

# **Total phosphorus targets for lake Natura 2000 Protected Area Special Areas of Conservation (SACs)**

## **Introduction**

Part of the work for the update of the River Basin Plans has been to agree common water quality and flow targets for Natura 2000 Protected Area sites, that are also WFD water bodies, where such targets are relevant. (See part 2 of the RBMP consultation document for more details).

For N2KPA SAC lake sites the only parameter where alignment of standards was reviewed was phosphorus and so this work was undertaken jointly at a national level between the Environment Agency and Natural England.

This document lists the proposed total phosphorus (TP) targets for these lake SACs. These targets are in line with the Common Standard Monitoring (CSM) guidance for standing waters (JNCC, 2005) and the revised guidance for lakes (IAFG, in prep.). CSM guidance advocates using site-specific TP targets based on available evidence, where possible, and using lake type targets, where site-specific evidence is unavailable. Consequently as new evidence becomes available, there is the capacity to change these targets. The principles behind the target decision-making process are in the appendix and the detailed reasons for individual targets are in Hall, 2014.

These in-lake TP targets may be achieved through a variety of measures, although all measures will not be required at all sites. Measures may include those that reduce phosphate inputs from the catchment from diffuse or point sources and in-lake measures that may be required to reduce internal cycling of nutrients and reduce re-suspension of sediments, such as controlling fish populations and promoting macrophyte growth. However, the relationship between lake ecology and phosphorus is complex; in shallow lakes in particular, significant changes in ecological structure (e.g. the rapid recovery, or loss, of macrophytes) can result in large changes in TP concentrations unrelated to the load from the catchment.

Hall, R.A. (2014) TP targets for lake SACs - Conclusions from the NE-EA meeting on 23<sup>rd</sup> April 2014

Inter-Agency Freshwater group (IAFG) (in prep.) Common Standards Monitoring Guidance for Freshwater Lakes.

Joint Nature Conservation Committee (JNCC). (2005). Common Standards Monitoring Guidance for Standing Waters.

**Table 1 TP targets (in  $\mu\text{g l}^{-1}$ ) for SAC lakes which are also WFD water bodies.**

<b>WFDWBID</b>	<b>Lake name</b>	<b>SAC name</b>	<b>TP target</b>	<b>Reason for proposed target</b>
GB31228965	Derwent Water	River Derwent and Bassenthwaite Lake	8	No deterioration
GB31229097	Blea Tarn (Armboth Fells)	Lake District High Fells	5	No deterioration
GB30229083	Red Tarn, Helvellyn	Lake District High Fells	5	No deterioration
GB31228847	Bassenthwaite Lake	River Derwent and Bassenthwaite Lake	10	Improvement required to reach favourable condition –HES.
GB31229052	Buttermere	River Derwent and Bassenthwaite Lake	5	No deterioration
GB31229000	Crummock Water	River Derwent and Bassenthwaite Lake	5	No deterioration
GB31229183	Wast Water	Wast Water	5	No deterioration
GB30229129	Grisedale Tarn	Lake District High Fells	5	No deterioration
GB30228955	Ullswater	River Eden	11	GES more stringent than CSM typology target and lake currently in favourable condition at this concentration.
GB31229647	Hawes Water, Silverdale	Morecambe Bay Pavements	9	No deterioration
GB30429844	Malham Tarn	Craven Limestone Complex	12	No deterioration
GB30745652	Hatchet Pond	The New Forest	17	Reference condition – unfavourable at HES
GB30846102	Little Sea	Dorset Heaths (Purbeck & Wareham) & Studland Dunes	21	Reference condition – unfavourable at HES
GB31233474	Oak Mere	Oak Mere	22	Potentially naturally higher TP due to colour, no obvious sources of enrichment, but some evidence of macrophyte species loss. GES but needs further investigation.
GB30535640	Hickling Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
GB30535645	Horsey Mere	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
GB30536202	Upton Broad	The Broads	26	No deterioration
GB30535738	Martham Broad (North and South)	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads Martham was at this concentration in the recent past - 1980's
GB30547010	Rollsby Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
GB30547009	Ormesby Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
GB30547012	Filby Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads

GB30547011	Ormesby Little Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
GB30536029	Cockshoot Broad	The Broads	44	Not designated as H3150 so HES TP may be sufficient
GB30535655	Barton Broad	The Broads	44	Not designated as H3150 so HES TP may be sufficient
GB30535977	Hoveton Great Broad & Hudsons	The Broads	44	Not designated as H3150 so HES TP may be sufficient
GB30535959	Decoy Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
GB30536730	Rockland Broad	The Broads	43	Not designated as H3150 so HES TP may be sufficient
GB30328220	Crag Lough	Roman Wall Loughs	20	CSM mesotrophic lake target
GB30328172	Broomlee Lough	Roman Wall Loughs	20	CSM mesotrophic lake target
GB30328165	Greenlee Lough	Roman Wall Loughs	20	CSM mesotrophic lake target
GB30644482	Woolmer Pond	Woolmer Forest	10	CSM target
GB30644464	Cranmer Pond	Woolmer Forest	10	CSM target

**Table 2 TP targets for non-WFD water bodies (TP in  $\mu\text{g l}^{-1}$ ).**

<b>Lake name</b>	<b>SAC name</b>	<b>TP target</b>	<b>Reason for TP target</b>
Abbots Moss	West Midlands Mosses	10	CSM target
Irstead Holmes	The Broads	50	CSM target
Catfield Broad	The Broads	50	CSM target
Dock Tarn	Lake District High Fells	5	CSM target
Barnby Broad	The Broads	50	CSM target
Little Broad	The Broads	50	CSM target
Calthorpe Broad	The Broads	50	CSM target
Chartley Moss dystrophic Pools	West Midlands Mosses	10	CSM target
Clarepool Moss dystrophic pools	West Midlands Mosses	10	CSM target
Langmere	Breckland	50	CSM target
Ringmere	Breckland	50	CSM target
Little Hawes Water	Morecambe Bay Pavements	10	CSM target
Styhead & Sprinkling Tarns	Lake District High Fells	5	In-line with other upland tarns for no deterioration
Cunswick Tarn	Morecambe Bay Pavements	10	CSM target
Bowscale Tarn	Lake District High Fells	5	In-line with other upland tarns for no deterioration
Scales Tarn	Lake District High Fells	5	In-line with other upland tarns for no deterioration
Round Water	The Broads	50	CSM target
Sprat's Water	The Broads	50	CSM target
Woolner's Carr	The Broads	50	CSM target
Devil's Punchbowl	Breckland	50	CSM target
Fowlmere	Breckland	50	CSM target
Home Mere	Breckland	50	CSM target
Sunbiggin Tarn	Asby Complex	15	CSM target
Lily Broad	The Broads	50	CSM target
Tarn Dub	Moor House - Upper Teesdale	10	CSM target
Heigham Sound	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
Upton Little Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
Wybunbury Moss	West Midlands Mosses	10	CSM target
Bargate Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
Wheatfen Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
Strumpshaw Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
Buckenham Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads
Hassingham Broad	The Broads	30	Evidence suggests this is what is required to support charophytes in the Broads

# Appendix 1

## Principles used in assigning targets

1. If a site is in favourable condition (for all attributes) the current total phosphorus concentration (as an annual mean) should be set as the target to prevent deterioration. If GES is more stringent than this, GES should be set as the target.
  
2. If a site is in unfavourable condition, but evidence is available of the TP concentration when the site was in favourable condition, this should be used to set the TP target, whilst giving consideration to the following:
  - i. Shallow lakes have some degree of resilience to increased nutrient loading and excessive loading may continue for some time before adverse ecological impacts are detected. Therefore, a target at the TP concentration observed just before the loss of favourable condition is not likely to be protective enough.
  - ii. It is often harder for lakes to recover from eutrophication than it is to move into a eutrophic state. Therefore, a lower nutrient concentration than the one experienced prior to eutrophication is often required for a lake to recover to its pre-eutrophic state.
  
3. It is possible to use evidence from other similar sites to set appropriate targets. Two examples are below:
  - i. Few upland, oligotrophic tarns are monitored; those which have been monitored have a TP concentration of less than 5 µg/l (often equivalent to HES). Therefore other upland oligotrophic tarns for which there are no data and no evidence of any nutrient inputs should be afforded a similar level of protection.
  - ii. Although many of the Norfolk Broads have been studied for a number years, not all the smaller Broadland water bodies are monitored. Therefore findings from the Broads that have been studied will be applied to other similar water bodies within the Broads.

4. If there is no evidence of the TP concentration at favourable condition, Common Standards Monitoring (CSM) typology targets should be used, unless GES is more stringent then this should be applied.
  
5. If the CSM typology target is more stringent than the modelled reference condition for WFD, national specialists should be consulted and further work may be required to clarify appropriate targets.
  
6. If a site is in unfavourable condition and showing symptoms associated with eutrophication, but the in-lake TP concentration is already at or close to the CSM typology target, a more stringent target will need to be set to enable the site to reach favourable condition. In the absence of other information, the TP standard associated with the next most stringent ecological status class should be used following the hierarchy GES-HES-reference.
  
7. In the light of new evidence targets can be reviewed.

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