BTO Research Report No. 670

The Use of Wetland Bird Survey (WeBS) Data for Rapid Condition Assessment of Non-Breeding Waterbird SPAs in England

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Report of work carried out by The British Trust for Ornithology

March 2015

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1. INTRODUCTION

Natural England (NE) wishes to adapt WeBS Alerts methodology to provide site condition assessments for inland waterbodies, estuarine and coastal SPAs (specifically, for non-breeding waterbirds using the SPAs, where data allow).

The initial phase of the project is to provide a rapid output for each feature of each SPA, in order to inform a pressing need for Conservation Objectives of SPAs to reflect condition. This will include comparison of outputs from Alerts and from Common Standards Monitoring approaches.

As part of this work analytic programs need to be developed to reflect requirements of Common Standards Monitoring. This will incorporate assessment of non-breeding waterbird assemblages as qualifying features, reflecting abundance of all waterbirds and diversity (expressed most simply as a count of different species).

Various metrics for characterising the assemblage and qualifying feature abundance for each of the two five-year periods are to be considered. These will be compared within themselves and also compared these with the published Alerts for the period since designation. The aim is to assess which metric(s) will provide the most robust assessments of status.

The aims of this work were therefore to:

- Develop computer code similar to that used for generating WeBS Alerts, to reflect requirements of Common Standards Monitoring;
- Check citation dates of relevant SPAs so that comparison period matches Natural England citation. Where a five year count period is not identified on the citation form, site / feature combinations should be listed for future consideration;
- Incorporate assessment (generation of alert and known natural variation values) of waterbird assemblages as qualifying features, reflecting abundance (i.e. peak counts of all waterbirds, excluding gulls and terns) and diversity (expressed most simply as a count of different species) of these;
- Output an Excel file to include as a minimum:
    - Time period assessed
    - % change in abundance (and species composition for assemblage features)
    - Whether status considered favourable / unfavourable, according to known natural variation
    - Tabulated comparison of WeBS Alerts values and known natural variation values

2. METHODS

2.1 Period of Designation

Where possible, periods of designation have been taken from the citations available from NE: http://publications.naturalengland.org.uk/category/6490068894089216 but where citations were not available from NE we have taken those specified in the document available from http://jncc.defra.gov.uk/page-1409 .

2.2 SPA Coverage

WeBS site boundaries generally encompass all areas used by waterbirds associated with a given estuary, inland waterbody or group of waterbodies usefully considered as a complex , stretch of open coast or riverine stretches. As such, in addition to strictly wetland habitats they may encompass agricultural fields, disused and derelict land, and other open spaces used by the waterbirds associated with a given area of wetland. Larger sites are generally sub-divided into multiple count sectors which can then be surveyed in a coordinated fashion by a team of volunteer counters. This would be the case for a substantial majority of SPAs.

For each SPA, WeBS holds a spatial definition, typically linking the SPA to one or more traditional WeBS sites or in the case of SPAs associated with the Thames Estuary, with traditional BoEE/NWC sub-sites for which WeBS holds time series of data extending back to the 1960s/1970s. Although more precise spatial definitions for SPAs are available in terms of WeBS count sectors, these frequently and often seriously underestimate the number of birds using a given SPA because visits are often made when many individuals are to be found outside the strict SPA boundaries; for example waders counted at roosts on adjacent areas over high-water during spring tides. It is therefore the whole WeBS site based SPA spatial definitions that are used to provide data on the abundance of waterbirds associated with each.

2.3 Species Coverage Through Time

There are issues regarding species coverage by WeBS. Firstly, WeBS as a monitoring scheme came into being by subsuming two existing monthly monitoring schemes: the National Wildfowl Counts (NWC) and Birds of Estuaries Enquiry (BoEE). The first monitored wildfowl numbers and the second, wader numbers on coastal sites. Although some NWC observers may have recorded waders and other species of waterbirds beside swans, geese and ducks recording of those species was at best incomplete. The BoEE did not extend to inland sites. Furthermore, inclusion of waterbirds other than wildfowl and waders as target species for the scheme(s) has been incremental: great crested grebe and coot were included from 1982; cormorant from 1987; little grebe from 1988 with all remaining waterbirds being included from the inception of WeBS in 1993. Since 1993, WeBS has covered all waterbird species including wildfowl, divers, grebes, cormorants, herons and rail and other “long-legged” wading birds such as cranes, storks and ibis. Gulls, terns and non-natives are also covered but do not form part of this analysis as they are not included in the waterbird assemblage. The implication of this is that waterbird species recorded during the most recent five-years may be absent from the data for the period of designation because they were not being recorded by surveyors at the time rather than because they were not present.

For the current analysis we have also excluded the British/Irish greylag as at the time of designation of all SPAs within England, these could confidently be assigned to the re-introduced population and as such were excluded from the waterbird assemblage. This species is problematic as since 2008 WeBS has ceased to differentiate between the re-introduced population and the ancestral northwest Scotland population. Furthermore the re-introduced population has spread throughout the UK and during winter can be found throughout the wintering range of the Icelandic population from which they cannot be distinguished. Whilst this is becoming a major issue for the allocation of numbers to the two populations in Scotland, in the context of England it is only problematic for the most northerly SPAs where Icelandic and British/Irish birds may both be present. We have therefore excluded greylag, together with barnacle goose from the analysis of all SPAs other than The Solway Flats and Marshes and Lindisfarne.

2.4 Compilation of and Assessment of Change for Waterbird Assembleges

The approach used here to characterise the waterbird assemblage for a site in any given winter is essentially similar to that used to derive the Principal Site Table published annually by WeBS which ranks site according to their waterbird abundance. This approach sums the maximum monthly abundance of each species and thus represents a minimal estimate for the total number of individual waterbirds that occupied the site during the twelve month period. Twelve month periods correspond to the winter-centric WeBS "survey year" – July to June. It has become established practise to characterise the abundance of individual species or indeed the waterbird assemblage as the mean of the annual peaks over five consecutive winters; a metric generally referred to as the "Five-year Peak Mean". WeBS publishes this value annually for all individual species on all monitored WeBS sites in addition to the equivalent for the waterbird assemblage on each site. These values are those that have been used extensively to underpin designations of features on protected sites.

Having obtained annual values for the waterbird assemblage a range of metrics (Table 1) have been extracted for both the five-year period upon which the SPA designations have been based (designation period) and for the most recent five-year period available from WeBS (current period). Where designation dates cited for a given SPA differed between species, for the purposes of this report the earliest period cited has been taken. Whilst the designation period differs between SPAs, with only one exception (Holburn Lake and Moss, UK9006041) all current periods refer to the winters 2008/09 - 2012/13.

Table 1 Metrics taken to characterise the waterbird assemblage for designation period and current period for each SPA. The associated code relates to column headings in the Excel workbook that accompanies this report.

Code	Description
DesMeanPeak	mean of annual assemblage for the designation period
CurMeanPeak	mean of annual assemblage for most recent available five-year period
DesMinPeak	minimum assemblage for the designation period
CurMinPeak	minimum assemblage for most recent available five-year period
DesMaxPeak	peak assemblage for the designation period
CurMaxPeak	peak assemblage for most recent available five-year period
DesiGAMcent	GAM-modelled assemblage for central year of designation period
CurrGAMcent	GAM-modelled assemblage for central year of most recent available five-year period
DesiGAMmean	mean GAM-modelled assemblage for designation period

Code	Description
CurrGAMmean	mean GAM-modelled assemblage for most recent available five-year period
DesiGAMMax	maximum GAM-modelled assemblage for designation period
CurrGAMMax	maximum GAM-modelled assemblage for most recent available five-year period
DesiGAMMin	minimum GAM-modelled assemblage for designation period
CurrGAMMin	minimum GAM-modelled assemblage for most recent available five-year period
AtDesInclusive	number of species (excluding non-natives) recorded during the designation period
LatestInclusive	number of species (excluding non-natives) recorded during the most recent five-year period
AllTimeInclusive	number of species (excluding non-natives) recorded over all time
AtDesExclusive	number of species (excluding non-natives, rare and naturally occurring vagrants) recorded during the designation period
LatestExclusive	number of species (excluding non-natives, rare and naturally occurring vagrants) recorded during the most recent five-year period
AllTimeExclusive	number of species (excluding non-natives, rare and naturally occurring vagrants) recorded over all time

The first two metrics, DesMinPeak and CurMaxPeak equate to those most likely to have been considered historically for assessing change in abundance of waterbirds in the waterbird assemblage. The metrics AtDesInclusive and LatestInclusive equate to those most likely to have been used historically for assessing change in species richness.

Comparisons using five-year mean peak, minimum peak or maximum peak essentially use a five-year rolling value to assess abundance. The minimum and maximum peak values are particularly vulnerable to uncharacteristic winters, the mean-peak less so. Consequently, we have also considered the effect of modelling the trajectory of the underlying trend in waterbird assemblage against which to derive similar metrics. The chosen method was to use a Generalized Additive Model (GAM), which is that used by WeBS to model the underlying trend in individual species abundance and against which assessment of change for WeBS Alerts are made. Using values from the GAM-modelled trajectory ensures inter-annual variation is taken into account whether using the minimum, maximum, central year or mean values.

With regard to the change in species richness, in addition to considering the overall number of all waterbird species (excluding non-natives) or “inclusive” numbers we have also considered an exclusive measure of species richness that in addition to excluding non-natives also excludes vagrant species and species that tend to be recorded infrequently as non-breeding features such as dotterel and stone curlew. We also report the all-time species list for each SPA, again using inclusive and exclusive alternatives.

Having obtained these metrics we can then calculate the percentage change between the designation period and the current period using a variety of comparisons, and absolute change for each of the species richness metric (Table 2). No all possible combinations for percentage change (of which there are 49) have been considered but rather we have considered the percentage change for each metric for the designation with its equivalent for the most recent five-year period, and because of its similarity with current practise have also considered comparing minimum metrics for the period of designation with their corresponding maximum metric for the most recent five-year period – the “Known Natural Fluctuation” (KNF) approach.

Table 2 Metrics taken to characterise the percentage change in waterbird abundance and species richness. The associated codes relate to column headings in the Excel workbook that accompanies this report.

Code	Description
DeltaKnownNaturalFluctuation	Percentage change between 5-yr minimum of annual assemblage during the designation period and maximum during the most recent 5-yr period
DeltaMeanPeak	Percentage change in 5-yr mean of annual assemblage: comparable with five-year mean of peak counts AKA "Peak Mean" used to characterise individual species abundance.
DeltaMinPeak	Percentage change in 5-yr minimum of annual assemblage
DeltaMaxPeak	Percentage change in 5-yr peak of annual assemblage
DeltaGAMKNF	Percentage change in GAM-modelled assemblage between minimum for the designation period and maximum for the most recent five-year period
DeltaGAMmean	Percentage change in mean GAM-modelled assemblage of each period
DeltaGAMmax	Percentage change in maximum GAM-modelled assemblage of each period
DeltaGAMmin	Percentage change in minimum GAM-modelled assemblage of each period
DeltaGAMcent	Percentage change in GAM-modelled assemblage value for central winter of each period
DeltaInclusive	Absolute change in in species diversity - measured as number of species recorded (excluding non-natives) - absolute number, not percentage
DeltaExclusive	Absolute change in in species diversity - measured as number of species recorded (excluding non-natives and rare/vagrant species) - absolute number, not percentage

2.5 Assessment of Change for Qualifying Features

The approach used here for assessment of individual qualifying features followed a similar approach to that used for the Waterbird Assemblage. For each qualifying feature in turn, the equivalent metrics of abundance were derived to those used for the waterbird assemblage (equivalent to the first 14 metrics listed for the waterbird assemblage - see Table 1) and from these, the equivalent metrics of percentage change in abundance of qualifying feature to that derived for the waterbird assembage (equivalent to the first eight metrics listed for the waterbird assemblage - see Table 2).

3. RESULTS

There were sufficient data to assess the waterbird assemblage and features for 56 SPAs that are wholly or partially within England of which the period of designation was available for 47 from NE citations available from http://publications.naturalengland.org.uk/category/6490068894089216. The remainder were taken from the document available from http://jncc.defra.gov.uk/page-1409 and where the use of the latter has been necessary it is recommended that NE investigate further so that a single definitive source will be available in the future.

Data were available for all SPAs for the cited designation period but in one case, Holburn Lake and Moss SPA (UK9006041) there are no counts available from the WeBS database since 2005/06. In the last case, the comparisons reported here relate to the period 2000/01 – 2004/05 rather than 2008/09 – 2012/13 which is used for all other SPAs. There is also an issue with The Wash in that prior to 1993/94 it is not possible to distinguish counts for Gibraltar Point SPA (UK9008022) from The Wash SPA (UK9008021) as WeBS data prior to 1993 are only currently available at the whole site level and The Wash WeBS site encompasses both SPAs. This means that whilst the five-year mean, minimum and maximum peaks for the designation period were unaffected, the time-series available for fitting the GAM-modelled abundance upon which the four of the metrics of abundance are based does not include the two-year lead-in was used for other sites to minimise the series end-effects on the model. There is also an issue with the Somerset Levels and Moors SPA (UK9010031) in that prior to 1993/94 and the formation of WeBS this site was only monitored through the NWC and it is apparent that non-wildfowl (including a high abundance of Lapwing and Golden Plover) were not consistently recorded. Accordingly, pre-1993/94 data have been excluded from the time series analysed for that site.

3.1 Waterbird Assemblages

A complete summary of all metrics for all SPAs is available in the Excel workbook accompanying this report (sheet ‘AssemblageSummaries’). With regard to the percentage change values we have arbitrarily colour coded cells as follow: blue - decline of less than 25%; orange - decline of at least 25% but less than 50%; outline – decline in excess of 50%. This colour coding follows closely that associated with the WeBS Alerts reporting where orange equates to a medium Alert and red equates to a high Alerts.

The Excel workbook also contains a sheet for each SPA (sheets named by EU code) detailing all species recorded on that site and whether each was recorded during the designation period, the current period, both these periods, or neither. Where species are a qualifying feature the assessment of change metrics are also included.

Abundance plots with the underlying GAM-modelled trend in abundance are available in the PowerPoint presentation that accompanies this report.

In order to draw conclusions of the relative merits of each of the percentage change metrics, each in turn was scored as to whether or not it places the change in the waterbird assemblage for a given SPA in the same category (>0; 0-10; 10-25; 25-50; >50) as the majority of all the metrics. This should not be considered a statistical comparison and, given that four of the metrics are based on the same GAM-modelled trend is to some extent self-fulfilling; however it does provide an indication of whether the assessment is likely to change as different change metrics are chosen. This is summarised below (Table 3).

Table 3 Comparison of assemblage metrics in terms of consistency with other metrics. The associated codes relate to column headings in the Excel workbook that accompanies this report.

Code	Proportion of cases where consistent with majority
DeltaKnownNaturalFluctuation	61%
DeltaMeanPeak	91%
DeltaMinPeak	70%
DeltaMaxPeak	91%
DeltaGAMKNF	71%
DeltaGAMmean	98%
DeltaGAMmin	91%
DeltaGAMmax	82%
DeltaGAMcentre	84%

3.2 SPA Features

A complete summary of all metrics for all qualifying features is available in the Excel workbook accompanying this report (sheet 'FeaturesSummaries'). Note these values are also available from the individual SPA sheets where appropriate.

In order to draw conclusions of the relative merits of each of the percentage change metrics, a similar approach was use to that employed for the waterbird assemblage *i.e*. each was in turn scored as to whether or not it places the change in the qualifying feature abundance for a given SPA in the same category (>0; 0-10; 10-25; 25-50; >50) as the majority of all the metrics. The same caveat applies. This is summarised below (Table 4).

Table 4 Comparison of metrics in terms of consistency with other metrics. The associated codes relate to column headings in the Excel workbook that accompanies this report.

Code	Proportion of cases where consistent with majority
DeltaKnownNaturalFluctuation	56%
DeltaMeanPeak	92%
DeltaMinPeak	75%
DeltaMaxPeak	80%
DeltaGAMKNF	69%
DeltaGAMmean	92%
DeltaGAMmin	78%
DeltaGAMmax	83%
DeltaGAMcent	87%

3.3 Comparison with Published WeBS 'Since Designation' Alerts

In order to compare the published WeBS 'since designation' Alerts with those using the CSM approach developed here it was necessary to run an alternative compilation and assessment of change whilst back-dating the latest period considered to 2006/07 - 2010/11 to correspond with Cook *et al*. (2013). A complete listing of all metrics for all qualifying features back-dated to this period is available in the Excel workbook accompanying this report (sheet 'CSM *cf.* Published Alerts'). The information is summarised below (Table 5).

Table 5 Cross-tabulation of the percentage decline classes derived from the potential metrics of change with published Alerts status (Cook *et al*. 2013). Cell values correspond to the number of qualifying feature/SPA assessments falling into each combination of Alerts status and percentage decline class. Cells highlighted in green are those for which the two are in agreement.

WeBS Alerts Status (2010/11)	Percentage decline: High	Medium	Low	no decline
Delta-Known-Natural-Fluctuation				
High-Alert	**22**	18	9	47
Medium Alert	2	**9**	13	80
No Alert	1	0	**7**	**272**
Delta-Mean-Peak				
High-Alert	**65**	19	7	11
Medium Alert	25	**33**	29	18
No Alert	16	33	**56**	**193**
Delta-Min-Peak				
High-Alert	**57**	16	6	14
Medium Alert	30	**30**	24	20
No Alert	20	30	**43**	**184**
Delta-Max-Peak				
High-Alert	**61**	21	5	15
Medium Alert	19	**44**	27	15
No Alert	23	32	**51**	**192**
Delta-GAM-KNF				
High-Alert	**35**	26	10	30
Medium Alert	4	**21**	30	49
No Alert	3	9	**27**	**254**
Delta-GAM-mean				
High-Alert	**62**	21	9	10
Medium Alert	23	**36**	27	19
No Alert	15	33	**56**	**194**
Delta-GAM-min				
High-Alert	**70**	13	10	7
Medium Alert	27	**36**	21	21
No Alert	20	43	**46**	**189**
Delta-GAM-max				
High-Alert	**63**	21	6	12
Medium Alert	14	**43**	26	22
No Alert	14	28	**55**	**201**

WeBS Alerts Status (2010/11)	Percentage decline High	Medium	Low	no decline
		Delta-GAM-centre		
High-Alert	**65**	20	6	9
Medium Alert	26	**35**	28	14
No Alert	20	36	**49**	**181**

Several sites do not feature in this comparison. In the case of the Humber Estuary, the current WeBS Alerts refer to the classification date of the now subsumed Humber Flats and Marshes SPA whereas the new analysis has been run for the Humber Estuary SPA and so any comparison would have been inappropriate. Comparisons for Gibraltar Point SPA were not possible as that site has not previously been assessed by WeBS Alerts and comparisons for the Crouch and Roach Estuary were not possible as that SPA had been inadvertently left out of the published WeBS Alerts report. Those for The Wash have been included even although values from the published Alerts do not exclude birds that may have been recorded within Gibratar Point SPA, however in reality those numbers are trivial in comparison to those within The Wash SPA itself and will have had no detectable impact.

4. DISCUSSION

4.1 Waterbird Assemblages

We have explored a number of different possibilities for characterising the waterbird assembledge within a given five-year period. Traditionally, the five-year peak mean has been used to underpin inclusion of individual species as qualifying features on protected sites and five-year means of summed peaks underpin the estimate for the waterbird assemblage. When considering to what extend the waterbird assemblage i.e. the total number of non-breeding waterbirds (excluding non-natives) has changed between two periods again the five-year mean peak is an obvious choice. However the current CSM approach, KNF, is to compare the minimum annual peak during the designation period with the maximum annual peak from the most recent five-year period. We may also wish to consider comparing values for the maximum peak during the five-year designation as clearly the SPA in question was capable of supporting that number of non-breeding waterbirds during that five-years. Likewise, we may wish to consider the minimum peak as a more conservative estimate of the number of non-breeding waterbirds the SPA supports. DeltaKnownNaturalFluctuation, DeltaMeanPeak, DeltaMinPeak and DeltaMaxpeak all compare periods using a five-year moving window but only DeltaMeanPeak makes any allowance for inter-annual variability around the underlying trend within a five-year period. However,only the fluctuation around the trend from within the window being characterised is taken into account.

We therefore also explored whether the GAM-modelling used by WeBS to assess change in abundance of individual qualifying features on SPAs could be usefully adapted to assess the underlying trend in the non-breeding waterbird assemblage. Potential advantages of this approach is that the GAM model takes into account the fluctuation around the trend across the entire time series (not just the five-years in question) and its consistency with WeBS Alerts. Also this approach would facilitate the seamless inclusion of the non-breeding waterbird assemblage into the existing WeBS Alerts online reporting for relatively little cost.

In order to facilitate the comparison of the relative merits of the various options for quantifying change in the non-breeding waterbird assemblage between the two periods we have chosen to use the percentage change since the designation period. Although a SPA showing any degree of decline in the assemblage may be considered to have “failed” the assessment the categorisation of percentage decline into low, medium and high into categories that correspond to the WeBS Alerts system is useful in assessing the degree of concern appropriate to a given percentage decline. Those for which the decline has exceeded 25% would be of particular concern and any for which the decline exceeds 50% would be of considerable concern. These thresholds could of course be modified but in the absence of a strong argument to do those already used by WeBS Alerts would seem appropriate.

Setting aside any arguments relating to any legislative considerations, which may guide which of the various metrics should underpin the assessment of change to be used or the desire to retain comparisons already in use, we can explore their relative merits by considering which are most consistent.

Of the metrics relating to the raw peak values, those that do not rely on the five-year minimum peak are reasonably consistent with the majority of percentage change metrics (percentage change in both mean-peak, and max-peak only being at odds with the majority in 9% of cases) whereas those which depend on minimum peak for a five-year period are frequently at odds with the majority (KNF in 39% of cases, minimum in 30% of cases). This is not unexpected as minimum and maximum values relate to a single winter and so will correspond to uncharacteristic winters should any exist within the five-year period. It is perhaps more common to get an unexpectedly low number of waterbirds on a site in a given winter than it is to get unexpectedly high numbers because the last is to some degree "capped" by carry capacity and buffered from sudden change by the sizes of the populations from which it draws birds, whereas the first can result from a number of stochastic and short-term factors such as a severe winter event, high disturbance or other factors causing abnormal bird behaviour. Furthermore, given an annual peak may be underestimated if there are one or more missing counts that coincide with periods of peak abundance, the minimum peak is especially vulnerable to incomplete data.

Of the metrics relating to the GAM-modelled trend values, that based on the five-year mean agrees with the majority of percentage change metrics in 98% of cases. That based on the KNF approach is again the metric that stands out as least consistent with the majority, although together with that based on minimum-peak are, as expected, in agreement more often when referencing the GAM-modelled trend values than the raw values. It is not clear why the modelled approach has not had the same effect on maximum-peak.

The current KNF approach is a conservative estimate of change in that it takes the "worst" winter from the designation period and the "best" winter from the current period. With reference to the data underlying the summary statistics in table 3 (see Excel sheet'AssemblageSummaries) it becomes apparent that where KNF approach agrees with the majority of metrics this is for cases where the majority suggest no decline (91%) and of those cases where KNF is at odds with the majority it is where KNF misses (82%) rather than underestimates the decline. Thus the agreement with the majority assessment is substantially related to those cases where the majority assessment itself suggest no decline i.e. those cases where a particularly conservative assessment be unlikely to be at odds.

Considering the KNF equivalent based on the GAM modelled trend of those cases where the KNF equivalent agrees with the majority assessment a lower proportion of these relate to no decline (77%) than when using the raw values. Similarly, in those cases where the KNF equivalent disagrees with the majority assessment a lower proportion of these are due to missed declines rather than underestimates of decline (55%). Thus although using a KNF equivalent approach based on the GAM modelled trend rather than the raw values is still a conservative approach it is less biased than when using the raw values.

Clearly the metric of change with the greatest agreement with the majority assessment is that based on the comparison of peak-means derived from the GAM-modelled trend. Both this metric and that based on mean of peaks of the raw data have the advantage of similarity to the five-year peak-mean typically used to characterise wintering waterbird numbers.

Thus the decision needs to be made by NE as to whether in their assessments they wish to be cautious not to raise concern when it may be unwarranted or wish to be cautious not to overlook a potential cause for concern. The last is more in keeping with the generally favoured precautionary approach to conservation assessments.

Consequently:

- The metric that is most robust to fluctuation around the underlying trajectory of the trend and most in keeping with the precautionary principal would be that based on the five-year average of the GAM-modelled values (DeltaGAMmean).
- The current KNF based on annual-peaks from the five-year windows is that most vulnerable to years when waterbird numbers are unexpectedly low or missing data and adhere least to the precautionary principal of assessment.

- The equivalent to KNF, based on GAM-modelled trend rather than raw annual peaks might provide a reasonable compromise if there is a desire to maintain degree of consistency of concept with previous assessments while taking advantage of the benefits of the GAM-modelled trend.
-

We considered two possible metrics for quantifying the absolute change in the species richness between the two periods: the 'Inclusive Change' which considers absolute change in the number of species recorded when including all non-breeding waterbirds with the exception of non-natives recorded on the SPA in question, and; the 'Exclusive Change' which in addition to non-natives also includes vagrant species and species that occur only occasionally in the non-breeding waterbirds assemblage. Vagrant species would include naturally occurring species such as short-billed dowitcher or pectoral sandpiper. Uncommon non-breeders would include species such as dotterel or stone curlew.

The reasoning behind excluding these occasional species is an effort to avoid a theoretical situation where an 'important' (i.e. regularly occurring and in non-trivial numbers) species is lost from a site but this does not have a negative impact on the species richness because an occasional species happens to be recorded in the current period. For example, if purple sandpiper were to be lost from the Northumbria Coast SPA this would give great cause for concern because not only is it part of the non-breeding waterbird assemblage, but it is also a qualifying feature of that SPA in its own right. However, if a new vagrant species happened to be recorded during the most recent five-year period, maybe even on only one occasion, this would negate the loss of purple sandpiper when considering the Inclusive Change but not when considering the Exclusive Change.

That said, in most cases both the Inclusive and Exclusive flagged the same sites as having lost species. The Inclusive Change flagged five SPAs and the Exclusive Change flagged the same five sites plus one other. In the case where a decline in the number of species recorded has been flagged the split between which metric detected the greatest loss in species was even at three SPAs each. However, overall the Inclusive Change detected higher losses of species on 38 out of 56 SPAs than did the Exclusive Change whereas the Exclusive Change only detected higher losses on nine SPAs. Overall the Inclusive Change reported an average increase of 2.6 species more than the Exclusive Change. Even so, the Exclusive Change in species would intuitively be the more robust assessment.

Given that the designation period for some of the sites extends back before all species of waterbird were routinely recorded by WeBS (1993/94) and the incremental addition of a small number of species starting in 1982, there will be a bias toward the positive in the comparison of species richness. Thought therefore needs to be given as to whether to base the change in number of species to wildfowl and waders only so that designation period and current period would be comparing like with like. The drawback of doing so would be that species such as cormorant, coot, little and great crested grebes would be amongst those excluded. The latter two especially may only be present in small numbers, even when a qualifying features in their own right, and therefore susceptible to being lost.

4.2 Qualifying Features

When considering assessment of individual qualifying features between the period of designation and the most recent five-year period, the same arguments can be made for the various metrics of change as made for the waterbird assemblage. Again changes based on the average over the five year periods appear to be most appropriate and the current KNF based on annual-peaks is most vulnerable to uncharacteristic winters or missing data.

Again if is for NE to decide whether they want to follow a precautionary approach to the assessment of change for qualifying features or whether to continue to follow a conservative approach. Either way it should be consistent between qualifying features and assemblage.

4.3 Comparison with Published Alerts

Currently, the WeBS Alerts report considers changes in the abundance of qualifying features on a site by site basis over the most recent 5, 10 and 25 winters. The WeBS Alerts also report change in abundance since designation, but actually takes the year of the citation rather than the designation period that the citation relates to. Because of this, one aim of this pilot study was to compare the percentage change since year of classification as currently reported by WeBS Alerts with the equivalent when using the period of designation cited by the SPA classification. Although this has been undertaken and results are available in the Excel Workbook accompanying this report, it is less informative than envisaged as the differences in percentage change (essentially Alerts status) between the two methods are influenced not only by the differences in analytical approach but also by the markedly different baseline winter/period used. Accordingly, further discussions around these comparisons are not warranted.

Perhaps more pertinent to the issue, it should be noted that the reporting of the change in abundance since year of classification implemented in the WeBS Alerts report was originally included in response to a request from NE to aid assessment for Common Standards Monitoring. It therefore seems appropriate to either modify the outputs of the WeBS Alerts report in this particular respect to better serve the needs of Common Standards Monitoring or to drop the since designation assessment from the future WeBS Alerts reports and incorporate a separate CSM report to sit alongside the Alerts report. This would seem preferable to publishing two alternative since-designation assessments which will inevitably lead to more confusion than at present, especially given that the way this comparison has been implemented in the WeBS Alerts reporting may well have been the result of miscommunication in the first instance. To this end we recommend that this should be brought to the attention of the WeBS Steering Group. The second the two options may be preferable given that the short-, medium- and long-term assessments published by WeBS Alerts would remain based on the comparison between values for specific winters on the GAM-modelled trend whereas the since-designation assessment is likely to be changed to using values derived over five-year periods.

4.4 Moving Forward

The work reported here was considered to be a pilot study to consider how a modelling approach similar to that used by WeBS when reporting Alerts might enhance the current approach to assessment of the conservation state of Spas made within the framework of CSM.

Although decisions still need to be made as to precisely which would be the preferred metrics for use in the future, should NE wish to move forward with these developments the work undertaken for this report has meant that the necessary analytical programs and integration with the WeBS database has already been undertaken. Subject to minor modification to report only those metrics NE may wish to retain and a little back-ground work to understand better any data issues affecting the earlier years of the time-series, although going a little beyond a standard data request, this means it would be a straightforward task for WeBS to provide updates of the spreadsheet and assemblage plots to NE in the future (potentially as work on call-out contract). However, NE may wish to consider funding work to integrate this into the standard WeBS online reporting to enable WeBS to automatically deliver customised material to support CSM either annually or following a periodic cycle such as is done every third year for WeBS Alerts.

It would also be relatively straightforward to undertake a similar analysis for other protected sites including SSSIs. Indeed, little if any development would be required to run the analysis for the equivalent to the waterbird assemblage for those SSSIs currently reported by WeBS Alerts. However, WeBS Alerts only includes those SSSIs not underpinning SPAs. To extend this to include SSSIs that underpin SPAs would require a relatively straightforward albeit considerable amount of GIS work to define those SSSIs in terms of WeBS count sectors. The latter is work that WeBS would like to complete in due course to enable the WeBS Alerts online report to consider all SSSIs with non-breeding waterbird interest but at present there are insufficient funds available to allow this task to be tackled. Currently, new SSSI spatial definitions are only being created as and when required to service data requests. However, once this task has been completed it will enable WeBS to deliver separate Alerts and potentially CSM assessment for each of the multiple SSSIs that underpin many of the larger SPAs (e.g. the six SSSIs underpinning the Severn Estuary SPA). There are also issues when considering individual species in that many SSSI notifications do not go into detail beyond “waterbirds such as …”, or “waterbirds including …” rather than providing definitive lists. However, running analyses for all species with sufficient data to support a GAM-model may be a solution here.

References:

Cook, A.S.C.P., Barimore, C., Holt, C.A., Read, W.J. and Austin, G.E. (2013). *Wetland Bird Survey Alerts 2009/2010: Changes in numbers of wintering waterbirds in the Constituent Countries of the United Kingdom, Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs).* BTO Research Report 641. BTO, Thetford.http://www.bto.org/volunteer-surveys/webs/publications/webs-annual-report