
<td>Well mixed</td>
</tr>
<tr>
<td>Is this waterbody a reservoir?</td>
<td>No</td>
</tr>
</tbody>
</table>

Natural or artificial lake:

Type of artificial lake:
--- Man made by historical peat diggings.

Lake perimeter (% artificial)

Significant changes in lake level due to seasonal drawdown:

Pumped storage or other reservoir:
0

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>213</td>
</tr>
<tr>
<td>If pumped, pumped catchment area (ha)</td>
<td></td>
</tr>
</tbody>
</table>

Hydrological character

--- The Broad is fed by surface run-off from the surrounding area and some groundwater input. Sluices are used to prevent water entering from the River Ant, so currently there is little input from the surrounding rivers.

Comments on accuracy of lake catchment:

Is the map representative of the natural catchment?

--- Assuming sluices remain in place to prevent entry of water from river (area is tidally influenced).

Is the map representative of the artificial catchment?

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)

NVZ Name: Cromes Broad
NVZ ID: EL106
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**
--- River Ant.

**Used for hydropower or flow regulation:**

--- Visitor centre nearby and marked trail to Broad.

**Recreational use:**

**Accessibility to public:**
--- Visitor centre nearby and marked trail to Broad.

**Recreational fishing:**

Contact watersports

Nature of watersports (if applicable):
---

**Other public benefit visits:**

- Bird watching, nature trails.

**Conservation status:**

**Conservation value of lake:**
--- National and Local nature reserves.

**Habitats Directive site:**
--- SSSI

**SPA or SAC for aquatic interest features**
---

**SSSI or local conservation designation:**
--- Cromes is part of Ant Broads and Marshes SSSI.

**Description of Aquatic interest features:**

---

**NVZ Name:** Cromes Broad  
**NVZ ID:** EL106
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>0.5</td>
</tr>
<tr>
<td>Total number of summer TON samples</td>
<td>18</td>
</tr>
<tr>
<td>75th percentile annual TON (mg/l)</td>
<td>1.5</td>
</tr>
<tr>
<td>Total number of TON samples</td>
<td>35</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 1 mg/l</td>
<td>Low</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 2 mg/l</td>
<td>Not confident</td>
</tr>
<tr>
<td>Date range of TON samples</td>
<td>2012 - 2014</td>
</tr>
</tbody>
</table>

TON monitoring data

NVZ Name: Cromes Broad
NVZ ID: EL106
Total nitrogen (TN) data

<table>
<thead>
<tr>
<th>Mean annual TN (mg/l)</th>
<th>2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of TN samples</td>
<td>36</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>Moderate</td>
</tr>
<tr>
<td>Date range of TN samples</td>
<td>2012 - 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?
Total phosphorus (TP) data

| Annual geometric mean TP (ug/l) | 54 |
| WFD face value  TP class         | Good |
| Confidence of moderate or worse TP status | 20% |
| 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?

--- Most recent assessment was carried out in March 2010 and provided information for the period Jan 2007 to December 2009. In Crome’s Broad the 3 year average total phosphate level is 0.0663mg/l.
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>7350</td>
<td>18</td>
</tr>
<tr>
<td>From agricultural sources minus atmospheric deposition</td>
<td>6873</td>
<td>17.3</td>
</tr>
<tr>
<td>From urban sources</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td>From all sources</td>
<td>7371</td>
<td>18.1</td>
</tr>
<tr>
<td>From all sources (minus atmospheric deposition)</td>
<td>6894</td>
<td>16.9</td>
</tr>
<tr>
<td>Ranking based on nitrogen loading from agricultural sources</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

Local assessment 2015

Significance of loading from agricultural sources to the catchment of the lake
--- Not connected to rivers, water only comes from surface run-off and a little groundwater therefore agriculture believed to be main source of nutrients.

Significance of loading from human habitation to the catchment of the lake
--- Could be a few unsewered properties but unknown.

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

NVZ Name: Cromes Broad
NVZ ID: EL106
## Chlorophyll data

<table>
<thead>
<tr>
<th>Annual mean Chlorophyll (ug/l)</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>total number of Chlorophyll samples</td>
<td>54</td>
</tr>
<tr>
<td>WFD face value Chlorophyll class</td>
<td>Good</td>
</tr>
<tr>
<td>Confidence of moderate or worse status</td>
<td>0%</td>
</tr>
<tr>
<td>Chlorophyll Good/Moderate boundary value</td>
<td>No data</td>
</tr>
<tr>
<td>Date range of Chlorophyll samples</td>
<td>2010-2014</td>
</tr>
</tbody>
</table>

### Chlorophyll monitoring data

![Chlorophyll monitoring data](chart.png)

**NVZ Name:** Cromes Broad  
**NVZ ID:** EL106
Other responses

<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>0.73</td>
<td>0.7</td>
<td>No data</td>
</tr>
<tr>
<td>Total number of samples/surveys</td>
<td>59</td>
<td>1</td>
<td>No data</td>
</tr>
<tr>
<td>WFD face value class</td>
<td>Good</td>
<td>Good</td>
<td>No data</td>
</tr>
<tr>
<td>Confidence of moderate or worse status</td>
<td>0%</td>
<td>36%</td>
<td>No data</td>
</tr>
<tr>
<td>Date range of samples</td>
<td>2013 - 2014</td>
<td>2012 - 2012</td>
<td>-</td>
</tr>
</tbody>
</table>

Number of years when algal blooms were observed based on reactive monitoring 2010-2015: 0

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 --- The Broads Authority’s macrophyte surveys have shown that there is a low abundance of aquatic plants but there is high species diversity. The community is typical of a high nutrient system. SSSI condition statement is unfavourable recovering

To which biological element(s) does it relate?

Macrophytes ---

**Palaeolimnology**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Change as Square Chord Distance</td>
<td>No data</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)

- Natural England conclude that this SSSI unit is in adverse condition due to Water Pollution – Agriculture/Run-off. Little information as is not a designated WFD lake.

Strength of evidence (local judgement)

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Local judgement on the evidence of eutrophic disturbance

---

**NVZ Name:** Cromes Broad

**NVZ ID:** EL106
## Review of evidence and recommendations

### Comments and decisions

**WFD Weight of evidence for eutrophication:**

<table>
<thead>
<tr>
<th>Certainty of eutrophication problem based on core WFD tools:</th>
<th>Certain no eutrophication problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certainty of eutrophication problem based on overall weight of evidence:</td>
<td>Certain no eutrophication problem</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WFD overall ecological status :</th>
<th>Not WFD waterbody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in WFD status :</td>
<td>Not WFD waterbody</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 - TN is slightly $>2$mg/l and TON $>1$ mg/l, but supporting evidence shows improved ecological status. Recommend continued designation due to elevated N but to be reviewed in future if ecological improvement is sustained.

#### Second national panel

**Comments from second national panel:**
Agreed with provisional decision to continue designation

**Recommendation:**
Continued designation

**Local summary and recommendation:**
This lake is currently designated. Additional evidence has been received from the Broads Authority - their macrophyte surveys have shown that there is low abundance of aquatic plants but there is high species diversity. The community is typical of a high nutrient system. The SSSI condition statement for the Broad is unfavourable recovering. Other evidence still stands, and continued designation is appropriate.

---

**NVZ Name:**  Cromes Broad  
**NVZ ID:**  EL106
Lake Description:
Cromes Broad is a high alkalinity, very shallow, well mixed Broad created by peat digging. It is believed that the lake is fed primarily by surface run-off. The lake is likely to be influenced by groundwater levels and hence the Broad may also receive some groundwater input. Sluices are used to prevent water entering from the River Ant, so currently there is little input from the surrounding rivers. Cromes is part of Ant Broads and Marshes SSSI, designated for a broad range of aquatic interest features. It is a SPA and SAC. Cromes Broad is in a predominantly rural agricultural catchment area although there are also unsewered properties within the catchment.

Why the lake should be designated as a Polluted Water (eutrophic):
Cromes Broad is an existing eutrophic waters NVZ designation, and lies within a groundwater NVZ. The catchment is agricultural and nitrogen concentrations are above the 1-2 mg/l threshold range, with evidence of eutrophic impact on the ecology.

Nitrogen:
The 75th percentile TON concentration is 1.5 mg/l, and mean TN is 2.2mg/l, thus values are above the 1-2 mg/l thresholds. Summer TON declines significantly suggesting that nitrogen limitation of growth is occurring, and further reduction in N concentrations would result in further limitation of phytoplankton development.

Phosphorus:
WFD classification for total phosphorus is Good status.

Ecological response:
Cromes Broad is not a WFD water body, but application of the WFD assessment tools indicates both phytoplankton and macrophytes at Good status. There is contradictory evidence from assessments by Broads Authority and Natural England.

Supplementary evidence:
The Broads Authority macrophyte surveys showed that although there was a high species diversity abundance is low and the plant community is typical of a high nutrient system. Natural England have given a status of unfavourable, recovering to the Broad and say that the SSSI unit is in adverse condition due to water pollution from agricultural runoff.
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