England Biodiversity Indicators 2020

This document supports
18. Spring Index

Technical background document:
Advice on the calculation of the Spring Index

For further information on the England Biodiversity Indicators visit
https://www.gov.uk/government/statistics/england-biodiversity-indicators

Calculation of the UK Spring Index

The Spring Index is calculated from the annual mean observation date of the following 4 biological events: first flowering of hawthorn (*Crataegus monogyna*), first flowering of horse chestnut (*Aesculus hippocastanum*), first appearance of orange tip butterfly (*Anthocharis cardamines*) and first sighting of a swallow (*Hirundo rustica*).

Until 2018 the overall index was compiled by calculating an annual mean across all sites where all 4 biological events were recorded. For example, in the year 2000, there were 126 locations in the UK recording all 4 events. For these locations a simple single average was calculated and was the Spring Index for that year, for example the average of 504 (equals 126 multiplied by 4) records. As there was no missing data the Spring Index could be calculated in 2 ways: the average of the four events or the average of the 126 locations (the same value will be returned). After the spring index is calculated the raw data was not used in the calculation again.

In order to include more data in the calculation the method was changed in 2019 and the overall index was compiled by calculating an annual mean for each species using all available data, and averaging these 4 means. This new method of calculation (see “Background and Further Information” section, below), has been applied to all previous years retrospectively and will be submitted for external review.

The number of locations will vary from year to year. The Spring Index varies year to year mostly because of differences in the temperature.

The average date of these events is now (1998 to 2019) about 8.4 days in advance of the average for the period 1891 to 1947. The Index shows a very significant relationship with mean March to April Central England Temperature, which appears to be stronger when mean temperatures exceed 7 degrees Centigrade. For the UK Spring Index, the relationship in years with mean March to April temperatures below 7 degrees centigrade was:

Spring Index = 147.7 minus 3.24, multiplied by Temperature, R to the power 2 = 36.6%, p being less than 0.001

The equivalent for years when mean March-April temperatures equalled or exceeded 7 degrees Centigrade was

Spring Index equals 175.1 to 7.33 multiplied by Temperature, R to the power two equals 80.2 percent, p being less than 0.001

Data for the 1891 to 1947 period comes from the phenological network of the Royal Meteorological Society as published in the Quarterly Journal of the Royal Meteorological Society. This was a voluntary network of recorders that submitted their phenological observations to a central coordinator. All these data have now been digitised and loaded into the Nature’s Calendar database. The UK Phenology Network/Nature’s Calendar project runs along broadly similar lines. As a citizen science project it also involves volunteers contributing their observations and is run and coordinated by the Woodland Trust. Here we use their data from 1998 onwards. The number of records varies from year to year, but the current scheme is substantially bigger than the earlier one.

Since locations reflect the distribution of volunteer recorders they are not evenly spread across the country, but rather reflect the density of human population, with a greater number of recorders in the South to East and fewer in the North.

The reliability of the data is dependent on the frequent and timely observations of the natural world by the volunteer recorders. The data show such a strong relationship with temperature that we have confidence in their reliability.

Background and Further Information.

- Previously, the spring index was calculated using only data from locations for which **all four** spring index species have been recorded. Recorders gave a postcode and could record anywhere within 10 km of that postcode.
- However, in 2017 (when Nature Calendar's website was launched), recording location changed to plotting records on a map and each recording location is now the area of a circle with only a 20 metre radius.
- This change means that it is much less likely that a single recorder can record **all four** spring index species in a single location.
- The new method (as applied to data utilised in the 2020 publication) takes into account all the individual sightings submitted.
- Consequently, the new method increases the amount of data that can be used in the calculation. It also allows an additional year of data (i.e. 1998) to be included in the dataset.